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**A STUDY TO ASSESS THE GERIATRIC NUTRITIONAL RISK INDEX AMONG THE GERIATRIC ADMITTED IN MEDICAL AND SURGICAL UNIT**

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**<sup>1</sup>Linda Xavier and <sup>2</sup>Sivaranjani P**<sup>1</sup>Department of Child Health Nursing, Saveetha College of Nursing, SIMATS, Thandalam- 602105 Chennai Tamilnadu, India<sup>2</sup>B.Sc(N) Final Year, Saveetha College of Nursing, SIMATS, Thandalam- 602105 Chennai, Tamilnadu, India**ABSTRACT**

Elderly individuals are at the greatest risk of accidents due to accidents which leads to the consequences of fractures, immobility, and even sometimes death. In addition to pain, a femoral fracture results in curtailment of physical activity, increased dependence, and rapid worsening of the health status. The older people with femoral fractures are often malnourished at the time of fracture, and subsequently have poor food intakes. Malnutrition is frequently underdiagnosed in geriatric patients and is considered to be a contributing factor for worse outcomes during hospitalization or after fracture surgery.

**INTRODUCTION**

In hospitalized patients, Malnutrition is commonly associated with an increased risk of complications, a longer hospital stay, and a higher mortality rate among hospitalized patients. The prevalence of malnutrition in severely injured patients ranges from 7% to 76% depending on the assessment tool for nutritional status and the study population. Even though there are various nutrition screening and assessment tools for the clinical setting, there is no recommended gold standard for nutritional assessment. The nutritional status has been considered important for elderly Patients.

The geriatric nutritional risk index (GNRI) was reported to be a very simple and objective method based on body weight, height and serum albumin levels to assess the nutritional status in a number of pathological conditions. The GNRI has also successfully predicted mortality in both elderly people and chronic HD patients.

The geriatric nutritional risk index (GNRI) was reported to be a very simple and objective method based on body weight, height and serum albumin levels to assess the nutritional status in a number of pathological conditions [7, 8]. To date, the relationship between the GNRI and mortality in hemodialysis patients has not been thoroughly studied. Some studies have investigated the reliability of the GNRI in assessing malnutrition and predicting overall mortality in chronic HD patients [8-11]. The GNRI has also successfully predicted mortality in both elderly people and chronic HD patients [12]. In other studies, however, GNRI has not been found to be a reliable predictor of all-cause and cardiovascular mortality [13-14]. Because of on this uncertainty we decided to conduct a meta-analysis of cohort and case-control studies to summarize the available evidence regarding the association of the GNRI with mortality in chronic hemodialysis patients.

The geriatric nutritional risk index (GNRI) calculated as  $1.489 \times \text{albumin (g/dL)} + 41.7 \times (\text{current body weight/ideal body weight})$  is useful in identifying high-risk for malnutrition in elderly patients with subacute or chronic diseases.

**METHODS AND MATERIAL**

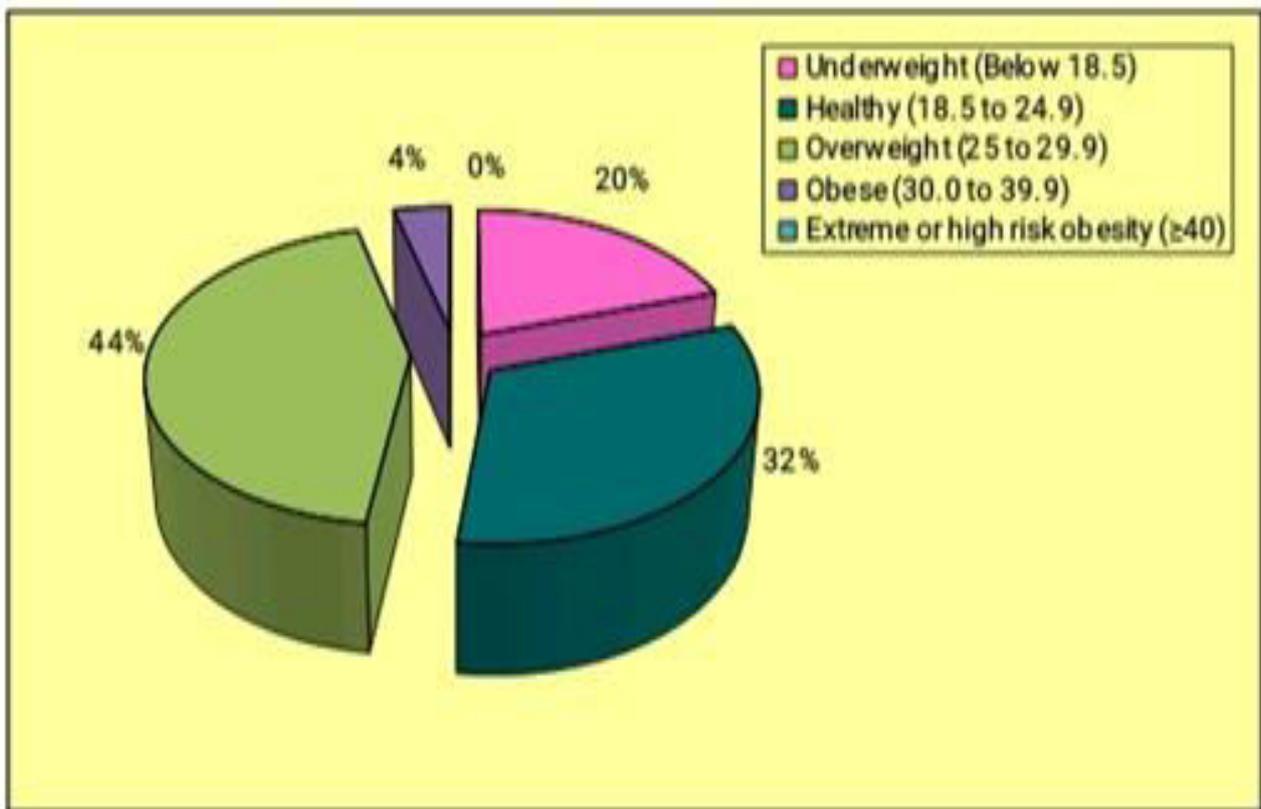
The methodology of the research study is defined as the way the information is gathered in order to answer elderly patients with subacute or chronic diseases. the question or analyze the research problem. It includes aspects like research design, setting of the study, population, and sample, sample size, sample technique, and criteria of the sample selection, scoring interpretation, data collection procedure and data analysis. Data were analyzed using descriptive and inferential statistics. The Descriptive study Frequency and percentage distribution were used to analyses the demographic data of geriatric patients. Mean and standard deviation was used to assess the geriatric nutritional risk index among geriatric patients.

**RESULTS AND DISCUSSION**

This chapter deals with analysis and interpretation of the data collected from 25 geriatrics. The data was organized, tabulated and analyzed according to the objectives. The findings are presented under the following sections.

**Table 1:** Frequency and percentage distribution of demographic variables of geriatrics.

Demographic variables	Frequently	Percentage
<b>Age in year</b>		
61-70	16	64.0
71-80	8	32.0
>80	1	4.0
<b>Gender</b>		
Male	16	64.0
Female	9	36.0
<b>Occupation</b>		
Working	5	20.0
Not working	20	80.0
<b>Religion</b>		
Hindu	16	64.0
Christian	6	24.0
Muslim	3	12.0
Others	-	-



**Percentage distribution of BMI of the geriatrics**

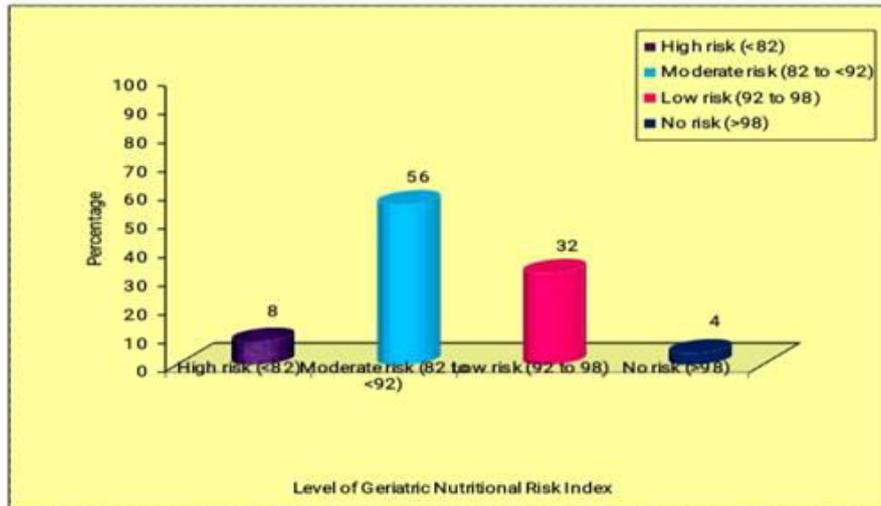
The Table 1 shows that most of the geriatrics, 16(64%) were aged between 61 – 70 years and were male, 20(80%) were not working, 16(64%) were Hindus and had no co-morbidities and 11(44%) were overweight

**Section B: Assessment of Level of Geriatric Nutritional Risk Index among Geriatrics.**

**Table 2:** Frequency and percentage distribution of level of Geriatric Nutritional Risk Index among geriatrics

Level of geriatric nutritional risk index	Frequency	Percentage
High risk (<82)	2	8.0
Moderate risk (82 to <92)	14	56.0
Low risk(92 to 98)	8	32.0
No risk (>98)	1	4.0

The table 2 shows that, 14(56%) had moderate risk, 8(32%) had low risk, 2(8%) had high risk and only 1(4%) had no risk.



Percentage distribution of level of Geriatric Nutritional Risk Index among geriatrics

Table 3: Assessment of mean and standard deviation of Geriatric Nutritional Risk Index among Geriatrics

Variables	Score
Minimum score	18.10
Maximum score	39.90
Mean	23.87
Standard deviation	4.98

The table 3 depicts that the mean score of geriatrics nutritional risk index was 23.87±4.98. The minimum score was 18.10 and the maximum score was 39.90.

Section C: Association of Level of Geriatric Nutritional Risk Index with Selected Demographic Variables

Table 4: Association of level of Geriatric Nutritional Risk Index among geriatrics with their selected demographic variables

Demographic variables	High Risk		Moderate Risk		Low Risk	No Risk	Chi- square test and p value
	F	%	F	%			
Age in years							
61-70	2	80.0	9	36.0	20.0	0	
71-80	0	0	5	20.0	8.0	4.0	
>80	0	0	0	90	4.0	0	
Gender							
Male	2	8.0	9	36.0	20.0	0	
Female	0	0	5	20.0	12.0	4.0	
Occupation							
Working	2	8.0	8.0	1	4.0	0	
Not working	0	0	48.0	7	28.0	4.0	
Religion							
Hindu	2.0	8.0	7	28.0	24.0	4.0	
Christian	0	0	5	20.0	4.0	0	
Muslim	0	0	2	8.0	4.0	0	
Other	-	-	-	-	-	-	
Co-morbidities							
Yes	1	4.0	5	20.0	8.0	4.0	
No	1	4.0	9	36.0	24.0	0	
BMI							
Underweight (Below 18.5)	2	8.0	2	8.0	4.0	0	
Healthy (18.5 to 49.9)	0	0	4	16.0	16.0	0	
Overweight (25 to 29.9)	0	0	8	32.0	12.0	0	
Obese (30 to 39.9)	0	0	0	0	0	4.0	

Demographic variables	High Risk	Moderate Risk	Low Risk	No Risk	Chi-square test& p value
Extreme or high Risk obesity (>40)	-	-	-	-	

The table 4 shows that the demographic variables occupation (( $\chi^2=8.817$ ,  $p=0.032$ ) and BMI (( $\chi^2=34.821$ ,  $p=0.0001$ ) had shown statistically significant association with level of geriatric nutritional risk index among geriatrics at  $p<0.05$  and  $p<0.001$  level respectively and the other demographic variables had not shown statistically significant association with level of geriatric nutritional risk index among geriatrics.

## CONCLUSION

This study demonstrated that GNRI could serve as a useful screening method to identify high-risk malnutrition in geriatric patients and it was found the geriatrics patients had moderate nutritional risk index score

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Nil

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## AUTHORS CONTRIBUTION

All the authors actively participated within the work of the study. All authors read and approved the final manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest

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**SOCIODEMOGRAPHIC MODALITY - INTERCOMPARATIVE STUDY OF BUYING PATTERNS OF RURAL CONSUMER FOR HAND WASH DURING COVID 19****<sup>1</sup>Ali Abbas Rizvi, <sup>2</sup>Dr. Arun Bhadauria and <sup>3</sup>Prof. Bimal Jaiswal**<sup>1</sup>Research Scholar and <sup>2</sup>Assistant Professor, Amity Business School, Amity University, Uttar Pradesh, Lucknow Campus, India<sup>3</sup>Professor, Department of Applied Economics, University of Lucknow- 226007**ABSTRACT**

*The rural Indian market is untapped till now for hand wash. The condition of hand hygiene is deplorable. The companies take the condition of hand hygiene as an opportunity with corporate social responsibility. The companies educate the potential buyers through advertisements. The socio-demography of rural India is an opportunity for marketers. The buying pattern of rural consumers for hand wash is somehow influenced by socio-demography like gender, occupation, income, internet, and social media in COVID-19. Each component significantly affects the buying pattern of rural consumers for hand wash. In gender comparison, reliability and trust become the major factor for buying patterns for the hand wash; that is why the transaction, preferential, and explore have more mean scores than referential. The referential z score is insignificant. Preferential and explore components of buying patterns have significant values ( $p < .001$ ) for occupation. The study suggests that income affects the preferential ( $p < .001$ ) and explore ( $p < .001$ ) component of buying patterns. The internet plays a crucial role for transactional and explore ( $p < .001$ ) component of buying pattern for hand wash. Social media significantly affect the transaction of hand wash.*

**INTRODUCTION**

Until now, the Indian rural market for hand wash has been unrivalled. The time of pandemic COVID -19 catalyses the selling of handwash in rural markets. Hand washes are classified solely based on the degree of protection offered to consumers. How much protection consumers get after using a hand wash indicates their level of satisfaction, which influences their buying patterns. Satisfaction is a general attitude toward a producer or an emotional response to the gap between expectation and reality in terms of need fulfilment. (Hansemark & Albinsson, 2004). The sociodemographic profile of potential buyers have effect on buying patterns through the level of satisfaction achieved by it. According to various industry studies, Reckitts Benckiser, HUL, Godrej, and Dabur India account for more than 70% of the market. India's rural consumers rely on Medimix, Hamam, Chandrika, Dettol, Savlon, and Lifebuoy for personal care products. (India Hand Hygiene Market Outlook, n.d.)

Oday, more emphasis is being placed on the role of consumer behaviour in hand wash marketing. Sociodemographic factors are constantly evolving, making it extremely difficult for businesses to compete for consumer and market share. (Khaniwale, 2015) Each company must adapt to market changes to survive. Companies must be aware of their consumers' preferences and buying patterns. Various scholars have dedicated significant effort in recent years to elucidate the buying patterns. The acquisition of information and the integration of knowledge are two critical components of buying patterns. Specific buying patterns are more critical than others, posing a more significant risk or cost. As a result, the level of effort varies. Buying patterns create a customer profile that analyses the characteristics of a product and chooses the one that best meets their specified needs at the lowest possible cost (Hawkins & Mothersbaugh, 2010).

**OBJECTIVE OF THE STUDY**

1. Gender and occupation have a positive influence on the buying pattern of rural consumer for hand wash
2. Income and the Internet (social media) impacted the buying pattern of rural consumer for hand wash

**LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

The physical and mental process series starts with ignition and continues after the purchase is referred to as consumer behaviour (Peter et al., 1999). Market behaviour analysis involves determining what product or service is available to buyers, how the buyer purchases the service or product, and why the buyer purchases the services or products. Consumer behaviour describes how a customer makes buyings and uses goods and services (Lamb et al., 2004). Conduct is "a series of behaviours in which people engage in the existing or perceived use of various market items, including goods and services, ideas, and the economic environment. (Berkman & Gilson, 1974)." Consumer habits are physical and emotional patterns designed to satisfy the needs and demands of customers in the selection, buying, and usage of services and items, as well as in the disposal of goods. Identifies formalised proper Consumer behaviour by researching the factors that affect the gathering, purchasing, and the application of products, services, concepts, and experiences to meet the needs and desires of

individuals or groups. (Wilkie, 1994). The behaviour somehow linked with the socio-demography of the region. It includes gender, occupation, income, internet and social media.

Gender is a significant demographic attribute taken into account when segmenting markets, positioning products, and promoting products. It is crucial to understand how men and women react to business tactics, whether they choose certain goods and brands, and their consumer conduct in making effective strategies.

Some studies involving gender have suggested that women's and men's biological differences are articulated in their attitudes, social relationships, and roles. It is found that tropes of women's and men's roles exist in all cultures. Males are thought to be tougher, more focused, and rational, while women are thought to be more fragile, uncertain, and emotional. (Tifferet & Herstein, 2012)

Meyers-Levy asserts that women carefully analyse the circumstances, activities, and messages they are exposed to products. At the same time, men are goal-oriented and therefore oblivious to news and events that are irrelevant to their goal (Meyers-Levy & Tybout, 1989). Furthermore, males are considered to be more risk-taking when it comes to product preference than females. (Darley & Smith, 1995) Men devote less time comparing competing goods. (Fischer & Arnold, 1990). Men were even less concerned about their look and attire. (Michael R Solomon & Schopler, 1982). They seem to be more deliberate and focused on their product selection. (Costa et al., 2001). Women are more likely than men to show disappointment with products. (Laroche et al., 2000). When receiving product information, women score higher on the opinions of their friends and acquaintances. (Shoaf et al., 1995).

Income level aids the customer in making purchasing decisions, such as whether to spend a certain amount on luxuries or save that amount. Individuals with a higher income level spend more, as their spending and desire for luxuries rises as their income increases. Income is a term that refers to the monetary and natural resources that an individual receives from other individuals or organisations to pay personal expenses. Salary and other sources of activity-based earnings (after taxes) such as transfers, net earnings from business or agricultural activity, land (rent), profits, and other sources of income are included. (Krasko, 2011)

Occupation is a broad word that refers to the profession or sector in which you work or the type of work you enjoy. Additionally, it can refer to your role within an organisation. In a single response, stating your occupation in an interview has consequences for you, your workplace, profession, and future.

An occupation is a job situation that an individual engages in because they have a particular area of interest and specific skills that support that area. The individual may seek employment within a particular occupation, be interested in pursuing a career in that occupation, and follow it as a profession if it needs licensing and certification.

The individual may seek employment within a particular occupation, be interested in pursuing a career in that occupation, and follow it as a profession if the work needs licensing and certification.

According to a new survey, the number of urban user lagging far behind rural users for the first time in India's history. According to the study, women were also listed as a factor in the trend, as were better connectivity and more affordable price plans. Rural areas had 227 million active internet users in November 2019, compared to about 205 million in cities. Internet users who log on at least once a month. Monthly active internet users, estimated at 574 million in 2019, have grown at a rate of 24 per cent per year, implying a 41 per cent overall penetration. The study forecasts 11% growth for 2020 and predicts that there will be 639 million monthly active internet users. (2019, n.d.)

The use of social media as a marketing tool is gaining traction. Because of the increased variety of goods on the Internet, consumers today have more options when making buying decisions. (Kalia et al., 2017) Social networks have evolved into important networking forum for the spread of hearsay messages. Since the phenomenon of hearsay has such a significant effect on consumer's decisions and expectations, companies make greater use of hearsay and think opinion leaders promote their goods and services (Rialti et al., 2017)

#### **HAND HYGIENE- THE INDIA RURAL MARKET**

India has a rural population of 83.5 million people who live in 6.38 lakh villages (Census 2011). The urban-rural distribution ratio is 31.16 per cent and 68 per cent, respectively (Census 2011). Since 2000, rural India's GDP per capita (per person) has increased by 6.2 per cent (CAGR). The FMCG market in rural and semi-urban areas surpassed 20 billion US dollars in 2018 and exceeds 100 billion US dollars by 2025. (Nielsen research). Annual real rural growth per household is expected to increase by 3.6 per cent by 2025, compared to 2.8 per cent over the previous 20 years. ((McKinsey, n.d.). Rural markets have boomed and are outperforming city

markets (Sunil Kataria ). Dabur found a parallel trend in which rural demand has increased at the same time as urban demand (Dabur India Chief Executive Officer Mohit Malhotra).

According to Statista, the personal care market in India was estimated at US\$11.5 billion in 2019 and is forecast to exceed US\$15 billion by 2023. In 2019, the personal care industry accounted for approximately 46% of India's overall beauty and personal care industry.

The effect of COVID 19 and India's various programs, such as Swachh Bharat Abhiyan, creates opportunities for hand hygiene products. Consumer awareness of health and hygiene has risen in both urban and rural India. Hand hygiene, specifically handwashing, has seen an unprecedented rise in India, with substantial penetration. (ITC). So far, the Indian demand for hand hygiene products has been underserved. Rural India's hand-hygiene market will hit 2159 crore by 2025, with a compounded annual growth rate (CAGR) of more than 9%. Lifebuoy (Hindustan Unilever Limited) and Dettol (Reckitt Benckiser) are the two industry leaders in Indian hand hygiene. Fem, like Medimix and Savalon, has a consistent market share in India's overall hand hygiene market. Demand in the rural market is being driven by sachet and miniature packs through our brand portfolio. New releases from our hygiene collection, such as sanitisers and soaps, show early signs of strong demand. (Emami Director Harsha V Agarwal.)

### **BUYING DECISION**

Consumer's decision making has studied from various viewpoints (Hansen, 2005). A consumer used to play the buyer, payer, and receiver positions when making a buying decision in the marketplace (Sheth & Mittal, 2004) Individuals, families, partners make buying decisions and, in some cases, corporate boards of directors. It is a type of information processing act that involves transforming knowledge and information into action (Galbraith, 1974) Several studies have focused on the conventional five stages of decision-making This decision-making process necessitates recognition, knowledge gathering, alternative assessment, buying decisions, and post-buying behaviour (Kotler & Keller, 2006). These five stages of decision-making are the most commonly used techniques for marketers to gain a deeper understanding of their consumers and their actions (Fitzmaurice & Comegys, 2006)

A person's purchasing intentions are their proclivity to buying a specific brand or product (Belch & A. Belch, 2013) Buying intentions reflect a person's likelihood of buying a product (Phelps & Hoy, 1996) According to Spears and Singh (2004), going to battle to buy a brand in the future is wise. It was a part of the customer's cognitive behaviour about purchasing a particular product, brand, or service. (Kwek et al., 2010)

Buying made solely for speculative purposes: This is referred to as conventional decision-making (M R Solomon, 2010) Buying decisions are made effortlessly or with little deliberate effort during this point. The buying decision-making process divided into stages. These phases are as follows: problem identification, alternative search, alternative assessment, buying decisions, and post-buying behaviours. The buying decision-making process shapes consumer purchasing preferences. The buying pattern is composed of four patterns, each of which represents a complete buying decision process. The hand wash manufacturing company concentrated on the purchasing habits of its clients.

#### **The Four Patterns are as follows:**

- A. Transactional decisions: this sign reflects the first or original buying of the hand wash.
- B. Referential decisions: Consumers serve as sociodemographic touchstones for others.
- C. Preference decisions: Due to sociodemographic influences, the consumer prefers hand washing.
- D. Exploratory decisions: As a consequence of the sociodemographic situation's exploratory approach, the rural consumer investigates the hand wash commodity.

Hence from the literature cited, socio-demography has an impact on the buying pattern. The sociodemographic component form the independent variable for buying the handwash. The buying patterns works as the dependent variable for the study. The sociodemographic components includes gender, occupation, income ,use of income and social media. While buying pattern include the transaction, referential , preferential and explore. Therefore we hypothesised that:

1. There is a significant effect of gender and occupation on the buying pattern.
2. There is a significant influence of income and internet(social media) on buying pattern.

**RESEARCH METHODOLOGY**

Respondent of the questionnaire were selected randomly available on local hats. Content validity of questionnaire was sufficiently high with using Cronbach's alpha value 0.780.

The statistical population of the study is the rural consumers of Lucknow, Sitapur, Ayodhya above age of 21. Rural population of India is very large about 83.5 crore. For the large statistical population, 2 stage random clustering sampling method is used. Cluster was formed on basis of Maujas (land revenue division of villages) then the 6 cluster were chosen for the study and 64 individuals were selected from each unit to fulfil the sample size of 384. The sample size was 384. In clustering method Maujas are chosen are some common similarities like geographical condition, lack of basic amenities and less access of technology.

Sample size was calculated on the basis of proportion considering equal response (50%) for each item under null hypothesis and returned to 384.

The empirical sample in this study includes consumers of various brands of hand wash products.

**STATISTICAL ANALYSIS**

The results were analysed using descriptive statistics and making comparisons among various groups. There are 5 intercomparison group are formed namely:

1. Intercomparison Group 1- Gender
2. Intercomparison Group 2- Occupation
3. Intercomparison Group 3- Income
4. Intercomparison Group 4- Internet
5. Intercomparison Group 5- Social-media

Data were summarized as proportions and percentages (%) while discrete (quantitative) as mean(SD). The Mann Whitney test was used for two-category variables and for multiple-category variables the Kruskal Wallis test is used in all comparisons. The Cronbach alpha estimator was used to calculate the data's reliability, which was found to be 0.780.

For statistical analysis SPSS is used.(SPSS version 23.0 SPSS Inc., Chicago, IL, USA). A value of  $p < 0.05$  was considered significant.

**DESCRIPTIVE ANALYSIS**

According to Table No.01, the socioeconomic distribution revealed that the majority of respondents (69.5 percent) were males, their main occupation was farming (34.6 percent), and their monthly income was Rs 5001-7000 in the majority of cases (23.4 percent), but a significant proportion also had monthly income between 9001-11000. The majority (76.3 percent) used the internet and were active on social media (53.6 percent).

Table 02 depicts an intergroup analysis of purchasing pattern components based on gender. Since there are two components of gender, men and women, the Man Whitney test is used. The mean score of the components transactional, preferential, and explore was higher in men than in women of rural population, and the difference was statistically significant ( $p < 0.01$ ). Referential is insignificant in both male and female ( $p > .001$ ).

Table 03 indicates a statistically important difference in preferential and explore components across occupations ( $p < 0.001$ ). The mean preferential score was highest for skilled labour and lowest for farmers, while the explore mean score was highest for farmers and lowest for skilled labour.

The intergroup comparison using the Kruskal Wallis test reveals that income has a substantial effect. Table 04 shows that a statistically significant difference in preferential and explore components by income ( $p < 0.001$ ) was detected. The mean preferential score was highest for the income group Rs 7001-9000 and lowest for the income group Rs 5001-7000, while the explore mean score was highest for the income group Rs  $\leq$  5000 and lowest for the income group Rs 11001-13000.

The use of the internet in rural areas has a huge effect. Table 05 revealed that the mean score of the components transactional and preferential was higher in internet users than in non-internet users. The difference found was significant ( $p < 0.01$ ).

The internet and the availability of social media also affect purchasing habits. Table No.06 shows that the mean score of component transactional was higher in social media users than in non-social media users. The difference found was significant ( $p < 0.01$ ).

Table 01-Socio-Dmographic Details:

Variable	Category	No. (N=384)	%
Gender	Man	267	69.5
	Woman	117	30.5
Occupation	Daily wagers	90	23.4
	Farmer	133	34.6
	MNREGA	91	23.7
	Skilled labour	70	18.2
Monthly Income	<= 5000	67	17.4
	5001 - 7000	90	23.4
	7001 - 9000	52	13.5
	9001 - 11000	70	18.2
	11001 - 13000	63	16.4
	> 13000	42	10.9
Internet Use	No	91	23.7
	Yes	293	76.3
Available on social media platforms like FB, twitter, Ins	No	178	46.4
	Yes	206	53.6

Fig.-01 Socio-Demographic Detail

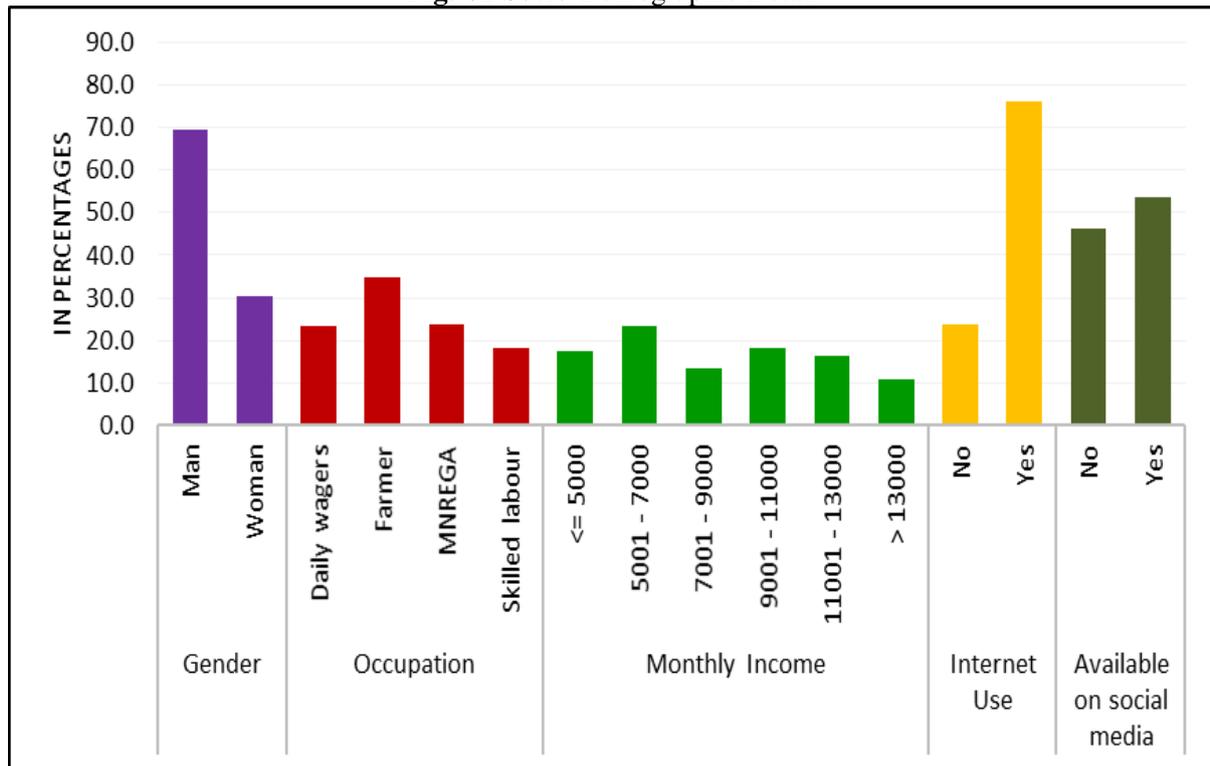
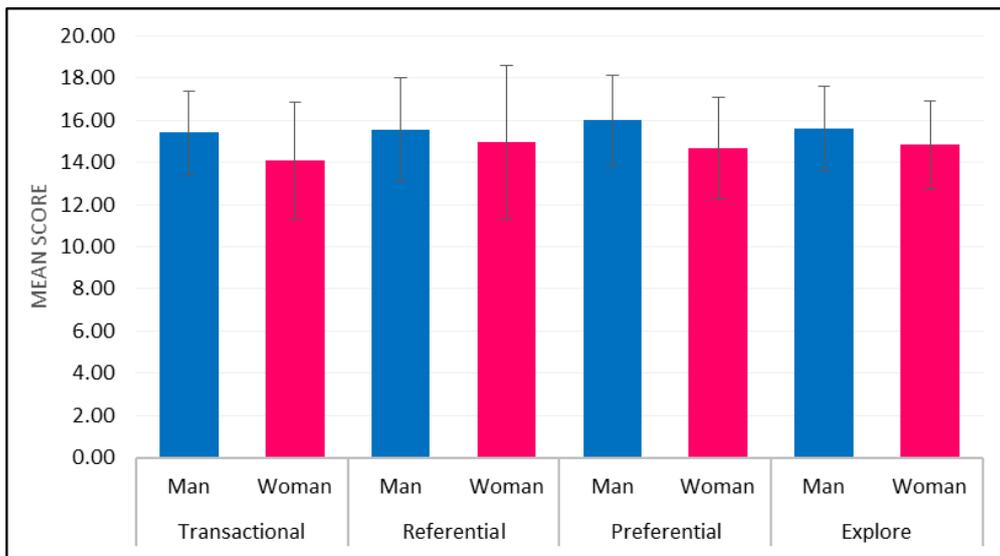


Table 02- Intergroup Comparison of Buying pattern Components according to Gender

Dependent Variable	Gender	Parameter		Mann Whitney Test	
		Mean	SD	z-value	p-value
Transactional	Man	15.41	1.98	-4.59	<.001
	Woman	14.10	2.74		
Referential	Man	15.56	2.44	-0.61	0.539
	Woman	14.97	3.62		
Preferential	Man	16.00	2.14	-4.92	<.001
	Woman	14.68	2.44		
Explore	Man	15.61	1.98	-3.38	0.001
	Woman	14.85	2.10		

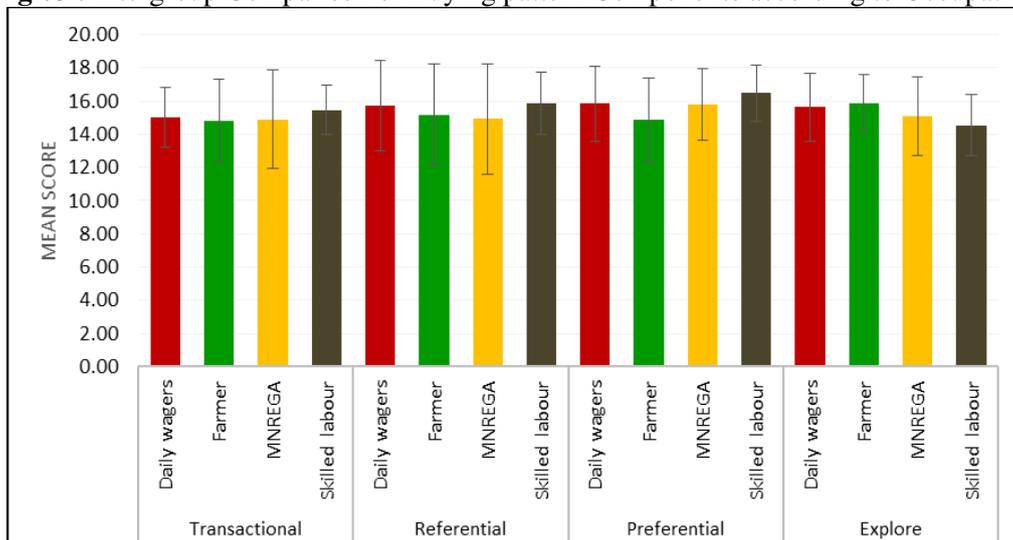
**Fig 01-** Intergroup Comparison of Buying pattern Components according to Gender



**Table 03-:** Intergroup Comparison of Buying pattern Components according to Occupation

Dependent Variable	Occupation	Parameter		Kruskal Wallis Test	
		Mean	SD	chi sq	p-value
Transactional	Daily wagers	15.02	1.80	2.84	0.417
	Farmer	14.84	2.48		
	MNREGA	14.91	2.95		
	Skilled labour	15.47	1.50		
Referential	Daily wagers	15.74	2.71	3.16	0.368
	Farmer	15.19	3.04		
	MNREGA	14.92	3.31		
	Skilled labour	15.87	1.86		
Preferential	Daily wagers	15.83	2.27	20.05	<.001
	Farmer	14.89	2.50		
	MNREGA	15.80	2.18		
	Skilled labour	16.47	1.71		
Explore	Daily wagers	15.62	2.04	19.74	<.001
	Farmer	15.88	1.74		
	MNREGA	15.10	2.36		
	Skilled labour	14.54	1.84		

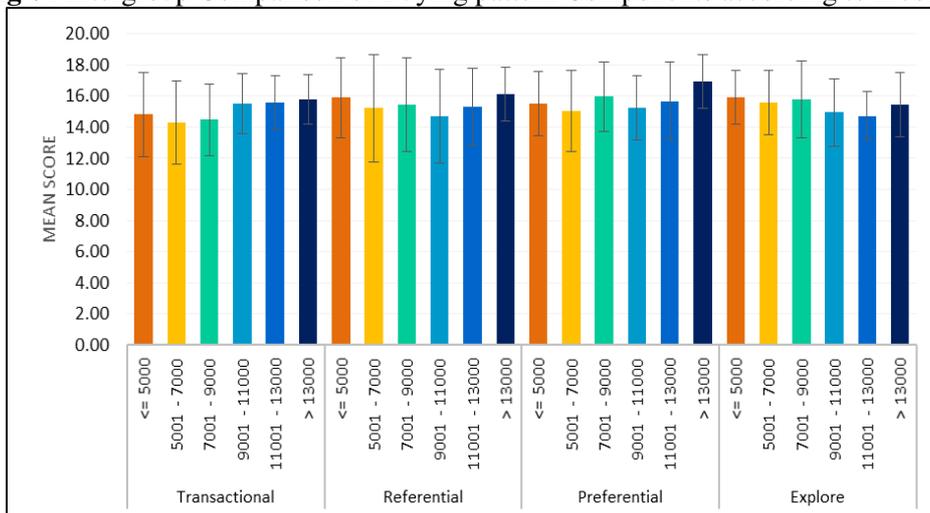
**Fig 03 :** Intergroup Comparison of Buying pattern Components according to Occupation



**Table-04** Intergroup Comparison of Buying pattern Components according to Income

Dependent Variable	Income	Parameter		Kruskal Wallis Test	
		Mean	SD	chi sq	p-value
Transactional	<= 5000	14.81	2.69	2.84	0.417
	5001 - 7000	14.31	2.68		
	7001 - 9000	14.47	2.27		
	9001 - 11000	15.51	1.95		
	11001 - 13000	15.57	1.70		
	> 13000	15.79	1.62		
Referential	<= 5000	15.90	2.57	3.16	0.368
	5001 - 7000	15.23	3.44		
	7001 - 9000	15.46	2.99		
	9001 - 11000	14.69	3.01		
	11001 - 13000	15.30	2.45		
	> 13000	16.10	1.72		
Preferential	<= 5000	15.51	2.08	20.05	<.001
	5001 - 7000	15.05	2.60		
	7001 - 9000	15.96	2.24		
	9001 - 11000	15.26	2.05		
	11001 - 13000	15.68	2.49		
	> 13000	16.93	1.73		
Explore	<= 5000	15.91	1.74	19.74	<.001
	5001 - 7000	15.56	2.05		
	7001 - 9000	15.77	2.47		
	9001 - 11000	14.94	2.14		
	11001 - 13000	14.73	1.58		
	> 13000	15.45	2.05		

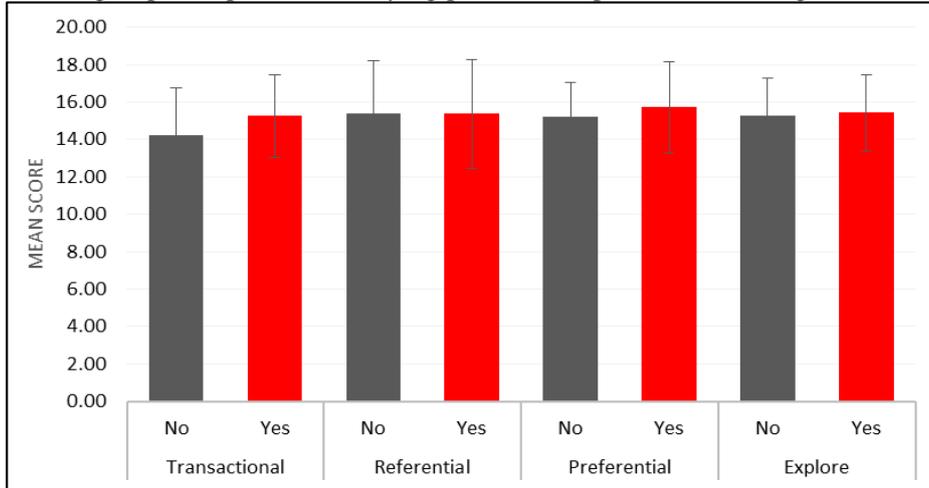
**Fig 04** Intergroup Comparison of Buying pattern Components according to Income



**Table 05** Intergroup Comparison of Buying pattern Components according to Internet Use

Dependent Variable	Internet Use	Parameter		Mann Whitney Test	
		Mean	SD	z-value	p-value
Transactional	No	14.25	2.48	-3.04	<b>0.002</b>
	Yes	15.24	2.22		
Referential	No	15.41	2.78	-0.09	0.925
	Yes	15.37	2.90		
Preferential	No	15.21	1.82	-2.42	<b>0.016</b>
	Yes	15.73	2.44		
Explore	No	15.27	2.02	-0.96	0.335
	Yes	15.42	2.06		

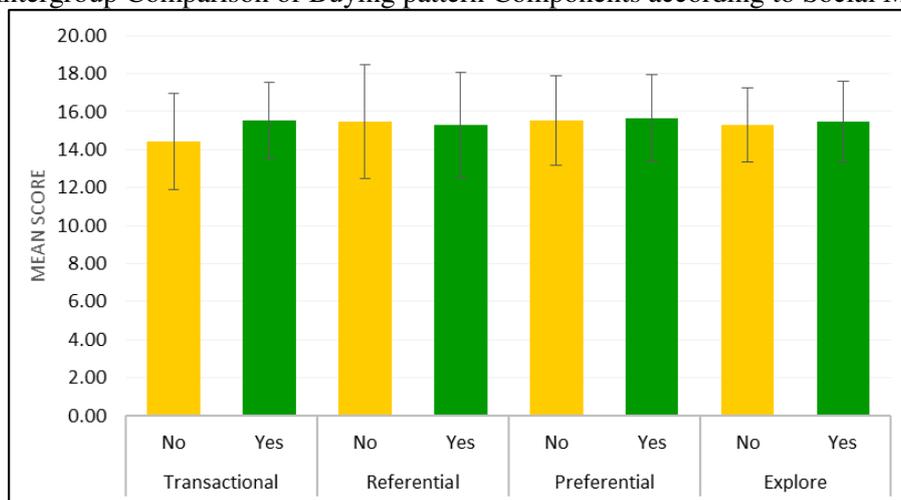
**Fig 05** Intergroup Comparison of Buying pattern Components according to Internet Use



**Table 06-** Intergroup Comparison of Buying pattern Components according to Social Media Use

Dependent Variable	Social Media Use	Parameter		Mann Whitney Test	
		Mean	SD	z-value	p-value
Transactional	No	14.44	2.52	-4.03	<.001
	Yes	15.51	2.00		
Referential	No	15.48	2.98	-0.86	0.392
	Yes	15.30	2.78		
Preferential	No	15.52	2.36	-0.64	0.523
	Yes	15.67	2.27		
Explore	No	15.30	1.95	-1.13	0.260
	Yes	15.45	2.13		

**Fig.06** Intergroup Comparison of Buying pattern Components according to Social Media Use



**RESULT**

**InterComparison-Group1 -Gender**

The gender is the integral part of buying decision. The analysis of gender and buying pattern shows that men have more mean score in transactional, preferential and explore while women have more referential mean score. The women prefer to refer as the women are more depends on hearsay that is they more depend on reference (Shoaf et al., 1995). After analysing of z-value for transaction , referential ,preferential and explore only referential have more p value (p value for referential >.001). Referential for hand wash is insignificant. The gender buyer focused mainly on self-buying rather than making reference for any hand wash. Accenture’s study “Master of Rural Market 2020” suggest that the rural women looked for the reliable and trusted product, they relied more on shop-keepers(ACCENTURE, n.d.)The men too wants the good product, in case of the hand wash the reliability and trust become the major factor for buying patterns, that’s why the transaction, preferential and explore have more mean score and referential z score is insignificant.

**InterComparision-Group2 Occupation**

Occupation plays a vital role in buying patterns. The buying pattern with occupation analysed with Kruskal Wallis test. Occupation is categorised and compare with buying pattern. The test have significant values. Preferential and explore component have the significant values( $p < .001$ ). Analysis shows that skilled labour (16.47) have maximum preferential score while farmer (14.89) have lowest. Farmer (15.88) explore more while skilled labour (14.54) minimum to explore for hand wash. The awareness of hand wash is due to COVID 19, before it the hand hygiene of India was very poor only 23% wash their hand regularly. (Yusuf Kabir, WASH specialist, UNICEF, Maharashtra.). Skilled labour and farmer are closely associated with buying pattern of hand wash. The remaining used due to the current problem that is COVID-19. The Accenture report also backed the this research, according to report 2019 the occupation of rural consumer have positive effect on buying patterns

**InterComparision-Group3-Income**

The income factor is most important for anyone. The current situation somehow cast the opposite shadow. For survival hand wash is the necessary item in buckets of consumers especially for rural India where the health system is not perfect. The study suggest that income have effect preferential ( $p < .001$ ) and explore ( $p < .001$ ) component of buying patterns. In income preferential buying is more in group who earn 7001-9000 rupees and minimum for who earn between 5001-7000 rupees while in explore is maximum for  $\leq 5000$  and minimum in 11001-13000. Sale of hand wash is increased during COVID 19, people wants the best in categories that why they are exploring the new ones. Hand hygiene, specifically handwashing, has seen an unprecedented rise in India, with substantial penetration. (ITC).

**InterComparision-Group4 -Internet**

Accenture report "Master of Rural Market 2019" suggest the penetration of internet in buying pattern of rural consumers. The report said that technological penetration in rural India formed loyalty and trust on the brand (Accenture). In case of hand wash, the internet plays a crucial role for transactional and explore the  $p < .001$  The rising connected customer in rural India was published by Boston Consulting Group (BCG) and examined, among other things, the distinctions between rural and urban Internet users that marketers must consider. ((BUSINESS STANDARD, n.d.). Rural consumers focussed on transactional and preferential component of buying patterns, internet work as a medium to connect with the remaining world. The internet also work as the awareness tools about hand hygiene for rural buyers.

**InterComparision-Group5-Social Media**

The social media working as the perfect tools for both marketers and rural buyers. The use of social media as a marketing tool is gaining traction. Because of the increased variety of goods on the Internet, consumers today have more options when making buying decisions. (Kalia et al., 2017). The study revealed that transaction of hand wash have significant impact with  $p < .001$ . Social media user are connect with outer word so the social media user do transaction of hand wash.

**DISCUSSION**

Gender affects the components of buying patterns. Both men and women have a significant influence on the transactional, preferential, and exploratory components. According to new studies, the current pandemic era corresponds to gender-based buying patterns. The referential is least relevant when it comes to gender-based buying of hand wash.

Undoubtedly, rural consumers from different occupational classes have varying degrees of buying patterns, preferential and exploratory buying patterns of handwashing decisions. However, skilled labour appears to be the most concerned with preferential buying through their hand wash alternative and the least concerned with referential buying. Farmers have the lowest score for preferential buying. However, considerable evidence suggests that the rural consumers' occupation during COVID19 is the source of their preferential and exploratory part.

The incomes of rural consumers have also influenced the preferential and exploratory components. The Accenture study "Master of Rural India" does not comply with the study, but more research is needed.

The effect of the internet and social media on rural buyers' buying habits instils confidence and loyalty in the hand wash. According to IAMAI, there has been a significant increase in internet users and social media penetration. The internet is helpful in purchases and as a preferred method of buying. In contrast, social media focuses on the transactional aspect of buying patterns.

Although previous research has indicated that socioeconomic status may influence some aspects of buying patterns. (Kemper, 1968)(Leigh & Gabel, 1992)

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**MANAGERIAL IMPLICATIONS**

Marketers use the sociodemographic argument to convince customers to buy the product by depicting consumption scenarios. Companies are using famous and attractive individuals to promote products and brands and to use conventional group members as spokespersons in promotional activities. (Majumdar, 2010) Advertising tactics increase brand recognition while decreasing customer imminent risk (Khan & Rehman, 2005) Advertising tactics increase brand recognition while decreasing customer imminent risk (Khan & Rehman, 2005)

Buying patterns components are significantly influenced by gender and often appeals to users' needs for group identity, belongingness, and adherence to sociodemographic norms. Hand washing is a must in today's world. However, rural India's hand hygiene is deplorable. For buying a hand wash, the buyer relies on sociodemographic factors.

According to the report, men focus on handwashing transactions using information obtained from the Internet and social media sites such as WhatsApp, Twitter, Facebook, and pop-up ads. After analysing the world, the internet, and social media, the study discovered that occupation and income earners prefer to buy a hand wash. With this, income also plays a part in exploring the latest brand in the rural sector.

Markets may also segment the rural markets based on sociodemographic susceptibility and buying habits. Rural consumers with a high susceptibility to sociodemographic control are distinguished from those with low susceptibility. Markets also are segmented on different sociodemographic effects, such as intercomparison classes, life gender, profession, income, internet, and availability on social media. Similarly, markets are classified as gender-inclined consumers, occupation-inclined consumers, income-inclined consumers, and internet and social media-inclined rural consumers. Several permutations and variations of sociodemographic power and diverse buying patterns can be made to arrive at new market segments.

Marketers have a simple choice before them: segment the market based on sociodemographic variables for hand washing. The present study's multiple comparison analysis identifies some more susceptible segments to sociodemographic variables, such as gender, income, occupation, internet, and social media. However, these are just surface-level measures of consumer behaviour. According to the researcher, marketers should try to identify the true motivations and drivers of hand wash use by studying consumer psychographics.

**STUDY LIMITATION**

Because of time, money, and respondent willingness, the sample could not be larger than it is now. While this limit the generalisability of the findings, it is considered a critical and cost-effective first step in identifying functional concepts and relationships that can later be evaluated in more elaborate study designs and representative samples.

Since India is a polyglot, multi-denominational, and has a plurality of zones, and the sample drawn may not represent the population, generalisation requires caution. Because of the country's diversity in sociocultural and socioeconomic structures, the results cannot be generalized to the entire country.

The Purposive sampling limits generalisability of research results which does not always imply their applicability in the research. The fact that the study was a convenience sample limits the external validity of the results.

Due to social conservatism in India, there is every likelihood of respondent bias. Respondents may have given socially acceptable responses.

Future research on the foundations of the current research will be a natural extension of this analysis. Based on the information gained from current studies and the researcher's restrictions, certain research areas are being highlighted for potential investigation by researchers. The current study is exploratory, with only a minor impact on theory and practice. The researcher believes an urgent need to perform experimental studies on handwashing (hand hygiene) in rural Indian communities for creating creates causal relationships. Future research should also investigate the degree to which affiliation, the development, and preservation of sociodemographic values are essential factors in understanding hand wash buying patterns and brand preference.

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**STUDIES ON STARTUPS MOTIVES AND CHALLENGES: A BIBLIOMETRICS ANALYSIS WITH SCOPUS DATASET**

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**<sup>1</sup>Dr. Kapil Malhotra and <sup>2</sup>Rubi**<sup>1</sup>Assistant Professor and <sup>2</sup>Research Scholar, Maharshi Dayanand University, Rohtak**ABSTRACT**

*The objective of this study is to conduct a bibliographic analysis of the objectives and challenges of startups. This research attempts to identify the most important journals, inter countries co-authors and countries in this field. Along with this, network maps of inter-country co-authorship and keyword analysis are also shown. In this study the Scopus database has been used to analyze a large amount of data from several papers. And it includes software such as VOS viewer and RStudio, and inter country co-authors used to create network maps and keyword co-occurrence analysis. A search of this research identified the most cited publisher as the "Journal of Business Ventures", and United States is founded as the most productive nation among co-authors and also has maximum institutions for startup motives and challenges. Limitations of this study are that the articles are only searchable in the Scopus database. In the future, additional databases such as the Web of Science and Google Scholar may be used for comparable research. This research contributes to the existing literature on startup objectives and challenges. A fairly complete and reliable image of the region is produced using bibliographical methods. The findings may help guide interested authors in further studies on this issue.*

*Keywords: Startup, startups, motives, motivation, challenge, Vos viewer*

**INTRODUCTION**

Entrepreneurship is the process of developing a unique and value-creating business model, developing new goods or services to meet the needs of consumers, and changing how organizations and people operate and live their lives. (Faltin and Ripsas, 2011). The startup is a temporary business seeking a reproducible, scalable, and successful business model Blank and Dorf (2012) A business must provide its customers a unique good or service that satisfies their needs. Additionally, a business must offer value through its products or services. According to this approach, companies that want to make profits should create a business model that specifies their position, supply chain, and target market. (Costa et al., 2021). Therefore, since the sole owner-manager is often in charge of making crucial business choices, the survival and growth of the majority of these enterprises depends on him or her (Frese, 2000). These variables are often separated into "pull" and "push" factors. Entrepreneurs' motivation levels are determined by these two categories of characteristics, which in turn has an impact on the performance of their businesses. Others are drawn to starting businesses by pull factors, whereas people are compelled to choose self-employment by push forces ("Dawson and Henley, 2012; Isaga. et al., 2015"). Autonomy, independence, social standing, and better personal control are pull factors that encourage people to create their own businesses (Kirkwood, 2009). On the other side, push factors consist of need, inadequate pay, and job unhappiness (Nchimbi, 2002). There are several issues that have been identified as impeding the growth of SMEs, resulting from a variety of internal and external causes. External variables are those over which the entrepreneur has no control. Internal elements, on the other hand, are directly related to the entrepreneur and to certain company traits. Additionally, it is generally known that the motivations for beginning a company have a significant impact on whether business operations begin or continue. The psychological concept of motivation is crucial to the study of entrepreneurship (Delmar and Wiklund, 2008; Henning and Akoob, 2017). The motivation for beginning and maintaining a company is the focus of this concept. The primary motivating theory examined in the literature on entrepreneurship is the desire for accomplishment (Shane et al., 2003; Aramand, 2012). According to the study on this subject, individuals start businesses for a number of reasons, both monetary and non-monetary, including the desire for success and independence, for personal improvement, for an improved social standing, and for community recognition. For instance, entrepreneurs in many developing nations are more likely than their counterparts in wealthy nations to deal with insecure and highly bureaucratic business environments (ILO, 2008). The valuation of startups (Da Silva et al., 2021), fintech startups (Benziane et al., 2022) and pivot decision in startups (Yordano et al., 2021, Jiang et al., 2021) are only a few relevant themes that have been the subject of bibliometric analysis by a number of writers (Chaparro et al., 2021). It became clear from reading the literature that very few studies had provided the kind of bibliometric analysis on startups' motivations and challenges.

**Thus the current study investigates the research questions as follows.**

**RQ1.** which journal has the most Citations?

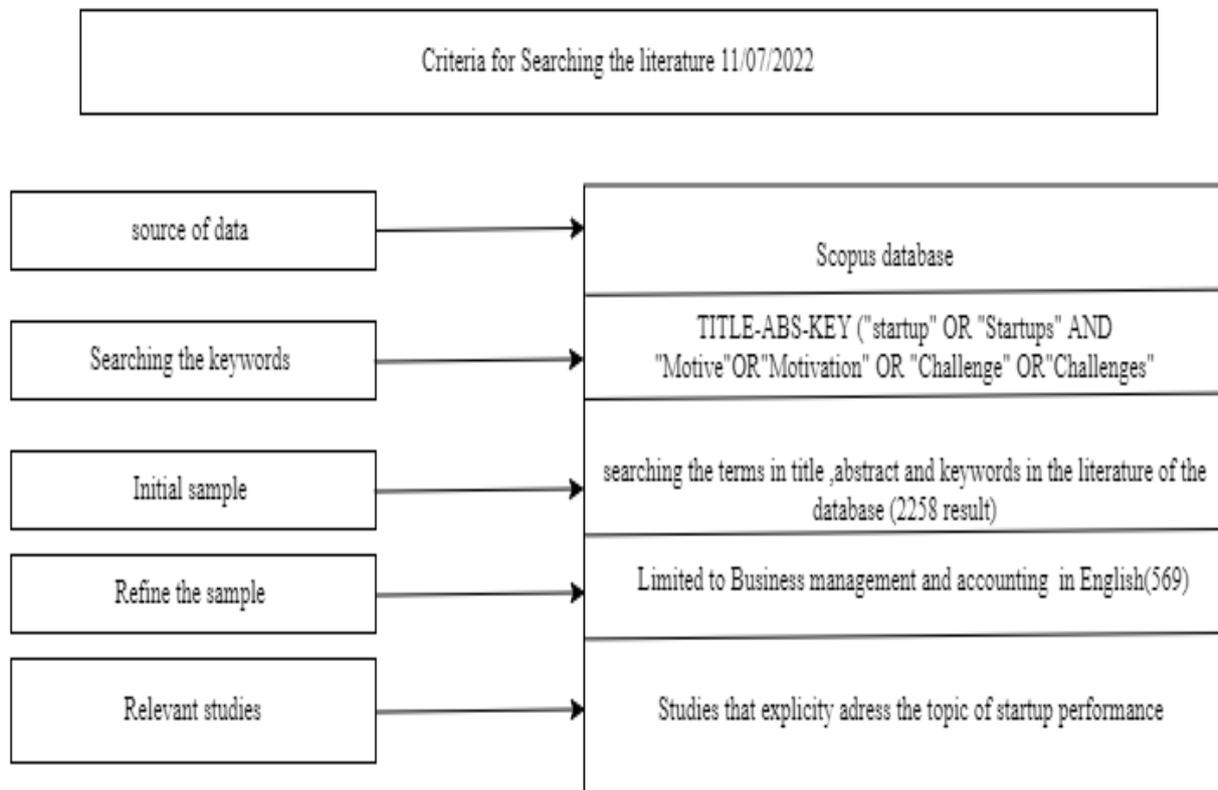
**RQ2.** which are the prolific country and the institution?

**RQ3.** Which authors most often collaborated with authors from different nations?

**RQ4.** What are the most relevant search terms?

**METHODOLOGY**

In this paper, a bibliometric analysis of the research on startups motives and challenge is conducted. This bibliographic study is often used to determine quantitative changes in a certain research area, to identify publication structure on a specific problem, and to estimate publication trend within a specific area. (Lee and Hey,2018; de Bakker et al., 2005). The Scopus database is used for article search and analysis (www.scopus.com). Due to the high quality of its database, the Scopus repository is often used by many researchers to conduct bibliographic analysis. The Scopus database has been used for papers addressing startup motives and challenges. The search terms (TITLE-ABS-KEY) "startup" or "startups" and "motive or motivation" or "challenge" or "challenges" were used for paper searches. The search filter has been used to find only those articles which were related to business management and accounting. On July 11, 2022, the first results for 2,258 documents were obtained using the above search phrase without any filters. And then, after applying subject area and language restriction, a total of 569 papers were retrieved and used for further research. The obtained results were exported to BibTeX and CSV Excel to examine the most important publishers, countries, co-authored with nations, and keyword occurrence.



The two primary studies carried out in this study were performance and science mapping. The performance analysis examines the research output using productivity measures and includes key literature data. Along with reporting on the database finding, network analysis broadens the scope of this study by detecting relationships in the literature.

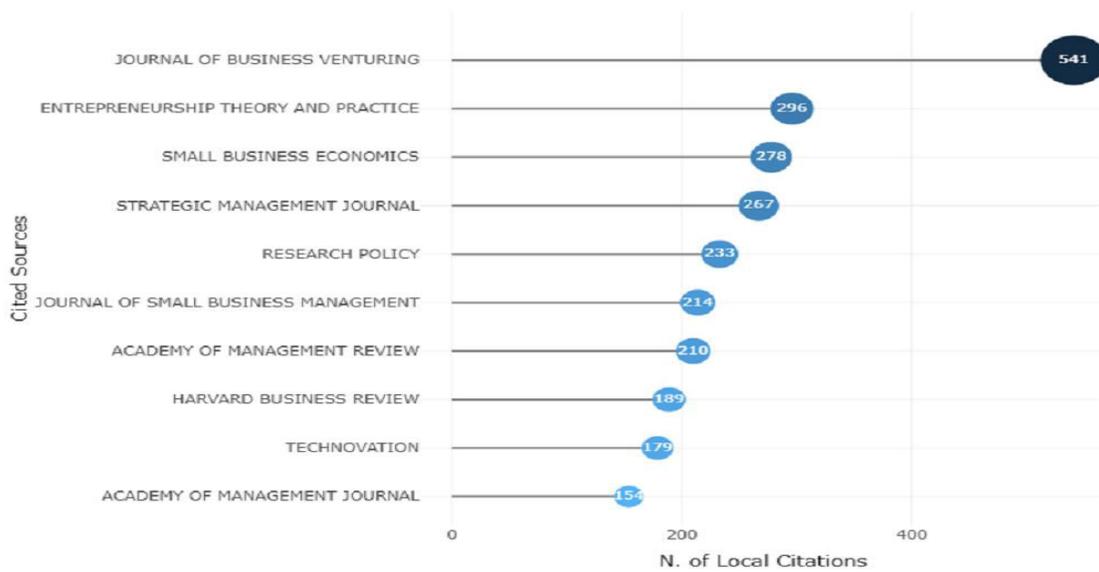
**RESULT AND FINDINGS**

**RQ1. Top 10 most cited source**

Total number of journals that belong to startups motives and challenges are 1042 and total numbers of citations they received are 10,415. In top 10 journals total citations received are 2561 and Figure 1 displays the top 10 journals, has the highest citation in startup motives and challenges. Among these top journals, 3 belong to the Elsevier, one to the springer, two to Wiley, one to Scopus, one to Sage, and two belongs to JSTOR publications.

The journal of business venturing that belongs to Elsevier has the highest number of citations around 541 Citation.It is one of the most active Journal followed by entrepreneurship theory and practice, and small business economics and research policy.

**Figure 1:** Top Ten Journals with Highest citation on Startups motives and challenges

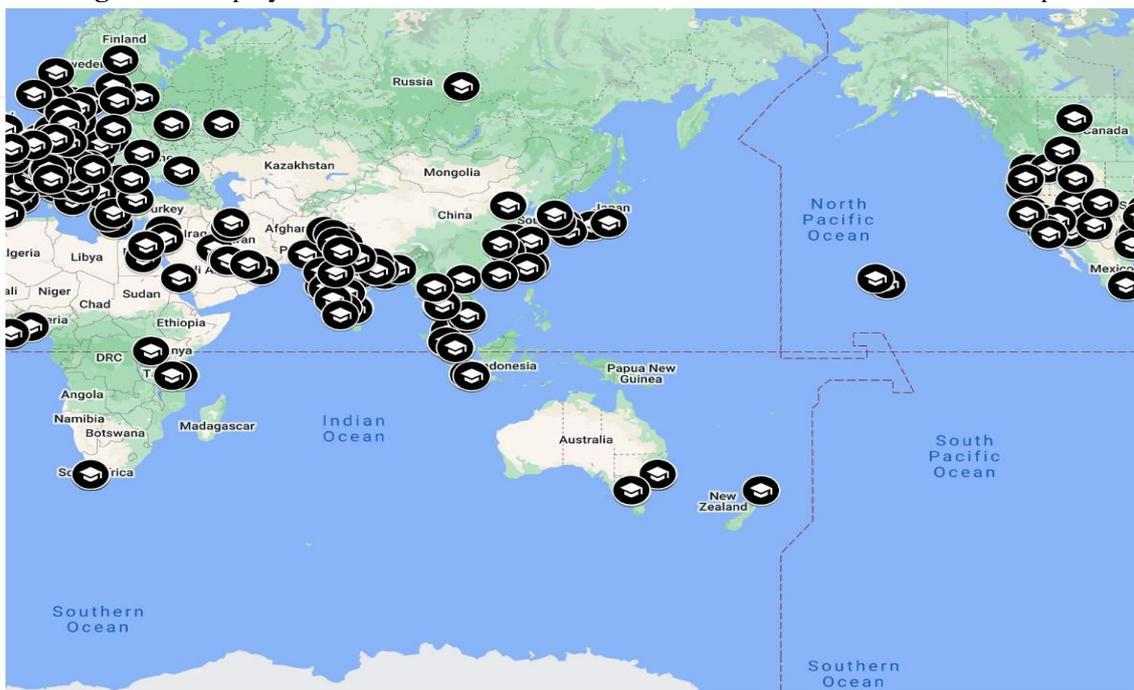


*Source: Figure extracted using RStudio software*

**RQ2. which are the prolific country and the institution?**

Figure2 demonstrates all the institutes that contributes maximum on startup motives and challenges. The USA ranks first with a total of 167 institutions followed by India, and Europe.

**Figure 2:** Displays the location of institutes which contributes maximum on startups.

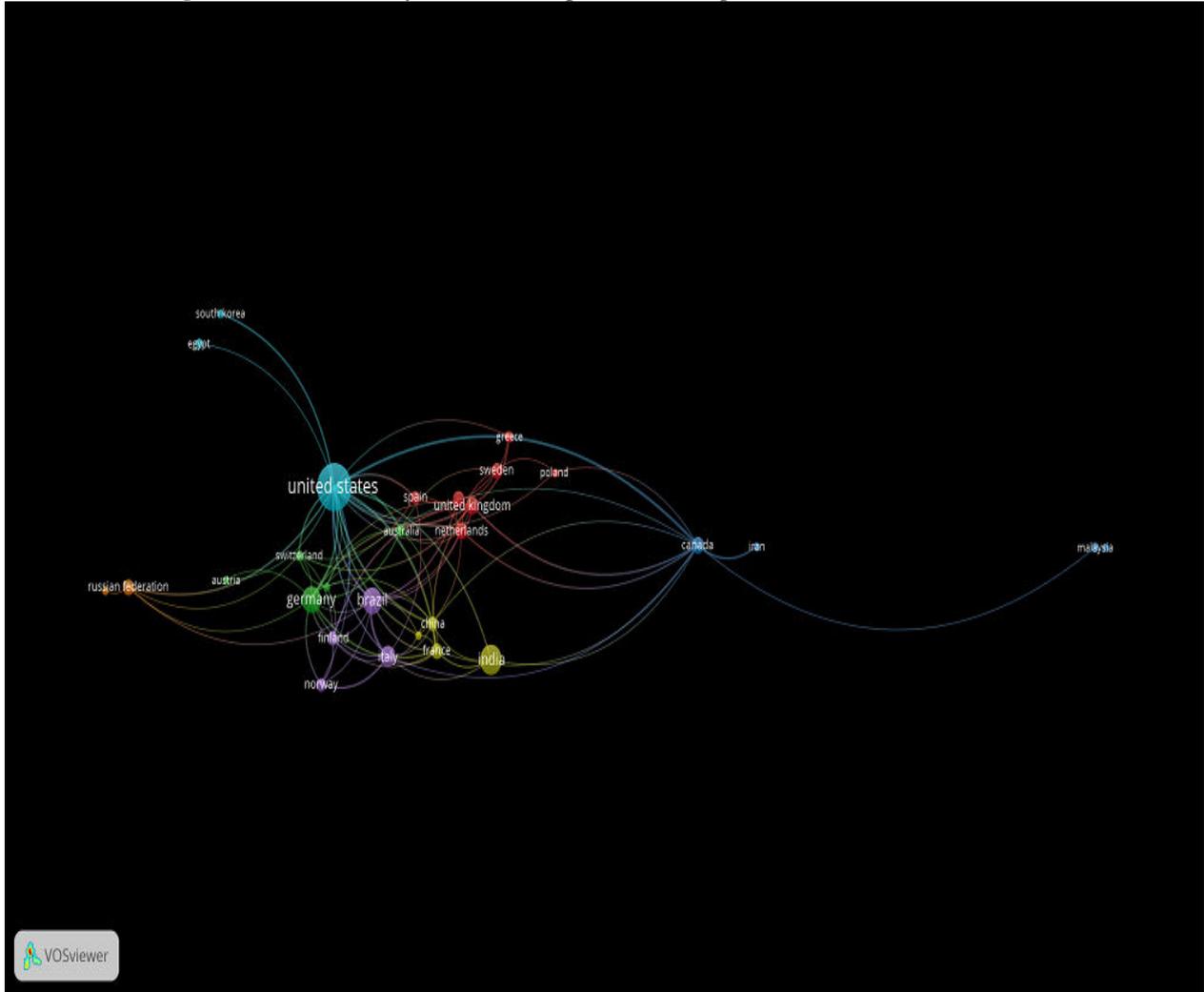


*Source: Figure extracted using Geocoding*

**RQ3 Analysis of the international co-authorship network**

This section has covered the examination of global co-authorship networks. The goal of this analysis is to determine which nations have the most co-authors who are from other nations. The inter-country co-authorship network map is shown in Figure 3. The data collection included information on 90 different nations. 31 of these nations were discovered by the VOSviewer programme to be connected as co-authors. According to the results authors from the United States, India, Germany, and Brazil shared the most co-authorship with authors from other countries, according to the results of an examination of the inter-country co-authorship network. Figure 3 shows that the circle with the word "United States" in it has the most lines connected to it. Thicker lines are awarded to nations that have collaborated with more writings. The top 10 nations, whose writers have collaborated with authors from other nations the most, are shown in Table 3.

**Figure 3:** Inter country co-authorship network map of various countries authors



*Source: Figure extracted using VOS viewer*

**Table 3.** Top 10 countries, whose authors co- authored the maximum number of times, with the authors of other countries

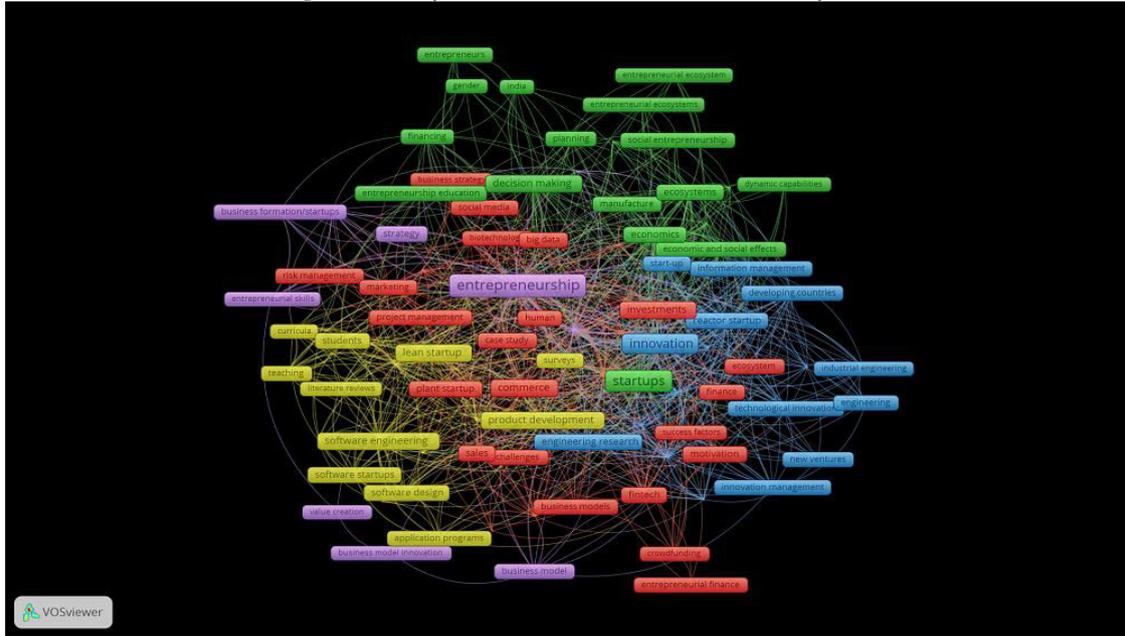
Sr. No.	Country	NC
1	United states America	57
2	India	7
3	Germany	26
4	Brazil	23
5	Italy	21
6	United Kingdom	19
7	Netherlands	14
8	Canada	20
9	France	20
10	Sweden	6

**Note:** \*N.C. stands for the number of nations that each country's authors collaborated with other co-author.

**RQ4 : Keywords Co-occurrences Network Analysis**

Use of VOS Viewer software helps in better visualization of data. Figure 5 shows the result of keyword analysis performed on the VOS Viewer software. In all, there were 2,556 keywords in the data collection. After that the applying counting method was implemented in which minimum 5 incidents were examined and hence 97 keywords related to the study on objectives and challenges of the startup were finalised. The color coding (red, green, blue, yellow, purple, ) represents the five groups of keywords of the respective study that occur together in the result. It turns out that nearly every other maximizing term in Table 4 co-occurred with "startup objectives and challenge" and its equivalent phrases. The most commonly used words in each cluster were as follows

Figure 4: Keyword Network for Cluster Analysis



Source: Figure extracted using VOSviewer

The terms that have featured the most often signal that further study has been performed in these areas. Graph illustrating five keyword clusters

The first cluster (32 terms, red nodes ) emphasizes big data , biotechnology , business modeling, business models , business strategy, case study , challenges, commerce ,covid-19, crowdfunding, design, ecosystem , entrepreneur, entrepreneurial finance ,finance , fintech, human , human resource management , investment managers , marketing , motivation , paper and pulp mills , project management , risk management , sales , social media , startup , strategic planning success factors venture capital .

Cluster 2 (19 terms, green nodes) focuses mostly on decision making, digital transformation, dynamic capabilities, economic and social effect, economics, ecosystem, entrepreneurial ecosystem, entrepreneurship education, financing, gender, India, innovation ecosystem, manufacture, planning, social entrepreneurship, startups, sustainability.

Cluster 3 (18 terms, blue nodes) focuses on competition, competitive advantage, developing countries, engineering, engineering research, entrepreneurial activity, industrial engineering, industrial management, information management, innovation, knowledge management,new ventures, open innovation , reactor startups, startup, technological, innovation , technology transfer .

Cluster 4 (14 terms, yellow nodes) focuses on application programs, curricula, data processing, education, engineering education, lean startups, literature review, product design, product development, software design, software engineering, software startup, software startups, startup companies, students, surveys, teaching.

Cluster 5 (11 terms, purple nodes) evaluates business development, business formation, business model, business model innovation, entrepreneurial skills, entrepreneurship, social enterprise, strategy, sustainable development, value creation, value proposition.

Table 4. The Top 10 keywords that appeared the most frequently

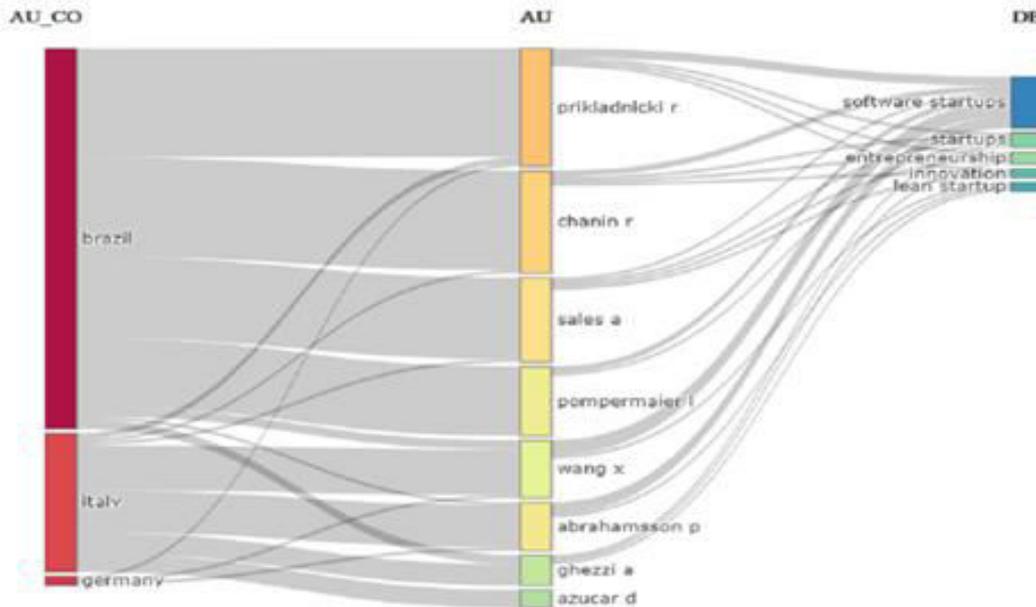
Sr. No.	Keywords	Occurrence
1	Entrepreneurship	90
2	Startups	59
3	Innovation	51
4	Startup	39
5	Sustainable development	20
6	Commerce	20
7	Lean Startup	20
8	Decision making	19
9	Product development	18
10	Investment	17

The purpose of the keyword co-occurrence network analysis is to determine which terms have been utilized frequently in numerous publications on startups motives and challenges. This analysis helps to determine which topics and themes have received the most attention from researchers. Table 4 displays the top 10 keywords that have appeared the most frequently in the data set. Entrepreneurship is the most popular keyword, appearing 90 times followed by startups with 59 occurrences. In addition to startup, sustainable development, innovation, commerce, the data set contained a large number of other frequently occurring startup-related keywords.

**Three Field Plot**

The three field plot network map of keywords, authors name, and authors countries are depicted in the given figure. All of ten most frequent keywords used by most productive ten authors with their countries.

**Figure 5:** Network Map of Keywords, authors name, and authors countries



*Source: Figure extracted using Rstudio software*

**DISCUSSION AND CONCLUSION**

The Scopus database was used in this research for bibliometrics analysis of the startup's motivations and challenges. The current study's aim is to discuss the most important publishers, international co-authors, and nations by using VOSviewer's cluster analysis. Four research questions (RQs) were developed to fulfill the purpose of the study. The finding revealed that the business venture, which has 541 citations, is belongs to Elsevier publishers. The most often occurring terms, according to keyword co-occurrence network analysis, are "entrepreneurship," "startups," and "innovation." The author from the USA is collaborating with authors from different countries. There are several limitation on the present study. The study's first drawback is that it only considers the Scopus database for research information, without taking into account other databases like Web of Science or Google Search. Second, papers authored in other languages were not included in this analysis; only those articles that were discovered to be written in English were. Future researchers are suggested to perform the same investigation using any other database. However, cutting-edge tools like page rank analysis or a variety of other accessible network matrices may be useful in further research of the same kind.

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**THE IMPACT OF COVID-19 IN TEXTILE AND APPAREL SECTOR OF INDIA**

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**Ms. Surbhi Bhardwaj**Assistant Professor, Department of Management Studies, The Technological Institute of Textile and Sciences,  
Bhiwani-127021, Haryana, India**ABSTRACT**

*The covid-19 epidemic is the first and foremost human disaster in 2020. The impact of covid-19 on India has been largely disruptive in terms of economic activity as well as a loss of human lives. Almost all the sectors have been adversely affected. Textile Industry is one among the biggest contributors to the country's exports with around 11.4% share in India's total export earnings for the fiscal period ended 2018-19 valuing to almost USD 37.5 billion (INR 2,596 billion) and growing at a CAGR of seven since 2004-05. The COVID-19 global pandemic has effects on all 7.8 billion folks in similar and unique ways. We are reeling from rising COVID-19 related death rates, broken health systems, hunger and starvation, joblessness, lockdowns of varying severity, a shadow pandemic of force, and this may be just the tip of the iceberg. The style industry has taken a troublesome hit. From the material to the spiritual, the supply chain to the ideological basis of its existence every aspect of the industry is being wrung bent on dry because of what's being called 'fashion's Darwinian shakeout'. The previous number of months has seen fashion houses, retailers, influencers, and fashion magazines introspect and pivot, in expected and surprising ways. Some have made small shifts, while others are forced to form more fundamental changes. The Indian fashion industry has responded in thoughtful and interesting ways. The fashion Design Council of India (FDCI), as an example, was amongst the first to announce a COVID-19 Support Fund for tiny businesses and young designers in need. Everyone, expectedly, is manufacturing masks, partly so their business gets to stay open as an 'essential service'. But masks are a controversial 'contribution' to the case, providing it isn't about how masks look but how they work that's important. Moreover, the kind of mask you wear is an expression of sophistication and establishes exactly where you're located on the social ladder. To wear a designer mask would seem quite tone unheeding the mood now.*

*Keywords: textile vs apparel industry; export marketing; impact of pandemic; government response.*

**1. INTRODUCTION**

India's textiles sector is one of the oldest industries in the Indian economy, dating back to several centuries. The textile industry in India traditionally, after agriculture, is the only industry that has generated huge employment for both skilled and unskilled labor in textiles. The textile industry continues to be the second-largest employment generating sector in India. It offers direct employment to over 35 million in the country.

Indian Textile Industry occupies a very important place in the economic life of India. The Indian textile industry is one of the largest in the world with a massive raw material and textiles manufacturing base. Our economy is largely dependent on the textile manufacturing and trade in addition to other major industries. About 27% of the foreign exchange earnings are on account of export of textiles and clothing alone. The textiles and clothing sector contributes about 14% to the industrial production and 3% to the gross domestic product of the country. Around 8% of the total excise revenue collection is contributed by the textile industry. So much so, the textile industry accounts for as large as 21% of the total employment generated in the economy. Around 35 million people are directly employed in the textile manufacturing activities. Indirect employment including the manpower engaged in agriculturally based raw-material production like cotton and related trade and handling could be stated to be around another 60 million.

The industry is extremely varied, with hand-spun and hand-woven textiles sectors at one end of the spectrum, while the capital-intensive sophisticated mills sector on the other end. The decentralized power looms/ hosiery and knitting sector forms the largest component in the textiles sector. The close linkage of textiles industry to agriculture (for raw materials such as cotton) and the ancient culture and traditions of the country in terms of textiles makes it unique in comparison to other industries in the country. India's textiles industry has a capacity to produce wide variety of products suitable for different market segments, both within India and across the world. The share of the India's textiles and apparel exports in mercantile shipments was 11% in 2019-20. Textiles industry has around 4.5 crore employed workers including 35.22 lakh handloom workers across the country. India is first in global jute production and shares 63% of the global textile and garment market. India is second in global textile manufacturing and second in silk and cotton production. 100% FDI is allowed via automatic route in textile sector. Rieter, Trutzschler, Saurer, Soktas, Zambiat, Picanol, Bilsar, Monti, CMT, E-land, Nisshinbo, Marks & Spencer, Zara, Benetton, and Levi's are some of the foreign textile companies invested or working in India. The textiles sector has witnessed a spurt in investment during the last five years.

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The industry (including dyed and printed) attracted Foreign Direct Investment (FDI) worth US\$ 3.75 billion from April 2000 to March 2021.

In May 2021, Indo Count Industries Ltd. (ICIL), announced an investment of Rs. 200 crore (US\$ 26.9 million) to expand its production capacity. The production-linked incentive (PLI) scheme for man-made fibre and technical textiles will help boost manufacturing, increase exports and attract investments into the sector.

### 1.1 REVIEW OF LITERATURE

Fairlie (2020) analyzed the impact of the COVID-19 pandemic on active small businesses in the USA, using nationally representative data. He observed that losses to business activity were felt across nearly all industries, and African American businesses witnessed 41% drop-in business activity.

Maliszewska et al. (2020) studied the potential impact of COVID-19 on gross domestic product and trade, using a standard global computable general equilibrium model. They estimated that the gross domestic product fell up to 2.5% for developing countries, and 1.8% for developed countries. They also estimated that there was underutilization of labour by 3% across all sectors in the global economy.

Donthu and Gustafsson (2020) studied the impact of the COVID-19 pandemic on commerce and highlighted that retailers and brands faced many short-term challenges, such as those related to health and safety, the supply chain, the workforce, cash flow, consumer demand, sales and marketing.

Brodeur et al. (2020) reviewed the literature on the socio-economic consequences of COVID-19 and government response, focusing on labour, health, gender, discrimination and environmental aspects. They also reviewed different studies related to effectiveness of social distancing in mitigating the spread of COVID-19 and its compliance.

Fabeil et al. (2020) studied the impact of the COVID-19 pandemic outbreaks on emotional health of entrepreneurs of micro-enterprises of Malaysia. They observed that the entrepreneurs experienced stress-related ill health due to business cancellation or closure and reduced income due to the closure of several supporting sectors like retail and transportation.

Naudé (2020) studied the impact of COVID-19 on entrepreneurship, as reflected in the start-up of new firms and observed that the unintended damage to entrepreneurship, innovation and growth could be persistent in the longer term also.

Hernandez-Sanchez et al. (2020) analyzed the impact that COVID-19 pandemic perception and psychological need satisfaction had on the entrepreneurial intention of university students of Latin America. Regression analysis models were built to examine the relationships between the COVID-19 pandemic perception, personality variables and entrepreneurial intention. They observed that students' perception of COVID-19 and psychological need satisfaction were associated with entrepreneurial intention.

Zhang and Ma (2020) investigated the immediate impact of the COVID-19 pandemic on mental health and quality of life among local Chinese residents aged over 18 years in Liaoning Province, mainland China. They found that respondents felt stressful, horrified, and apprehensive due to the pandemic. They analysed the impact of the COVID-19 pandemic in the life of an individual as a whole. They observed that lack of social relations and social interactions resulted in loneliness, anxiety drives, depression, panic states, mental disorders, health hazards and many other issues that impacted the life of the individual and the society.

Bown, & Javorcik, (2020) The other major impact of COVID-19 has been on the production segment of the Indian textiles industry. With rampant government-mandated textile factory closures all across the globe, for these do not fall under the category of 'essential' goods and services, the sector faces one of its worst crises in the century. Whether it is India, China, Bangladesh or Vietnam, the industry faces the prospect of significant disruptions in supply chains as well as halted manufacturing activity, thanks to cancelled orders and difficulty in procuring raw materials from the source nation, China.

Sahoo & Ashwani Sen et al., (2020) India has registered the second-highest coronavirus cases in the world and it presents a new set of opportunities and obstacles to the textile and apparel industry. In developing economies, the social and health care systems are not robust enough to handle the large population, and in the case of such pandemics, the challenge intensifies. The series of lockdowns in the nation has put the textile and apparel industry to a complete standstill. Negative growth patterns, international trade deficits, unemployment, income, poverty, factory shutdowns, retail closures, labour displacement, and shortages are some of the noteworthy challenges that the sector has faced in the current times. According to Sahoo and Ashwani (2020), production may decrease from 5.5 to 20%, exports from 13.7 to 20.8%, imports from 17.3 to 25%, and MSME net value added from 2.1 to 5.7 if the current situation continues.

Mishra (2020), The Indian business development model depends on the export-led-growth and hence it could experience a massive impact on growth due to the mandatory lockdowns. This paper employs the Value chain analysis (V.C.A.) method to delve particularly into each stage of the value chain and bring out positive and negative aspects of the current crisis.

Kanupriya (2021), The covid-19 crisis affected the Indian fashion and textile sector holistically states that the effect of crisis could be understood by examining the demand-side factors (social distancing, consumer demand, and exports) and the supply-side factors (production, supply chain, employment, prices of essential raw materials, and imports). The manufacturing activity across Asia was halted due to cancelled orders and unavailability of raw materials. Due to the mandatory lockdown, thousands of garment factories, and textile factories (40,000 in Tamil Nadu) had to shut down causing a major disruption in the supply and demand. Apparel export promotion council study reported that, 83% of export orders had been wholly or partially cancelled. The apparel export sector suffered a huge hit as the buyers (U.K., U.S.A, E.U.) cancelled the order or stopped placing new orders. This led to an immediate inventory build-up and overhead costs at the manufacturer's end.

## **2. RESEARCH METHODOLOGY**

### **2.1 Purpose of the Study**

- To study the textile sector and apparel sector in India.
- To study the export marketing of in India.
- To study the government response for pandemic crisis

### **2.2 Research Design**

To study the above objectives, we build Descriptive research design so that we can easily studies with description of whole content.

### **2.3 Data Collection and Source**

Secondary data has been chosen for fulfilling the objectives of the present study. I used several sources to make my study better and meaningful. The main sources of collected data are Published articles, research papers, published journals, government reports, newspapers, online contents, available facts and figures, magazines, websites, government departments journals, reports of the company.

## **3. ANALYSIS AND INTERPRETATION**

### **3.1 Textile Industry**

The textile industry is primarily concerned with the design, production and distribution of yarn, cloth and clothing. The raw material may be natural, or synthetic using products of the chemical industry. The future for the Indian textiles industry looks promising, buoyed by strong domestic consumption as well as export demand. With consumerism and disposable income on the rise, the retail sector has experienced a rapid growth in the past decade with the entry of several international players like Marks & Spencer, Guess and Next into the Indian market. High economic growth has resulted in higher disposable income. This has led to rise in demand for products creating a huge domestic market.

#### **Uses of Textiles**

Textiles have an assortment of uses, the most common of which are for clothing and for containers such as bags and baskets.

In the household they are used in carpeting, upholstered furnishings, window shades, towels, coverings for tables, beds, and other flat surfaces, and in art.

- (a) In the workplace they are used in industrial and scientific processes such as filtering.
- (b) Miscellaneous uses include flags, backpacks, tents, nets, handkerchiefs, cleaning rags, transportation devices such as balloons, kites, sails, and parachutes textiles are also used to provide strengthening in composite materials such as fiberglass and industrial geotextiles. Using textiles, children can learn to sew and quilt and to make collages and toys.
- (c) Textiles used for industrial purposes, and chosen for characteristics other than their appearance, are commonly referred to as technical textiles. Technical textiles include textile structures for:
  - Automotive applications e.g., tyre cord, seat belt; Medical textiles e.g., implants
  - Geotextile's reinforcement of embankments,
  - Agro-textiles for crop protection,
  - Protective clothing e.g., against heat and radiation for fire fighter clothing, against molten metals for welders, stab protection, and bullet proof vests.

- Bio-textiles (Medical textiles) e.g., Breathing masks, wound care, wipes etc.

In all these applications stringent performance requirements must be met. Woven of threads coated with zinc oxide nanowires, laboratory fabric has been shown capable of "self-powering Nano systems" using vibrations created by everyday actions like wind or body movements.

### 3.2 Apparel Industry

Clothing industry or garment industry summarizes the types of trade and industry along the production and value chain of clothing and garments, starting with the textile industry, embellishment using embroidery, via the fashion industry to apparel retailers up to trade with second-hand clothes and textile recycling. The garment industry is a major contributor to the economies of many countries. The industry for Ready Made Garments has been criticized by labor advocates for the use of sweatshops, piece work and child labor. India is among the world's largest producers of Textiles and Apparel. The domestic apparel & textile industry in India contributes 5% to the country's GDP, 7% of industry output in value terms, and 12% of the country's export earnings. India is the 6th largest exporter of textiles and apparel in the world.

The textiles and apparel industry in India is the 2nd largest employer in the country providing direct employment to 45 million people and 100 million people in allied industries.

India has also become the second-largest manufacturer of PPE in the world. More than 600 companies in India are certified to produce PPEs today, whose global market worth is expected to be over \$92.5 bn by 2025, up from \$52.7 bn in 2019.

- FDI in the textiles and apparel industry in India has reached up to \$3.9 bn till December 2021
- India's exports of textiles and apparel are expected to reach \$100 bn in the next 5 years, growing at a CAGR of 11%
- To double the Indian textile and apparel industry size to \$190 bn by 2025-26, 7 mega textile parks have been planned
- The Indian technical textiles market was estimated at \$17.6 bn in 2020-21 and grew at a CAGR of 10% since 2015-16
- The domestic technical textile market for synthetic polymer was valued at \$7.1 bn in 2020 and is projected to reach \$11.6 bn by 2027, growing at a CAGR of 7.2%, while technical textile market for woven is expected to grow at a CAGR of 7.4% to \$15.7bn by 2027, up from \$9.5 bn in 2020
- India has a share of 4% of the global trade in textiles and apparel.

### 3.3 Export Marketing

**Export marketing** is the practice by which a company sells products or services to a foreign country. Products are produced or distributed from the company's home country to buyers in international locations. But there is a difference between products that are *available* to foreign countries and products that are *specifically marketed* to foreign customers.

### 3.4 Impact of Pandemic on Export Marketing

India is the world's second-largest exporter of textiles and apparel, and the textile industry contributes significantly to the country's economy, making up 7% of industry output, 2% of the national GDP, and 15% of the country's total exports earnings. A third of India's textile production is exported. India's Textile Exports was worth US\$37.74 billion in 2017-18. The US and the European Union are the two largest markets for Indian textile exporters, followed by various Asian countries and the Middle East. Below is a breakdown of the various product categories under textiles and apparel exports, and their contribution in FY 2017/18 (data updated as of January 2018):

Category	Value of Indian T&A Exports in \$ million	%
Readymade Garments	13,511.79	49.42
Cotton Textiles	8,908.09	32.58
Man-made Textiles	4,454.92	16.29
Wool & Woollen Textiles	292.56	1.07
Silk	172.71	0.63
Total	27,340.07	

Source: Ministry of Textiles

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- Effects global supply chain and In India 60% of textile and apparel export market effected.
  - Demand shifted from textile and apparel to mask, a health protector
  - The power of purchasing shifted from apparel to basic commodities
  - The apparel industry has already lost the summer cycle of sale and given the current situation it is almost certain that the virus will hit the winter sales also.
  - Shutdowns changed the consumer's attributes as well as attitude.
  - Create unemployment
  - Increase cost of maintenance as well as production because Indian textile industries touches the line of diseconomies of scale due to pandemic.
  - Improve the innovation status in textile industries
  - Increase demand of hygiene textile in global level.

### **3.5 Government Response**

Indian government has come up with several export promotion policies for the textiles sector. It has also allowed 100% FDI in the sector under the automatic route. Initiatives taken by Government of India are:

- Government launched production linked incentive scheme to provide incentives for manufacture and export of specific textile products made of man-made fibre.
- On September 2, 2020, the Union Cabinet approved signing an MOU between textile committee, India and M/s Nissenken Quality Evaluation Centre, Japan, for improving quality and testing Indian textiles and clothing for the Japanese market. This India- Japan impact on cooperation in textiles will facilitate Indian exporters to meet the requirements of Japanese importers as per the latter's technical regulations.
- Under Union Budget 2020-21, a National Technical Textiles Mission is proposed for a period from 2020-21 to 2023-24 at an estimated outlay of Rs. 1,480 crore (US\$ 211.76million).
- In 2020, New Textiles Policy 2020 is expected to be released by the Ministry of Textiles. CCEA approved mandatory packaging of food grains and sugar in jute material for the Jute Year 2019-20.
- The Government of India has also announced a special economic package viz AatmaNirbhar Bharat Abhiyaan for boosting economy of the country and making India self-reliant. Relief and credit support measures have been announced for various sectors. The weavers & artisans can avail benefits of these relief and credit support measures to revive their businesses which have suffered due to lock down necessitated by Covid-19 pandemic.
- To support the handloom and handicraft sectors and to enable wider market for handloom weavers/artisans/producers, steps have been taken to on-board weavers/artisans on Government e-Market place (GeM) to enable them to sell their products directly to various Government Departments and organizations.
- To promote e-marketing of handloom products, a policy framework was designed and under which any willing e-commerce platform with good track record can participate in online marketing of handloom products. Accordingly, 23 e-commerce entities have been engaged for on-line marketing of handloom products.
- A social media campaign #Vocal4handmade was launched on the 6 National Handloom Day by the Government, in partnership with all stakeholders, to promote the handloom legacy of India and to ensure people's support for the weaving community. It has been reported that the social media campaign has resulted in renewed interest of the Indian public in handlooms and several e-commerce players have reported increase in sale of Indian handloom products.
- The Ministry of Textiles has requested the Chief Ministers of all States and UTs to instruct their State Handloom Corporations/Co-operatives/Agencies to make purchases of the finished inventory available with the handloom weavers/artisans to put some ready cash in the hands of the weavers to enable them to meet their household needs.
- Design Resource Centres are being set up in Weavers Service Centres (WSCs) through NIFT with the objective to build and create design-oriented excellence in the Handloom Sector and to facilitate weavers, exporters, manufacturers, and designers for creating new designs.

- Under Union Budget 2020-21, a National Technical Textiles Mission is proposed for a period from 2020-21 to 2023-24 at an estimated outlay of Rs. 1,480 crore (US\$ 211.76 million).
- In 2020, New Textiles Policy 2020 is expected to be released by the Ministry of Textiles. CCEA approved mandatory packaging of food grains and sugar in jute material for the Jute Year 2019-20.
- In September 2019, textiles export witnessed a 6.2% increase post GST as compared to the period pre-GST.
- The Directorate General of Foreign Trade (DGFT) has revised rates for incentives under the Merchandise Exports from India Scheme (MEIS) for two subsectors of Textiles Industry - readymade garments and made-ups - from 2% to 4%.
- The Government announced a special package of US \$ 31 billion to boost export, create one crore job opportunity and attract investment worth Rs. 80,000 crore (US\$ 11.93 billion) during 2018-2020. As of August 2018, it generated additional investments worth Rs. 25,345 crore (US\$ 3.78 billion) and exports worth Rs. 57.28 billion (US\$ 854.42 million).
- The Government of India has taken several measures including Amended Technology Up-gradation Fund Scheme (A-TUFS), estimated to create Indian government has come up with several export promotion policies for the textiles sector. It has also allowed 100% FDI in the sector under the automatic route.
- Apart from the above initiatives, Ministry of Textiles is implementing various schemes through the Offices of Development Commissioner (Handlooms) for overall development of handlooms and welfare of handloom weavers across the country.
- The Scheme details are as under: -
  - National Handloom Development Programme (NHDP)
  - Comprehensive Handloom Cluster Development Scheme (CHCDS)
  - Handloom Weavers' Comprehensive Welfare Scheme (HWCWS)
  - Yarn Supply Scheme (YSS)

#### 4. FINDINGS

The COVID-19 pandemic has exposed the economy to immense distress, ruptured multiple systems and left the economy out of breath. It has drastically shattered traditional fundamental economic assumptions.

- There has been an exponential growth in the online traffic; so, marketing departments must grab the opportunities that have surfaced during these challenging times.
- Production may decrease from 5.5 to 20%, exports from 13.7 to 20.8%, imports from 17.3 to 25%, and MSME net value added from 2.1 to 5.7 if the current situation continues.
- According to the U.S., 30% of India's export earnings are made from textile and apparel, and the industry employs 38 million. The salary of these workers ranges from Rs.10,000 to 12,000 (US\$ 133 to 160 per month), while the living wage, as calculated by the Asia Floor Wage Alliance (AFWA) is Rs.29,323 per month.
- Most of the domestic brand owners suffer from unsold inventory/deadstock, overhead costs, and shall result in staff reduction as the turnovers have dropped intensively. The cash flow cycle is disturbed as a major portion of the money is blocked into finished products waiting to be sold.
- As digital marketing is taking the main stage for selling and promoting around the world during the pandemic. It was observed that a majority of them were aware of the omnichannel strategy (Lorenzo-Romero et al., 2020) but implementation was still a difficult task for them as they had no significant training in this area. This had led to a limited online selling revenue to the local brands. This indicates that there is a large gap in the digitization of the value chain which has led to a steep financial crisis.

#### 5. CONCLUSION

After agriculture, textile sector is on the second rank. This sector is one of the oldest and it has accorded a big amount to the national economy, it gives about 15% of production value-addition, and about one third of our gross export earnings, it also serves employment to millions of people. It is a unique sector in this country. One of the finest and earliest that came into presence in India, it produces around 15% of total industrial production and contributes to 30% of exports and it is the second largest sector serving employment to Indian citizen after

agriculture sector. Textile industry serves the most common requirement of citizens and of great importance, developing day-by-day and enhancing quality of Indian people. However, because of this Covid-19, this sector is at risk. The production, turnover, employment, export, everything has come down and it is very difficult to predict when things will revive in Indian textile sector. This paper is an analysis of the impact of Covid-19 on Indian Textile Sector.

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**SUSTAINABILITY AND ENVIRONMENTAL HEALTH OF INDIA WITH REFERENCE TO THE ENVIRONMENT PERFORMANCE INDEX (EPI) 2022**

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**<sup>1</sup>Sudhir Bhandarkar\* and <sup>2</sup>Sachin Chaurasia**<sup>1</sup>Assistant Professor in Zoology, Manoharbai Patel College Arts, Commerce and Science, Deori, India<sup>2</sup>Assistant Professor in Chemistry, Manoharbai Patel College Arts, Commerce and Science, Deori, India**ABSTRACT**

*The study effort also intends to improve the analysis of success criteria for environmental legislation. The research attributes India's poor ranking to deteriorating air quality and fast expanding greenhouse gas emissions. EPI 2022 rates India in the bottom of 180 nations in terms of performance across factors relevant to mitigating climate change, improving environmental health, and protecting ecosystem vitality. The report is normally compiled by scholars from Yale and Columbia Universities in the United States. Denmark is first with a score of 77.90, while India is second with a score of 18.90. The government accused the EPI team of focusing on anticipated emissions over the previous decade rather than longer time periods, neglecting India's forests and wetlands, which serve as critical carbon sinks, ignoring per capita greenhouse emissions, and dismissing India's renewable energy growth. The present paper highlighted many facets of EPI as well as concerns about India's poor ranking.*

*Keywords: EPI 2022, India, EPI Score, Environmental Health, GHG emission, Sustainability*

**INTRODUCTION**

There has been very little scholarly work focusing on a comparative examination of South Asian nations' environmental performance (EP) in managing climate change vulnerabilities. Climate change-related difficulties in South Asia have been acknowledged for many years, but their impacts have generally been attributed to excessive poverty and unchecked population expansion (Bhandari, 2011). The World Bank's Environment Performance Index-2022 has India at the bottom of the list. This signifies that India is among the countries with the lowest environmental health in the world. India is rated in the lowest five out of 180 nations, with a score of 18.9. Even Bangladesh, Myanmar, Pakistan, and Vietnam outperformed India. The country has also performed poorly on a variety of indicators, including corruption control, rule of law, and government performance. The decline is dramatic, with India ranking 168th out of 180 nations in the EPI-2020. The final score was 27.6. Denmark was rated top in the categories of sustainability and environmental health for the year 2022, owing to good performance across almost all areas examined by the EPI, as well as prominent leadership in efforts to promote a clean energy future and sustainable agriculture. The United Kingdom and Finland come in second and third, respectively, with strong marks for reducing greenhouse gas emissions in recent years. The US ranks 20th out of 22 rich democracies in the Global West and 43rd worldwide. India is ranked 180th, after Pakistan, Bangladesh, Vietnam, and Myanmar, with a score of 18.9. India ranks low in terms of rule of law, corruption control, and government performance. India rejected this technique of EPI, claiming that the most appropriate method for a growing country like India would be to compute GHG emissions per capita. It also stated that a model should be developed with coefficients that account for the influence of emission-cutting strategies, such as greater use of renewable energy and electric cars, or the establishment of a carbon sink, in order to estimate values for future years. The environmental impact of human activity could go in a variety of directions. On the one hand, excessive and irresponsible industrial output causes pollution, natural resource depletion, and environmental degradation. Effective environmental governance and eco-friendly technologies, on the other hand, mitigate environmental dangers to human health and encourage long-term growth (Huang and Xu. 2019). According to the EPI research, most low-scoring nations prioritized economic expansion above sustainability. The present paper, a review of the relevant literature will assist in navigating the concepts for a better India.

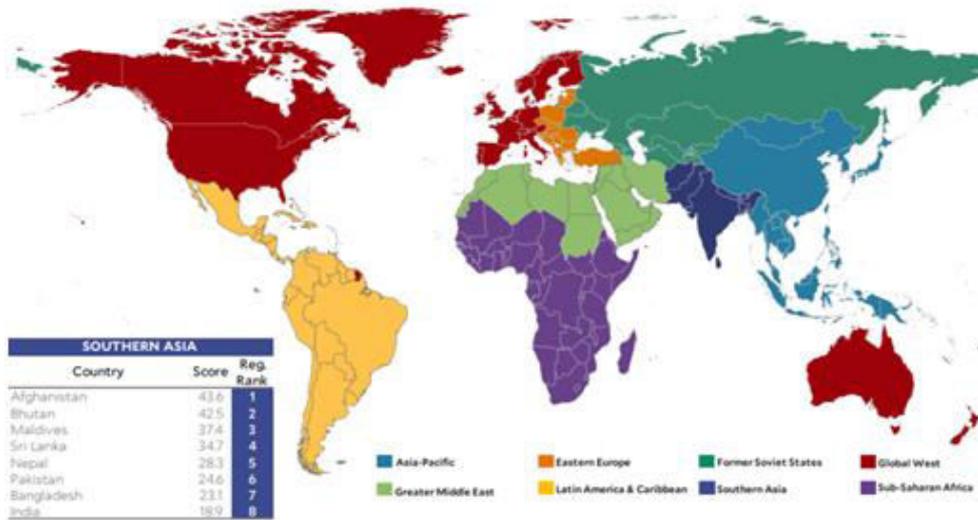


Fig.1: Southern Asian Countries with their score. Source: EPI

1. What is EPI:

The Environment Performance Index (EPI) is a global rating system that assesses a country's environmental health and sustainability. The World Economic Forum launched the EPI, a biennial index, in 2002 as the Environmental Sustainability Index. The Yale Center for Environmental Law and Policy and Columbia University's Center for International Earth Science Information Network produce the Environmental Performance Index (EPI). It is a means of assessing and numerically designating a state's environmental performance. The 2022 Environmental Performance Index (EPI) presents a data-driven overview of the global condition of sustainability. The EPI rates 180 nations on climate change performance, environmental health, and ecosystem vitality using 40 performance indicators spread over 11 issue areas. These metrics measure how near countries are to meeting stated environmental policy objectives on a national basis. The EPI team converts raw environmental data into indicators that rank countries from worst to best on a 0-100 scale. The EPI produces a scorecard that recognizes environmental performance leaders and laggards and gives practical suggestions for nations seeking to move toward a more sustainable future.

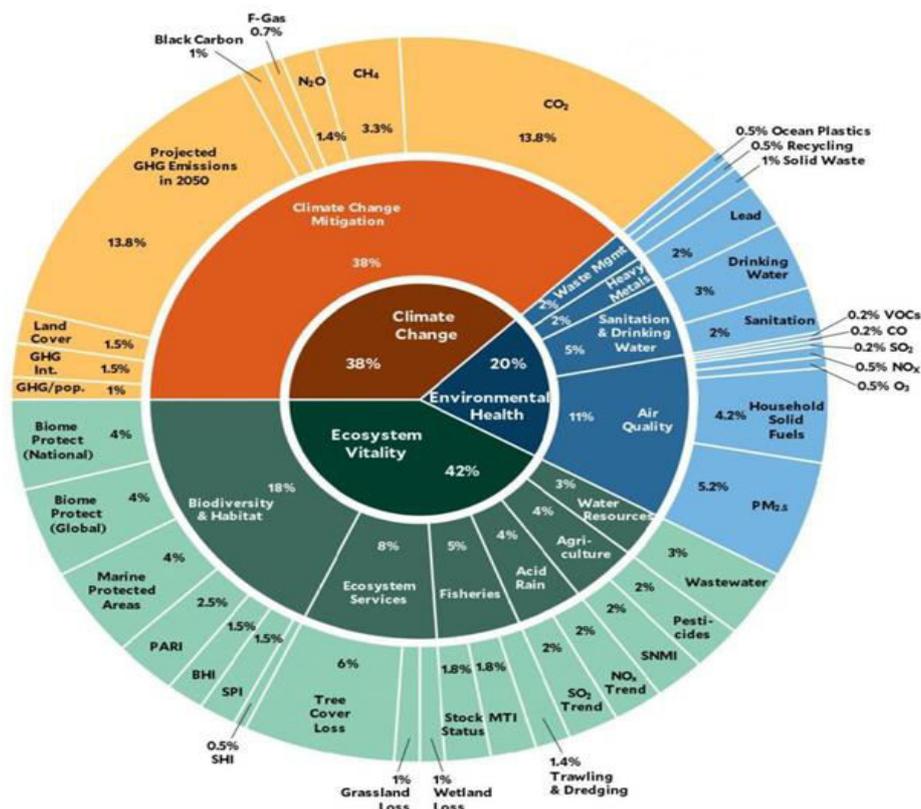


Fig.2. The framework organizes 40 indicators into 11 issue categories and 03 policy objectives, with weights shown at each level as a % of the total score. Source: epi.yale.edu

**1.1 Importance of EPI:**

The Environmental Sustainability Index (ESI), the first joint product of the Yale-Colombia team and commissioned by the World Economic Forum/Davos, was created as an index with the ambitious goal of conceptualizing a sustainability profile of countries, allowing for the assessment of a country's basic capacities to deal with environmental problems over time (Analysis of the Yale Environmental Performance Index (EPI) Final report, 2008). The overall Environmental Performance Index rankings show which nations are doing the greatest job of solving the environmental difficulties that each country faces. It allows you to identify problems, create goals, evaluate trends, assess outcomes, and discover best policy practices. The EPI investigates ten issue areas classified under the two sub-indicators of environmental health and ecosystem vitality, which show the hazards presented to human health by environmental pollution and the effects of environmental deterioration on the ecosystem. The Environmental Health Index (HLT) in the 2018 EPI framework, for example, analyses air pollution, water quality, and heavy metal exposure, whereas the Ecosystem Vitality Index (ECO) addresses issues such as biodiversity and climate change. The EPI is derived from the weighted average of these two sub-indicators as an overall assessment of a country's environmental status (Wendling et al. 2018). Data and fact-based analysis may also help policymakers streamline their goals, improve relationships with important stakeholders, and optimize the return on environmental spending. With a new indicator that estimates nations' progress toward net-zero emissions in 2050, the 2022 EPI contributes to developing climate policy conversations.

**2. Environmental Performance Index 2022, Key Findings:**

India is rated 180th, with a score of 18.9. In 2020, India ranked 168 (score 27.6). India was placed lower than the lowest performers, Pakistan, Bangladesh, Vietnam, and Myanmar. In reality, India has received the lowest ranking. Denmark comes in first place with a score of 77.9. In a variety of metrics, India scores towards the bottom, including ecosystem vitality (178th), biodiversity (179th), biodiversity habitat index (170th), and species protection index (177th) (175th). Aside from that, there is a poor performance in terms of wetland loss, air quality (179th), PM 2.5 (174th), heavy metals like lead in water (174th), waste management (151st), and so on. It forecasts that by 2050, China, India, the United States, and Russia will account for more than half of remaining global greenhouse gas emissions. Carbon dioxide, methane, fluorinated gases, and nitrous oxide are examples of greenhouse gases (GHG).

**2.1 Trends in India's GHG emissions from the 2022 EPI:**

According to the research, the key causes for India's poor score are deteriorating air quality and fast expanding greenhouse gas emissions, both of which require immediate attention. According to current trends and EPI predictions, China, India, the United States, and Russia will account for more than half of remaining global greenhouse gas emissions in 2050. Carbon dioxide, methane, fluorinated gases, and nitrous oxide are examples of greenhouse gases (GHG). The study assesses the average rate of rise or reduction in emissions over ten years (2010-2019) and extrapolates this trend until 2050 to forecast GHG emission levels.

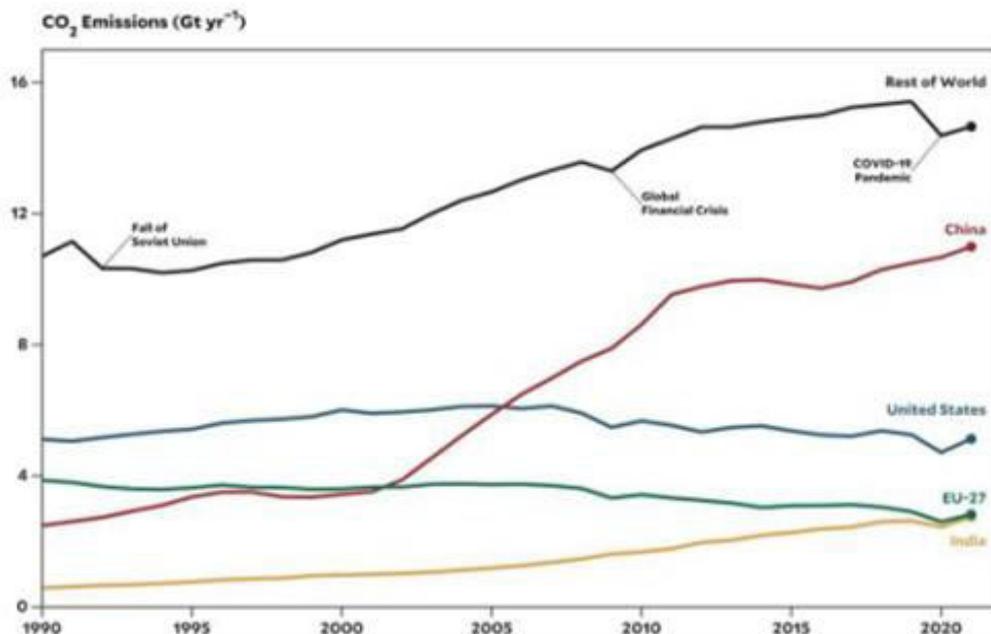


Fig.1 Carbon dioxide (CO<sub>2</sub>) emissions for selected countries Source: Global Carbon Budget 2021

### 3. REASONS FOR INDIA'S LOW RANKING:

According to the Environmental Performance Index study, the majority of low-scoring countries favored economic expansion over sustainability.

#### 3.1 Issues with fossil fuels and air quality:

As their populations grow, numerous countries, particularly India and China, rely heavily on coal to power economic growth. The widespread usage of fossil fuels contributes to poor air quality. India has 21 of the world's 30 most polluted cities and one of the worst air quality scores in the world. As a result of air pollution, India has a disproportionately high death and disease burden (Balakrishnan et al., 2019). Air pollution kills around 16 lakh people in India each year, according to data. It also identifies home fuel combustion as the country's major source of particulate matter emissions. According to EPI, air quality is a direct indicator of the impact of air pollution on human health. PM 2.5 exposure, household solid fuels, ozone exposure, nitrogen oxides exposure, sulphur dioxide exposure, carbon monoxide exposure, and volatile organic compound exposure are the seven indicators used to assess air quality in the countries mentioned.



Fig.2 One of most polluted city in India, Source: BBC.Com

#### 3.2 Generation of plastic garbage:

The top two generators of marine plastic garbage in the world have been identified as India and Indonesia, whereas China has managed to reduce its ocean plastic pollution. Ocean plastic pollution is quantified as the absolute amount of plastic dumped into the ocean by a country each year. The top five manufacturers of ocean plastic pollution are Indonesia, India, the United States, Brazil, and Thailand, accounting for 43 percent of the global total. Every year, Indonesia produces over 1.4 million tonnes of ocean plastic, accounting for 16% of the global total. India is just behind Indonesia, accounting for 13% of the world total. The yearly plastic output in India has been increasing, but it is crucial to remember that India has announced a ban on single-use plastic, which will go into effect on July 1, 2022.

#### 3.3 Biome conservation:

In a study of nations that safeguard the world's biomes, India came in last in five of 14 sub-categories, the most for a single country. In their rejoinder, India's Ministry of Environment, Forests, and Climate Change stated that the ranking prioritizes the size of Protected Areas over the quality of protection. The ministry stated that "management effectiveness evaluation of protected areas and eco-sensitive regions is not considered into the compilation of biodiversity indexes." India did somewhat higher than its overall rating in the category-specific rankings for environmental health, ecosystem vitality, and climate change mitigation. India is rated 178th out of 180 nations in terms of environmental health and ecosystem vitality. India is placed 165th out of 180 countries in the climate change mitigation category, which assesses progress in combating global climate change.

### 4. INDIA'S OBJECTIONS ON EPI 2022

According to the Environment Ministry, some of the performance metrics are extended and based on questionable methodology. The reweighting of various characteristics has resulted in India's dismal standing. For example,

- 4.1 India's score for black carbon growth improved from 32 in 2020 to 100 (the highest score) in 2022. The weightage of this indicator, however, has been reduced from 0.018 in 2020 to 0.0038 in 2022. Climate Change has been given a high weightage (38 percent or 0.38) and has a propensity to disregard the development needs of poorer nations.
- 4.2 Similarly, the low weightage assigned to per-capita GHG emissions unavoidably lowers India and China's rankings. The projection for GHG emissions is based on the average rate of change in emissions over the previous ten years. It is not based on modelling that considers a longer time horizon, the level of renewable energy generation and consumption, extra carbon sinks, and so on. Important carbon sinks that attenuate GHG emissions, such as forests and wetlands, have been overlooked.

4.3 The EPI assumes every country is in the same position economically, developmentally and environmentally, therefore all had to achieve net zero emissions by 2050.

4.4 The ranking emphasizes the amount of protected areas rather than the level of protection they provide. The calculation of biodiversity indexes does not take into account the management efficacy of protected areas.

4.5 Indicators such as agro-biodiversity, soil health, food loss, and waste are not included, despite the fact that these are critical for developing nations with significant agricultural populations.

## 5. FUTURE STRATEGIES

5.1 To begin, the report's criteria should be modified to improve its dependability. The most exact method would be to calculate GHG emissions per person. Furthermore, a model with coefficients that account for the impact of emission-cutting programmes should be constructed. This will assist in forecasting values for future years. Such measures include increased use of renewable energy and electric vehicles, as well as the construction of a carbon sink.

5.2 India must ensure that its present environmental policies and pledges are properly implemented. For example, India has declared a ban on single-use plastic, which will go into force on July 1, 2022. This should be done correctly.

5.3 India must enhance its environmental litigation structure by adding more National Green Tribunal benches around the country. This will raise environmental awareness and encourage individuals to register complaints against those who violate the law.

5.4 People should be educated about climate change by partnering with organizations such as Green Peace India. This would also aid in the formation of Climate Change Political Parties.

5.5 On the basis of equality and justice, developed countries must assume historical responsibility and contribute financial resources to developing countries. This is essential for global environmental preservation rather than focusing just on one's own local jurisdiction.

## CONCLUSION

Much has been said about the newly announced Environmental Performance Index (EPI), which classified India as the worst country in the world. The ranking was rejected by the Government of India (GoI) as "unscientific." Many environmental experts have called the methods into doubt. In response, the report's main investigator reportedly stated that "EPI does not seek to condemn countries; rather, we strive to assist them in improving their environmental performance." However, in the research, the EPI team refers to low-ranking countries as "laggards," while high-ranking countries are referred to as "leaders." This demonstrates that serious environmental challenges in India (particularly air pollution) must be addressed promptly in order to achieve sustainable growth.

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## DETERMINATION OF HEAVY METAL CONTENT IN VARIOUS LOCATIONS IN THE SATU-MARE AREA, ROMANIA

**Svetlana Trifunshi and Melania F. Munteanu**

Vasile Goldis" Western University of Arad, Faculty of Pharmacy, Romania

### ABSTRACT

*The study aimed to examine the dust samples deposited from different locations of Satu Mare, Romania, a city located on the river Someş, 13 km from the border with Hungary and 27 km from the border with Ukraine. The sampling points were chosen according to location, namely, residential area, industrial area and agricultural area. The samples were taken in the fall of 2020 and in the summer of 2021 in windless weather conditions on a horizontal, dry, unpolluted surface. The metal content Fe, Cu, Pb, Zn and Cd in the case of the samples was determined using flame atomic absorption spectroscopy, and the heavy metal content was expressed in mg / g. In the case of Cu, Pb and Zn the metal content of samples exceeded the normal concentration values in all cases, but in many cases reached the warning or intervention limit, and the Cd content of the samples was below the detection limit. The value of Fe concentration in the samples taken was in close intervals in both harvest periods.*

*Keywords: heavy metals, particulate matter, air pollution, atomic spectrometry*

### INTRODUCTION

Air pollution is one of the forms of pollution with major, disastrous effects on the environment. If from a technical point of view, any physical, biological or chemical change in the atmosphere can be called air pollution and occurs when any harmful gas, dust or smoke enters the atmosphere and affects plants, animals and humans, in case of contamination. air, we are talking about changing the natural composition, especially if there are vapors, gases, dust / smoke, soot / or aerosols that are harmful to the wild and the lifeless constituents of the environment (Draghici&Pernia, 2002; Rojamschiet al, 1997).

Solid pollutants can be divided into two large groups for inhalation: "coarse" powders and "fine" powders (Haiduc &.Bobos, 2005).

Heavy metals are considered to be among hazardous polluting materials and great efforts are being made to detect, determine and neutralize them in the environment (Perkins, 1973; Dimov et al, 2004; Suvarapu & Beek, 2016).

Heavy metals that are present in the atmosphere are metals emitted into the atmosphere during the burning of fossil fuels, and these are Pb, Cd, Zn, Cu, and the other metals remain in the ash and enter the water and soil (Visan at al, 2000; Murariu & Murariu, 1997; Anghelescu &Crisan, 2006).

### MATERIALS AND METHOD

The study aimed to examine the dust samples deposited from different locations of Satu Mare, Romania, a city located in northwestern Romania, on the river Someş, 13 km from the border with Hungary and 27 km from the border with Ukraine.

The dust samples were collected from six different points in the city of Satu Mare, and in the process of selecting the sampling points, their location was taken into account, in the residential area, in the industrial area, respectively in the agricultural area(Visan at al, 2000).

**Table I:** Sampling locations

Number of sampels	Sampling locations
1	The middle part of the street Cloşca
2	Beech Street (Woco factory area)
3	Downtown (near the park)
4	The middle part of the street Lucian Blaga
5	Meat factory
6	Satu Mare vineyards

### Sampling

The samples were taken in the autumn of 2020 and in the summer of 2021. The samples were stored and sealed accordingly, the marking being used to specify the date, number and location of the sampling points.

In order to prevent contamination of the samples, sampling was carried out in windless weather conditions. on a horizontal, dry, unpolluted surface and using a brush.

#### Reagents:

- chemically concentrated pure hydrochloric acid solution (36%)
- 68% nitric acid solution - strong oxidizing agent, with destructive effect on organic matter.

#### Description of the analysis method (Gheorghe, 1997, Popa, 2005)

The collected dust samples were thoroughly dried in a desiccator at 100 ° C, then sieved and homogenized.

From the dust samples thus obtained, an amount of approximately 1 to 2 grams was weighed to four decimal places on an analytical balance in Berzelius glasses of 50 ml marked accordingly.

**Table II:** Quantity of dust samples taken, sampling locations in autumn 2020 and summer 2021

Sampels number	Weighed sample Fall 2020 (g)	Weighed sample Summer 2021 (g)
1	2,0021	2,0987
2	1,5890	2,04781
3	1,1712	2,0690
4	2,1418	2,0724
5	2,0179	2,0697
6	1,4574	2,0804

The samples were treated with 30 ml of concentrated hydrochloric acid and then heated on a sand bath for two hours and evenly for all six samples.

After boiling, the samples were left in the resulting state for 24 hours. Subsequently the solutions were filtered, the slag was washed with distilled water, being subsequently filtered; the two substances thus obtained were mixed for each sample. The resulting mixtures were then boiled to near drying, exposed to 10 drops of 68% nitric acid, and then treated with hydrochloric acid and 10 ml of concentrated hydrochloric acid.

The resulting solutions were made up to 50 ml and stored in a plastic container containing distilled water and provided with a stopper. The test solutions thus prepared are suitable for the determination of heavy metal concentrations by atomic absorption.

Atomic spectrometry determinations were performed with a single-channel single-channel HEATH-701 flame-retardant atomic absorption spectrometer (Heath Co., Benton Harbor, MI, USA) (HEATH EU-700). Photoelectron multiplier signal (1P28A RCA) and M12FC51 (NARVA) was measured with a K-201 (Carl Zeiss Jena) recorder. The output signal of the recorder - in proportion to the deviation of the instrument indicator - was recorded in a computer using programs written in QBasic language (for determining atomic emissions and atomic absorption). 700 has been modified according to the different heavy metals, as follows:

**Table III:** Monochrome and lamp data used for Zn, Cu, Pb, Cd and Fe

Elements	Slot width (µm)	Lamp current intensity (mA)
Zn	70	5
Cu	30	5
Pb	60	6
Cd	30	6
Fe	30	10

**Table IV:** Lengths of measurement waves used to determine absorption

Elements	λ (nm)
Zn	213,9
Cu	324,8
Pb	217,0
Cd	228,8
Fe	248,3

The experiment conditions were previously optimized for each element; the optimized experimental parameters were as follows: flame composition, observation height, slit width, data collection parameters (integration time, number of parallel measurements). Preliminary definitions indicated an appropriate accuracy of the

determinations based on the calibration curve, no need to use the standard dosing procedure. Thus, this procedure was further implemented. Optimal values of data collection parameters: integration time -300, number of parallel measurements - 50; the results were calculated with a probability of 95%.

A computer program (EXCEL) was used to determine the calibration curve based on the measurement data, the amounts of Zn, Cu, Pb, Cd and Fe in the dust samples being determined using the calibration curve.

**Determination of the Calibration Curve**

The chemicals used were of analytical purity (Reagent, Bucharest, Romania) (Specpure, Johnson Matthey Chemicals Limited, England), being used for the preparation of standard solutions. The measurement solutions were prepared by properly diluting the standard solutions. Double-distilled water was used to prepare and dilute the solutions.

From 1000 ppm standard solutions 100 ppm standard solutions were prepared; thus the necessary ppm solutions for calibration were prepared. The solutions were diluted with distilled water. The concentration values of the solutions used for calibration are specified in Table V.

**Table V.** Concentration values of the solutions used for calibration in the two measurement phases (ppm)

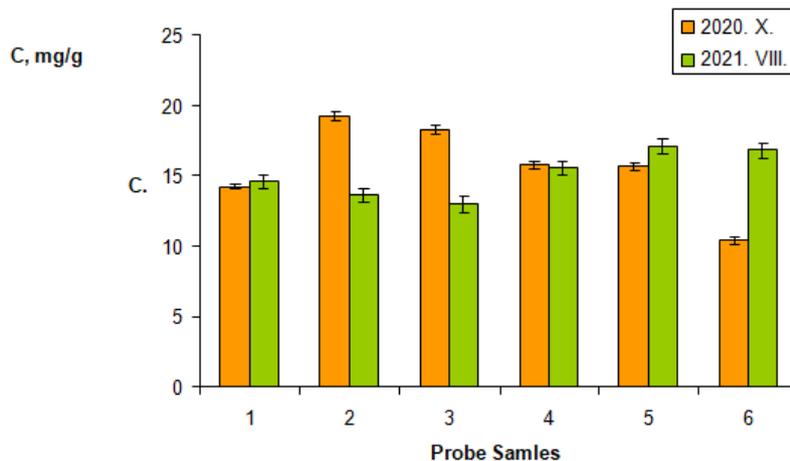
Zn		Cu		Pb		Cd		Fe	
Phase 1	Phase 2								
0,50	0,50	0,50	0,50	2,00	2,00	2,00	2,00	1,60	1,00
2,00	2,00	1,00	1,00	4,00	4,00	4,00	4,00	3,20	5,00
4,00	4,00	3,00	3,00	6,00	6,00	6,00	6,00	4,80	10,00
6,00	6,00	5,00	5,00	8,00	8,00	8,00	8,00	6,40	20,00
		10,00	10,00	10,00	10,00			8,00	

The calibration curves were drawn both in the fall of 2020 and in the summer of 2021

**RESULTS AND DISCUSSION**

The content of heavy metals in the case of both sampling periods (autumn, summer) is shown in the figures below. The values of Fe, Cu, Pb, Zn and Cd concentration mentioned in the case of samples are expressed in mg/g.

**Iron content of samples**



**Fig. 1.** Fe content of dust samples taken at collection points varies in autumn and summer.

Regarding the Fe content of the samples, during the autumn and summer periods, it can be stated that the highest concentration values were measured at sampling points 2 and 3, in autumn. At points 1, 4 and 5, almost the same concentration values were measured, while in the case of sampling point 6, the value of the measured concentration was the lowest in autumn.

In the case of points 5 and 6, the highest concentration values were observed in summer. At points 1 and 4, almost the same concentration values were measured. During that period, the lowest concentration values were measured at points 2 and 3.

**Copper content of sample**

With regard to the Cu content of the samples during the autumn and summer periods, it can be stated that the highest values were measured in autumn in the case of sampling point 3, a high Cu content being also measured

at point 6. During that period the lower values were measured in points 4 and 5, the values thus measured being almost identical.

During the summer, the highest values were measured in point 6. Regarding the period mentioned, the lowest values were measured in points 1 and 2.

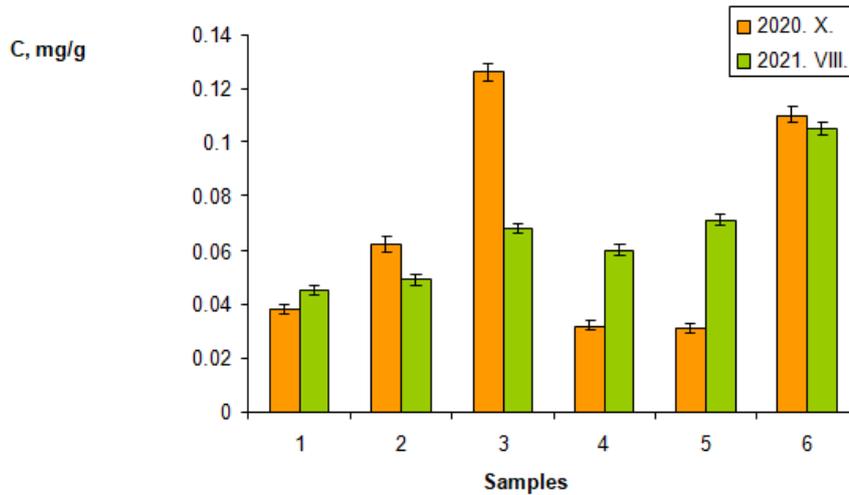


Fig. 2 Cu content of dust samples taken at collection points varies in autumn and summer.

**Lead Content of Samples**

Regarding the Pb content of the samples during the autumn and summer periods, it can be stated that the highest values were measured in autumn in the case of sampling point 3, a high Pb content being measured in points 2 and 6. 1 and 3 measured almost the same concentration values.

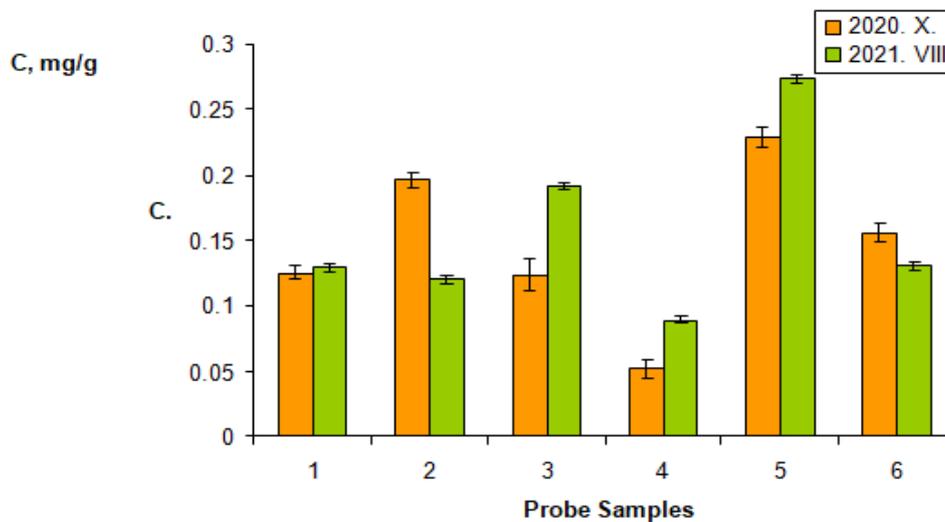


Fig. 3 Pb content of dust samples taken at collection points varies in autumn and summer.

During this period, the lowest Pb content was measured in point 4.

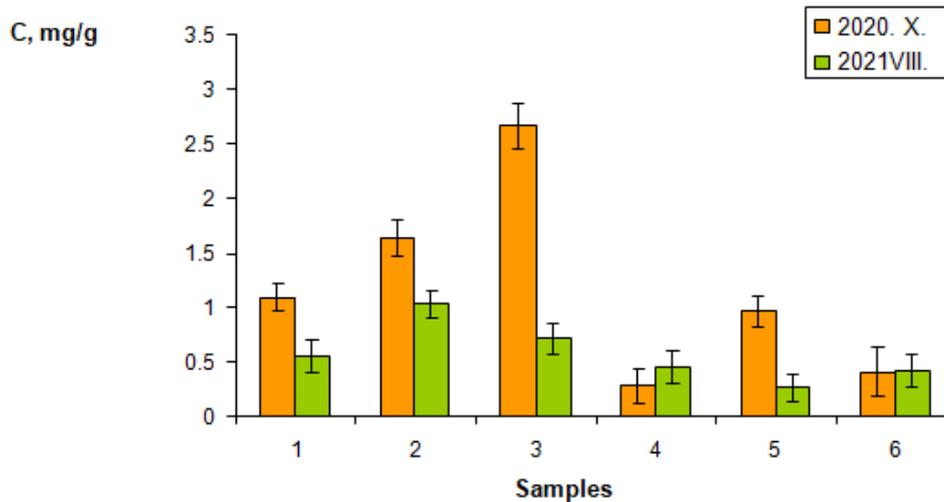
In summer, the highest Pb content was measured at point 5, with a high Pb content also measured at point 3. At points 6, 2 and 1, almost the same concentration values were measured.

In summer the highest Pb values were measured in point 4.

The comparison of the two periods shows the following findings:

- In the case of sampling points 2 and 6 in autumn, high concentration values were measured, while during the summer the samples taken at the same points indicated lower values.
- In the case of sampling points 1, 3, 4 and 5, the values measured in autumn are lower compared to the summer period, when the higher values were measured at the same points.
- The lowest Pb content in both periods was measured in point 4, while the highest Pb content in both periods was measured in point 5.

**Zinc Content of the Samples**

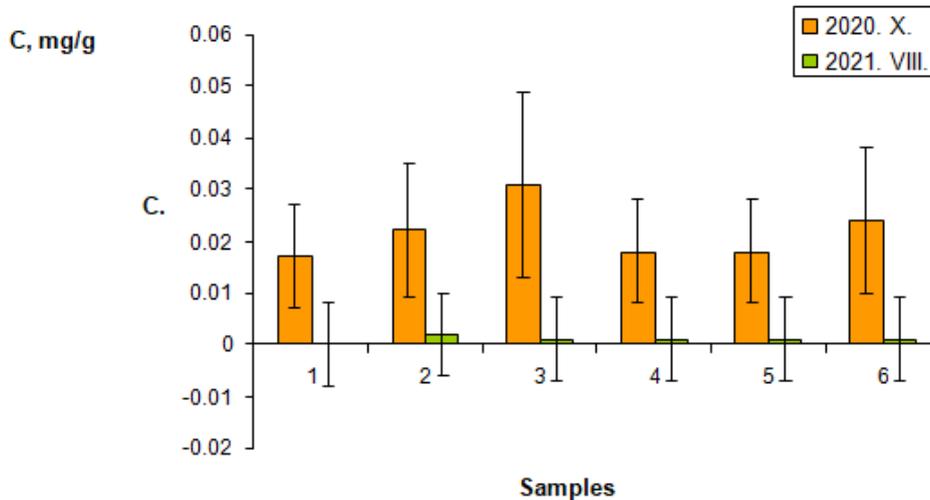


**Fig 4** Zn content of dust samples taken at collection points varies in autumn and summer.

Regarding the Zn content of the samples during the autumn and summer periods, it can be stated that the highest values were measured in autumn in the case of the sampling point 3.

At points 2, 1 and 5, the Zn content was lower. During this period, the lowest Zn content was measured at points 4 and 6. In summer, the highest values were measured at point 2. The lower Zn content was measured in points 3, 1, 4 and 6, while point 5 showed the lowest value.

**Cadmium Content of the Samples**



**Fig 5** Cd content of dust samples taken at collection points varies in autumn and summer.

The Cd content of the samples was below the detection limit in both measurement periods.

As no contamination limit values were identified for the deposited dust layers, the defined limit values for the soil were used for comparison. In the case of Cu, Pb and Zn the metal content of the samples exceeded the normal concentration values in all cases, but in many cases reached the warning or intervention limit:

**CONCLUSIONS**

The amount of Zn, Cu, Pb, Cd and Fe was determined from the dust samples taken. The measurements were performed with the atomic absorption method.

**Sampling took place in two different periods:**

**The autumn**

- The value of Fe concentration in the samples taken was in the range of 10.39 .... 19.25 mg / g.
- The value of Pb concentration in the samples was in the range of 0.05 .... 0.23 mg / g.
- The value of the Cu concentration from the samples was in the range of 0.03 .... 0.13 mg / g.

- The value of Zn concentration in the samples was in the range of 0.28 .... 2.66 mg / g.
- The CD content of the samples was below the detection limit.

**Comparing the results of sampling at the six points in both periods (autumn and summer) the following were established:**

#### Summer

- The value of Fe concentration in the samples was in the range of 12.98 .... 17.08 mg / g.
- The value of Pb concentration in the samples was in the range of 0.09 .... 0.27 mg / g.
- The value of the Cu concentration from the samples was in the range of 0.045 .... 0.10 mg / g.
- The value of Zn concentration in the samples was in the range of 0.41 .... 1.27 mg / g.
- The CD content of the samples was below the detection limit.

**Comparing the results of sampling at the six points in both periods (autumn and summer) the following were established:**

#### The autumn

- In the case of Cu, an exceedance of the maximum allowed concentration values was observed in the case of samples 3 (Center) and 6 (Viile Satu Mare). The values measured in the case of Cu did not reach the intervention level.
- In the case of Pb, it was observed that the maximum concentration value allowed was exceeded at samples 1 (Cloșca street), 2 (Fagului street), 3 (Center), 5 (Meat Factory) and 6 (Satu Mare Vineyards). The values measured for lead did not reach the intervention level.
- In the case of Zn, it was observed that the maximum concentration value allowed for samples 1 (Cloșca Street), 5 (Meat Factory) and 6 (Satu Mare Vineyards) was exceeded. In the case of Zn, the measured values exceed the intervention threshold at samples 2 (Fagului street) and 3 (Center).

#### Summer

- In the case of Cu a value similar to the maximum permissible concentration values was observed in the case of sample 6 (Viile Satu Mare). The values measured in the case of Cu did not reach the intervention level.
- In the case of Pb, it was observed that the maximum concentration value allowed in samples 1 (Cloșca street), 2 (Fagului street), 3 (Center), 5 (Meat Factory) and 6 (Satu Mare Vineyards) was exceeded. they have reached the level of intervention.
- In the case of Zn the value of the maximum permissible concentration has been exceeded in the case of each sample. The values measured in the case of Zn did not exceed the intervention limit, but an approximate value was measured in the case of sample 5 (Meat Factory).

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## TIME SERIES ANALYSIS OF NDVI OF PALAMU DISTRICT OF JHARKHAND, INDIA

Vibhanshu Kumar<sup>1</sup>, Birendra Bharti<sup>2</sup> and Harendra Prasad Singh<sup>3</sup><sup>1</sup>PhD Research Scholar, <sup>2</sup>Assistant Professor and <sup>3</sup>Professor, Department of Water Engineering & Management, Central University of Jharkhand**ABSTRACT**

*The purpose of this study is to use remote sensing technology to assess the state of the vegetation over the Palamu area of Jharkhand, India. In this work, the variability in vegetation response patterns in the study region was examined using 21 years (2001-2021) of Moderate Resolution Imaging Spectroradiometer (MODIS) Terra/Aqua 16-day Normalised Difference Vegetation index (NDVI) data. To examine the trend in the vegetation pattern across the research region, we utilised the Mann Kendall test and Sens slope technique. A substantial trend with an increasing degree of NDVI was discovered in our investigation. Significant temporal and geographical variations were visible in the vegetation cover. All of the NDVI values for each month show an upward trend, with December having the smallest slope.*

*Keyword: Vegetation, Mann-Kendall Test, Sens Slope, Normalized Difference Vegetation Index*

**INTRODUCTION**

Understanding the functioning of terrestrial ecosystems and their interactions with variables like climate change or human driving requires a detailed description and study of vegetation dynamics at regional and global scales. The term "ecological environment" is used to describe the interplay between human civilisation and the numerous natural variables in its vicinity, and it is crucial to human survival and progress (Galford et al., 2008) and the degradation of natural ecosystems (Cleland et al., 2007). It is, therefore, critically important to keep a close eye on the state of things and see how they evolve in the natural world. Long-term observation is necessary to have a comprehensive understanding of the ecological environment's fluctuations and processes in a vegetated landscape. Observations made possible by remote sensing allow us to evaluate temporal and spatial dynamics in vegetated landscapes over extended periods of time. Predicting natural catastrophes, assessing their damages, and coming up with preventative measures all benefit from vegetation analysis.

In contrast to a satellite-based synoptic view, which can monitor the whole planet, traditional vegetation monitoring is only able to monitor the spatial-temporal distribution of vegetation and vegetation using sparsely dispersed ground observation station data within a small region. Many Indian farmers rely on rainfed farming, therefore, prolonged dry spells have a significant impact on agricultural output and monetary losses in the country. A key drought index, such as NDVI, developed by (Rouse et al., 1974), is widely used by many researchers at different time scales to monitor vegetation. This is why it is crucial to track the spatial and temporal fluctuations of vegetation risk for agronomy and forestry.

Understanding the phenomena and its development in qualitative and quantitative dimensions is crucial for analyzing the impact of climate. As part of a comprehensive drought preparedness strategy, it is essential to first identify the unique characteristics of local vegetation in order to then design a more accurate and advanced early warning system. For the present investigation, we zeroed in on the Palamu district, where a high proportion of tribal households own only small plots of land, most of which are dry and barren and hence contribute to the region's chronic water shortage (Sharma, 2019). Previous drought studies have found that the Palamu has highly drought prone regions (Pandey et al., 2012), while research into the effects of climate change has shown a rising pattern of dryness throughout the monsoon (Tirky et al., 2018). So, the main goal of this study was to use NDVI to figure out how vegetation has been over the past 20 years.

**MATERIAL AND METHOD****Study Area**

In the study's geographical focus the Indian state of Jharkhand has a district called Palamu that is between 23°50' and 24°8' N and 83°55' and 84°30' E (Figure 1). It has a total area of 5043.80 km<sup>2</sup>. Paddy, wheat, and sugarcane are only some of the key crops grown in this North Koel river-drained region. While the district as a whole has mountainous topography and sedimentary soil, sandy and loamy soils are widely spread throughout the area. The research region receives less than 1200 millimetres of precipitation on average each year. MOD13A1 is one of the MODIS products from the EOS/Terra satellite (Solana et al., 2010), and it contains the NDVI time series of 16 days at a resolution of 500 metres from 2001 to 2021.

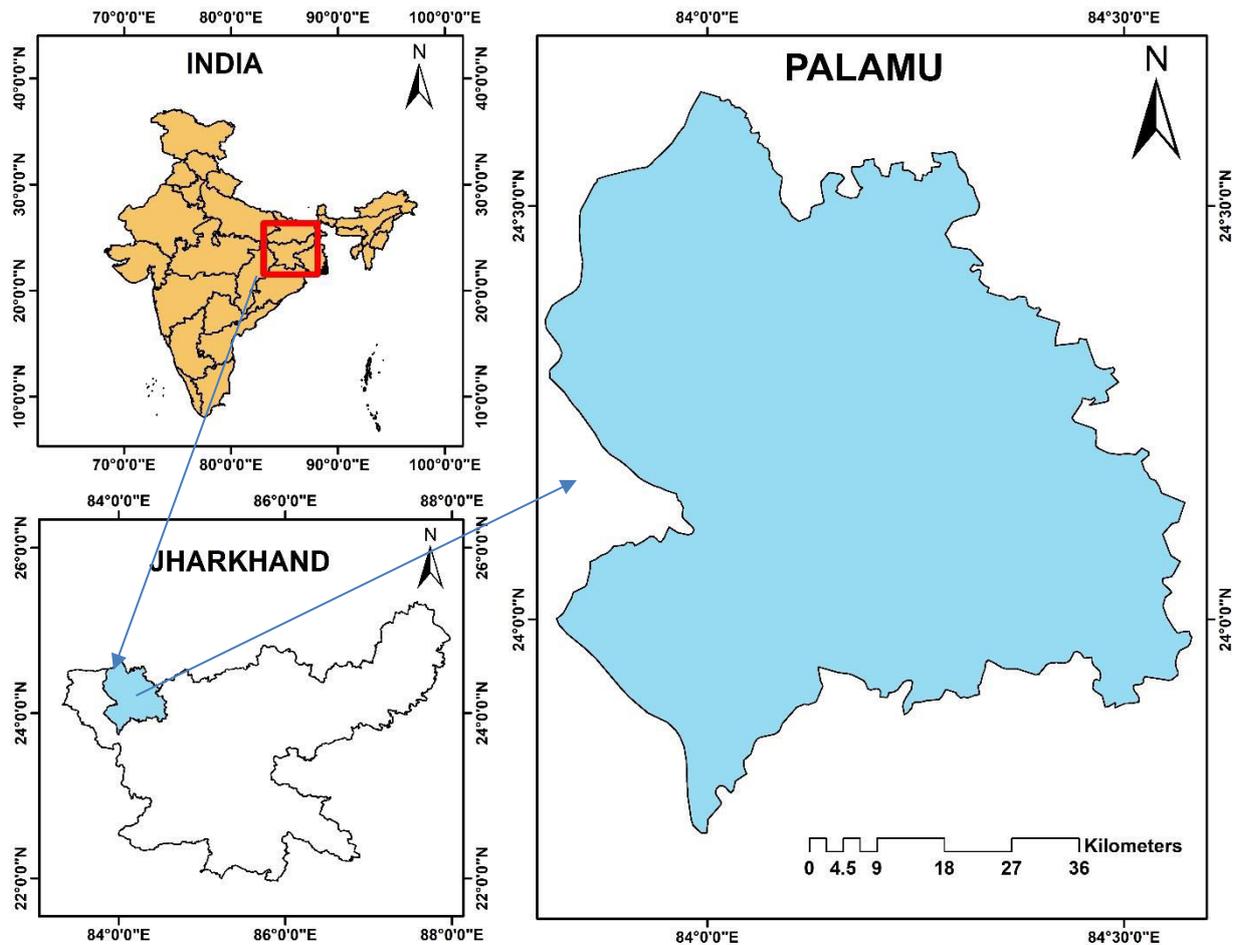


Figure 1: Study area Map

## Method

The technical procedure used in this study can be broken down into two sections: the first is the NDVI, and the second is the trend analysis of NDVI in the study region.

### NDVI

Reflectances in the RED and NIR bands are the basis for NDVI [Rouse et al., 1974]. Pixel-by-pixel analysis of the wavelength range and characteristics for various aspects is performed by deducting the red band value from the NIR band value and dividing by their sum. Devoid of vegetation, places with an NDVI of 0.1 or below are characterised by bare rock, sand, or snow. Shrub and grassland reflect moderate values (0.2–0.3), whereas high values depict temperate and tropical rainforests (0.6 to 0.8). Values closest to 0 for the NDVI reflect bare soil, whereas negative values represent bodies of water.

In the second phase of the enquiry, substantial changes in a random variable over time can be detected using parametric and non-parametric statistical approaches. Longitudinal analysis of time-series data is performed to determine causality and foretell the future course of a given set of variables. A time series having long-term variations, such as the results of a long-running survey, can be inferred using trend analysis. Depending on spatial and temporal changes, the trend might either increase or decrease.

### Mann-Kendall Test

In this work, the Mann-Kendall (MK) test method was employed as a statistical test to analyse NDVI trends (Mann, 1945). There are several advantages to taking this test. It is not a test that presumes properly distributed data, to start. The test can sustain variations in the time series for a brief period of time without failing. Comparing the alternative hypothesis  $H_1$  to the null hypothesis  $H_0$  is one technique to see whether there is a trend. We can evaluate the quality of this data by using the Mann-Kendall test, which enables us to identify whether stations have seen statistically significant change (Hirsch et al., 1982). A group of data can be subjected to this practical non-parametric test to see if their trend is monotonically growing or decreasing. It has been used to affect changes in the climate, meteorology, and hydrology, to name just a few.

The Mann-Kendall statistics (S) is given in equation (i).

$$S = \sum_{i=1}^{N-1} \sum_{j=i+1}^N sgn(x_j - x_i) \tag{i}$$

Where,  $x_j$  and  $x_i$  are the annual values at different time  $j$  and  $i$ , respectively and ‘N’ is the dataset length.

$$sgn(x_j - x_i) = \begin{cases} 1 & ; \text{if } x_j - x_i > 0 \\ 0 & ; \text{if } x_j - x_i = 0 \\ -1 & ; \text{if } x_j - x_i < 0 \end{cases} \tag{ii}$$

Any value for S that is positive implies an upward trend, whereas any value for S that is negative suggests a downward trend. If the value is high, the direction of the Trend is very likely to continue in that way; if it is low, the Trend is less likely to continue in that direction.

Under the assumptions that data are dependent or independent, the variance of the S statistics is provided in equation (iii)

$$var(S) = \frac{n(n-1)(2n+5) - \sum_{i=1}^n t_i(t_i-1)(2t_i+5)}{18} \tag{iii}$$

Where  $n$  represents the total number of tied rank groups and  $t_i$  is the number of data points in the  $i^{th}$  tied group, and  $\Sigma$  shows the summation over all tied groups.

After obtaining the data variance, the standard normal distribution Z-Statistics is calculated using equation (iv).

$$Z = \begin{cases} \frac{S-1}{\sqrt{var(S)}} & ; \text{if } S > 0 \\ 0 & ; \text{if } S = 0 \\ \frac{S+1}{\sqrt{var(S)}} & ; \text{if } S < 0 \end{cases} \tag{iv}$$

Additionally, the computed standard Z value is compared to the standard normal distribution table using a two-tailed significance threshold of = 0.05. The  $H_0$  hypothesis of no trend is rejected if the estimated Z is larger than  $z/2$ ; otherwise, the  $H_0$  hypothesis is accepted, indicating that the trend is not statistically significant (Mehmet, 2003). The significance level used in this analysis to reject the null hypothesis was 0.05. Z values that are positive imply an upward trend, whereas negative values suggest a downward trend.

**SEN’S SLOPE METHOD**

Sen (1968) established a means of determining the gradient of the trend in hydrometeorological records. When working with monotonic data, the linear slope approach, which is non-parametric, produces the best results. In contrast to linear regression, it is robust to problems including missing data, outliers, and high data errors. In this way, we may use equation to get the linear slopes  $T_i$  for any collection of data (v).

$$T_i = \frac{x_j - x_k}{j - k} \text{ for } i = 1, 2, 3 \dots n, j > k \tag{v}$$

Where  $x_j$  and  $x_k$  are data values at time  $j$  and  $k$  ( $j > k$ ). On the other hand, the median of these N values of  $T_i$  is implies to the slope of trend, which is calculated using equation (vi)

$$Q_i = \begin{cases} T_{\frac{N+1}{2}} & \text{if } N \text{ is odd} \\ \frac{1}{2} \left( T_{\frac{N}{2}} + T_{\frac{N+2}{2}} \right) & \text{if } N \text{ is even} \end{cases} \tag{vi}$$

An increase in trend is depicted if  $Q_i$  show positive value; conversely, a negative value shows that the trend in the time series is declining.

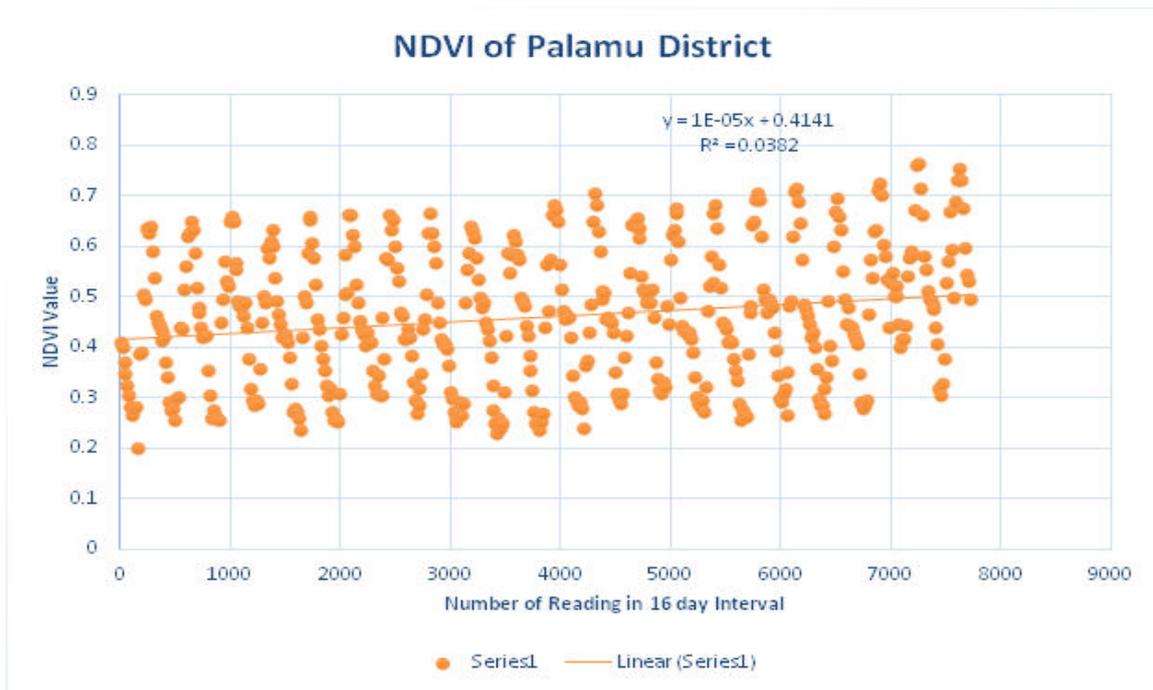
**RESULT AND DISCUSSION**

The current study examines the monthly and yearly NDVI trend analysis of the Palamu district over the 21-year data set. To determine trends across successive years, a non-parametric MK approach was used. Table 1 also shows the size of the trend as determined using Sen's slope approach. As a result, the monthly data variance was computed and depicted in Fig. 2. The Z statistics values for all months were calculated which are 0.238, 0.247, 0.257, 0.080, 0.466, 0.323, 0.080, 0.219, 0.619, 0.366, 0.209, 0.176 and 0.485. The NDVI Values of all months show an increasing trend however December month has least increasing slope.

**Table 1:** Values of Man-Kendall (Z) statistics and Sen’s Slope ( $Q_i$ ) for different months

Months	Kendall Tau Z Statistics	Sen's slope	Mean
January	0.238	0.0019	0.448
February	0.247	0.0017	0.432
March	0.257	0.0031	0.372
April	0.080	0.0016	0.295
May	0.466	0.0082	0.312
June	0.323	0.0045	0.439
July	0.080	0.0012	0.535
August	0.219	0.0044	0.651
September	0.619	0.0036	0.676
October	0.366	0.0035	0.622
November	0.209	0.0027	0.560
December	0.176	0.0010	0.476
Annual	0.485	0.0029	0.485

The trend analysis of annual NDVI is depicted in fig.4 with a rising trend. It shows that the highest average NDVI has occurred is 0.573 in 2020 and a minimum of 0.444 in 2005. The Palamu get the lowest NDVI value 0.249 ever in the month April of the year 2010. However, the study area encounter highest NDVI value 0.76 in the month of September of the year 2020. On an annual basis the positive values of Z and  $Q_i$  shows a rising trend. The maximum NDVI occurred during the monsoon season. Table 1 depicts that Kendall has positive Z values for throughout months. Similarly, Sen’s Slope shows a positive value for respective months. This study give the scenario of the NDVI of the study area in which quality of the NDVI is increased in last two decade can seen in Figure 2. The NDVI value of the study are show the increasing trend having gradient value  $y = 1E-05x + 0.4141$  with  $R^2$  value of the NDVI is 0.0382.



**Figure 2:** Linear Trend of NDVI of the Palamu District

**CONCLUSION**

Today's growing environmental concerns and unpredictable weather patterns are having a negative impact on farming. The influence of climate change on sustainable development may be evaluated, in part, by analysing the trend and variance of NDVI data. Twenty-one years of data were analysed to determine trends in the Palamu area (2001-21). A nonparametric Mann-Kendall test was used to analyse the trend, and the magnitude of the trend was estimated using Sen's Slope. According to the data presented by Z Stats, the NDVI has been on the rise for the whole month. Based on this research, it was determined that the Rabi season will have an impact on farming, cattle, and woodcrafting. These findings also have implications for monitoring drought risk assessment and improving water resource planning, both of which are important for fostering economic growth.

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**A STUDY ON INSTRUMENTS OF GLOBALISATION****<sup>1</sup>Dr. Sumit and <sup>2</sup>Dr. Harvinder Barak**<sup>1</sup>Assistant Professor, Public Administration, Darsh Model Degree College, Gohana, Sonipat Haryana<sup>2</sup>Assistant Professor, Law Meri Law College Sampla, Rohtak, Haryana**ABSTRACT**

*Globalisation provides an opportunity to conceptualize in the context of emerging economies a new mainstream economic system and dynamic. In this respect it applies to a qualitatively different kind of world order not just in terms of the conjectural transition towards greater trading and investment convergence between comparatively distinct national and regional economies. This mechanism entails the growing incorporation into international business relations of more and more nations and economic players. This integration to a greater extent promotes economic equality and reduced poverty. The need for globalization in developed countries is closely associated with the broader benefits of trade, such as access to finance, technology, management processes, manufacturing technologies and the introduction of formerly unemployed workers in manufacturing. The compression of time and space allowed faster entry, which might otherwise be shown. The collapse of the supply chains has provided development countries with prospects that may not previously have been viewed as one of the principal developments associated with globalisation. Such prospects include international trading, gathering export revenue and the national incomes, and attracting Foreign Direct Investment (FDI) in the growth of the manufacturing sector. Globalisation instrument is a complex and dynamic phase of globalisation phenomenon. What make this phenomenon more complex are the contradictory justifications on the origin of globalization, conflicting ways of defining the phenomenon and differing viewpoints on globalization dimensions. This paper tries to provide an basic understanding of globalization instruments which support its historical development perspective. History has provided some details about ground breaking events in different eras of globalization. Various dimensions of globalization are also available in this study. Brief description of each instrument is given for understanding the concept of instruments of globalization from different aspects. Last and most important part of this paper is comprised of current events, statistics, reports and trend analysis which help in predicting globalization's future. Future is forecasted based on available facts and figures.*

*Keywords: Globalisation, Instrument, Critics, Trade, Economy.*

**INTRODUCTION**

Political decision making for the purpose of emerging Globalisation through excellence is an apparent instrument surging ahead with establishing the process of setting global standardization of techniques, technologies, economic standards, and excellence in almost in every area of human life. That is why the journey of Globalisation is moving forward from country to country and from one region to another the world over. Therefore, Globalisation despite being an economic exercise; in general, it is the product of political conditioning of emerging human aspirations of national and international levels. This political decision making writs large not only as a foundation stone of the pillar of Globalization but also as an amplifier and booster to provide the impetus to good governance and other characteristic features of the Globalisation and instruments of Globalisation. Globalisation as old as human civilization, but has accelerated considerably since World-War II, driven by various instruments. The first is the technological advancements that have lowered the costs of transportation, communication, and computation to the extent that it is often economically feasible for a firm to locate different phases of production in different countries. Second is the increasing liberalization and privatization of trade and capital markets, more and more governments are refusing to protect their economies from foreign competition or influence through import tariffs and non-tariff barriers such as import quotas, export restraints, and legal prohibitions. The third one is the establishment of international institutions in post-world war II, including the United Nations and Brettonwood institutions, i.e., the World Bank, International Monetary Fund (IMF), and General Agreement on Tariffs and Trade (GATT), succeeded in 1995 by the World Trade Organization (WTO) -have played an important role in promoting free trade in place of protectionism. Any characterization of Globalisation that excludes the roles of these instruments will be too reductionist since the primary goal of Globalisation is the integration of a world in almost every area of life. As such, all these instruments have played crucial roles.

**1. RESEARCH QUESTION**

- What are the major instruments of Globalization?

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**METHOD**

- Keeping in view the very complex scope of the study both primary and secondary sources has been judiciously used.

**1. TRADE AS AN INSTRUMENT OF GLOBALISATION**

An important instrument of the Globalisation is the trade, in which the principle entities are national economies. Trade produce growing interconnection between different national economics. Such a process involves the increasing integration of more and more nations and economic actors on the world market. The history of these activities goes back to the earliest civilizations, but it was the Middle Ages in Europe that market the initiation of systematic cross-border trading operations carried out by institutions of private corporations. During the fourteenth century, the Hanseatic League organized German merchant's conducts commerce and trade in Western Europe, which involved them in agricultural production, iron smelting and other manufacturing activities. At the same time, the Merchant Adventurers organized the sale of the products manufactured in the United Kingdom (UK) to another part of the world.

The volume of international trade expanded at about 3.5 per cent per annum from 1870-1913. Trade was adversely affected by the growth of tariffs, quantitative restrictions, exchange controls and then wars (World War-I and World War-II), and it expanded by less than 1 per cent annum on average between 1913 and 1950. Since 1950 there has been a consistent expansion of trade at an annual rate of nearly eight percent. Since 1983, the pace of world trade has accelerated again, reaching an average annual rate of 5.7%. The factors that contribute to this are:

- 1992 European Union lift barriers to internal trade in goods and labour . January 1, 1994 the North American Free Trade Agreement (NAFTA) took effect.
- 1995 The GATT Marrakech Agreement specified formation of the WTO
- January 1, 1995 World Trade Organization was created to facilitate a free trade.
- EC was transformed into the European Union, which accomplished the Economic and Monetary Union (EMU) in 2002, through introducing the Euro and creating this way a real single market between 13 member states as of January 1, 2007.
- 2005, the Central American Free Trade Agreement was signed; It includes the United States and the Dominican Republic.

**Critics**

International trade has made it easy to buy and sell good internationally and facilitate Globalisation. The critics don't agree with this and argue that international trade also has various problems that hinder the process of Globalisation. First, a developing country runs the risk that some of their industries, those that are less competitive and adaptable, will be forced to shut down or merge at Multinational Corporations (MNCs). Second, as underdeveloped countries attempt to cut costs to gain a price advantage, many workers in these countries face low pay, substandard working conditions and even forced labour and abusive child labour. Third, increasing the economic efficiency and international competitiveness of key industries should be considered as an alternative to protectionist policies.

**2. TECHNOLOGY AS AN INSTRUMENT OF GLOBALISATION**

The advancement in communication, information and transportation technology to a greater extent facilitates the global business, global communication, global governance, and standardization that are the vital features of globalisation. The worldwide expansion of the Multinational Companies (MNCs), Transnational Cooperation (TNCs) and other international economic entities, has been highly stimulated by the technological advancements in the designing, manufacturing and marketing of consumer and industrial products. The services were also improved by technological advancement. The information and communication technology (ICT) revolution has triggered e-commerce and e-governance as a strong driving force for global business. Improved transportation and communication now make it possible to be in continuous contact with producers anywhere in the world. This makes it easier for companies for the produce and distributes some good worldwide example Coke, McDonald, Lives and etc.

Technological innovations have contributed a lot in moving towards Globalisation by making the infrastructure of trans-world connections. As mentioned above, improvements in means of transport, communications, and information technology have allowed global links to become denser, faster, mor reliable, and much cheaper. Some of the conclusions draw from the above discussion about the contribution of technology to the process of Globalisation:

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- Technology has created more chances for better communication flow between the world.
  - It has given opportunities to increase the trade and education flow and then allocation of the best resources to meet standards around the world.
  - The technological innovations are helpful for developing countries by bringing them to the mainstream to compete with a developed world all terms.

### **Critics**

Critics argue that the technological innovations and development has generated the tendency among the developing countries to emulate the strategies adopted by the developed countries. The developed countries, with all their advancement in the technological field, find it difficult to cope up with the ever-increasing problems of ecology and environmental degradation. The main problems of the third world are poverty and unemployment, i.e., satisfaction of the basic needs and not the wants. Hence, they should decide what should be the technique to be followed to eradicate poverty and unemployment. They have to think about adopting a production strategy that would be labour-intensive and should give the utmost importance to hands and not to machines, as Gandhi indented. The technology should be appropriate and not to imported technology from the developed countries. It should be developed indigenously. Such a technology, if used through rural industries to exploit local resources for production in a decentralized manner, would reduce the problems of social costs and help the third world countries to achieve their goals of self-sufficiency and self-reliance. It will serve as an effective weapon to correct the world economic imbalances. It will help the developing countries to look at the developed countries with self-respect and on an equal footing as partners.

### **3. COLONIALISM AND IMPERIALISM AS AN INSTRUMENT OF GLOBALISATION**

The contribution of the colonialism and the imperialism to the process of Globalisation is unique. Colonialism refers to the establishment, maintenance, acquisition, and expansion of colonies in one territory by people from another territory. Whereas imperialism is a policy which aims at creating, organizing and maintain an empire. Both these terms are closely related in the sense that it envisages the affiliation between the superior -inferior or rulers-ruled relationship and ideologically linked with mercantilism. A colony is part of an empire, and so colonialism is closely related to imperialism. The initial assumption is that colonialism, and imperialism are interchangeable, however, imperialism is the concept while colonialism is the practice. Colonialism is based on an imperial outlook, thereby creating a consequential relationship between the two. Through an empire, colonialism is established, and capitalism is expanded, on the other hand, a capitalist economy naturally enforces an empire. The methods which the imperial power follows for expansions of their empire or colonies are as follows:

- Military interventions and wars.
- Economic methods like exploring the foreign market for the sale of finished products and purchase of raw material and cheap labour.
- Means of economic investment and economic assistance is also employed.

### **Critics**

Critics label this as a policy of exploitation and racial discrimination and generate inequalities. Imperialism destroyed the economy, culture, and social values of the colonial people. They were also the major cause of international wars and rivalries. In this way, the international market that was originated in the eighteenth, and nineteenth century was not full global, because the imperial powers got the maximum benefits in terms of economy, on the other hand, major parts around the world, i.e., Asia, Africa and Latin America were an only a supplier of raw material and consumers of finished products.

### **4. NEO- COLONIALISM AS AN INSTRUMENT OF GLOBALISATION**

The neo-colonialism of today represents imperialism in its final and perhaps its most dangerous stage. In the past, it was possible to convert a country upon which a neo-colonial regime had been imposed-Egypt in the nineteenth century is an example- into a colonial territory. Today this process is no longer feasible. Old-fashioned colonialism is by no mean entirely abolished. Once a territory has become nominally, independent it is not longer possible, as it was in the last century, to reverse the process. Existing colonies may linger on, but no new colonies will be created. In place of colonialism as the main instrument of imperialism we have today's neo-colonialism.

Prior to the Second World War, the main features of colonialism, are to capture more and more colonies, and the struggle between the imperial powers for the redistribution of territory and spheres of influence. However, the post-world war II led to the introduction of a new element in the shape of competitive struggle to reconquer

that part of the world which had opted out of the imperialist network. In this context, industrialized countries use different methods like military and political as well as economic. While the imperialist powers did not give up the colonies gladly or easily, the main purposes of colonialism had been achieved prior to the new political independence; the colonies intertwined with the world capitalist markets; their resources, economies, and societies had become adapted for the needs of the metropolitan countries. The current task of imperialism now becomes to hold onto as many of the economic and financial benefits of these former colonies as possible. And this course meant the continuation of the economic and financial dependency of these countries on the metropolitan centers.

- Since 1945, the United States emerge as the world leader for the entire imperialist system. As a result of its maturing economic and military strength and the destruction inflicted on rivals by the wars. The United States had the capacity, and the opportunity to organize and lead the imperialist network today. The neo-colonialism proceeded through the medium of the international institutions established toward the end of the war; the United Nations, the General Agreement on Tariff and Trade (GATT) the World Bank, the International Monetary Fund and World Trade Organization (WTO) in the leading role.
- The new technology, spurred on by the war, is much more international in scope than the old technology, and therefore has special implications for the current operation of imperialism. The most obvious aspect is the technology of space. The large number of "space" stations across the globe is one of the international features. In addition, the technologies of atomic energy and computers have special international features. The enormous investment in research and development required in these industries gives a special edge to the corporations which are large enough to generate the Globalisation.

### **Critics**

Opponents to the above mentioned aspects argue that the majority of the nations of Asia, Africa and Latin America are politically free and sovereign, but in reality, they are the victims of big power politics. In the words of Palmer and Perkins, "this neo-colonialism is regarded as a new one and more insidious form of imperialism, widely prevalent and particularly pernicious and dangerous". It is the continuation of the exploitation by foreign aid, foreign direct investment, cultural invasion, military intervention, media and others. The chief objective of neo-colonialism is to take care of the flow of imperialist profits from former colonial territories. Its aim is to have economic dominance in place of political and military aids.

### **5. CAPITALISM AS AN INSTRUMENT OF GLOBALISATION**

Capitalism stands for economic system in which the means of production are privately owned and operated for a private profit. As an important supporter to the Globalisation, the capitalism developed in the sixteenth century in Europe in the form of mercantilism. Mercantilism was associated with geographic exploration of the 'Age of Discovery' being exploited by a merchant overseas trade, especially from England, the Low Countries, the European colonization of the Americas, and the rapid growth in overseas trade. Mercantilism was a system of trade for profit, although commodities were still largely produced by non-capitalist production methods. Mercantilism as a form of capitalism declined in the nineteenth century because of industrialization, and Britain occupied the dominant position which was widely regarded as the classic case of laissez-faire capitalism. At the end of the nineteenth century, from the opening of the canal forward, the Britain slowly lost its pre-eminence in manufacturing and finance. There were many elements, including the obsolescence of the personal management style, confrontational labour relations, inadequate capital investment, and the rise of at least three competing industrial giants, i.e., Germany, Japan and the United States. Other aspects of twentieth century capitalism include the rise of Global Markets, Global Production, Global Commodities, and Global which in a wider sense fuelled the process of Globalisation.

### **Critics**

Capitalism that is a predominant phenomenon in today's Globalisation, affecting the world negatively through excessive consumption, the unequal distribution of wealth, exploitation, dependency of developing countries on developed world, conflicts and environmental degradation. These problems exist at the international level, because of capitalism are interconnected and work as one system. In lieu of these widespread effects, capitalism got the attention of critics, as people are being exploited and marginalized by the reinforcement of inequality. Not only, are humans being affected negatively by capitalism, also. The environment suffers severe damages because of excessive consumption, which is performed by people who strive for profits and consume excessively.

### **6. UNITED NATIONS AS AN INSTRUMENT OF GLOBALISATION**

After the bitter experience of two world wars within twenty-five years, the necessity of forming a United Nations Organization, with more powers than the League of Nations, was discussed first at the Dumbarton Oaks

Conference in August 1944. It was finally put into shaped by the delegates from 50 nations assembled in San Francisco on October 24, 1945. The establishment of the United

Nations accelerates the process of Globalisation to a wider extend. Today, the United Nations is the best-Know a global organization with 193 independent states from every region in the world with six major organs i.e., General Assembly, Security Council, Economic and Social Council, Trusteeship Council, International Court of Justice and Secretariat.

The purpose of the United Nations as set forth in Article 1 of the Charter includes maintenance of international peace and security; development of friendly relations among nations and cooperation in solving international problems. For the attainment of the above purposes, the UN acts in accordance with certain principles such as:

- The sovereign equality among the member nations
- Settle international disputes by peaceful means
- Refrain from the threat or use of force in international relations
- To assist the UN in any action within the UN charter an
- No intervention in the domestic affairs of member nations

**Critics:**

Critics do not agree to aforesaid points. Instead, they argued that United Nations disappointed the Globalisation. It fails to maintain world peace and serve peaceful settlement of disputes. Since the establishment of the United Nations, the world has witnessed over 100 major conflicts which left over twenty million people died. United Nations also fail to tackle some of the major current problems like drug trafficking, international terrorism and environmental degradation. No doubt, the United Nation has tried to these problems, but it did not meet with much success. Another notable defect in the working of the United Nations has been the dominance of prominent members, particularly the USA. This considerably paralyzed the organization and its functions.

**7. BRETTONWOODS INSTITUTIONS AS AN INSTRUMENT OF GLOBALISATION**

The first five decades of the twentieth century were full of turmoil in which the world had seen two world wars and great economic depression. The consequence of this turmoil was senseless wastage of human life. Many countries became bankrupt, widespread unemployment, dumping of food in the sea, closure of factories and etc. The impact of this turmoil was clearly noticed in the world trade which was devastating decline from 1913 to 1950 at a rate 1.9 per cent per annum Recognizing this, the Bretton Woods institutions were created in Bretton Woods, New Hampshire in 1944 during the United Nations Monetary and Financial Conference at the Mount Washington Hotel. At the conference, member nations agreed to create a family of institutions to address critical issues in the international financial system which are as follows:

- a. International Monetary Fund (IMF),
- b. The International Bank for Reconstruction and Development (IBRD) and
- c. General Agreement on Tariffs and Trade (GATT)

**a. The International Monetary Fund (IMF)**

It was established to promote a monetary cooperation, exchange stability and orderly exchange arrangements, to encourage economic growth, generate employment opportunities and promotes financial assistance to countries to help ease balance of payment adjustment. In this respect, International Monetary Fund has been assigned several functions:

- I. It promotes international monetary cooperation.
- II. It facilitates the expansion of international trade.
- III. It promotes exchange stability.
- IV. It establishes a multilateral system of payments.
- V. It fosters members' confidence in the IMF.
- VI. It allocates the resources available..

**Critics**

Despite the potential benefits of the International Monetary Fund, which can provide an effective counter to the financial crisis and accelerates the Globalisation, the role of the IMF has proven very controversial, i.e., First; the IMF insists on blanket policies of structural adjustment, which harm the economies of developing countries

by forcing them privatization and deregulation. Second, the IMF turned a minor financial crisis into a major economic recession with unemployment rates in countries like Thailand, Indonesia and Malaysia shoot up. Third, the conditions of IMF loan cause more harm than good. In the Asian Crisis of 1997, many critics of the IMF's insistence on a deflationary fiscal policy's (spending cuts and tax rises) and higher interest rates. Fourth, the IMF takes away the ability of countries to decide national policy. Instead, they have to follow the economic dictates of an unelected body (MNCs and TNCs), with a perspective skewed by free market ideology and the interest in the developed world.

**b. The World Bank Group**

It was created in July 1944 at the Monetary and Financial conference held in Bretton Woods, which was attended by 44 countries. The World Bank was designed to support reconstruction efforts after the Second World War and to assist through loans in "the development of productive facilities and resources in less-developed countries". The World Bank Group consists of five closely associated institutions, all owned by member countries that carry ultimate decision-making power. Each Institution plays a distinct role in the mission to fight poverty and improve living standard for people in the developing world. The term "World Bank Group" encompasses the following five institutions:

- International Bank for Reconstruction and Development,
- International Association,
- International Finance Corporation,
- Multinational Investment Guarantee Agency, and

**Critics**

The World Bank has long been on the radar of critics. For them, the World Bank represents nearly 188 countries worldwide, but it is run by economically developed countries, and these countries choose the leadership, manipulate the rules and modus operandi for distribution of funds. In this sense, their interests are dominating in the World Bank. Second, The World Bank has been criticized for promoting Washington Consensus, policies, which included deregulation and liberalization of markets, privatization, and the down-scaling of government. Though the Washington Consensus was conceived as a policy that would best promote development, it was criticized for ignoring equity, employment and how reforms like privatization were carried out in developing countries. And third, criticism against the World Bank is its role in causing high debt among developing countries. Although the World Bank's loans are intended to help countries, they also cause those countries to take on debt that they must pay interest on and remain under the conditions at the institution. Over the last twenty years, these debts have piled up so much that, critics say, they amount to "perpetual debt" that the poor people around the world are saddled with.

**c. The General Agreement on Tariffs and Trade (GATT)**

It was a multilateral agreement regulating international trade. According to its preamble, its purpose was the "substantial reduction of tariffs and other trade barriers and the elimination of preferences, on a reciprocal and mutually advantageous basis". It was negotiated during the United Nations Conference on Trade and Employment and was the outcome of the failure of negotiating governments to create the International Trade Organization (ITO). GATT was signed in 1947 with the following objectives:

- I. It promotes free trade.
- II. Elimination of tariffs; creation of free trade zones with small or no tariffs.
- III. Reduced transportation costs, especially resulting from development of containerization for ocean shipping.
- IV. Reduction or elimination of capital controls
- V. Reduction, elimination, or harmonization of subsidies for local businesses
- VI. Harmonization of intellectual property laws across the majority of states, with more restrictions
- VII. Recognize intellectual property restrictions.

**Critics:**

They argued that the WTO is failing to maintain the conducive environment for Globalisation. There's this argument can easily be analyzed from the different meetings of the WTO, in which developed and developing countries both protested against the ineffective functioning of the WTO. In 1996, the Ministerial Conference of the WTO took place. The ministers failed to adopt a US initiative to include labour standard in the WTO program. Agricultural trade liberalization was next on the agenda, to begin in 1999. These two issues have been

the most contentious, since the imposition of labour standards would take away the advantage of poor countries while agricultural trade could wipe out the food security of others.

## **8. GANDHI AND INSTRUMENTS OF GLOBALISATION**

As noted above the present-day process of Globalisation, has been accelerated by international trade, technological innovations, international institutions such as the United Nations and International Financial Institutions such as the IMF, IBRD, GATT and WTO. These entire instruments had just stated evolving or manifesting themselves when Gandhi passed away in 1948. As such he did not address himself in specific terms on their merits and demerits. Hence, by and large, we could ascertain his attitude toward them through the application of what may be called derivative or inferential logic. To this end, it would be necessary to recall the board corpus of his idea of civilization, westernization, Swadeshi, Sarvodaya, truth, non-violence, trust and interdependence. As regards international trade, Gandhi's views on it were broadly determined by his commitments to ideals of national self-sufficiency, i.e., Swadeshi'. To quote him:

“To reject foreign manufacturers merely because they are foreign, and to go on wasting national time and money on the promotion in one's country of manufacturers for which it is not suited would be criminal folly, and a negation of the Swadeshi spirit”.

Gandhi distinguished between tools and implements and large-scale machines, between technology that increases the productivity of individuals and groups, and technology that leads to concentration of power and exhaustion of non-renewable sources of energy. The one leads to peace, cooperation, and universal fellow feelings, and the other leads to violence, concentration of power into the hands of the few, irresponsibility, utter hopelessness, and helplessness, aggression, and exploitation. He desired to give a new direction to technological development through the symbol of the spinning wheel.

Modern technology is replacing out dated techniques in almost all sectors the world over. However, Gandhi admitted large scale technology in his model only in those sectors where it was unavoidable. He wanted the use of machines to be subject to several important constraints. It should not destroy village crafts. It should not increase economic inequality. Above all, it should not displace manual labour.

Thus, we must say that the process of Globalization is old as human civilization, but has accelerated considerably since the mid-1980s, driven by various instruments. The important one is the technological advancements that have lowered the costs of transportation, communication, and computation to the extent that it is often economically feasible for a firm to locate different phases of production in different countries. This further led to describe various newly emerged instruments as mentioned above and far in future hope for the best to emerge.

Critics did not agree with these and argued that Globalisation is responsible for insecurity of human life in all respects such as social, economic, political, cultural and ecological. They relate it with an onslaught of foreign capital and technology, which destroy the native systems of production, and lead in the exploitation of poor nations by the rich. Many of them think that the Globalisation undermines sovereignty of nation-states, particularly in economic areas. The post-cold war era is the best illustration of this, in which most of the third-world countries have been opted for structural adjustment programmes, to remove geographical barriers to foreign investment. This leads to various problems in these countries in the shape of economic inequalities, unregulated economy, social insecurity, erosion of cultural values (i.e., domination of a monetary and commercial aspect in traditional social relationship and family values), unemployment, the threat to small-scale and cottage industries, the population explosion in urban areas, commercialization of education and etc.

## **CONCLUSION**

They further argue that even in the developed world not everyone is happy, the phenomenon of unemployment, price rise, economic inequalities, economic crises, degradation of moral and ethical values, wider spread violence and etc., is also there. The critics again blame the Globalisation for their adverse impacts on the environment. The process of Globalisation has facilitated the institutions and activities that have led to greater exploitation and depletion of natural resources and have promoted environmentally harmful activities, which lead to continued reduction in the status of the earth environment for human life.

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## STANDARDIZATION OF HERBAL DRUG FOENICULAM VULGARE

Amal Kumar, Dr. Arvind Kumar and Rajat Saini

S.D. College of Pharmacy and Vocational Studies, Muzaffarnagar, U.P

## ABSTRACT

The procedure of standardising herbal preparations is a key aspect of obtaining the product's quality and efficacy, and it is the rate-limiting stage in Ayurvedic formulations. The data about the concentrations employed in the formulation are provided in detail by the procedure. In this study, standardization of herbal drugs- *Foeniculum vulgare* was investigated. The formulary of ayurvedic drugs in India was followed in the production. For the standardisation of commercial and in-house ayurvedic medicinal products, the organoleptic qualities, physical properties, and physiological features were utilised. The drug property was evaluated and compared to the reference standards for control and quality assurance in pharmaceutical laboratories using precise and accurate metrics.

Keywords: Anti-inflammatory, physicochemical, standardization.

## INTRODUCTION

Herbal medicines are plants or parts of plants that have been transformed into phyto-pharmaceuticals by simple gathering, harvesting, drying, and storage methods. Herbal medicines are the oldest type of medicine known to man, and they have been utilised for ages by people of all cultures. Since ancient forebears realised their need for nature for a healthy life, humanity has relied on a huge variety of plant sources for nourishment, shelter, clothes, and medication to treat a wide range of diseases.

Nature, taste, and experience encouraged Mesopotamian clay tablet writing and Primitive men and women to heal illnesses using plant, animal, and mineral components that were not commonly eaten.

Experimentation taught primitive humans how to distinguish between beneficial plants with beneficial effects and inactive or hazardous plants, as well as the processing procedures or combinations to use to get the greatest outcomes.

SYNONYMS	:	SAUPH
BIOLOGICAL NAME	:	FOENICULUMVULGARE MILL
FAMILY	:	UMBELLIFERAE
KINGDOM	:	PLANTAE
GENUS	:	FOENICULUM
SPECIES	:	F. VULGARE

**Habitat**— Fennel is a tough, annual, umbelliferous plant with yellow flowers and fluffy foliage that grows naturally in most regions of continental Europe. It is native to the Adriatic coasts, from which it extends east to India. It has followed society, particularly wherever Italians have colonized, and may be seen growing wild on different areas of the universe in semi arid soils along seashores and riverbanks. It grows well on limestone soils and has become naturalized in several regions of the nation. It can be seen throughout North Wales to Kent, with the highest concentrations in Devon and Cornwall, as well as on chalk cliffs near the sea. It is frequently found in semi-wild condition in calcareous regions downstream.

## Description-



Fig 1: Fennel fruits

Fennel is a pretty shrub. It will have a strong, annual root, robust stalks that are four to five feet in length, upright and tubular, brilliant emerald and so silky that they appear finished, and many branching leaflets that are sliced through into tiniest of sections. The golden yellow petals, which bloom in July and August and are developed in big, flat ending inflorescences with 13 to 20 beams, are developed in huge, shallow termination inflorescence.

### **Cultivation**

Fennel can be cultivated practically anywhere and can last for years. Seeds, put in damp soils early in April, are a simple method to distribute it. It prefers bright sunshine and may thrive in dry, sunny environments. It does not require a lot of organic manure in the soil, but it will yield more on thick, hard ground. With an annualised rate of 15 cwt. per hectare, this fruit is considerable. Fennel roots are occasionally used in medicine, but the fruit, which is the only portion approved by either of the Pharmacopoeias, is usually preferable in terms of quality.

### **CHEMICAL CONSTITUENTS**

Fennel is not consistent in composition when purchased. Fennel produces 4 - 5% essential oil (sp. gr. 0.960 to 0.930), its main components of those are Anethol (50-60%) and Fenchone (40-50%). (18 - 22 per cent). Anise oil also contains Anethol as a major component.

Fenchone is a colourless gas with a strong, camphoraceous odour & flavour that provides several industrial oils an unpleasant bitter flavor when available.

### **METHOD AND MATERIAL**

#### **1. Raw Material Collecting and Identification**

Collected four batches of *Foeniculum vulgare* Mill. fruits from the Herbal Garden of S. D. College Of Pharmacy And Vocational Studies, Muzaffarnagar and authenticate from Botany department of Chotu Ram P.G. College Muzaffarnagar.

#### **2. Studies on Pharmacognosy**

i. **Macroscopical Studies-** Macromolecular fundamental studies concentrate on large segment qualities that are difficult to detect with traditional methods.

ii. **Microscopy-** Cross-sections of Fennel show a pentagonal mericarp, with four of the edges nearly equal and marginally sunken, the other or commissural surface being significantly longer and only the end of the root or less undulate; cells of the seed-cover firmly joined with those of the pericarp, giving the part two extremely distinct regions, the internal and larger piece (endosperm) pretty much adjusted pentagonal and fairly rhombic.

#### **iii. Powder Microscopy**

Fennel Fruit Endosperm Powder Microscopy: Endosperm particles were plentiful and are made up of irregular tough outer walls cells having attached lipid granules and aleurone granules. Micro-rosette grains of calcium oxalate can also be seen in those layers.

#### **1. Physiochemical Analysis**

##### **Loss on Drying**

The Loss on Drying Study is used to determine how much aqueous and aromatic materials are present in a solution of sample after it has been dehydrated beneath specific circumstances. A statement like "not more than 0.50 percent (104 percent, 180 minutes)" inside the Pharmacopoeia means that weight reduction is not more than 0.50 percent of the sample as evaluated by drying 1.5 to 3 g of the sample, correctly measured, at 105o for 180 minutes. A description like "not more than 0.50 percent (0.5 g, not more than 1.3kPa, 24 hours)" means that the weight reduction is not more than 0.50 percent of a specimen when measured besides simply putting approximately 0.50 g of the sample, correctly weighed, inside a desiccator with silica gel as the dehumidifier & dried under pressure of 1.3kPa and not less for 24 hours.

##### **Ash Value:-**

##### **Ash Determination**

After ignition the remaining material is known as ash. There are two types of ash one is the ash derived from plant tissues (physiological ash) and the other one is remaining part of dust or soil material which adhering to plant surface (non-physiological ash). Ash will be determined by following three methods-

##### **Total ash**

➤ The mass of the ash is carried out after it has been ignited.

- A uncoated silicon crucible is filled with around two gm of granular substance.
- Inside a muffle furnace, burned at 450°C till it will be carbon-free.
- The crucible let remain cool and weighed the substance.
- % of total ash was calculated with air-dry substance.

#### Formula for the Total Ash Value Determination-

$$\text{Total Ash value of the given sample} = 100 (A-B) \% / C$$

Where,

A = weight of empty crucible,

B = weight of the given drug sample,

C = weight of the crucible + ash (after complete incineration).

## 2. Phytochemical Evaluation

**Successive Extraction-** Fennel seeds are distilled using crude ingredients as from Cepogo District in Boyolali, Indonesia. This uses 5 kg of materials with black beans that are 0.3 mm long and have a particular flavour. 5 kg fresh fennel seeds were added to the pure water inside the pot.

The reason for implementing the dissolution rate of fennel seed oil in alcohol would be to assess the concentrations of volatile oil obtained from anise extraction process. This is accomplished by placing 2 ml of fennel oil inside a glass container, adding ninety percent ethanolic extract, and shaking the mixture until it is fully mixed. The ethanol is gradually added to generate a real solution and until the proportion of fennel oil and alcohol equals 1:3. The chemical contents of fennel seed oil are determined using GC-MS, and the metal content of fennel seed oil refined products is determined using AAS.

#### Qualitative Phytochemical Analysis-

**Anethole (between 42–71%)**

**Fenchone (between 3–21%)**

**Estragole (between 3–8%).**

A portion of one isolated volatile oils (0.1 mL) mixed with dichloromethane (10 mL) and appropriate samples prepared in organic solvents were used for TLC analysis of *Foeniculum vulgare*. The samples are placed on a pre-coated Bayer silica gel plate (80, GF254, 250m) and grown across a 10 cm path with a 93:7 cyclohexane/Ethyl acetate solvent solution. UV light (254 nm) and H<sub>2</sub>SO<sub>4</sub> at 140 °C for 3-6 minutes were used to detect these stains. The spots were initially seen under UV light (254 nm), and then at 140 °C for 5 minutes with H<sub>2</sub>SO<sub>4</sub> in a second solvent solution (5:1 hexane / methylene chloride).

## RESULT AND DISCUSSION

### 1. Macroscopic Examination of Fennel Fruit:-

**Table 1:** Macroscopical Characteristics

S.No	Property	<i>Foeniculum vulgare</i> mill
1	Colour	Dark Green
2	Odour	Pleasant
3	Taste	Sweet
4	Size	4-10 mm long
5	Shape	Cylindrical
6	Surface characteristics texture	Hard

**Table 2:** Microscopic examination of Fennel fruit:-

Sr. No.	Constituents	Procedure for test/reagent	Result
1.	Starch crystals, Hemicellulose	Take a Spoon of Crude drug + 2 Drop of Iodine Solution	Blue colour
2.	Mucilage	Ruthenium Red	Pink colour
3.	Lignin	T.s. of crude drug + 1 drop of phloroglucinol + 1 drop of HCL	Pink colour

Observation with microscope, cross over segments of Fennel show a pentagonal mericarp, four of the edges being almost equivalent and marginally sunken, the other or commissural surface being significantly longer and that's only the tip of the iceberg or less undulate; cells of the seed-cover firmly joined with those of the pericarp, giving the part two extremely particular regions, the internal and bigger piece (endosperm) pretty much adjusted pentagonal and fairly reniform, made out of polygonal cells, loaded up with aleurone grains containing rosette totals of calcium oxalate and a meager protoplasmic layer encasing a decent oil;

The external or pericarp layer recognized by huge circular vittae with thick, earthy colored dividers, happening independently and rotating with the essential ribs, and two vittae on the dorsal surface, making typically six vittae taking all things together, happening independently and substituting with the essential ribs, and two vittae on the dorsal surface, making generally six vittae taking all things together, there now and then being, not withstanding, a couple vittae extra; in the focal piece of every one of the ribs happens an almost roundabout, fibro-vascular pack with a couple tracheae and various flimsy walled, firmly lignified sclerenchymatous filaments.



Fig 1.2: Microscopy of Fennel

1. Evaluation of Physical Parameter

a. Determination of Total Ash

Table 3: Observation of Total Ash

Name of Compound	Total Ash
Fennel	8.46

By deducting the entire weight of a crucible and also the weight of the ash from the weight of the empty crucible, the total ash of the plant was estimated. The overall ash content of the *Foeniculum Vulgare* mill was discovered to be 8.46% w/w.

Determination of Acid-Insoluble Ash

Table 4: Observation of Acid Insoluble Ash

Name of Compound	Acid Insoluble Ash
Fennel	0.97

The insoluble ash of the plant was performed and calculated by subtracting total ash from wweight of crucible and weight of acid insoluble ash. The acid insoluble ash of *Foeniculumvulgare* mill was found to be 0.97% w/w.

a. Determination of Water Soluble Ash

Table 5: Observation of water Soluble Ash

Name of compound	Water soluble ash
Fennel	4.36

b. Loss on Drying:-

Table 6: Observation of Loss on Drying

Name of Compound	Loss on drying %w/w
Fennel	9.60

c. Determination of Water extractive value

Table 7: Determination of Water extractive value

Name of Compound	Water extractive value %w/w
Fennel	20.46

**d. Determination of pH:**

pH was evaluated by using the polyherbal solution (1%) in the distilled water and pH is determined by using Systronic Digital pH meter that is 6.60.

**e. Phytochemical Screening**

Successive extraction of the dried fine powder of the plant were done using different suitable solvent. The extract were dissolved in dil. HCl and then perform the various test as mentioned in the table below with results.

**Table 5.7:** Various Chemical tests

S. No.	Name of test	Pet. Ether extract	Chloroform extract	Ethanol extract
1.	Alkaloids	--	--	--
2.	Carbohydrates	++	++	++
3.	Phenolic compounds	++	--	++
4.	Flavonoids	++	++	++
5.	Saponins	++	--	++
6.	Steroids	++	++	++
7.	Glycosides	++	--	++
8.	Proteins	--	+	+
9.	Amino Acids	++	++	--
10.	Resins	--	++	--

**CONCLUSION**

Numerous research were conducted on the sample, including morphological, pharmacognostic, phytochemical, and physiochemical tests.

Based on the findings of the preceding studies, we can conclude that the parameters defined for the standardisation of *Foeniculum vulgare* are effective enough to be considered by the quality control department in order to ensure that the finished product consistency is maintained from batch to batch.

According to a literature study, the plant in the drug have Physiological properties. As a result, it was established that the drug had a substantial anti-anxiety and anti-anxiety behaviour impact.

More research is needed to determine the pharmacological and chemical characteristics of the formulation in order to determine the precise mechanism of action of the formulation and isolate the active principles responsible for these types of activities.

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**AN ANALYTICAL STUDY EXAMINING THE IMPACT OF TEACHER PROFESSIONAL TRAINING ON STUDENTS' LEARNING****Abhinav Shrivastava<sup>1</sup>, Dr Somesh Dhamija<sup>2</sup> and Vipin Chauhan<sup>3</sup>**<sup>1</sup>Research Scholar, GLA University, Mathura, Uttar Pradesh - 281001<sup>2</sup>Head, Management (UG), GLA University, Mathura, Uttar Pradesh - 281001<sup>3</sup>Executive Soft Skills Trainer, TMU University Moradabad- 244001**ABSTRACT**

Teachers are considered the building blocks of a nation since ages. Teaching is not just a self-propagating profession but also helps in the development of other professions and professionals. It is the teacher who teaches young talents and helps them grow into different professions. As different professionals are well equipped with newer technological advancements in their armory that help them to create feasible solutions of the existing problems, similarly teachers should also be periodically well acquainted with newer changes in education system, which appears to be impossible without the aid of professional development trainings. These trainings can be on different topics related to teaching like recent technological trends, online content delivery, teaching methodologies, pedagogies, motivational lectures etc. These trainings can prove to be milestones in the development of their career and can increase their possibilities to grow as a successful professional in their respective fields which in correlation may directly or indirectly influence their students. Therefore, after on-job-training of the teachers, they must undergo different trainings periodically to enhance their expertise and professional growth, which consequently can help the students to achieve desired learning outcomes and also improve the results.

Many researches have shown a strong relationship between the teacher's professional development trainings and their effectiveness. Empirical studies have concluded that professional development trainings and the efficiency of teacher's and students' learning are functionally linked together. The present study examines the effects of teacher's professional development trainings on students learning capabilities, attitude & performance and concludes that professionally developed teachers can make the entire learning process effortless and leveled for students thereby significantly affecting their overall learning outcome and performance in exams.

*Keywords: Professional Development, Teachers Training, Students Learning, Professional Training, students' achievement*

**1. INTRODUCTION**

The teaching profession can be a key factor in a country's prosperity and can lead to success on a variety of fronts. Teachers are expected to be extremely efficient and professional in their particular disciplines of study, as education plays an important role in the development of society. As a result, they must be provided with a vast knowledge base as well as teaching strategies and assessment measures in order to meet the growing demands and match the high standards of education with improved quality; therefore a country's primary concern should be to train instructors with advanced skills. Good instructors play a critical role in empowering education and making learning a never-ending process; therefore steps to develop and expand teaching abilities among teachers is imperative. Many global schools and universities provide teacher training and professional development programmes that are formed on a regular basis and seek to help instructors learn and enhance their skills.

Professional training for teachers is broadly defined as a wide range of specialised training, knowledge transfer sessions, or any other type of professional training provided to teachers by an expert in any subject or technology in order to improve their skills, competencies, and command of the technology or subject. Teachers' professional development is primarily divided into three categories:

- Periodic Workshops
- In class observation
- Single Session Workshop

Periodic workshops consist of training sessions for teachers after a set length of time, and these sessions are repeated on a regular basis. This phase could be on a weekly or monthly basis. These sessions are held when there is a lot of content to impart to instructors and the trainee teachers need to do a lot of hands-on practise. Teachers are instructed in real time, i.e. during their classes, through in-class observation. Trainers just monitor the teacher's class and note the subject delivery approach as well as class behaviour. He may or may not be able

to improvise the teachers on the spot. Furthermore, single-session workshops are often shorter forms of training, with less content to offer to teachers and sessions that may be finished in a single day.

As a result, the primary academic concern should be that the key members of this designing board have adequate professional hands-on training in order to gain a wealth of information and abilities to teach, as well as the ability to be determined enough for this crucial job. So, teachers should not only receive adequate training, but these programmes should also be designed, led and tested by professionals. Qualitative teacher training programmes that can help them develop professionally, and a good inspiring and learning environment can all contribute to produce a positive motivating influence and improve their teaching and learning. Some of the most important factors that institutions that deal with teacher training must focus on are detailed substantial knowledge, skills for teaching and evaluation, well defined achievable and focused educational objectives, determination and persistence to learn, commitment to the profession, motivation and motivating attitudes towards this profession. Educational centers must leave no stone unturned in their efforts to equip aspiring teachers with an appropriate and sufficient set of skills, as well as the ability to increase their professional and positive attitudes.

Furthermore, students have varying perspectives on learning. They act differently toward different subjects, enhancing or losing their interests in diverse ways. Other teachers, despite having greater experience, have been found to have a stronger impact on pupils and to influence them. On the other side, some teachers with extensive knowledge and teaching experience cannot have the same impact on students. To address this issue and improve students' learning and interests, professional development programmes to improve instructors' skills and trainings to improve their positive, professional, and motivated attitude toward their work should be made available. In this review, we looked at the outcomes of past studies conducted by researchers in the field of teacher professional development in countries other than India, their impact on students' learning, and how it affects students' learning and performance. And using those studies as a foundation, we have attempted to address the following research questions:

**RQ1:** What effect does teacher training have on student achievement?

**RQ2:** How does teacher education influence students' learning attitudes?

**RQ3:** Does a well-trained instructor make a big difference in a student's performance?

The goal of this research is to see how professional development training for instructors affects kids' learning capacities. This study also has the goal of examining a student's performance following a teacher's professional development training. We will be able to analyse how teacher training affects students' performance and learning attitudes by evaluating prior researches done by researchers and basing our conclusions on their findings. This study is significant in that it provides further research for articles on teacher training and educational success. Furthermore, it has global implications in other industries, as training is the most important necessity for keeping your workforce up to date. This research could be a watershed moment for fields that are yet to be explored. In this fast-paced technological era, there is a significant shift in students' learning attitudes that can only be reached through enhanced teacher training. Teachers' training should be advanced to the point that they can provide a teacher with knowledge of education that can help them meet national objectives and philosophy, as well as a full comprehension of the national curriculum.

## **2. LITERATURE REVIEW**

Many facets of teacher training and its impact on students' learning and organisational performance have been documented in previous research. These studies also shed light on the link between training and many characteristics of student performance. One of them is teacher training to improve their ability to design inclusive learning (Shaymaa et al., 2017). In this regard, there is a wealth of literature available, which is covered below. Much research on teacher professional development, the necessity for professional development, and its impact on student learning have already been conducted in different countries.

### **2.1 Researches Based on the Professional Development of Teachers:**

After estimating the value of teachers in Chicago Public Schools, previous researchers (Aaronson, Barrow, & Sander, 2007) underlined that teacher quality is more crucial for lower ability kids. Furthermore, May Britt Postholm (2017) indicated in a review research that instructors must engage in learning processes on a regular basis in order to lead school improvement. His findings also revealed that an outside resource person, such as a trainer or researcher, may make a significant contribution to the development of a school. Frans Hermans, Peter Sloep, and Karel Krejins (2017) found that after receiving professional training, teachers are highly driven to improve their teaching style and classroom practise.

**2.2 Researches Based on Effects of Teachers Training on Students' Learning:**

Harris and Sass (2011) conducted a relevant study on the subject, examining the effects of various types of education and training on teachers' ability to encourage students' successes. They also mentioned that on-the-job training boosts teacher productivity. Another study conducted by Ali and Hamza (2017) looked at the impact of teacher training on student learning. They found that if more teacher training opportunities are available, students' learning attitudes increase and they are more eager to learn from professionally qualified teachers. However, Jacob and Lefgren's study, which looked at the influence of teacher training on primary children's arithmetic and reading performance, found that minor improvements in in-service training have no meaningful impact on either math or reading. The good influence of a qualified instructor on student learning was described by reviewing literature (Clotfelter, Ladd, & Vigdor, 2007). As a result, N. Harris (2008) investigated the impact of teacher training on student achievement. However, in order to provide students with greater learning opportunities, a unified framework for planning teacher training is essential (Silvia Baldiris et al., 2016). Teachers' training improved their ability to communicate with students in a more effective manner in order to improve students' attitudes toward learning (Zachary, Eleazar, & Wilfred, 2016).

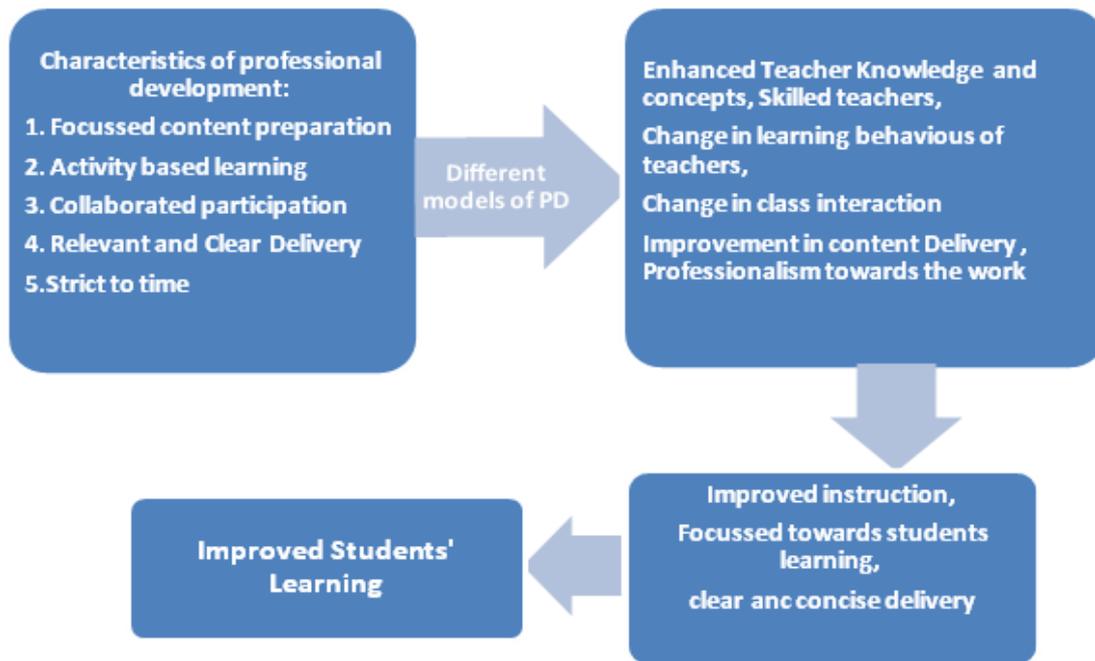
**2.3 Researches Based on Importance of Teachers Training:**

The effective use of resources in the teaching and learning process significantly improves student comprehension. Changes in textbooks and other resources make little difference if teachers don't know how to use them effectively, according to study (Darling-Hammond, 1997). The study went on to say that proper resource use can be improved through continuing teacher training. In addition, Rowan (2002) emphasised the importance of teacher preparation in the utilisation of resources in elementary school mathematics and reading. In their research review on school resources, Greenwald, Hedges, and Laine (1996) noted the considerable benefits of teacher training on the usage of school resources. Ali and Hamza (2017) investigated the impact of teacher training on organisational performance and concluded that teacher professional development can improve organisational performance. Furthermore, Morgan (2010) stated in his study on the benefits of professional development that instructors get more information, which allows them to deliver more in the classroom. Teacher feedback is also given to them as part of their training. It can increase the quality of education by enhancing students' learning capacities (Muralidharan&Sundaraman, 2011), as well as their attitude toward learning. Teacher training can also assist in changing teachers' attitudes toward students' learning styles (Biktimirov& Armstrong, 2015). It enables teachers to support students in a way that is conducive to learning and knowledge improvement (Bertagna, 2015).

**2.4 Researches Based on Models of Professional Development of Teachers:**

Orit Avidov-Ungar (2016) proposed a model for professional development and teachers' perceptions of their professional development process in a valuable study. In this model, the researcher created two aspects that teachers used to describe their professional growth stories: intrinsic and extrinsic motivation for professional development. The instructors' aspirations, are classified as lateral and vertical. The author created four professional development patterns based on motivation and aspiration: hierarchically ambitious, hierarchically compelled, laterally ambitious, and laterally compelled. In his research, another researcher, Eylon and Bagno (2006), proposed a methodology called "Research design model for professional development of teachers: Using physics education research to design education". In this methodology, the author proposes ten actions divided into three stages, with the first stage referring to goal setting, the second to lesson planning, and the third to case studies. And it was recommended that workshop-based professional development could assist teachers achieve their goals.

Many of the authors argued that professional development is a crucial aspect of teachers' and educational development after reviewing their past studies. Many researchers have found that when teachers are professionally trained, they change their attitude toward their profession and improve their classroom behaviour, interaction with students, and content delivery methodology, which helps students to be motivated and improve their academic performance. A conceptual framework is proposed based on the same findings.



**Fig 01:** Framework of Teachers Training to Enhance Student learning

Following is the table which represents the findings of the authors on different categories of professional development of teachers:

**3. DISCUSSION**

Various points that need to be examined can be mentioned after examining the literature and prior researcher's research. Many prior studies have found that instructors are significant peers for stakeholders, and students have direct and frequent contact with them, so teachers' interactions with students are crucial. As a result, the content expertise and demeanor of teachers are extremely crucial. When employed in a process where the aspects of professional development may be used with pre-defined goals and objectives, and with a concentrated content, a conceptual framework can be highly useful for teacher professional development. If supplied to teachers, this type of learning environment and training can have a significant impact on their professional progress and attitude toward their work. Consequently, it has the potential to improve students' learning behaviour and attitude. To improve the quality of training, teachers should get pre-service and in-service training. Following a study of the existing literature and research conducted by the authors, it can also be concluded that teacher training is critical for students with poorer learning abilities or who have learning difficulties when compared to other students.

Furthermore, it has been discovered that teacher professional development is equally crucial in order to signal a major change in teaching methodology and classroom practise. After researching various methods of training, another study concludes that on-the-job training can assist students enhance their successes and encourage them to do better. Teachers need to follow the learning procedures on a regular basis for professional development, which can also aid with organisational development. Teachers are strongly motivated to employ the enhanced measures in their teaching skills, teaching technique, and in their regular classroom sessions after attending professional trainings. May of the researchers confirmed that these professional development courses help teachers increase their potential and capabilities, and hence their quality. Significant improvements in teaching quality have been seen, as well as an increase in teaching morale. Furthermore, it has been suggested that teachers be given adequate time to interact with the subject matter. Teachers who have completed an average of 50 hours of professional development can assist pupils in improving their grades. When a teacher engages in a professional development programme, students have a better probability of attaining a higher proficiency score. Many researchers have also emphasised the importance of teachers participating in content generation and instructional strategy design in order to improve student accomplishment. It's also been argued that when professional development focuses on specific instructional methods, it makes it easier for teachers to use those practises in the classroom. Teachers' training can also aid in the growth of schools and organisations, and can be the most important component in improving school performance and student learning. As a result, teachers' learning is passed on to students. The learning of professional development would be greatly strengthened with periodic continuous talks and exchanges among teachers, schools, and learning activities, according to prior study.

Many past studies have discovered some of the most important aspects of professional development. The information should be particularly focused and related to the issue, according to the major features. Irrelevant discussion during a professional development programme session may cause learners to lose interest. The learning that is derived from any activity, on the other hand, can assist learners in remembering it for a longer period of time. As a result, activity-based learning is another crucial aspect of professional development. Participation is another crucial component of professional development programmes. Any session that assures the learners' participation encourages them to pay attention and maintain their interest. The most crucial elements to examine are adherence to deadlines and clear content delivery.

When teachers are exposed to active learning chances, they can do exceptionally well. Teachers can benefit from active learning when it comes to classroom interaction. If they can combine active learning with opportunities for feedback, reflection, and cooperation, they will be able to perform even better. Thus, there is a significant need to call for stronger, more focused, and scalable professional development programmes, which, as noted in one of the studies, is a difficult challenge to do. There is a paucity of substantial evidence about instructors learning, according to some scholars. The effectiveness of teachers' learning and its impact on students' learning is disputed due to a lack of scientific proof. It has also been noticed that specific checkpoints must be present throughout teacher professional development meetings. One of the primary issues raised by the authors is the importance of putting what you've learned into practise. Professional development may help teachers enhance their learning as well as their knowledge and skills for teaching, but they may not apply it to their teaching approach or classroom practise. Accordingly, it is critical for teachers to put their professional development learning into practise in order to ensure student improvement. Another key aspect of professional development programmes to consider is the duration of the programmes and their sessions. A large number of professional development programmes have also been found to have a negative impact on student progress. Furthermore, it has been noticed that having too many professional development trainings from various sources might lead to a loss of instructional cohesion. Short development programmes, on the other hand, have a favourable impact on teaching procedures and approaches.

However, it has also been noted that providing professional development training to instructors can improve students' learning attitudes. In another study, it was discovered that when teachers receive minor in-service training in mathematics problem solving and reading, the pupils in basic grades had no meaningful influence. As a result, it has been discovered that the impact on students might be influenced by their grades. Following the findings of studies on the importance of training, it is widely accepted that professional development of training is necessary to instil qualities in teachers such as proper resource use, content delivery, proper classroom behaviour, student interaction, and thus to improve students' learning attitudes and the organization's performance. However, it has been noted that numerous models for teacher professional development have been given by different academics from time to time. One model proposes a matrix based on aspiration, which is divided into two levels: lateral and vertical, and motivation, which is divided into two levels: extrinsic and intrinsic. A variant approach based on 10 successive phases integrated in three stages is presented in another study. It has been suggested that professional development models should always have a defined aim and purpose to achieve, and that only the programme should be structured to achieve those goals and objectives.

## **CONCLUSION**

"Teachers are the key to the implementation of NEP 2020," according to the context of the New Education Policy in India 2020. As a result, teachers will play a critical role in implementing NEP 2020. Therefore, teachers are one of the most important resources for making our educational system stronger and learner-centered. Teachers must be updated with new technology innovation trainings, new methodologies, and new strategies to interact with students in order to facilitate easy, better, and faster learning.

Based on the review studies of the researches, as well as the above findings and discussion, it can be stated that teacher professional development can be an important benchmark and can prove to be an important milestone in improving and enhancing educational quality. Teachers who increase their learning abilities and attitudes toward their profession can improve the quality of pupils and their learning abilities. As a result, it can be argued that teacher professional development training is critical for improving the quality, abilities, and competencies of instructors. Furthermore, instructors' professional development programmes must be monitored on a regular basis to ensure that learning occurs. Also, some important factors such as the length of the teacher training sessions, strict adherence to the content, and relevant and focused content can assist teachers in having a positive impact on their learning and thus in improving their teaching methodology, but any failure in these factors can result in devastation and teachers losing interest in professional development programmes. So, it can be stated that a professional development programme with a definite set outcome, after which teacher learning

can be ensured and quantified, can greatly assist teachers in their professional growth. Furthermore, because the teacher is always a student's first point of contact, professionally trained teachers who have experienced the positive impact of professional development training on their attitude can ensure that the learning is applied in their classroom practise and student interaction, allowing these teachers to have an even greater impact on students' learning. As a result, teacher professional development can aid in improving students' performance, achievements, and learning attitudes.

Teachers' professional development training can assist students' performance, and because students are one of the most important stakeholders in any educational institution, their success has a significant impact on the company's performance. So, based on the assessment of prior research, it can also be inferred that teacher professional development can increase the organization's performance. It can also be stated that, in order to ensure the efficacy of the professional development programme, training programmes should always be effectively connected with the training needs of teachers and students' learning. Training need analysis may aid in the development of a more successful and efficient programme, as well as the creation of content that is brief and relevant to the training.

#### **4. SCOPE AND LIMITATIONS**

This report is merely a study and observation of earlier scholars' valuable research. In this work, prior researchers' research on professional development training and models, their value for instructors' professional growth, and their impact on students' learning attitudes, knowledge skills enhancement, and organisational performance is examined. Therefore, it is restricted to the analysis and observation of earlier researchers' research.

However, it adds more dimensions to further research and can be linked to various attributes such as students' practical knowledge enhancements, students' learning capabilities or skills, teachers' professional attributes or attitudes, or any other aspect that is important for student, teacher, and organisational performance improvement.

This paper helps to connect and observe the findings of many researchers while also adding new dimensions to the study and investigation of crucial areas of student and teacher performance. Also, new aspects will be opened to highlight the link between the relevance of teacher training and the impact on students' academic performance. As any nation's growth is directly proportional to its students' growth in knowledge, any educational institution can only expand as the students' knowledge bank expands. When it comes to knowledge, it's not about the grade; instead, it's about their learning attitude, their ability to think through problems, and their accomplishments and performance in curricular and extracurricular activities. The purpose of this work is to investigate the relationship between students' learning abilities, problem-solving abilities, and teacher training. As a result, this study will undoubtedly assist educational institutions in improving the qualities of teachers, hence improving students' learning abilities. Subsequently, the educational institute's performance will improve even more. This study can also serve as a baseline for a new emergent training sector known as "Train the Teachers."

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**AN EVALUATION OF HUMAN RESOURCE MANAGEMENT IN INDIAN HEALTHCARE ORGANIZATIONS**

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**Sukhjeet Kaur and Dr. Sukhdeep Kaur**

Department of Management &amp; Commerce, Desh Beg Hat University Mandi Gobindharghar, India

**ABSTRACT**

*This essay discusses the part-human resource management plays in raising employee productivity, which in turn increases client contentment and enhances healthcare services. Safe, patient-centered, timely, efficient, and equitable treatment should be the primary goals of high-quality healthcare. For the best possible use of the resources at hand, human resource management should encourage training, motivation, retention, the implementation of new techniques, and systematic planning. The current situation leaves a broad spectrum of healthcare personnel with insufficient training and a lack of competency. The delivery of safe healthcare now depends heavily on patient-centered care. The Human Resource Department should use the most up-to-date strategies in order to compete and survive in the competitive healthcare sector, given the industry's increasing bloom and change. Monitoring the laws and regulations governing the healthcare system in regard to its employees is another aspect of the responsibility of human resource management. For better patient-centered healthcare, an interdisciplinary team must be formed by identifying the root causes of errors, developing strategies to lower the likelihood of future errors, conducting a gap analysis, incorporating the necessary skills to close the gap, and utilizing quality improvement methodologies.*

*Keywords: Healthcare, Employees training, Management.*

**INTRODUCTION**

The management of human resources is important in the delivery of healthcare, and methodical management is essential. In addition to using an existing approach, human resource management places a strong emphasis on new strategic plans for training and assessing the competence of both new and existing workers. Human resource management is based on three main principles. Physical, capital, and consumable resources should also be taken into consideration along with health system inputs. Human resource management primarily focuses on the administration of public and individual health systems and interventions, which are directly managed by various types of clinical and non-clinical staff. Knowledge and skills play a major role in the performance outcomes and advantages that human resource management might attain. The drive of those people that make up the entire healthcare system. In a healthcare organization that is situated in a hospital or clinical laboratory, it is crucial to evaluate the performance of all staff levels at the outset and on a regular basis. Human resource management's primary responsibility. This involves job analysis, personnel requirements, workforce structure, performance assessment and evaluation, implementation of rewards, professional development, and ongoing workforce maintenance. In order to maximize patient satisfaction, good medical services and delivery systems are critical components of every organization. Human resources management has been the subject of numerous studies in the past. These studies emphasize the significance of Human resources management in achieving the objectives of healthcare organizations as well as the significance of ongoing training and development for all staff levels in order to raise the standard of care. Medical practitioners that are highly motivated and qualified are essential to the success of the national healthcare forum. Alternative methods of implementing Human Resource Management should be developed and used if the current practices are insufficient to achieve the desired results. All senior-level managers ought to plan out fresh ideas and tactics to improve human resource management. According to studies, human resource management in hospitals has been able to boost staff performance by providing them with incentives and encouragement to work hard as well as bonuses based on performance ratings of individual employees. A key component of human resource management should be preserving employees' mental health. In low- and middle-income countries, there are gaps in the management of employees that could lead to staff with poor mental health. If appropriate techniques are not implemented within the primary healthcare setup itself, this could result in a major decline in the performance of such employees. It is commonly known that low and middle-income countries lack the human resource management tools necessary to sustain mental health and that innovative approaches are needed to fill these gaps. If appropriate measures are not taken to fix it, it could take a serious turn. Community-based interventions could provide better mental health in primary care settings.

Employing laypeople, non-professional health care providers, and careers who can take an active part under proper supervision can improve the situation of all mentally ill people by allowing for earlier detection, diagnosis, and treatment. Without sufficient funding from Human Resources Management, the number of

employees who are mentally sick would rise across the board. To promote the mental health of employees, a practical method, funding, creative thinking and strong leadership are urgently needed. The size, makeup, and proper management and distribution of the healthcare personnel, as well as training based on the demands of economic development, socio demographic trends, and cultural considerations, must all be determined for improved human resource management. In a case study conducted in a small private hospital in New York, it was discovered that how the corporate culture of a business is shaped has a big impact on how well healthcare is delivered. With a set of prefixed goals, steps were made to define the values, behaviors, and competency of the current culture. g culture with a prefix of aims. Human resource management specialists received training to empower staff members with training objectives to increase their creativity and innovation. A number of nurse stations were put up inside the hospital for convenient access to patient's needs, and the nursing staff received training on a team-based approach to patient care. Additionally, staff received training to help them get ready for marketing internal resources and promoting career prospects outside the company. The management of people at work is the focus of human resource management. It exhibits a new way of thinking, strategy, and perspective. Some individuals mistakenly believe that human resource management and management are the same things because the human aspect is so significant in the subject of management. The management of an organization's human resources, which are all humans involved in organizational operations at any level, is the focus of this topic. Within an organization, it talks about interpersonal relationships. Bringing people and organizations together to achieve their objectives is what it is called. The manner in which management recruits, selects, trains, develops, and uses its workforce mainly influences whether or not the firm will meet its goals. As a result, the management of the business needs to appropriately manage, employ, and organize the staff at their disposal. The goals of an organization can be accomplished via the combined efforts of its management and employees. An organization cannot achieve its goals without concerted and team efforts. Therefore, the goal of human resource management is to acquire and keep a skilled workforce so that the organization's goals may be met. Human resource development can be defined in an organizational context as the process by which employees of an organization are continuously and intentionally assisted in acquiring and honing the capabilities and skills necessary to perform a variety of tasks related to their current and anticipated future roles. They are also given assistance in enhancing and developing their untapped potential for the growth of the firm as a whole. The third dimension of the process is creating an organizational atmosphere, which supports the professional happiness, motivation, and pride of the personnel. Having competent, motivated, devoted, and disciplined staff is typically the organizational goal of Human Resource Department in order to ensure improved levels of productivity, profitability, and organizational growth. The process of assisting people in acquiring the skills and talents necessary for their current and anticipated future responsibilities is known as human resource development. Their organization as well as their individual qualities is further developed, and their latent potential is also revealed and harnessed. It fosters a culture of trust, cooperation, and positive supervisor-subordinate interactions among units, which benefits the workers' motivation and professional well-being.

### **LITERATURE REVIEW**

Throughout all four industrial revolutions, human resource management has evolved in tandem with the economy and the emergence of innovation. At the turn of the 19th and 20th century, manufacturing enterprises began to employ the first human resource managers and HR departments. Initially, their duties were restricted to administration, accounting, and resource planning. We believe that describing the developmental stages and recognizing the evolution of personnel management are vital in order to understand the level of quality of human resource management in the healthcare industry. There are four fundamental developmental stages that can be used to quickly summarize the development of human resource management.

The personnel department, which offers payroll accounting, basic labor legislation, and personnel administration, represents the fundamental level of human resource management. The second layer of human resource management focuses on organizational design management, selection, training, and remuneration. The human resource role consists of human resource business partners who support managers strategically and human resource service centers that offer services to employees. The third level is a superstructure where integrated talent management is provided through human resource management. The creation of a coaching culture, talent management, leadership support, and succession planning are new jobs. The most cutting-edge human resource management departments are totally digital, completely connected with the business, and capable of foreseeing the future and generating value through big data analytics. Their effect and knowledge are both constantly growing. They are more concerned with what they deliver than with what they do. Measured and assessed is how human resource management actions affect the organization's performance. Blstakova's model [8], which addresses conceptual issues of human resource management, describes the impact of the 4.0

era on human resource management through changes in the values, roles, architecture, and content of human resource management. This model can serve as the foundation for developing a human resource management strategy and subsequent sub strategies.

The association between the adoption of cutting-edge, developed human resource management systems and a company's organizational success has been supported by numerous international researches. The mixed (mature) function of human resource management in healthcare facilities (hospitals) has a favorable impact on their organizational performance, according to Jankelova's research in 44 Slovak hospitals. For instance, West et al. observed that human resource management systems in healthcare facilities have a direct impact on the standard of care delivered and the patient mortality rate in hospitals.

The amount of investment in people (as demonstrated by effective human resource management and, in particular, investment in training and development) is listed by West et al. as one of the developed human resource management practices that is most important to apply, according to prior research. Similar to this, according to Townsend et al., a human resource management system must use cutting-edge methods (like the miraculous question) to recognize and address employee concerns. West emphasizes that employing cutting-edge human resource management approaches in isolation is insufficient and that high performance human resource management practices must be used instead. According to Townsend et al., the significance of a sign that employees also hold a prominent place in the organization is human resource management. The creation of tools and methods for human resource management is not uniform. The level of competition, the organization's ownership structure, and its size frequently has a favorable impact on the growth of human resource management. In industries like IT services and the telecommunications sector, where there is a significant need for qualified labor, human resource management advances the quickest. Human resource management covers fundamental staffing tasks in areas like primary agricultural production throughout the long term.

Studies by a number of writers have outlined the beneficial association between a well-developed human resource management system and transformational leadership of managers in the healthcare industry, which in turn has a favorable impact on employee happiness and loyalty. Burnout and low job satisfaction are two issues with modern healthcare, claim Joniaková and Jankelová. In the meantime, according to West et al., medical staff stability (reduction of attrition to other departments, increased interest in studying and working in healthcare), and quality work performance (reduction of patient mortality, compliance with procedures and regulations, reduction of nosocomial infections, etc.) are all dependent on the satisfaction and motivation of medical staff. According to other research, one of the most important things for health workers everywhere is job happiness. Scientific evidence supporting the beneficial effects of HRM practices on boosting employee motivation and satisfaction has been provided by a number of authors. Utilizing all of the available information on human resource management in healthcare is desirable. Adherence to policies and guidelines, diminution of.

### **Human Resource Management Challenging in Healthcare System**

Compared to management in other areas, healthcare management is highly difficult. Many concepts have been put up globally in an effort to address the issues with inefficiency. First, the results of healthcare are quite complex. Healthcare firms are under constant pressure to increase productivity, innovate, and deliver high-quality treatment. Second, it's frequently ambiguous and challenging to evaluate. Third, as hospitals are typically considered to be public institutions, their financial performance cannot typically be evaluated. Finally, because of their dual lines of accountability, healthcare organizations are especially complicated. Professional and operational. Healthcare delivery requires a lot of effort, and staff motivation is crucial for the sector's performance. Additionally, as the need for the high-quality services provided by government health establishments grows every day, it is essential for service improvement and customer satisfaction to continuously invest in human resource development. In order to examine the HRM "inputs" while trying to find acceptable and industry-specific measurements of processes, output, or outcome, researchers trying to develop the evidence base on HRM in the health sector must use these non-clinical research approaches. Both rural and urban healthcare systems are experiencing a scarcity of medical experts. India has been at the forefront of numerous global trends in the areas of population and health. Overall, the Indian healthcare sector is evolving, and significant changes in the way healthcare is provided and the responsibilities played by different participants in the health system are anticipated to occur in the future. It is anticipated that India's healthcare system will advance to a more advanced state. The management of human resources in the health sector is now a significant barrier to India's progress in developing its health systems. Planning, production, recruiting, and use of health staff are all included in this. Although numerous steps have been taken to address this challenge. It is becoming more widely acknowledged that any long-term solution to health system performance must center on getting HR policy and HR administration properly. The success of the delivery of the health system depends

on a workforce that is highly motivated, suitably trained, and deployed. The actual techniques used to manage human resources in the healthcare industry are a significant barrier to or enabler in attaining the goals of any health company. Although it is commonly acknowledged that better human resource management is essential to delivering a more effective, efficient, and high-quality health service, few developing nations have made notable advancements in this area.

### **Human Resource Management in Public Sector in India**

Hospitals are currently at the forefront of the delivery of healthcare services, and their top priority is giving their patients access to high-quality care. A hospital is a crucial component of a social and medical institution whose purpose is to offer the public comprehensive healthcare that is both curative and preventive, and whose outpatient services extend out to family and the environment where they live. A company's people resources are its most valuable asset due to the potential they hold. Only by fostering an environment that can consistently recognize, highlight, and make use of human nature and skills will the promise be realized. Health organizations must also please their doctors and patients if they want to achieve performance on quality, cost, and patient satisfaction dimensions. Employees. Managers should consider how motivation theories may apply to physicians since they are key players in the utilization and allocation of resources within the healthcare system as well as the overall operation of these organizations. The most crucial elements in the construction of a public health system is human resources for health. For successful health care services to be provided to the population, there must be a sufficient quantity of human resources available with the right skill mix, and they must be deployed in the right places at different levels of the healthcare system. Information on the health sector's human resources is often unreliable and incomplete in developing nations like India. Effective staff planning and management are hampered as a result. National Health Profile seeks to fill this gap by creating a more comprehensive the availability of skilled and specialized medical, nursing, and paramedical employees in the nation is outlined by human resource indicators. Additionally, they provide information on regional distribution and discrepancies. Human resource indicators include information on the number of allopathic physicians, dentists, AYUSH physicians, nurses, and other paramedical health workers in the nation. In 2016, there were 25,282 registered allopathic doctors with MCI Act-recognized medical credentials who were also registered with state medical councils.

### **METHODOLOGY**

The purpose of this essay is to describe the difficulties in managing human resources in the healthcare industry and to emphasize the significance of putting effective human resource management procedures into practice in order to raise the standard of care. A literature search is the research methodology. Analyses of published studies, analogies, and comparisons of pertinent data all went into creating this page. The knowledge currently available concerning human resource management in Slovakian healthcare is thus synthesized and improved. The author of the essay, who serves as the HR head of a modern hospital in Slovakia, shares his or her own experience with human resource management principles and methods in the article. Her own empirical expertise in the field of actual human resource management enriches the research findings and discussion.

### **RESEARCH RESULTS AND DISCUSSION**

We discover a proven relationship between the sophistication of human resource management systems and medical performance based on an analysis of the results of published studies. The article's research focused on the difficulties now facing the Slovak Republic's healthcare system in managing its human resources, as well as the readiness of medical staff to manage people. The research included instances of developed human resource management best practices from international hospitals.

### **Advanced Human Resource Management in Hospitals - Examples of Good Practice**

The best human resource management practices are typically not found in the healthcare sector of the business. Lüthy says that hospitals still have a bad reputation for wanting to be desirable employers. Hospital management frequently holds the opinion that working in a hospital is inherently very tough and that little can be done to change this. Lüthy contends that this is the wrong strategy and offers the following solutions to improve the situation: professional leadership, employee motivation and recognition, career planning and further education, process optimization and averting bureaucratization, flexible work schedules, work-family balance, and the creation of codes of ethics to deal with internal and external stakeholders. According to a study from Germany, for instance. The hospitals that are successful in guaranteeing the aforementioned and that their HRM departments are in the third to fourth developmental levels of human resource management are examples of good practice that are provided below. One of the top medical facilities in the country is the Mayo Clinic network of hospitals. Their company culture and leadership are rated A to A+ by Comparably.com, a website that compares numerous US firms over the long term. The fourth level of human resource management at Mayo

Clinic supports the organization's strategy and tracks how human resource management practices and regulations affect the organization's performance. Teamwork is a major principle of Mayo Clinic, which has continual professional growth ingrained in its organizational DNA along with strong support for diversity. Helios is Germany's biggest private hospital network. It addresses the issue of human resource management and productivity over the long term and professionally, employing more than 66,000 staff members in 86 clinics across Germany and treating more than 5.2 million patients yearly. According to Bornewasser et al., Helios managers identify a number of factors that support high staff motivation and the consequent ongoing growth in their clinics' productivity. High labor productivity generates long-term revenue growth for the network, which is then invested in expanding healthcare delivery. Education, professional opportunity, work-family balance, and healthcare are among Helios' key employer levers.

The British NHS is an example of a high level of HRM (National Health Service). The NHS is the second-biggest public healthcare system in the world and the largest public system in the UK (after Brazil). The NHS upholds a high standard for its human resource management. It has described in depth the various HR specialties. Current Problems of the Corporate Sector and presents them openly externally through its web page. It extensively utilizes components from the third and fourth human resource development levels.

### CONCLUSION

The Human Resources Management is crucial in encouraging employees, enhancing interpersonal skills, communicating, listening, interacting, and escalating problems. They do, in fact, serve as a conduit between management and employees. Periodic evaluations, reviews, correcting issues, and selecting standards for employee awards and appraisals are helpful methods. Simplified standards must be developed by Human Resources Management. Human Resources Management cannot disregard issues such a lack of skilled labor, poor cooperation, and a lack of efficient communication if they want to provide high-quality healthcare. Developed human resource management has been linked to higher levels of healthcare quality, according to the most recent research on human resource management in the industry. The requirement for a focused improvement in the operation of pertinent HRM systems in healthcare is highlighted by research findings as one of the elements for enhancing patient care. The lack of healthcare workers and the unpreparedness of healthcare managers to manage people have long harmed the standard of healthcare and the degree of medical performance in Slovakia. According to research, recruitment and retention are the main problems facing the Slovak Republic's human resource management systems in the healthcare industry. Quality human resource management in its mature stage of growth is the only method to increase the attractiveness of the medical profession and stop Slovak medical professionals from working abroad. Furthermore, it's critical to articulate and convey the significance of the employee experience in the healthcare industry. A created HRM system can be used in an organization only if certain prerequisites are present, according to Jankelova. We can see how important it is for healthcare workers to continue their management education after they graduate from college and enter the workforce. We believe that the foundation of high-quality healthcare is effective human resource management in hospitals.

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**A STUDY OF THE STATE OF LOGISTICS MANAGEMENT IN ASIA-PACIFIC REGION WITH SPECIAL REFERENCE TO RESEARCH COLLABORATION AND KNOWLEDGE APPLICATION****Atul Dayal**

Research Scholar, Teerthanker Mahaveer University, Moradabad – 244001, UP (India)

**ABSTRACT**

**Purpose:** This paper investigates the state of logistics management research in Asia-Pacific region. The study focuses on the research agenda, the topics of interest, and the extent of research collaboration in logistics theory building and knowledge specific to Asia-Pacific.

**Design/Methodology/Approach:** This study uses a mixed methods approach namely, content analysis drawn from the articles found in five well-known peer-reviewed logistics management related journals from 2003 to 2013, followed by social network analysis which is applied on the selected articles to give a structure of the collaboration relationship.

**Findings:** Initial findings put forward that there are some scholars in Asia-Pacific who are instrumental in research collaboration and in building a body of information on logistics management. More co-production of knowledge from deeper and tightly knit industry-academic collaboration is needed to uplift this sphere. Most of the published work use an empirical instrument drawn from the resource based view to discover firm level supply chain collaboration and strategy. This suggests a positivist research tradition within logistics. There is a scarcity of studies conducted on the supply chain as a network of enterprises. It needs to be emphasized that all businesses need to be treated as relationships and not as transactions and become business partners of customers.

**Limitations and Implications:** The review of the articles is limited to five logistics specific journals and we only ponder on logistics management research focused on Asia-Pacific. Contributions from other journals will definitely add more value. More collaboration at the institutional, national, and international levels is called for especially on cross-collaboration between theory and practice.

**Originality/Value:** This is the first paper to discuss the state of logistics management research collaboration in Asia-Pacific and provides an overview of the research issues, topics, and approaches undertaken thus far. Through this work, this study hopes that it will encourage greater research collaboration between industry and academia, and academics themselves.

**Keywords:** Logistics research, Content analysis, Network analysis, Asia-Pacific, Collaboration

**Roadmap:** To build collective long-term resilient supply chains, a partnership has unveiled a roadmap that includes steps to counter risks arising from supply chain dependencies and vulnerabilities.

Technology is rapidly changing the world as we know it but all of it seems untrue when you first look at it. And matching the rhythm of the drums, supply chains are evolving at an equal pace. An industry that used to present the picture of men carrying back breaking weight into warehouses, now proudly exhibits automated guided vehicles navigating their way through modern warehouses. All thanks to technology and the human skill of being able to wield it. Hence we are now getting a grasp of trying to understand a much talked about aspect of technology in supply chains – Digitization – and why it has become the need of the hour.

**Way Forward** - Moving forward, New-age logistics companies are closing gaps in Tier 2 and Tier 3 cities. A good example is the launch of the GatiShakti master plan in India which has tremendous scope in achieving the aim of logistics efficiency. With India being one of the most attractive destinations for investment in the world, the Indian government has prepared some important framework to help businesses thrive in the country. Propelled by seven engines – roads, railways, airports, ports, mass transport, waterways and logistics – Gati Shakti is an idea whose time has come.

**Logistics research** - Logistics research can be classified into the following streams: (1) research focus which refers to identifying the different levels within the network of operations such as function, firm, dyad, and network (Selviaridis and Spring, 2007) (2) research method which refers to analyzing the research by its design, method, and data analysis techniques (Woo et al., 2011), and (3) the research context which refers to the industry, theory, and topics covered (Shook et al., 2009). Previous studies have focused on the level of analysis, research design, and the data analysis methods to highlight the orientation of logistics and supply chain research. Most of the review studies have focused on specific contemporary topics such as sustainability logistics capabilities and third party logistics. Further, research has also focused on a specific region. Doing so

helps the researchers to identify the trends in logistics development in regions such as Asia and this can suggest opportunities for further logistics research and to inform policy. Asia has engendered research attention on supply chain collaboration (Cadilhon et al., 2005; Nakano, 2009), green (Zhu et al., 2010; Chiou et al., 2011), supplier selection (Ting and Cho, 2008), outsourcing (Chu and Wang, 2012), inventory (Mustaffa and Potter, 2009), and literature survey (Liu, 2014). Liu (2014), who studied China-based logistics research articles published in peer-reviewed logistics and supply chain management journals from 2001-2012, reports that logistics service providers, transport and logistics infrastructure, outsourcing, environmental issues, relationship management, and risk management are popular topics among academics who have used at least ten different theories to explain the phenomenon studied. 2.2 Research collaboration In general, the value of fostering collaborative research has been extensively discussed in the literature. However, Bjerregaard (2010) notes that cultural differences and communication can impede the co-production of knowledge and collaboration. In addition, the disparities in work style, language, and time schedules distracts collaboration between academics (Chen et al., 2013). Lee and Bozeman (2005) surveyed 433 professors on collaboration and publishing productivity. Their empirical results reveal no significant relationship between research collaboration and research productivity.

Besides, other related studies have shown that industry tends to collaborate with university or research institutions to improve firm performance through innovation (Kang and Park, 2012; Chen et al., 2013). Cross-institutional collaboration can deliver an increased diversity of resources, skills, knowledge, and viewpoints (Curran and Hannigan, 2008). Cantor et al. (2010) have examined 3,116 articles published in seven logistics journal from 1987 to 2007. They conclude that scholars in the logistics domain value co-authored research. The results show that co-authorship and the frequency of citations are significant related. This leads us to a proposition, namely, cross-disciplinary and international collaboration are a conduit for providing knowledge, and they facilitate an ongoing knowledge exchange for developing a better understanding of this domain. Given the complexity of supply chain issues even in a research context, it is understandable that research collaboration, either between scholars or between academia and industry is needed to meet publication outcomes. Recently, research collaboration has become a focal sub-domain of interest among academics (Autry and Griffis, 2005). Melin and Persson (1996) have studied the effects of scientific collaboration and suggest that the growth of such collaboration is attributed to the internal dynamics of the subject matter and the prevailing environment. Logistics management, which straddles several traditional learned disciplines, is one such subject matter. Indeed, research collaboration is intense and fast becoming a requisite for success in the publication arena, which often requires multi-disciplinary expertise. According to Melin and Persson (1996), a key indicator for the success of such collaborations is the extent of co-authorship in scholarly output. One intended outcome of collaboration is an improvement in scientific productivity (Lee and Bozeman, 2005). However, "the literature has also highlighted the collaboration paradox which claims that collaboration seems has a positive impact on publishing productivity (Lee and Bozeman, 2005), particularly when it is research undertaken in developing areas such as logistics management in Asia. The extant literature is also replete with theoretical lenses such as the popular resource based view, and transaction cost economics theory which have been used to show that international research collaborations are more successful when complementary resources are increased and transaction costs reduced. Clearly, this points to the choice of social networks as an important collaboration mechanism.

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**A STUDY TO ASSESS THE LEVEL OF PERCEPTION, PERFORMANCE AND SATISFACTION REGARDING ONLINE LEARNING AMONG UNDERGRADUATE NURSING STUDENTS**

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**Mrs. Linda Xavier**

Department of Pediatric Nursing, Saveetha College of Nursing, SIMATS, Chennai- 602105, Tamil Nadu, India

**ABSTRACT**

*As E learning plays a vital role in this present scenario among the students all around the world. The present study aimed in assessing the level of perception, performance and satisfaction regarding online learning among undergraduate nursing students. A quantitative approach with non experimental descriptive research design with 60 Bsc nursing students were recruited as study participants by using non probability sampling technique for the present study. Data was gathered by exploiting a self structured questionnaire for both the demographic information and for assessing their level of perception, performance and satisfaction regarding online learning. Outcome of the present study revealed that the mean score on level of perception, performance and satisfaction towards students found 31.28, 33.20 and 33.35 and hence concluded that, the undergraduate students had moderate level of perception and satisfaction with fair performance towards online learning.*

*Keywords: Online Learning, Perception, Performance, Satisfaction, Undergraduate nursing students.*

**INTRODUCTION**

Online learning is frequently used in the training of students – not as a single technique, but combined with the traditional education–guide approach [1]. E- learning, including online education and teaching , has been conscious for decades. Many research works, theories, representations, quality, and assessment criteria focus on standard e- learning, online learning and online course design [2]. E- learning management structure are in use to facilitate the face to face education ongoing in multiplied institutes. There are many elements that shape and authority a student’s insight of an online education management system [3]. Online learning is a frequently evolving learning method. Online learners in the first half of the 20<sup>th</sup> century were teach between the mail, television, and telegraphy, in the final section of the century came to be learning between new technologies such as tape- record, internet, e-training and video conference[4]. Distance learning is also known as e- learning , online learning, computer assisted directions, internet- based learning, administer learning, distance learning, online electronic learning, or web based learning. the use of online based learning is not a new happening in some parts of all over the [5].The rapid growth of computer and world wide web technologies has completely increase the way of teaching and learning[6]. Distance learning allows the teachers and students to change the way of education, and transporting of details in various greatly. The form of e- learning depends on the webs example includes satellite, and the technologies example includes laptop, phones used. e-learning take the form of rute and element and smaller learning articles [7].Online education is broadly accepted and is think about an main approach that can control the restriction of on campus learning, mainly in higher education technologies, generally depends on technology related to faith and the recognize facility of use [8]. E-learning system uses a rotting of the (offline) value interactivity and (online) increase learning, thus reach a significant development of education rate and run time [9]. E-learning is becoming normal in the kingdom of modern world learning. A massive open online course is an open online education environment contribution learners and teachers an open and past the limits of normal online course [10].Online learning also increase to learning extra classroom activity for student as well. Therefore the objective was to assess the current level of students perception, performance and satisfaction towards online learning among undergraduate nursing students and to find our the association between level of perception, performance and satisfaction towards online learning among undergraduate nursing students with their selected demographic variables.

**MATERIALS AND METHODS**

A quantitative approach with non experimental descriptive research design was adopted for the present study. After obtaining ethical clearance from the institutional ethical committee (IEC) of Saveetha and a formal permission from the administrative head of Saveetha College of Nursing, the main study was conducted. A total of 60 BSC (N) students who are meeting the inclusion criteria were recruited as the study participants using non probability convenience sampling technique. The inclusion criteria includes B.Sc(N) students who are between the age group of 17-21 years using smart phones with internet connections, who are attending the online classes regularly ,willing to participate and can read, write and understand English and Tamil. The exclusion criteria includes Bsc (N) students who are in the locality with poor net work connections and are not available during the study period. The demographic data and the level of student perception, performance and satisfaction was collected by using the self- structured questionnaire and the collected data were tabulated, analysed by using descriptive and inferential statistics.

**RESULTS AND DISCUSSION**

**SECTION A: Demographic Characteristics**

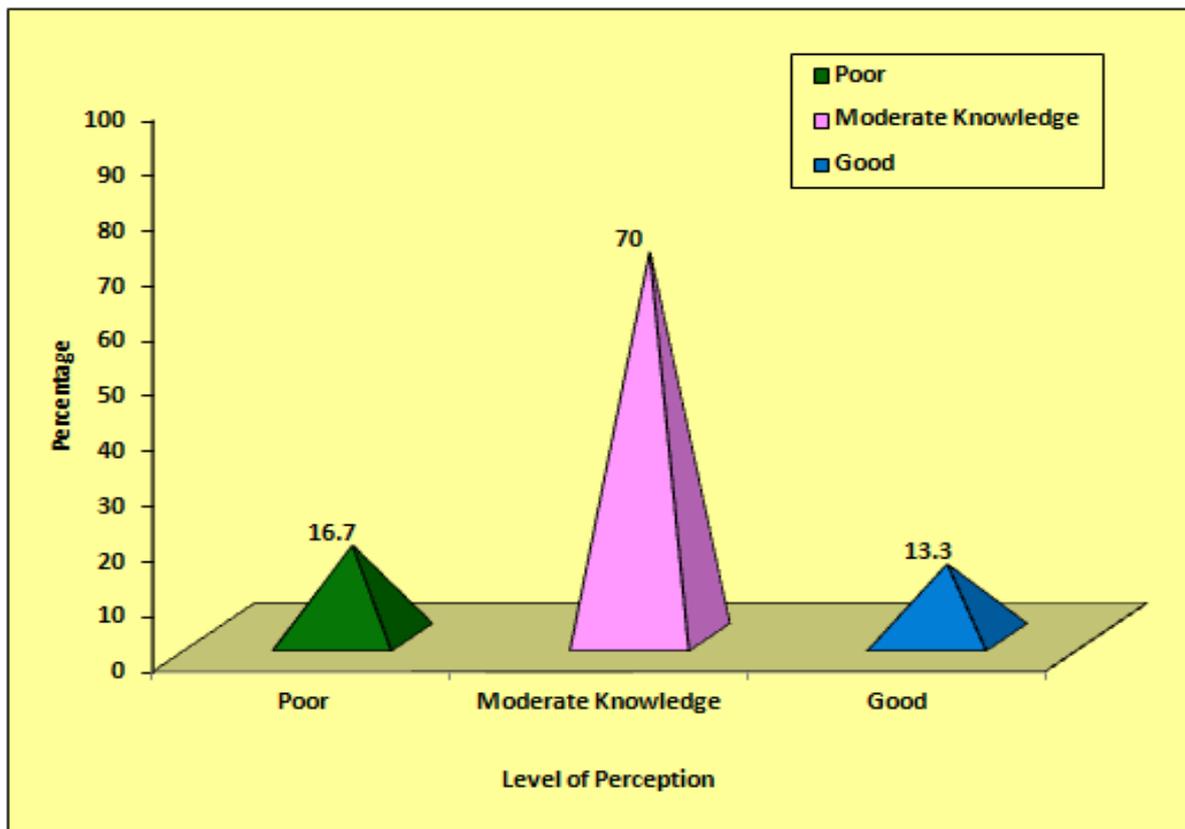
Among 60 study participants, most of the B.Sc. (N) Students 30(50%) were aged between 19 – 20 years, sex 39(65%) were female, religion 38(63.3%) were Hindus, education 20(48.4%) were B.Sc. (N) 3<sup>rd</sup> year students and 36(60%) received previous information through social media.

**SECTION B: Level of Student Perception, Performance and Satisfaction.**

The level of perception, performance and satisfaction among B.Sc.(N) students, is 42(70%) had moderate perception, 10(16.7%) had poor perception and 8(13.3%) had good perception, 44(73.3%) had fair performance, 13(21.7%) had good performance and 3(5%) had poor performance and 44(73.3%) had moderate satisfaction, 12(20%) had high satisfaction and 4(6.7%) had low level of satisfaction on online teaching.

**Table 1:** Frequency and percentage distribution of demographic variables of B.Sc. (N) Students.

Level of Perception	No.	%
Poor ( $\leq 50\%$ )	10	16.7
Moderate (51 – 75%)	42	70.0
Good ( $< 75\%$ )	8	13.3



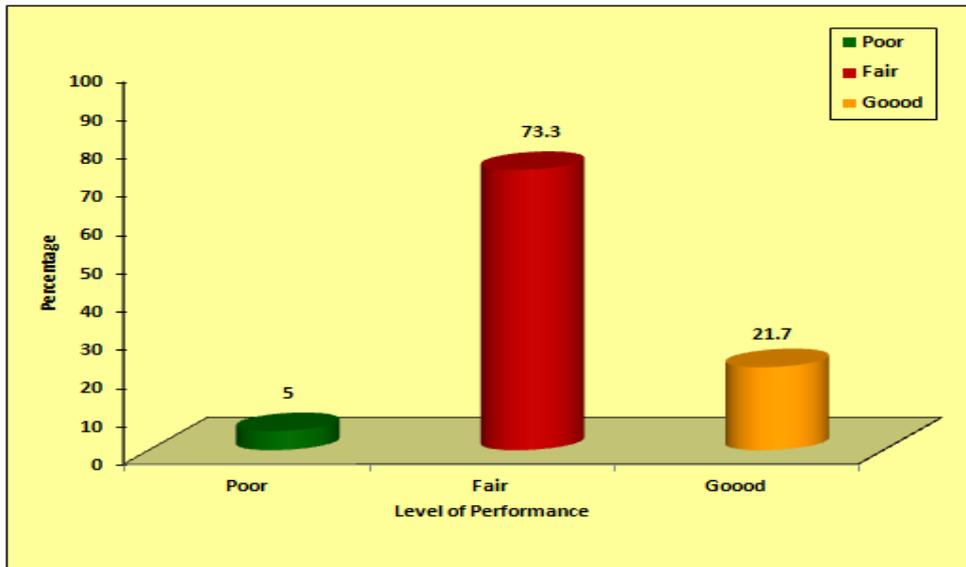
**Figure.1:** percentage distribution of level of student perception on online learning among B.Sc. (N) students

The present study findings is supported by Michal Baczek,(2021) conducted a study to assess the students perception of online learning during the COVID 19 pandemic. The study results concluded that, out of 804 samples, 451(56%) were good, 337(42%) were moderate, 16(2%) poor.

Hence, it was concluded that, there is a need to improve the online learning by using more techniques like pamphlets and improve teaching methods.

**Table 2:** Frequency and percentage distribution of level of performance on online teaching among B.Sc(N) students.  
N = 60

Level of Performance	No.	%
Poor ( $\leq 50\%$ )	3	5.0
Fair (51 – 75%)	44	73.3
Good ( $> 75\%$ )	13	21.7



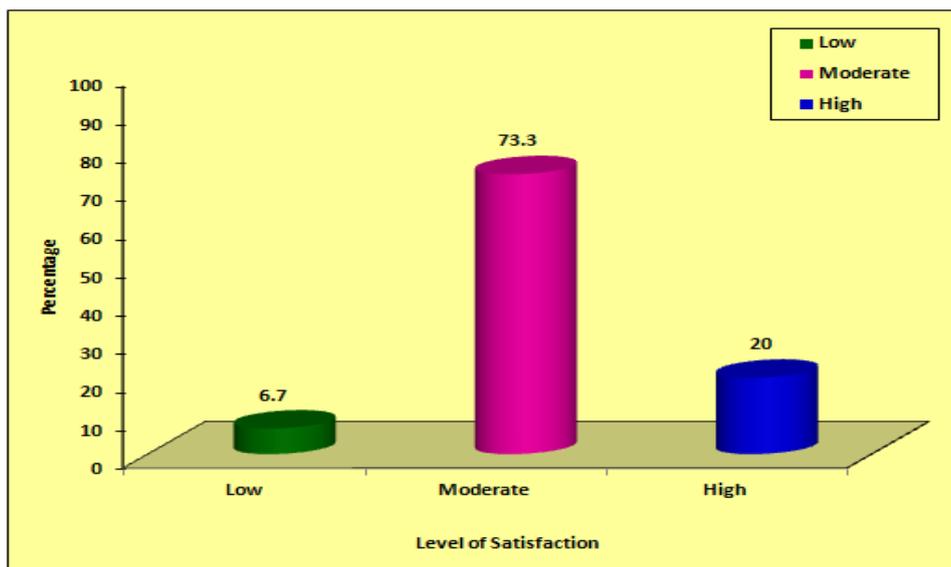
**Figure 2:** Frequency and percentage distribution of level of performance on online teaching among B.Sc (N) students.

The present study findings is supported by Ryan Micheal F Oducado, Homelo V. Estoque (2021) conducted a study to assess the undergraduate nursing students stress, satisfaction and academic performance during online learning. The study results concluded that, out of 108 samples in the cross-sectional and descriptive - correlational study of students 40(37%) were poor, 54(50%) were fair and 10(9.3%) were good performance.

Hence, it was concluded that, the students performance increase the during online learning.

**Table 3:** Frequency and percentage distribution of level of satisfaction on online teaching among B.Sc(N) students.  
N = 60

Level of Satisfaction	No.	%
Low ( $\leq 50\%$ )	4	6.7
Moderate (51 – 75%)	44	73.3
High (<75%)	12	20.0



**Figure 3:** Percentage distribution of level of satisfaction on online teaching among B.Sc (N) students

The present study findings are supported by Ence Surahman (2020) conducted a study to assess the student satisfaction toward quality of online learning during the COVID 19 pandemic. The study results concluded that, out of 224 samples in the descriptive statistical analysis techniques, the 19% were very satisfied, 41% were satisfied, 30% were dissatisfied, 10% were very dissatisfied on online learning.

Hence, it was concluded that, there is increase the students' satisfaction level on online learning.

**SECTION C:****Table 4:** Assessment of perception, performance and satisfaction scores on online teaching among B.Sc. (N) students.

N = 60

Variables	Perception	Performance	Satisfaction
Minimum score	14.0	15.0	10.0
Maximum score	43.0	50.0	50.0
Mean	31.28	33.20	33.35
S.D	6.27	5.54	6.29

For the present study, the perception, performance and satisfaction mean score and SD was  $31.28 \pm 6.27$ ,  $33.20 \pm 5.54$ ,  $33.35 \pm 6.29$  with minimum score of 14.0, 15.0 and 10.0. Maximum score of 43.0, 50.0 and 50.0.

**SECTION D: Association of Level of Perception, Performance and Satisfaction on Online Teaching among B.Sc. (N) Students with Selected Demographic Variables.**

The demographic variable significant association with level of perception on online teaching among B.Sc.(N) students at  $p < 0.05$  level respectively. None of the demographic variables had shown statistically significant association with level of performance and satisfaction on online teaching among B.Sc.(N) students.

**CONCLUSION**

Thus the findings of the present study revealed that, assess the level of student perception, performance and satisfaction regarding online learning among students through perception was moderate, performance was fair and moderate satisfaction on online learning.

**ACKNOWLEDGEMENT**

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**CONFLICT OF INTEREST**

Authors declare no conflict of interest.

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**ASSESSING THE GLOBAL RESEARCH PERFORMANCE ON CAPITAL STRUCTURE: A BIBLIOMETRIC STUDY**

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**Dr. Ashwin H. Parwani**

School of Liberal Studies, Pandit Deendayal Energy University, Gandhinagar, Gujarat, India

**ABSTRACT**

*The current study aims to assess research productivity in the domain of capital structure by employing a variety of bibliometric measures. Using relevant keyword searches, a total of 5516 scientific papers were obtained from the Scopus database between 1950 and 2020. The findings were provided in both tabular and graphical formats. The VOSviewer© R tool was also utilised in the study to analyse the network visualisation and identify collaboration and relationships with authors, coauthors, nations, institutions, co-occurrence of keywords, and co-citation of cited references in the topic domain capital structure. The findings indicated that overall publications have been increasing during the previous ten years of study. There were 1,42,582 total citations discovered from a total of 5516 scientific articles, with an average of 25.85 citations per publication. The United Kingdom and the United States were the most productive countries in terms of publishing research in the subject, although Portugal and China generated more prolific writers. Fuqua School of Business, Taylor's University Malaysia and Rutgers University–New Brunswick were reported top three productive organisations in the realm of capital structure. In the visualisation analysis, the study also discovered collaboration and cooperation across authors, countries, and organisations. According to the findings of keyword co-occurrence, capital structure, leverage, debt finance, financial leverage, and debt-equity were shown to be frequently used terms with the highest link strength.*

*Keywords: Capital Structure, Bibliometrics, Citation Analysis, Scintometrics*

**INTRODUCTION**

The capital structure of a company is the blend of stock, debt, and hybrid securities that it employs to fund its assets for long-term financial decisions in order to optimise the firm's value. Hence, capital structure decisions are among the most crucial for any business since they impact the firm's worth. Firms often raise cash from three sources: internal sources (retained earnings), borrowing, and/or equity. The capital and ownership structure are formed by these three sources. (April Bhattacharjee, Mihir Dash 2018) Though companies favour internal sources of money, they should not rely entirely on them because this might lead to capital loss. Debt is typically less expensive than equity, and it also gives tax benefits; nevertheless, a larger share of debt in the capital structure leads to higher interest charges, increasing the danger of bankruptcy. (Masiukiewicz, 2017). Pioneering work showed that capital structure had no effect on company valuation in ideal markets, i.e. in the absence of taxes and transaction costs. They went on to say that in imperfect markets, the capital structure selection is influenced by things like taxes, agency fees, contacts, bankruptcy costs, and so on. (Modigliani and Miller's 1958) The financial leverage of Indian SMEs was determined by the type of company, the age of the firm, the growth of the firm, the intensity of competition, the extent of capital investment, and the founder's qualification; additionally, most SMEs still rely on their own funds and rely on borrowed funds to a lesser extent. (Dogra and Gupta 2009) Debt financing, gearing, or trading on equity refers to the use of fixed-charge sources of money, such as loans and preference capital, in conjunction with the owner's equity in the capital structure (Pandey 2006). The capital structure is explained primarily by three theories: Trade-off Theory, Pecking Order Theory (Information Asymmetry), and Agency Cost Theory (Free Cash Flow). These are known as conventional theories of capital structure; each provides a different explanation for corporate finance than the other two ideas. The Trade-off Theory is based on the assumption of an optimum capital structure and focuses on the trade-off between the marginal benefit of debt (debt tax shields or tax savings) and the marginal cost of debt (bankruptcy costs). The Pecking Order Theory, on the other hand, posits hierarchical financing decisions, with the business initially using internal financing sources, then seeking external financing from debt if the internal sources are fewer than the investment requirements, and then using equity as the final source. According to the Agency Cost Theory, debt represents a fixed obligation that must be satisfied by the company in the form of debt interest and principal payments. It is thought that these responsibilities discourage managers from overusing the firm's financial resources, as they consume the firm's free cash flow if it exists (Sakr & Bedeir 2019). Capital is the most important component of all types of business operations, which are determined by the size and nature of the firm. If the firm maintains a suitable and sufficient amount of capital, it will generate a high profit and will be able to pay out more dividends to its shareholders. Corporate companies obtain money through a variety of sources, including the issuance of shares, debentures, long-term loans, short-term loans, and the reinvestment of earnings. As a result, specific proportions or combinations of various factors

must be preserved in the acquisition of money from various sources, as well as in the subsequent commitment of this cash to various assets. This capital arrangement is known as Capital Structure. The capital structure comprises equity capital, which is made up of retained earnings, as well as long-term loan capital. The ratio of different types of securities raised by a business as long-term funding is referred to as capital structure. (HemalPandya, 2016)

### **Significance of Capital Structure**

This study is important for lending institutions to avoid and reduce non-performing assets when making loans and advances to businesses. Shareholders stand to benefit from the study's findings as well. They can comprehend the quantity of leverage employed by the industry and, as a result, restructure their portfolio. (Pandey, 2017) Empirical research on capital structure assess growth by calculating the percentage change in sales or assets, or by calculating the market to book equity ratio. Leverage has a favourable relationship with overall growth. Growth necessitates investment, and investment necessitates cash. Because equity is more expensive than debt, debt is favoured (Kumar, 2017). According to a capital structure study, retained earnings are the most favoured source of funding, followed by debt and finally equity. The findings appear to indicate that companies do not have a certain capital structure in mind when selecting how to fund their initiatives. In comparison to high growth businesses, low growth firms choose to employ more debt in their capital structure. Large corporations like to issue bonds in the primary market. Few businesses utilise hybrid securities as a form of financing to shield bondholders against the firm/shareholders undertaking hazardous or undesirable initiatives. (Anand, 2002)

### **OBJECTIVES OF THE STUDY**

The following research objectives are identified for the present study:

- (1) To investigate the yearly scientific production of capital structure literature in terms of total publications (TP), total citations (TC), average citation per publication (ACPP), and percentage share of total published literature.
- (2) To investigate the most prolific writers, the most productive source titles, and the most productive institutions in the field of capital structure.
- (3) To comprehend the bibliometric network visualisation of citation of documents and nations, country co-authorship, co-citation of cited references, and co-occurrence of keywords analysis in the area of capital structure using the VOSviewer© Tool.

### **DATA COLLECTION AND METHODOLOGY**

A bibliometric study is a quantitative method for categorising research performance on a certain topic or area. It provides retrospective statistics to assess the contribution of the study sector. It is a well-organized, clear, and reproducible method that improves the quality of the study. A bibliometric study identifies the most significant books for scholars and assists in research planning. (Zupic and Carter 2015).

Data on capital structure from 1950 to 2020 were gathered for the current study from the Scopus database, which is heavily used by numerous researchers for bibliometric research. (Shri Dhawan, Gupta, and Elango, 2021; Haq, 2021; Chhtrapati et al., 2021, Ram, 2020). The data is taken from several types of publications available in the Scopus database, such as articles, conference papers, reviews, book chapters, books, conference reviews, and editorial notes/letters.

Using the associated keywords, data on the domain of capital structure are gathered. (TITLE-ABS-KEY("capital structure") OR TITLE-ABS-KEY("leverage") OR TITLE-ABS-KEY("debt") OR TITLE-ABS-KEY("financial leverage")). The study took great care in the process of retrieving data from Scopus in terms of search criteria such as keyword selection, document duplication removal, and document type filtration, and finally retrieved total 5516 documents on subject domain capital structure and considered in the final study for basic bibliometric analysis and network visualisation. The current study employed VOSviewer© for the investigation of relationship and network visualisation, since these tools are frequently utilised in the evaluation of visualisation in bibliometric studies (MacDonald and Dressler 2018; Mohan and Kumbar 2020; Widianingsih et al. 2021)

### **RESULTS AND ANALYSIS**

The present study retrieved total 5516 scientific publications during 1950– 2020 from Scopus bibliographic database and in line with the objective identified, the bibliometric analysis has been conducted and results presented in tabular and graphical forms.

Distribution of Annual Scientific Production of Publications, Citations, and Average Citations

Table 1: Annual Scientific Production

Year	TP	TC	ACPP	% Share
1950 to 2010	2050	112416	54.84	37.16
2011	316	5786	18.31	5.73
2012	302	4555	15.08	5.47
2013	293	3892	13.28	5.31
2014	307	3835	12.49	5.57
2015	307	3562	11.60	5.57
2016	302	2429	8.04	5.47
2017	329	2011	6.11	5.96
2018	372	1996	5.37	6.74
2019	435	1302	2.99	7.89
2020	503	798	1.59	9.12
<b>Total</b>	<b>5516</b>	<b>142582</b>	<b>25.85</b>	<b>100 %</b>

Table 1 displays the yearly scientific publication output. It is divided into two sections: 1950 to 2010 and 2011 to 2020, with a total of 5516 publications. From 1950 to 2010, there were a total of 2050 publications published on capital structure, with a total of 1,12,416 citations. During the same time period, the average citation per publication was 54.83, and the share percentage of total published papers was 37.16 percent. In the previous ten years of study, a total of 503 articles were published in the year 2020. The year 2013 saw the publication of the fewest papers, with just 293 being published. In terms of citations during the previous ten years, the findings indicated that the greatest citations were obtained in 2011 (5786 citations), with the lowest in 2020. (798 citations). The overall trend of article publishing shows positive development, but the trend of citations, average citation per publication, reflects in declining order. The findings also show that the percentage share of total number of publications is rising between 2017 and 2020. Overall, it has been found that the average citation per publication in the subject of Capital Structure was 25.85.

Table2: Top ten authors: the relationship between author, number of articles, co-citation, country and institution

Rank	Author	NP	TC	h_index	ACCP	Institution	Country
1	Graham, J.R.*	16	4043	14	252.69	Fuqua School of Business	USA
2	Hussain, H.I.	16	185	8	11.56	Taylor's University Malaysia	Malaysia
3	Lee, C.F.	13	152	6	11.69	Rutgers University–New Brunswick	USA
4	Serrasqueiro, Z.	13	184	7	14.15	Universidade da Beira Interior	Portugal
5	Strebulaev, I.A.	13	849	10	65.31	Stanford Graduate School of Business	USA
6	Titman, S.	12	2265	10	188.75	The University of Texas at Austin	USA
7	Yang, J.	11	85	4	7.73	Shanghai University of Finance and Economics	China
8	Bany-Ariffin, A.N.	10	96	6	9.60	Universiti Putra Malaysia	Malaysia
9	Dang, V.A.	10	304	8	30.40	Alliance Manchester Business School	UK
10	Haron, R.	10	96	5	9.60	International Islamic University Malaysia	Malaysia

Distribution of Most Prolific Authors

Table 2 displays the results of the top ten most prolific authors in the domain of capital structure, as well as their relationships with various aspects such as total publications, total citations, average citation per publication, h index, current affiliation, and country representation of respective prolific authors. Based on total publications, the findings indicated the top ten most prolific authors, each of whom had written at least ten articles in the area. Graham, J.R. appears to have published the most articles (16 papers). who is from the United States and is affiliated with the Fuqua School of Business and has gotten a total of 4043 citations with an average citation of 252.69, followed by Hussain, H.I.( 16 papers and 185 total citations) and Lee, C.F. (16 Papers and 152 total citations) from Taylor's University Malaysia and Rutgers University–New Brunswick

,respectively, secured top three position. Titman, S was likewise determined to be sixth in terms of number of publications, but second in terms of total citations (2265 total citations) and second in terms of average citation (188.75 Average Citation).

**Table 3:** Distribution of Top Productive Journal, its Scimago rank and Publisher

Sr. No.	Most productive journals					
	Journal Title	NP	SJR	Publisher	ACCP	Citations
1	Journal of Financial Economics	132	11.67	Elsevier	54.84	20878
2	Journal of Finance	118	18.151	Wiley-Blackwell	18.31	30777
3	Journal of Banking and Finance	117	1.894	Elsevier	15.08	4302
4	Journal of Corporate Finance	116	1.894	Elsevier	13.28	4238
5	Managerial Finance	68	0.271	Emerald	12.49	676
6	Journal of Financial and Quantitative Analysis	63	4.657	Cambridge Uni. Press	11.60	3678
7	Corporate Ownership and Control	62	0.148	Virtus Interpress	8.04	129
8	Financial Review	57	0.621	Wiley-Blackwell	6.11	464
9	Review of Financial Studies	51	12.8	Oxford Uni. Press	5.37	3945
10	Investment Management and Financial Innovations	50	0.213	Business Perspectives	2.99	190

**Distribution of Highly Productive Source Titles**

The top ten most prolific source titles were determined using a minimum of 22 published research papers in the subject. Table 3 shows the highly prolific source title's total publications, total citations, average citation per publication, Scimago rating, and publisher information. The journal entitled 'Journal of Financial Economics' (132 total publications, 20878 total citations) was discovered to be the most productive journal in the domain of capital structure, followed by 'Journal of Finance' (118 total publications, 30777 total citations) and 'Journal of Banking and Finance' (117 total pub., 4302 total citations) received top three positions in terms of total publications. The chart also shows that Elsevier was taking the lead and producing more articles in the subject of capital structure.

**Table 4:** Top Productive Organizations

Sr. No	Affiliations	NP	Country	h_index	TC	ACCP
1	National Bureau of Economic Research	57	USA	34	7450	130.70
2	New York University	34	USA	14	919	27.03
3	University of Pennsylvania	32	USA	12	2701	84.41
4	The University of Texas at Austin	32	USA	19	3172	99.13
5	Centre for Economic Policy Research	32	UK	75	26666	833.31
6	Universiti Putra Malaysia	30	Malaysia	11	258	8.60
7	University of Illinois Urbana-Champaign	29	USA	9	1666	57.45
8	Hunan University	27	China	8	175	6.48
9	Purdue University	26	USA	6	1086	41.77
10	The University of British Columbia	26	Canada	6	800	30.77

**Distribution of Highly Productive Institutions**

The top ten most prolific institutions were determined based on a minimum of 26 published research articles in the subject. Table 4 shows the most prolific institutions in terms of total publications, total citations, average citation per publication, and geographic location. In the top three places, the National Bureau of Economic Research was first, followed by New York University and the University of Pennsylvania. In terms of total citations, the Centre for Economic Policy Research obtained the most (26666 total citations, 833.31 average citations), followed by the National Bureau of Economic Research (7450 total citations, 130.70 average citations) and The University of Texas at Austin (3172 total citations, 99.13 average citations) in top three positions and also have significant average citation per publication.

**Analysis of Bibliometric Network Visualizations**

The network visualisations were identified in this investigation using the VOSviewer programme. The current study looked at the link between co-authorship and nations, as well as the co-occurrence of author keywords, citation analysis with documents and countries, and co-citation of cited references. All of these bibliometrics elements must be studied in terms of total network linkages and network strength.

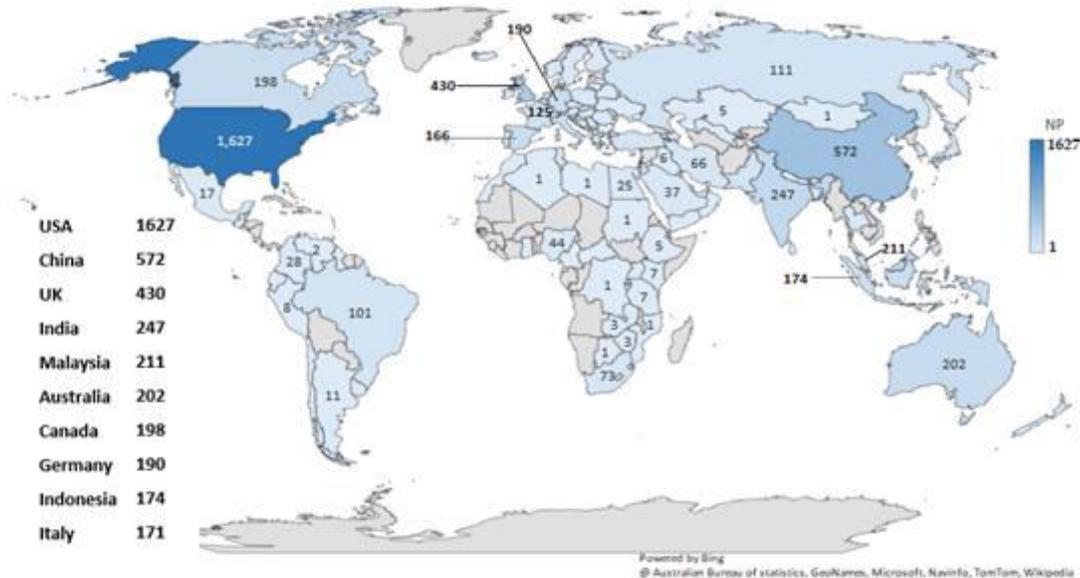


Figure 1: Distribution of Country-wise Scientific Research Production

Figure 1 revealed country-wise scientific research production that indicates the highest number of research in the region. The leaders in the research domain are USA (1627 publications) and China (572 publications) followed by UK, India, and Malaysia in top five position in the research domain. Africa has lowest number of production in the list.

**Coauthorship Analysis When the Unit of Analysis is Countries**

Figure 2 depicts an examination of country co-authorship based on the degree of relationship between nations as well as the domain's dominating countries. It depicts a circle that represents a nation/region, the size of each circle representing the number of items produced by each country, and the activity of the country/region. When two countries or areas work together, a line is established. Each line's depth represents the degree of cooperation and the number of partnerships between countries/regions. These 108 circles are divided into 28 clusters using the VOSviewer programme. A total of 322 links were observed, with a total link strength of 876. According to the network, the United States and the United Kingdom ranked first and second, with 61655 and 8657 citations and 351 and 184 total link strength, respectively. Countries such as Canada and China generated less but had respectable 87 and 83 link strength, respectively, and achieved third and fourth place in the link strength criteria, indicating more collaboration with other countries.

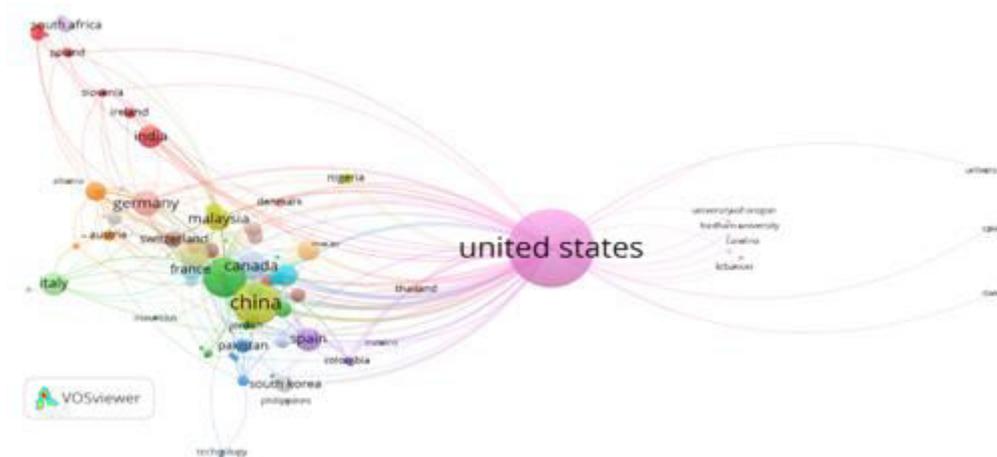


Figure 2: Co-Authorship – Authors

**Network Visualization of Co-Occurrence of Keywords**

In this study, author keywords were employed for network visualisation in this domain. As the author offers keywords relating to the topic discussed in the essay, other scholars will benefit. Keyword analysis reveals the most current research trends. Figure 3 illustrates the visualisation of keyword co-occurrence using the VOSviewer tool. The current study established a minimum of 12 keywords for visualisation from a total of 590

author keywords. Based on the number of co-appearances, the size of the circle represents the number of articles in which each term appears in various clusters in which the keyword is involved. The larger the size of a circle, the more frequently the keyword appears. Two keywords are more closely related if they co-occurred in the analyzed papers more frequently. There are 10 major clusters and 13423 links in all, with a total link strength of 26005. According to the figure, capital structure and leverage have the highest incidence of 1631 and 185 times, respectively, and the highest link strength of 5197 and 558.

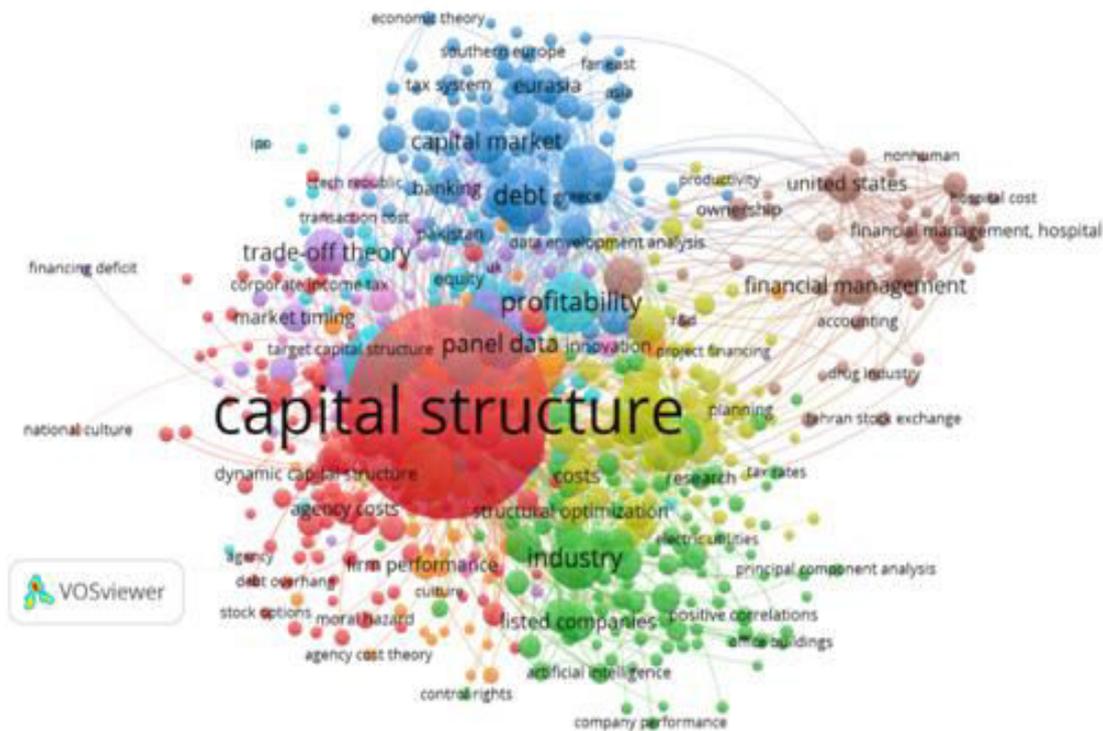


Figure 3: Co-occurrence of keywords

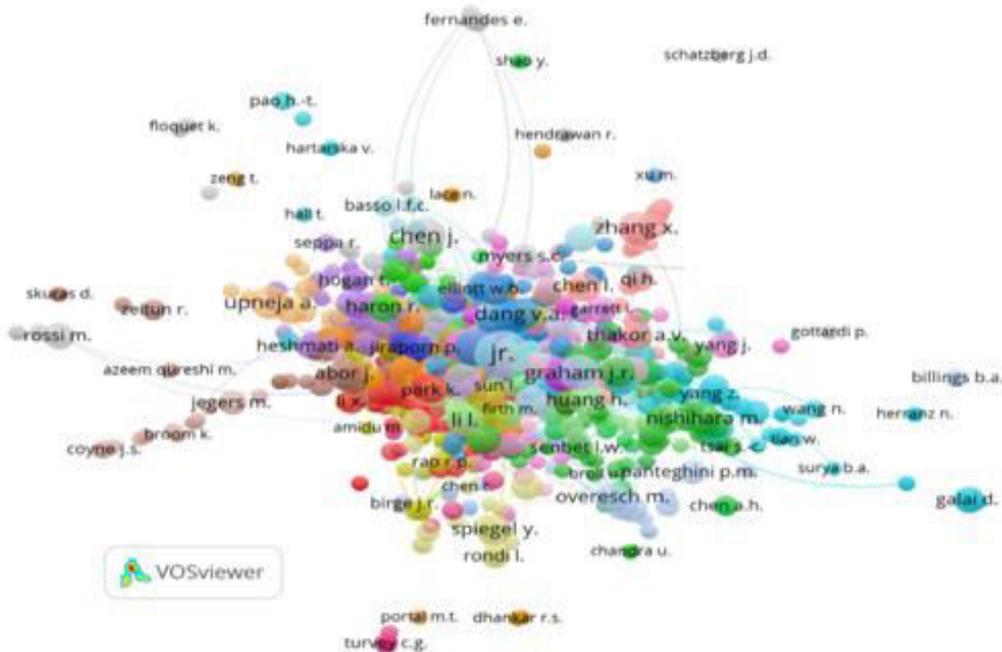


Figure 4: Citation – Authors

Figure 4 shows network visualization of citation analysis when unit analysis authors. The criteria set with minimum of two number of papers from authors with minimum two citations of country and generated the network map, results revealed that out of total 947 authors 868 authors meeting the threshold. Total 31 clusters and 13471 links with total link strength of 20601 reported in the analysis.



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**INVESTIGATION OF CHARACTERISTICS OF THE SOIL AND ITS DIELECTRIC PROPERTIES  
AT X-BAND FREQUENCY**

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**Vijay Sahu<sup>1\*</sup>, S.K. Srivastava<sup>2</sup>**<sup>1</sup>Department of Physics, Dr. CV Raman University, Bilaspur, C.G.495113, India<sup>2</sup>Department of Physics Govt. P.G. College Ambikapur C.G.497001, Indi**ABSTRACT**

*Soil is a valuable natural resource that is vital to preserving environmental equilibrium. The goal of this article was to look at how the dielectric constant of dry soils varied depending on their physical constituents and accessible nutrients. It describes the relationship between physio-chemical parameters and dielectric constant of a soil sample from South Bastar Dantewada. Soil samples were taken from various agricultural lands. The dielectric constant was measured using a determined experimentally under laboratory conditions at 9.967GHz. using infinite sample method. The values of ( $\epsilon_1$ ) and ( $\epsilon_2$ ) first increase slowly with moisture content up to a certain transition point and then increase rapidly with moisture content. Soil samples were tested for physical properties, pH, and electrical conductivity. All of these qualities aid in a better knowledge of soil physics, agricultural applications, and remote sensing data analysis. This research also aids farmers in making the best crop choices.*

*Keywords: Dielectric constant, electric conductivity, physio-chemical*

**1. INTRODUCTION**

Dielectric properties of materials are defined as a molecular property that is fundamental in all the materials that are capable of impeding electron movement resulting in polarization within the material on exposure to an external electric field. The soil has physical, chemical and electrical properties. The physical properties of the soil are its colour, texture etc. The chemical properties are its naturally available nutrients, organic matter, inorganic matter etc [1]S. K Shrivastav 2004]. The electrical properties include dielectric constant, dielectric loss, electrical conductivity, permeability etc. Dielectric properties of soil are the parameters of natural, artificially created electrical fields in soils and influenced by distribution of mobile electrical charges, mostly inorganic ions, in soils. Distributions of electrical charges and properties in various soil profiles are results of the soil-forming processes. Soil properties influencing the density of mobile electrical charges are related with electrical resistivity and potential based on Boltzmann's law of statistical thermodynamics. When the electromagnetic waves interact with the soil, from the reflected wave we can give away the basic information, which will be useful for the microwave remote sensing. The dielectric properties of soil are function of its chemical constituents and physical properties. In a non-homogeneous medium such as soil, the dielectric constant is combination of individual dielectric constant of its constituents such as sand, silt, clay, organic and inorganic matter etc. Different studies predict that the dielectric properties of soil at microwave frequencies are the function of its physico-chemical constituents.

**2. MATERIALS AND METHODS**

The measuring techniques that are appropriate for each given application are determined by the type of the dielectric material to be tested, the frequency of interest, and the needed degree of precision. Microwave measurements and material dielectric characteristics are being more widely used as new electro-technology in domains including agriculture, space research, and food processing. Furthermore, these bulk dielectric property measurements (dielectric constant, dielectric loss factor, etc.) aid in the comprehension, explanation, and empirical correlation of specific physico-chemical characteristics of the test material. As a result, an effort is made in this chapter to describe and clarify the key experimental methodologies employed in our research.

- Resonance method
- Non-Resonance method
- The Electrical conductivity with method
- Organic C by wet oxidation method
- alkaline  $\text{KMnO}_4$  method
- Macronutrients content by adopting standard laboratory method

2.1 DIELECTRIC CONSTANT

If a substance has the potential to store energy when an external electric field is applied, it is characterized as a "dielectric." Faraday pioneered the dielectric hypothesis, which was later expanded upon by Maxwell. Michael Farad studied the effect of filling the gap between the plates of a capacitor with dielectric material in 18375. When a direct current voltage is delivered across a parallel plate capacitor, more charge is stored when a dielectric substance is present between the plates than when no material (a vacuum) is present. The dielectric material enhances the capacitor's storage capacity by neutralizing charges at the electrodes to some amount (depending on its dielectric characteristics), which would otherwise contribute to the external field. The dielectric constant is connected to capacitance with dielectric material. When a DC voltage V is supplied across a parallel plate capacitor (Figure 1.1), a dielectric material put between the plates stores more charge than when no material (a vacuum) is present between the plates.

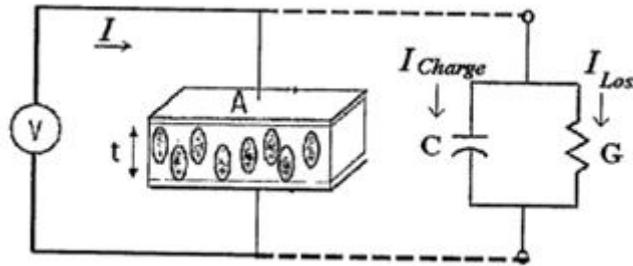


Figure 1: Application of DC voltage across the plates of a parallel plate capacitor

For the figure 1

Where  $k' - \epsilon_r$  is the dielectric constant of the material

$C_0$  = Capacitance without material (vacuum) = and

$C$  = Capacitance with dielectric material =

If an AC sinusoidal voltage  $V = V_m \sin(\omega t)$  is applied across the same capacitor (Figure 2.2), the resulting current will be made up of a charging current  $I_{Charge}$  and a loss current

$I_{Loss}$  that is related to the dielectric constant the losses in the material can be represented as a conductance ( $G$ ) in parallel with a capacitance ( $C$ )

Figure 1.2 application of AC Voltage across the plates of a parallel plate capacitor

For the applied voltage across the capacitor, the current

The complex dielectric constant  $k^*$  is made up of two parts: a real component  $k'$  that represents storage and an imaginary part  $k''$  that indicates loss.

A material's complex dielectric constant  $k^*$  is identical to its relative permittivity  $\epsilon_r$ , i.e., the permittivity  $\epsilon^*$  relative to empty space  $\epsilon_0$ .

Here's  $\epsilon_r$  - complex relative permittivity, and

$\epsilon_0$  = Permittivity in free space =  $8.854 \times 10^{-12}$  Farad/m

The real part of permittivity  $\epsilon'$  is a measure of how much energy from an external electric field is stored in a material. The imaginary part of permittivity is called the loss factor and is a measure of how dissipative or lossy a material is to an external electric field. The imaginary part of permittivity is always greater than zero. The loss factor includes the effects of both dielectric loss and conductivity.

When complex permittivity is drawn as a simple vector diagram (Figure 1.3), the real and imaginary components are  $90^\circ$  out of phase. The vector sum  $\epsilon_r^*$  forms an angle  $\delta$  with the real axis  $\epsilon_r'$ . The relative "lossiness" of a material is the ratio of the energy lost to the energy stored.

$\tan \delta$  - Energy lost per cycle / Energy stored per cycle

Where  $\tan \delta$  = loss tangent,  $\tan \delta$ , tangent loss, etc.

$D$  = dissipation factor, and

$Q$  = quality factor. The complex dielectric constant calculated using the relation

$$\epsilon = \epsilon_1 - j\epsilon_2 = \left[ \left\{ \frac{1}{1 + (\lambda_c/\lambda_a)^2} \right\} + \left\{ \frac{1}{1 + (\lambda_g/\lambda_c)^2} \right\} \right] \times [R - j \tan\{k(D - D_R)\}/1 - jR \tan\{k(D - D_R)\}], \quad (1)$$

where  $\lambda_c, \lambda_g$  and  $k$  are cut-off wavelength, guide wavelength and wave vector respectively,  $R$  is voltage standing wave ratio (VSWR) and  $D$  and  $D_R$  are the positions of first minima with and without the sample connected. The samples were filled and pressed manually in a 50cm long waveguide, which was terminated in a matched load. The values of  $D, D_R$  and  $\lambda_g$  were determined using a dial indicator on the slotted line section. The VSWR was determined using double minimum power method. The soil sample taken for present study belongs to the South Bastar area of the Chhattisgarh region. Samples are taken from both irrigated and non-irrigated areas. The characteristics of the soil were measured in the soil mechanics lab at the Govt. Agriculture Collage Raipur, Govt. Soil Test Centre Bilaspur and the dielectric constants were measured at the Department of Physics, U.V College Latori, Ambikapur. The moisture content in percentage by dry weight,  $W_c(\%)$  is calculated using the following relation

$$W_c(\%) = [(wt. of wet soil - wt. of dry soil)/wt. of dry soil] \times 100. \quad (2)$$

Measurements have been carried out at 9.967GHz. This experimental set-up consists of a 2K 25 reflex klystron as the microwave source, with maximum output power of 25mW and frequency range 8.2–12.4GHz. The source is connected with a broadband isolator with maximum isolation of 30dB and insertion loss of 1.25dB. This is used to avoid interference between the source and reflected signals. After isolator a variable attenuator is used to control the power at the desired level. This is followed by a 20dB multihole directional coupler which is used to monitor the power level flowing through the system. A direct reading absorption type frequency meter with high Q-factor ( $Q \sim 1000$ ) and 2.5MHz resolution with dip  $\geq 1$ dB is used to measure the frequency of the signal. The detector was of square law characteristics with VSWR better than 2:1. A precession slotted line section was employed to measure the VSWR and distance. The accuracy of the distance measurement is within 0.004cm.

**3. EMPIRICAL MODEL**

Field Capacity (FC) refers to the quantity of water that remains in a soil after gravity drainage has halted. Following saturation by rain or irrigation, this number shows the maximum quantity of water that a soil can retain against gravity. The capacity of a field is generally represented as a percentage of its weight (for example, a soil holding 25 percent water at field capacity contains 25 percent of its dry weight as retained water). Field capacity is influenced by the texture of the soil.

$$FC = 25.1 - 0.21 \times \text{SAND} + 0.22 \times \text{CLAY} \dots (1)$$

The permanent withering percentage is the quantity of water in a soil after plants have wilted beyond recovery. There may still be some water remaining at this stage, especially in clays, but it is trapped so securely that plants are unable to absorb it. The plant available water is the quantity of water retained by the soil between field capacity and the permanent wilting point. Using the Empirical Model by Wang, J. R., and Schmutge T. [2], the Wilting Point (WP) and Transition Moisture ( $W_t$ ) of the soils are estimated as follows:

$$WP = 0.06774 - 0.00064 \times \text{Sand} (\%) + 0.00478 \times \text{Clay} (\%) \dots (2)$$

$$W_t = 0.49 \times WP + 0.165$$

There is also a strong dependence of  $W_t$  on FC for a given frequency. A linear regression between the Transition Moisture and FC gives

$W_t = 0.070 + 0.0047 \times FC$  Wang & Schmutge (1980) applying the regression analysis related the values of  $w_t$  and with the wilting point (WP) of the soils by the relation

$$w_t = 0.49 \times WP + 0.165, \quad (3)$$

$$\gamma = -0.57 \times WP + 0.481, \quad (4)$$

where  $w_t$  and  $\gamma$  both have the dimensions of WP, which is a volume ratio ( $\text{cm}^3/\text{cm}^3$ ). The WP can be calculated from the texture of the soils using the following relation

$$WP = 0.06774 - 0.00064 \times \text{sand} (\%) + 0.00478 \times \text{clay} (\%), \quad (5)$$

where, clay and sand are the clay and sand contents in percent by dry weight of the soil. The values of WP,  $w_t$  and  $\gamma$ ; porosities along with the texture information of the soils used in this study are shown in table 1. The porosity of soil can be calculated using the relations

$$\eta = (G \times \gamma_w - \gamma_d)/G \times \gamma_w, (6)$$

where  $G$  is  $2.65$ , and  $\lambda_w$  is density of water, and  $\gamma_d$  is density of sample.

Study of the characteristics of the soil of Chhattisgarh

Sample No.	Sand (%)	Silt (%)	Clay (%)	WP	Wt	$\Gamma$	Bulk Density	Porosity
S1	40	24	36	0.21422	0.2699678	0.3588946	1.46	44.64
S2	60	28	12	0.0867	0.207483	0.431581	1.52	41.78
S3	80	9	11	0.06912	0.1988688	0.4416016	1.52	41.45
S4	72	12	16	0.09814	0.2130886	0.4250602	1.52	41.04
S5	42	18	40	0.23206	0.2787094	0.3487258	1.45	45.29

Table1. Physical characteristics of soil used for dielectric measurements at 9.967GHz.

S.No.	Real part of Dielectric constant					Imaginary part of dielectric constant				
	Dry Soil	10%	20%	30%	40%	Dry Soil	10%	20%	30%	40%
S1	3.21	7.23	11.62	15.73	19.21	0.12	0.18	0.26	0.38	0.48
S2	3.36	7.52	11.92	16.12	19.51	0.17	0.21	0.29	0.41	0.50
S3	4.34	8.41	12.79	16.92	29.42	0.17	0.21	0.29	0.41	0.51
S4	3.36	7.52	11.92	16.12	19.51	0.17	0.21	0.29	0.41	0.50
S5	3.71	7.81	12.98	17.12	20.51	0.16	0.20	0.27	0.40	0.51

Table 2: Real and Imaginary part of Dielectric Constant (Measurement of dielectric data and emissivity at 9.86 GHz)

4. RESULTS AND DISCUSSION

Variations in values of the dielectric constant, both  $\epsilon_1$  and  $\epsilon_2$ , with percentage moisture content have been measured and are plotted in figures 1 and 2. The constituents of the soils have been listed in table 1. It is found that the relative permittivity's of the soils increase only slowly with moisture content initially and after reaching a transition point, they increase rapidly. This observation is qualitatively in good agreement with the results of others (Vyas 1982). The first feature obtained in this study can be explained using the bi-phase dielectric behaviour of water molecules in soils that have much smaller permittivity values (comparable with the permittivity of ice) as compared to free water molecules (Wang & Schumge 1980). At moisture contents below the transition point due to the presence of only a few free water molecules, the mixture dielectric permittivity's increase only slowly whereas at moisture contents above the transition point the number of free water molecules increases rapidly and hence a steep rise in permittivity is observed. The second observation can be attributed to much smaller noncapillary pore space, less drainage, less aeration and thus high-water capacity of high clay content soils as compared to sandy soils. The experimental results obtained are clearly matched with earlier reported results.

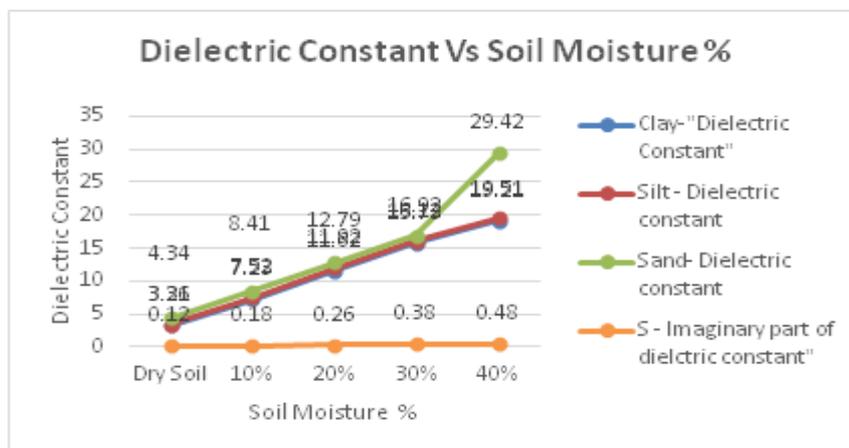


Figure 1: Variation of dielectric constant with percentage water content for moist Clay, Silty and sandy sample.

5. CONCLUSION

The Conclusions Obtained from this Study are as Follows

- (i) Moisture content, frequency, and temperature all have an impact on the dielectric properties of soils. The dielectric properties may be impacted mostly by moisture content and frequency if temperature variations aren't significant during the trials. Water has a considerable influence on the dielectric properties of soil at

microwave frequencies (and hence the soil emissivity and scattering coefficient). Because the relaxation frequency of water is in the microwave frequency band, this is the case. The dipolar relaxation of water molecules in an electromagnetic field result in microwave energy absorption, which may be used to assess the moisture content of the soil. The dielectric properties' frequency-dependent trend may disclose a lot about the material's characteristics. Electric conduction and various polarisation processes have an impact on the dielectric loss factor.

(ii) The results of our research on dielectric constant ( $\epsilon'$ ), dielectric loss ( $\epsilon''$ ) electrical conductivity, and other dielectric properties for this soil samples, our findings include the dielectric constants of soils are strongly dependent on soil moisture and soil texture. Dielectric constants of solid particles, like sand, silt and clay present in storms are essential in the estimation of the total attenuation due to sand and dust storms in microwave communication

## 6. ACKNOWLEDGEMENT

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## 7. FUTURE SCOPE

This kind of study helps to our knowledge of how soil dielectric, emissive, and scattering properties vary as MC and microwave frequencies increase. This will help us better grasp soil science, which will be beneficial to farmers. The most important findings and conclusions from our research are presented here. Various experimental and/or instrumental limits are emphasised throughout the project. The future scope of research, as well as the possibility of such studies being expanded, is also discussed

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**ELECTRIC VEHICLE: STATUS, FUTURE & CHALLENGES**

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**Afaque Khan, Manoj Pawar and Ajay Gangarade**

Mechanical Engineering Department, K.J. Somaiya College of Engineering, Vidyavihar, Mumbai, India

**ABSTRACT**

*Electric vehicles (EV) have recently sparked a surge in global interest since they emit significantly less pollution than their gasoline-powered competitors. Insufficient charging stations, long charging times, high initial costs, and restricted range are the key barriers to EV adoption. Making India an all-EV market by 2040 also brings in incentives for EV development, such as the Faster Adoption & Manufacturing of Electric Vehicles (FAME) Scheme, which was launched in 2015 to encourage the production of environmentally friendly vehicles, including hybrid electric vehicles (HEV). By 2030, the Indian government wants "only Electric Vehicles" on the road.*

*Transportation is one of the most energy-intensive businesses, with serious issues such as pollution, congestion, and environmental concerns. Electric vehicles (EVs) have been introduced to replace conventional automobiles in order to address these environmental issues (CVs). EVs are commonly regarded as an environmentally beneficial and renewable energy technology that can help accelerate the transition to a low-carbon transportation system while minimizing the impact on natural resources.*

*However, despite several advantages of the technology and accompanying government incentives, consumer demand for it has not increased. This article is current and looks at the various aspects that influence a consumer's decision to buy an electric vehicle. Further-more research gaps and the future work needed will be discussed.*

*Keywords: Electric Vehicle, Charging Station, Charging Time, Range, Hybrid Electric Vehicle, Sustainable transportation.*

**1. INTRODUCTION**

The increase in energy consumption may be traced back to a variety of global and national economic activities, such as tourism, industrial manufacturing, and transportation, as well as their contributions to global carbon dioxide (CO<sub>2</sub>) emissions. Since the mid-twentieth century, emissions from economic activity have been the dominant cause of global warming, according to the Intergovernmental Panel on Climate Change (IPCC). All UN member countries pushed new Sustainable Development Goals (SDGs) in 2015, with the goal of reducing greenhouse gas (GHG) emissions for peace and prosperity for people and the planet by 2030. The transportation sector has grown, and as a result, it continues to drive both established and emerging countries' economic growth. As a result, there is an increased demand for fossil fuel to power vehicles. As a result, the sector has become associated with issues such as traffic congestion, environmental challenges, and subsequent CO<sub>2</sub> emissions. In fact, transportation is the country's largest consumer of petroleum products, accounting for 55% of total domestic consumption and 7.5% of CO<sub>2</sub> emissions. As a result, alternative propulsion systems that reduce global GHG emissions are required.

The following are the various types of EVs:

**HEV:** Hybrid electric vehicles (HEVs) are vehicles that run on both gasoline and electricity and have an engine and an electric motor. The braking system's electricity charges the battery.

**PHEV:** Plug-in hybrid electric vehicles (PHEVs) are similar to HEVs, but have a smaller engine and larger batteries. The batteries are recharged via the braking system or by connecting to an external electric charging point.

**BEV:** It lack an engine and rely on electric motors for propulsion, with batteries serving as energy storage devices. They rely on external power sources to charge the battery. These vehicles are also known as plug-in hybrids, electric vehicles, or battery electric vehicles (BEVs). BEVs accounted for a larger share of electric car sales in 2019, with global annual sales increasing by 14% in 2019, with 80 percent in Europe and 43 percent in Canada, and stable sales in China and the United States. Furthermore, by 2019, PHEVs would have covered roughly one-third of the electric car stock. Europe and China are the primary markets for PHEVs, accounting for 36% and 21% of total sales, respectively.

Furthermore, EV adoption has increased in a number of countries, including Norway (39.6 percent), Hong Kong (10.61 percent), the United States (3.32 percent), the United Kingdom (1.94 percent), China (2.41 percent), and others.

**1.2 Organization of Paper**

This paper is divided into various sections. Section 1 has covered introduction of the entire topic. Section 2 covers literature survey part in which Research findings and Research gaps are assigned with the sub-sections. Section 3 covers case studies of the different papers on Electric Vehicle status in India. Section 4 is conclusions drawn on the basis of study and future scope of current study. At the end, references of the articles selected are provided.

**2. LITERATURE SURVEY**

Literature survey for this report using Scopus database peer reviewed research articles only. Conference proceedings and thesis work are not included in this study. Research papers are selected from 2018 onwards. Articles are selected from reputed Journals like International Journal of Engineering Research & Technology on Electric Vehicles and published by reputed publishers like Taylor and Francis, Springer, Elsevier etc.

30 articles were selected on the basis of TAK (Title, Abstract and Keywords) principle after the scanning process. Upon further reading, 15 papers were shortlisted and summary of the contributions of the shortlisted articles are summarized in the below table, which highlights the key factors investigated, findings of the article and research gaps. Table 2.1 describes the objective of the papers selected, year in which they are published, country and Electric vehicles status.

Sr. No	Author	Objective of the paper	Year	Country
1	Patyal et.al.	The main aim of the paper is to identify and examine the relationship between the identified 13 barriers for adopting of EV's.	2021	India
2	V. Singh et al	The main purpose of this paper to review the policies, strategies, and technical considerations for developing EVs, by analyzing both the Indian EV market and the global evolution of EVs	2021	India
3	Abhijeet K. Digalwar et al	This article intends to establish and validate criteria affecting the sustainable manufacturing of electric vehicles in India, which can be used by original equipment manufacturers and service providers in the sector.	2021	India
4	S. Goel, R. Sharma and A.K. Rathore	The study addresses the numerous modelling approaches and optimization strategies used in studies of Electric Vehicle, Hybrid Electric Vehicle, Plug-in-Hybrid Electric Vehicle, and Battery Electric Vehicle penetration rates in the market.	2021	India
5	Khurana et.al.	The author has given contemporary and examines the different factors that affect a consumer's adoption of an EV.	2020	India
6	Agarwal et.al.	The main purpose is to examine the current situation of electric and hybrid vehicles worldwide, as well as current technology and engineering.	2020	India
7	J.-P. Skeete, et al.	In this automotive study, we take a longer-term view to better comprehend the total transition to "zero-emissions" road transportation by empirically and conceptually contributing to the strategic management of lithium ion-powered vehicle electrification.	2020	UK
8	Erik Figenbaum	This paper analyses the usage pattern of these fast chargers using a dataset from two large operators covering most of their charging events between Q1 2016 and Q1 2018.	2020	Norway
9	Rakesh et.al.	Explained the working of Electric Vehicles & different types of Charging structure available.	2019	India
10	Pruthvi et.al.	The authors of this paper provide an overview of the capabilities of OCPP and how they might be applied to the charging infrastructure for electric vehicles.	2019	India
11	Sreeram et.al.	It is focused on providing an overall picture of the modern Electric Vehicle scenario and areas for further growth.	2019	India
12	Vidhi et.al.	The various stages of an electric vehicle's (EV) lifecycle,	2018	India

		their impact on environmental emissions, and policy recommendations relevant to the Indian market for various socioeconomic groups.		
13	Rodge et.al.	This paper describes current status as well as future prospects of electric vehicles in India. It also focuses on basic EV functioning as well as its effect on the environment and economy.	2018	India
14	Prakash et.al.	The main aim of the paper is to identify a set of barriers for mass adoption of EVs in the context of the Indian automotive market, find relationships and hierarchy to interpret them using Interpretive Structural Modeling (ISM) technique.	2018	India
15	L. Noel et al	In this paper, we examine the status of electric vehicles in the Nordic region, based on original data from multiple methods, including expert interviews and focus groups.	2018	Denmark

## 2.1 Research Findings

Patyal et.al. (2021), the goal of this study is to learn more about the roadblocks to mainstream EV adoption in India. The researchers looked at how the identified barriers interacted and classed them as 'driving barriers' and 'dependent barriers.' A rigorous literature analysis identified thirteen hurdles to EV adoption, which were then validated by involving experts from academia and industry. The relationship between the identified barriers is then investigated using an ISM-MICMAC-based technique. This study will aid policymakers, electric vehicle manufacturers, and other stakeholders in developing strategies to promote EV adoption in India. This study will provide recommendations to policymakers, EV producers, and other stakeholders for increasing EV adoption in India.

V. Singh et al (2021), The most important policies and technical aspects of EV deployment in India were examined in this study. The findings found that state governments were leading the way in terms of EV advertising and promotion, with incentives such as reduced road taxes, registration fee exemptions, and subsidies. India will benefit from central policies that give incentives to support the national EV market in terms of both supply and demand, according to the conclusions of a SWOC analysis undertaken to analyze the strengths, weaknesses, possibilities, and problems of EV adoption.

Abhijeet K. Digalwar et al (2021), Factors affecting the long-term viability of electric car manufacturing have been identified. The 67 variables discovered were divided into seven categories. The nominal grouping approach was used to assess the significance of these characteristics. An academic, an industrialist, and a policymaker from the Indian government made up the three-person group. The Shannon Entropy approach was used to generate the criterion weights of the factors based on the input from the group. The technological component was shown to be the most relevant of the seven criteria. Within the technological arena, the most important parameters were found to be range, power, seating and baggage capacity, and battery switching technology.

Khurana et.al. (2020) The proposed conceptual model was empirically examined in India for this study. It is advisable to carry out comparable investigations in various settings and places. The 'intention' to adopt, however, might not result in a purchase. If intention changes into adoption, it may be suggested by more research. According to Hassan, Shiu, and Shaw (2014), the relationship between intent to adopt and purchasing behavior necessitates extensive modeling. This association is more prominent for complicated environmentally friendly product purchases. Four factors were examined in the study: EC, perceived economic benefit, IM, and SoC.In. Additional research could look into the effects of additional covariates. These include things like knowledge, skepticism, safety, risk, perceived consumer efficacy, and interest.

J.-P. Skeete, et al.(2020), proposed the steps to reduce the Obsolete Lithium-ion batteries stock piles. Also, due to the high quantities, complexity, heterogeneous chemistries, and range of materials anticipated in the OLIB waste stream, OLIBs will create a greater challenge for waste management in the future. In order to manage the OLIB's the author has suggested some of the steps. Reuse OLIBs packs, modules, or cells that are in good health. Multiple electrode chemistries and form factors are examples of recycling procedures that can recover high-value elements from heterogeneous OLIB feedstock (e.g. cylindrical, prismatic, and pouch). Despite low initial OLIB volumes and concern over the entire costs of recycling, updated environmental legislation promotes effective OLIB collection and sorting as well as the maximum recovery of all recyclable materials. Safe disposal options for materials with little or no secondary use or recovery potential.

Sreeram et.al. (2019), Electric vehicles (EVs) have a strong chance of influencing the transportation sector's future and halting global warming caused by conventional auto engines that depend on finite fossil fuels. Along with the EV policy adopted by Kerala, the EV scenario in the world and in India is also addressed. There is an explanation of the EV classifications and associated jargon. By integrating with smart grid and renewable energy, EVs offer a significant opportunity to support a healthier and more environmentally friendly system.

Vidhi et.al. (2018), the article discusses the impact of India's policy to transition to all-electric vehicles by 2030 on air pollution and found that one of the main causes of air pollution in New Delhi is caused by car emissions. Further, if no action is taken, both the number of automobiles and vehicular pollution will keep rising. The article discusses a number of issues, such as the necessary changes in policy and behavior, as the government has set the aim of selling only electric vehicles (EVs) by 2030. It was discovered that depending on the energy source utilized for charging, NOx emissions from automobiles can be decreased by 7–25 percent, while CO and CO2 emissions can be reduced by up to 85 percent.

Rodge et.al. (2018), discussed the use of renewable energy resources for the Electric Vehicles implementation in India. One significant step the government has taken to reduce environmental pollution is the conversion of commercial vehicles to electric vehicles. However, renewable energy sources should be employed to produce power rather than non-renewable resources in order to practically reduce pollution. Additionally, given that batteries generate a significant amount of pollution during their production process, we should concentrate on reusing and recharging batteries. In order to produce less trash, we should increase the battery's capacity.

## 2.2 Research Gaps

Many studies and research has been done by numerous authors regarding the technologies & development in Electric Vehicles across the globe but still not many nations Conventional vehicle ratio to Electric Vehicle ratio are less. This section will discuss the mismatch between research and real-world circumstances particularly in India.

- Cost of an Electric Vehicle is higher as compared to conventional vehicles. The federal and state governments do offer a lot of incentives. But a commonality throughout all of the programmes is that the incentives are only valid for a set number of vehicles, and that when the discount and incentives are removed, the same EV that looked like it would be a good investment suddenly becomes out of reach.
- People considering switching to electric vehicles frequently cite poor infrastructure as one of their top concerns. Poor infra includes both a lack of proper home charging infrastructure and a lack of charging outlets. Any owner of an electric vehicle who doesn't have the necessary setup (powerful MCB, cable, and earthing) close by may have trouble charging a bigger electric vehicle.
- Range Anxiety - This issue with mental pressure is brought on by a lack of charging infrastructure, which is gradually becoming better but still needs a lot of work.
- The absence of standards is a plague on the Indian EV industry, harming both the current and future of the EV market. Since there is no single charging station that can be designed to charge all sorts of electric vehicles, every second electric scooter has a unique charging outlet, which has an impact on the infrastructure of charging stations. Additionally, the rate of EV adoption in society-based societies is lowered by the lack of standards.
- Because electric vehicles are still uncommon, there are no cost-effective repair options.
- It's merely a matter of assuming the increment in electricity consumption when everyone in the city is utilizing just electricity to charge their vehicle.
- Since we currently rely heavily on burning fossil fuels to produce electricity, the increase in demand for electricity will be horrifying. The EV revolution won't be useful until we use renewable energy sources to provide electricity.

## 3. CASE STUDY

The different case studies related to the status of Electric Vehicles have been discussed. Below some case studies will be discussed.

### 3.1 Case Study 1

Patyal et.al. (2021), Numerous theoretical and administrative ramifications stem from this study. It initially offers insights on the adoption of EV in the setting of an emerging economy before moving on to the theoretical implications. By employing the Delphi Technique and a thorough literature review to identify thirteen main barriers, it adds to the growing body of research on EV adoption while taking into account the early stages of

EV. In order to research the given objectives, this study used ISM and MICMAC analyses, which is a unique contribution to the body of literature on EV because it allowed for the identification of the hierarchical structure of the barriers. First off, because this study seeks to identify the most important hurdles to EV adoption and examines how those barriers interact with one another, it may aid in determining how to break down or lessen the impact of those barriers. In order to comprehend this link and create the necessary strategies for it, EV manufacturers may find the current ISM-MICMAC model helpful. The research's findings also show that the biggest obstacles are "Government regulations," "Charging Infrastructure," and "Resource Limitation." The fact that these obstacles are at the base of the hierarchy suggests that they have the strongest motivation. Because of this, policymakers may offer purchase-based incentives to remove these obstacles, such as direct subsidies on EV purchases and registration/emission/tax exemptions, which are frequently used by different countries to lower purchase prices while increasing EV adoption. To create a proper convenience strategy for EV adoption, use-based incentive policies like free parking, toll exemptions, and additional highway lanes are necessary.

Finally, less important hurdles such as resale anxiety and lengthy recharge times for refueling EVs were discovered. The availability of rapid chargers and battery shifting options may be to blame for this. Therefore, in their numerous talks with various stakeholders, policymakers can aid in reducing resale anxiety by highlighting the use of rapid charges, battery swapping stations, and battery-related technology improvements.

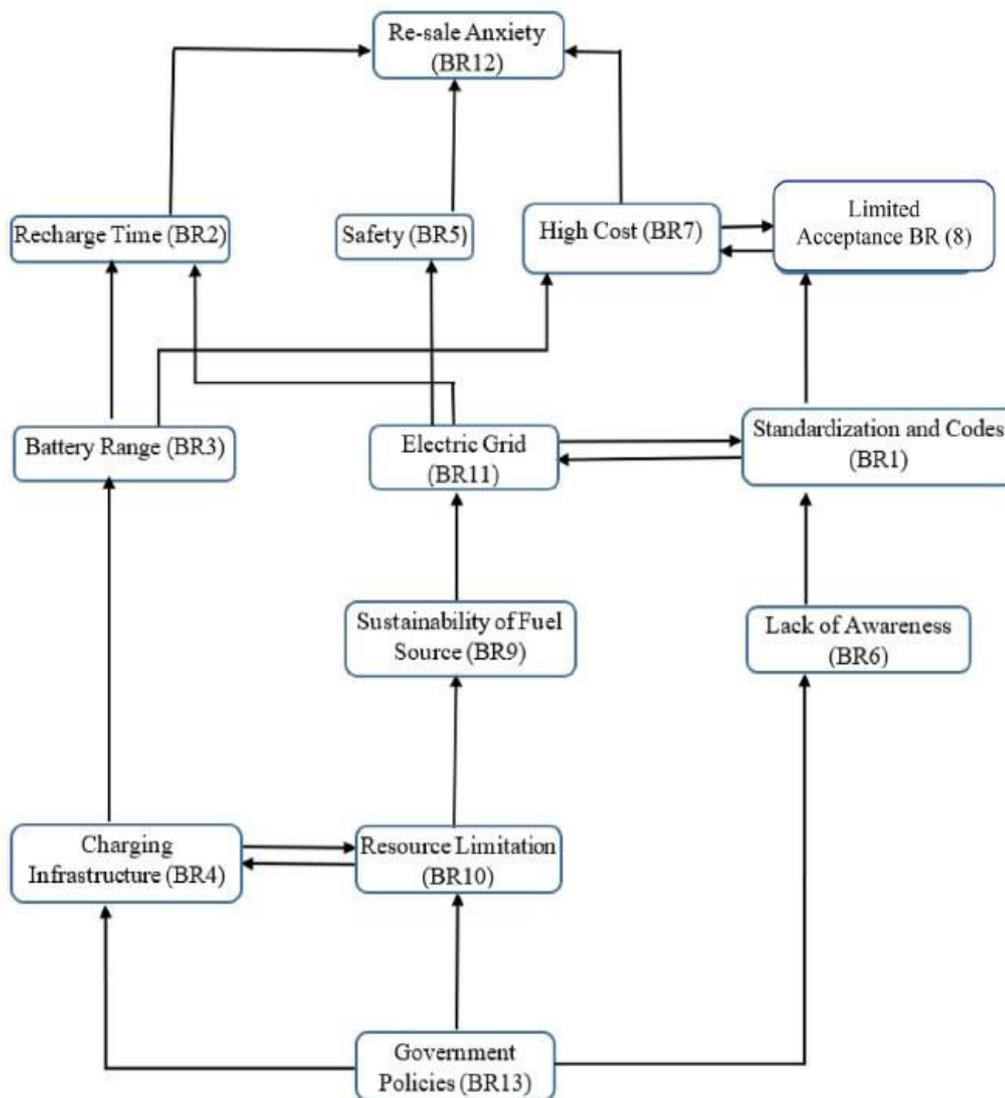


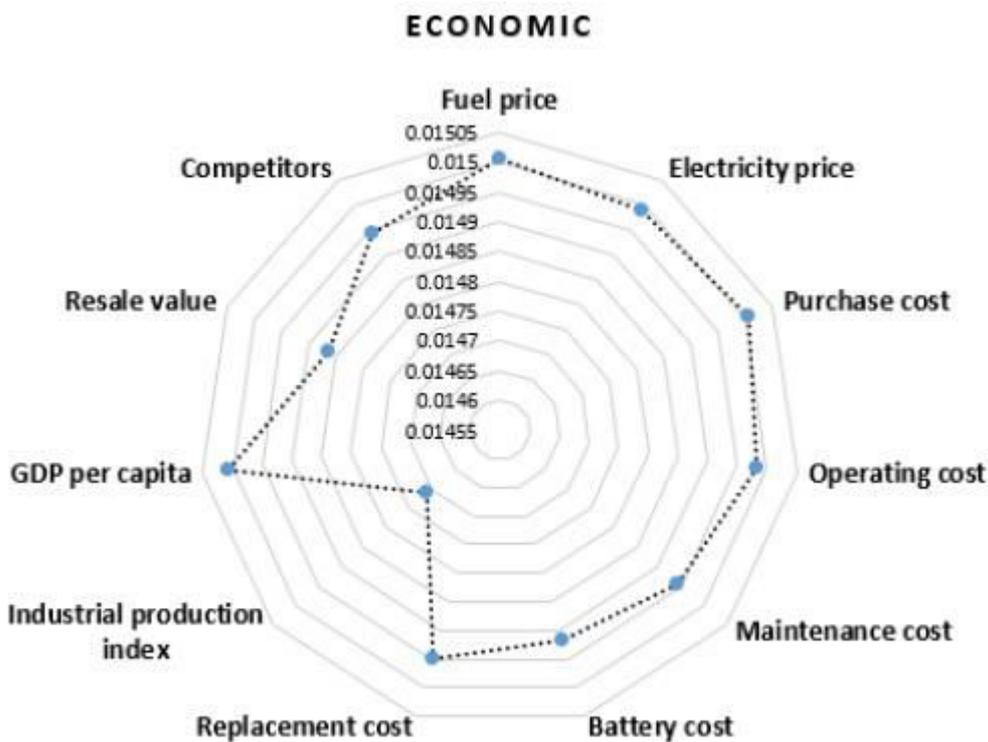
Fig 3.1: ISM-based model of EV barriers adoption, Source - Author.

Figure 3.1, shows the 13 barriers how they are inter-connected with each other & their dependency. Other barriers, including those with the most force behind them, are influenced by BR13 (Government Policies). This demonstrates the vital influence that government initiatives have played in the overall growth of the EV sector. Therefore, the government must create regulations that will aid in the widespread adoption of EVs in the context being researched.

The ISM-MICMAC model may be quantified, tested, and validated as part of this study's future objectives. Future studies might create hypotheses, use "Confirmatory Factor Analysis," and then use "Structural Equation Modeling" to statistically examine and validate these associations.

**3.2 Case Study 2**

Abhijeet K. Digalwaret.al.(2021) proposed the following. The 67 variables' criteria weights provide a focused picture of each aspect, while the category weights of the seven factors provide a holistic overview of sustainable electric vehicle manufacturing. The production of electric vehicles might be affected by many factors. Seven factors were created from the 67 variables that were found. The nominal grouping approach was used to examine the importance of these elements. A professor, an industrialist, and a policymaker from the Indian government made up the trio of members. The Shannon Entropy approach was used to determine the criteria weights of the factors based on group input. The technological element was shown to be the most significant of the seven criteria. Range, power, seating and baggage capacity, as well as battery switching technology, were further deduced to be the most important factors in the technological sphere. The environmental component came after the technological factor, and among its considerations, greenhouse gas emissions, noise, and global warming were the most important ones. Additionally, it was discovered that the economic factor's purchasing cost and fuel price were relatively more relevant than other components. Geographical and cultural constraints did not significantly hinder India's ability to manufacture sustainable electric vehicles, thus they do not need to be addressed right now. The recommendations and suggestions made based on the study's findings will be beneficial for future policy-making. In order to analyze a large number of alternatives to improve the acceptability of hybrid and electric vehicles, the criteria weights produced from the Shannon Entropy method can be employed in an integrated multicriteria decision-making strategy.



**Fig 3.2:** Radar chart showing weights of criteria under economic factor, Source - Author.

Figure 3.2 shows the radar chart with weights of criteria under economic factors, an electric vehicle now costs more to purchase than a car with an internal combustion engine so consumers are hesitant to do so. The high price of the battery is to blame for the high buying price. However, an electric car is less expensive over the course of its lifetime. This can be ascribed to EVs having reduced lifetime operating and maintenance costs. Additionally, ongoing advancements in battery technology will result in lower battery prices and, eventually, cheaper electric car purchase prices.

**3.3 Case Study 3**

J.-P. Skeete, et al. (2020), proposed the Obsolete Lithium-ion batteries (OLIB's) concept and how to dispose of the removed Lithium - ion batteries from the Electric Vehicles.

For OLIBs, numerous waste management plans must be created, including.

### 3.3.1 Traceability

Stakeholders have identified the lifecycle traceability of LIBs as a characteristic that could significantly affect how OLIB stockpile waste flows are managed in the future. A lack of traceability across the LIB lifetime is resulting in material leakage and economic/value loss because there are currently no reporting methods or certification programmes. The use of battery identification, such as a Quick Response (QR) code or through blockchain technologies, could provide a variety of useful data, including state-of-health (usage, performance, charging history, and charging capacity), chemistry type, and can ideally be paired with standard testing procedures and measurement conventions. The management of OLIB waste in the future, particularly for initiatives involving reuse or second-life in the UK, may depend heavily on this type of battery data.

### 3.3.2 Metals Recovery

The dynamic OLIB stockpile is another method for protecting the supply chains of the auto and battery industries against harm. Given the anticipated future demand and supply risks for these metals, cobalt, lithium, and rare earths are given top priority. By 2030, it is predicted that OLIB recycling will contribute roughly 10% of Europe's cobalt use by the automotive industry. Recovered cathode materials from OLIBs might lower total LIB pack cost by more than 20%. Since there is currently no primary component raw material supply chain, this means that OLIB recycling could be especially advantageous for future LIB manufacture in the UK. The largest obstacle to OLIB recycling in the long run will continue to be the unpredictability of future LIB chemical compositions. The future financial feasibility of OLIB recycling may be in peril if the industry's efforts to reduce the cobalt content in LIBs are successful.

### 3.3.3 Closed-Loop Systems

Closed-loop systems are one factor that our dynamic stockpile forecast is unable to take into account.

A take-back and recycling plan created by OEMs that can be connected with the LIB production process is known as a closed-loop system. For instance, Tesla recycles the residual OLIB after physically separating electronic components and casings for reuse. Tesla wants to develop a closed-loop system that recycles OLIBs and uses the recovered materials in new batteries made in the same plant. In order to improve recycling rates and material traceability, closed-loop battery cycles can also be created by cooperative businesses, as is the case with Umicore (material recovery) and LG Chem (battery maker) or Umicore and Audi (OEM).

## 4. CONCLUSION

In India, a number of activities are being implemented to encourage the usage of EV. These programmes must overcome obstacles such high costs, difficulties obtaining and charging batteries, the limited driving range of EVs, subpar incentive policies, and a lack of consumer understanding of the advantages of EVs. However, more investigation may be conducted to assess the EV trend by taking into account multiple nations. Future research can leverage the quantitative analysis of policy that was overlooked in this thorough assessment to determine which policies have a significant impact on the EV market. Further research is required to determine whether other EV regulations also need to be presented, as well as EV statistics from local cities and municipalities encouraging adoption.

When compared to conventional automobiles, hybrid, plug-in hybrid, and electric vehicles can boost fuel efficiency while costing more to purchase. In general, their lower petroleum consumption and higher productivity provide long-term financial benefits to consumers, society, automakers, and politicians. A thorough assessment of the literature, an overview, and recommendations for studies on the penetration rates of HEV, PHEV, and BEV into the Indian Market. The Indian government's recent measures and various incentives will aid in advancing the country's push toward e-mobility.

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**FLOWER SPECIES DETECTION USING CONVOLUTION NEURAL NETWORK****<sup>1</sup>Subapriya V and <sup>2</sup>N. Senthamilarasi**<sup>1</sup>Assistant Professor, Department of CSE, Sathyabama Institute of Science and Technology, Chennai<sup>2</sup>Assistant Professor, Department of Information Technology, Panimalar Institute of Technology, Chennai**ABSTRACT**

*Characterization and Recognition frameworks are being utilized to utilize the current information successfully and get the highlight extraction from the information and presentation them. In this undertaking, we need to blossom characterization utilizing text acknowledgement. As a matter of fact, the components of blossoms are thought of and the bloom is referenced in the dataset including the aspects. The objective of this paper is to extricate the highlights of blossoms and show the benefits and inconveniences of the blossom. As indicated by the presence of a few calculations we considered KNN and Random Forest as they gave the most extreme precision.*

**I. INTRODUCTION**

Blossom Classification is the initial segment of this undertaking in order to characterize every one of the blossoms in the light of the sepal length, sepal width, petal length and petal width of the flower. In the present world, there are numerous vegetation and fauna around us. The issue is individuals do not perceive their significance of them in our day-to-day existence for some uses.

There are numerous ayurvedic plants, medicinal blossoms and solid organic products around. This undertaking is useful for some by taking into account blossoms for beautification as well as for the treatments. Not just for restorative purposes, even the scent is additionally utilized in quite a large number of therapeutic utilization. We fostered the undertaking so that when we need to figure out every one of the subtleties of a blossom those are undeniably shown with the assistance of the existing dataset. The advantages and inconveniences are additionally shown with the goal that it would be more effective. We have performed explore utilizing the Iris dataset. It comprises three distinct species with right around 150 tuples valuable for blossom characterization and viewing as the exactness. AI is being utilized here which plays a fundamental job in classification. We got significant exactness and results utilizing two distinct calculations Cnn calculation and irregular timberland. AI is being utilized in here which assumes a fundamental part in characterization.

**II. LITERATURE REVIEW**

Feeling portrays a feeling of a human which can be positive negative or nonpartisan and the surveys are an assortment of information that is opinion rich will help the item producer to make acceptable choices for the development of the organization sites like amazon and trivago investigate the surveys based on sentiment analysis to construct an enormous client base this outcome or result is utilized by the client to settle on the ideal choices while buying the item founded on various feedback most of the information on internet-based sites is unstructured and it is additionally cleaned and investigated to create or distinguish the assessment in light of extremity creator zeenia Singhal has expressed in the paper that calculations like support vector machine are utilized for handling a blend of product surveys is gathered in light of volume assortment and speed for the comprehension of peoples points of view to distinguish their mentality and conduct of them on a specific product the creator Meena belwal proposes the thought of cooperative information for a similar item accessible on various sites and can be used by the producer for the enhancement of business knowledge and appropriate independent direction the results are envisioned involving diagrams for better understanding and finding out about the whole criticism.

**III. METHODOLOGY**

The proposed blossom acknowledgement framework is carried out by fostering a convolutional brain network which is an exceptionally proficient model for picture characterization. CNN models are prepared by at first taking care of a bunch of rose pictures along with their marks. These pictures are then gone through a heap of layers including convolutional, ReLU, pooling and completely associated layers. These pictures are taken in clusters. In the proposed framework, a cluster size of 32 was given. The model was prepared to utilize 150 ages.

At first, the model extricates little highlights and as the preparation interaction advances more point-by-point highlights will be extricated. The vast majority of the pre-processing is done consequently which is one of the significant benefits of CNN. What's more input pictures were resized. Expansion is additionally applied which expands the size of the dataset by applying activities, for example, revolution, shear and so on. During the preparation interaction, the model finds highlights furthermore, designs and learns them. This information is

then utilised later to find the name of the blossom when another bloom picture is given as information. Straight-out cross-entropy is utilised misfortune capability.

At first, the misfortune values would be very high however as the interaction progresses the misfortune capability is diminished by changing the weight values. Once the characterization is finished, the CSV document is imported and the significant purposes of that plant would be shown. To expand the ease of use of the framework, the model was conveyed into a web application. In this manner, the client can snap a photo of the blossom on their cell phone or camera. The client can then take the web app and transfer the picture and snap on the anticipate button.

The model will be stacked and the expectation is finished. The normal name, family name and significant purposes of that blossom will be shown to the client. In this manner, the most common way of finding out about a delightful blossom that you have quite recently seen is streamlined by this framework.

#### IV. IMPLEMENTATION

##### Descriptive Statistics

Descriptive statistics focus on the social occasion of disorderly information to translate information. This is the method involved in portraying the past information and investigating the significant highlights. The numeric information from the examination is envisioned in the type of word mists and outlines. The pre-processing steps assume a fundamental part in enlightening the investigation as per the following. Every one of the crude information is incorporated into a text document.

From this solidified information, the delimiters are distinguished to stay away from irregularity to clean the information. Then, at that point, separators are thought-about to divide the sentences into tokens. The recurrence of every token is determined to change the information. The produced recurrence is arranged for decrease and determination. The chosen tokens and their individual frequencies are used to envision. The bundle is for performing Descriptive. The investigation is Syuzhet.

The techniques utilized from this bundle for Analysis are `get_text_as_string()` and `get_tokens()`. The `get_text_as_string()` technique drives the input document which follows the way of the record as the contention. Then, at that point, the `get_tokens()` technique is utilized to divide the sentences into words. The recurrence of the produced tokens is determined by `as.integers()` technique. The tokens with the most minimal recurrence are dispensed with. The coordinated information is addressed as a structured presentation and word cloud. This should be possible hypothetically by utilizing Chi-Square Test to classify the information in light of the recurrence appropriation. In this technique, the number of highlights and the number of surveys is contrasted and the normal qualities in every classification to know the affiliation. The Chi-Square Test is viewed as critical when there is an enormous distinction between the noticed and anticipated values. The distinction fluctuates relying upon the size of the example information.

**Step 1: Image Acquisition:** This step includes gathering pictures that can be utilized to prepare the model so that later at the point when it runs over an obscure picture, it can recognize the bloom in view of the information obtained during the preparing stage.

**Step 2: Image Preprocessing:** Here the pictures gathered in the past step were resized and expanded to increment the proficiency of the model during expansion the size of the dataset would be expanded by performing tasks for example revolution shear and so on then the picture will be parted into 75 preparation and 25 testing sets

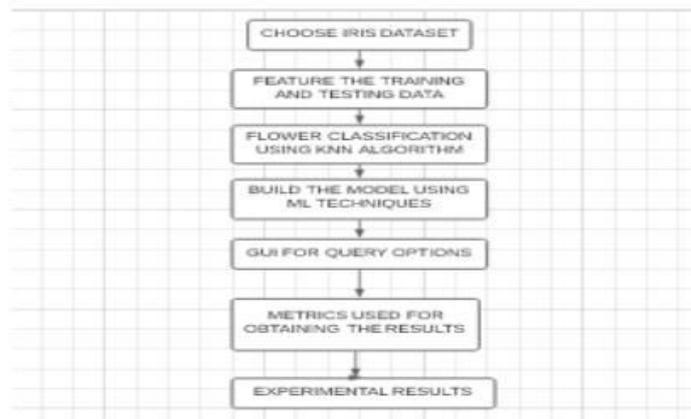
**Step 3: Training Phase:** Then the real medication of the model happens in this stage the model extricates rudiments like tone and state of the bloom employed for preparing every one of the medication film and will be gone through a mound of layers which incorporates convolutional subcaste relu subcaste pooling subcaste and fully associated subcaste

**Step 4: Validation Phase:** When the model finishes its preparation from the preparation set it attempts to work on itself by tuning its weight values. The misfortune capability utilized is down-right cross-entropy and the analyzer utilized is stochastic slope plummet.

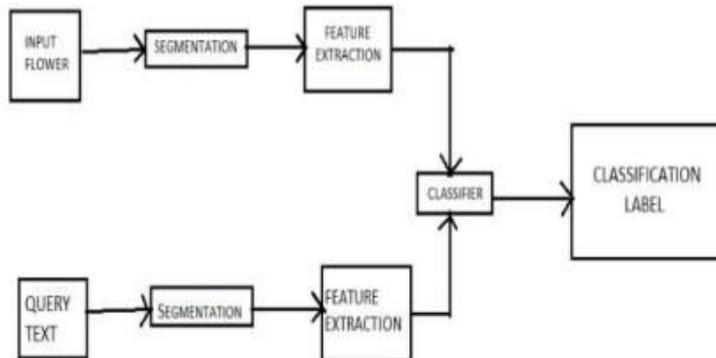
**Step 5: Output Prediction:** When the approval stage is over, the model is prepared to take an obscure picture of a bloom and foresee its name from the information it acquired during preparing and approval stages. Once the grouping is finished by the model, it shows the normal name as well as the family name of that blossom.

**Step 6: Benefits Module:** When the personality of the bloom is found out, a formerly made CSV document is imported and the advantages of the comparing bloom will be found out, what's more, shown to the client.

**Step 7: Web Application:** At long last, the created model was conveyed into a web application which further makes the framework easier to understand.



**FIGURE: FLOW CHART**



	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
5	6	5.4	3.9	1.7	0.4	Iris-setosa
6	7	4.6	3.4	1.4	0.3	Iris-setosa
7	8	5.0	3.4	1.5	0.2	Iris-setosa
8	9	4.4	2.9	1.4	0.2	Iris-setosa
9	10	4.9	3.1	1.5	0.1	Iris-setosa

Iris Dataset

```
In [7]: #Import Random Forest Model
from sklearn.ensemble import RandomForestClassifier

#Create a Gaussian Classifier
clf=RandomForestClassifier(n_estimators=100)

#Train the model using the training sets y_pred=clf.predict(X_test)
clf.fit(X_train,y_train)

y_pred=clf.predict(X_test)

In [8]: #Import scikit-learn metrics module for accuracy calculation
from sklearn import metrics
# Model Accuracy, how often is the classifier correct?
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))

Accuracy: 0.9333333333333333
```

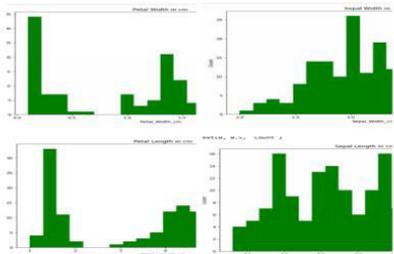


Figure : Histograms of flower attributes in classification

**V. RESULT AND ANALYSIS**

The model was prepared with a bunch size 32 and with 150ages. The order report got after the preparation and approval stage is displayed in fig 1. The diagram plots the preparing misfortune, approval misfortune, preparing precision and the approval precision for every age.

The model achieved a general exactness of 90%. When the model is taken care of with a continuous picture of hibiscus taken on a portable camera, a right forecast with 98.46% precision was gotten.

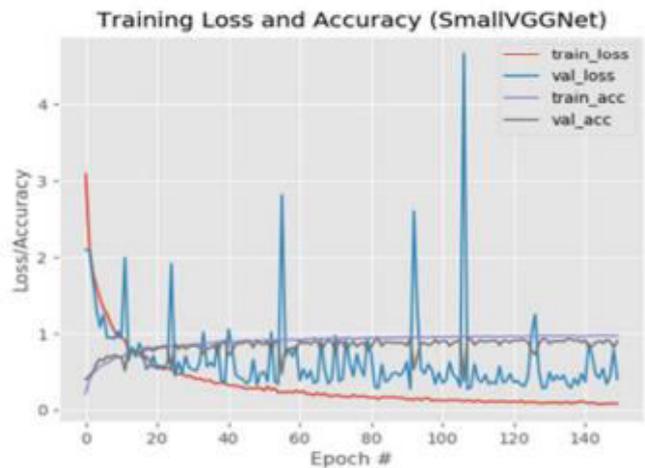


Figure 1

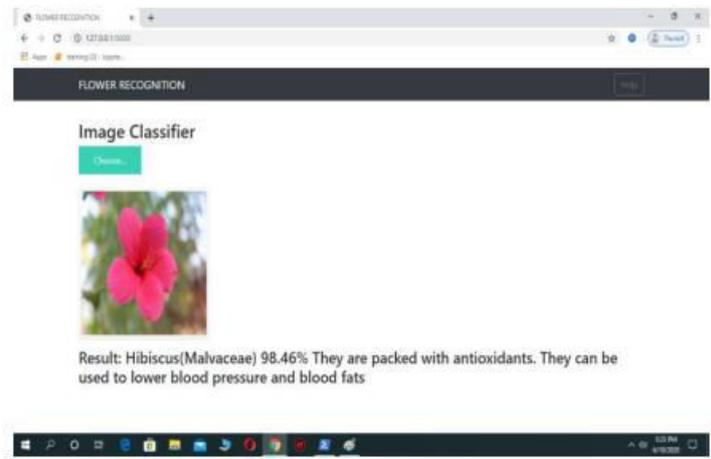


Figure 2

**VI. CONCLUSION**

blossom being the most alluring part is the most ideal way to distinguish a plant subsequently recognizing the bloom can help in find out about that plant the proposed framework takes as information a picture of a bloom and shows the normal name as well as the family name of the bloom since the model is a convolutional brain network which has demonstrated to be one of the most effective picture characterization strategies the proposed framework is profoundly dependable a csv record is imported after order and the relating utilizations of the plant are shown to the client hence making the framework more helpful further the model was conveyed into a web application.

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**FACTORS INFLUENCING IMPULSE BUYING BEHAVIOUR OF CONSUMERS TOWARDS  
SELECTED CONSUMER GOODS**

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**Dr. Shilpi Saraswat<sup>1</sup> and Alinda Kashyap<sup>2</sup>**

<sup>1</sup>Assistant Professor and <sup>2</sup>Ph.D. Scholar, Department of Family and Community Resource Management, Faculty of Family and Community Sciences, the Maharaja Sayajirao University of Baroda, Vadodara- 390002

**ABSTRACT**

*Impulsive behaviour is the apple of entrepreneurs' and marketers' eye. The average customer makes three accidental purchases per four out of ten store visits as revealed through several related researches. Consumer behaviour research has undergone substantial changes in recent years, primarily in the decision-making process and, as a result, in the influences on purchase intention. This paper is an attempt to investigate the factors which results in impulsive buying behaviour of consumers towards selected consumer goods. Present research was descriptive where the data was collected through a questionnaire from 125 consumers selected randomly from Vadodara city. To achieve this purpose, the study was guided by three categories of questions in the area of background information of the consumers, their state of impulse buying and the factors affecting their impulse buying. The study finds that 75% of the females indulged in impulsive buying. The findings further revealed that the respondents had the highest impulsive buying behaviour towards clothing and apparel (62%). It was also found that factors such as discount offers (31%), reviews and ratings on various products (28%) standard of living (24%), comments by reference group (22%), and products of latest trends (18%) were the factors that influenced the consumers to make impulsive buying. The study's most significant contribution will be for the retailers in monitoring strategies to coax consumers into buying impulsively. Consumer buying behaviour research is critical for consumer goods retailers' survival in this competitive period.*

*Keywords: Consumer, behaviour, impulse buying, influence, consumer goods.*

**INTRODUCTION**

In the marketing literature, consumer behaviour is the most popular topic of study. There are several studies on the antecedents and predictors of consumer purchasing behaviour in the literature. From the consumer's perspective, impulse buying is a problem, but from the retailer's perspective, it is a necessary strategy for increasing sales volume (Xiao and Nicolson, 2011; Akram et al., 2018). For decades, researchers have studied impulsive purchase behaviour from various angles (Xiao and Nicholson, 2011).

Consumer buying behaviour is defined as the mental, emotional, and physical behaviours that people engage in when they select, purchase, use, and dispose of things and services to meet their needs and preferences (Schifman & Kanuk, 2009). Consumer behaviour is the study of how people, groups, and organisations choose, purchase, use, and discard goods, services, ideas, and experiences to meet their needs and desires (Solomon, 2011; Kotler, Keller, Koshy, & Jha, 2012). Economic factors such as income expenditure patterns, product prices, price of complementary products, replacement goods, and demand elasticity influence consumer purchasing behaviour (Abraham, 1997; Kotler; Weng, Sanders & Armstrong, 2001). Buying behaviour marketing is the process of developing connections between market products and specific buying behaviour groups. It entails segmenting the market based on buying behaviour dimensions, positioning the product in a way that appeals to the targeted market's activities, interests, and opinions, and launching specific promotional campaigns that take advantage of buying behaviour appeals to increase market value of the offered product.

Because impulsive buying is a complex process that is congruent with classical economics' rational-choice theories, researchers' interest in the behaviour has not faded (Amos et al., 2014; Xiao and Nicholson, 2011). Furthermore, despite the fact that their disposable income has not increased, consumers' leisure spending has decreased while impulsive buying has increased (Gultekin and Ozer, 2012; Pradhan et al., 2018). Customer behaviour is influenced by shopping convenience, atmosphere, competitive price, promotion, and staff, according to Nguyen et al. (2015); consumer behaviour is also influenced by a well-known brand and an attractive informative package. Shopping for groceries has evolved into a leisure pastime for families all around the world. Enhancing perceived physical proximity to a product, according to Hoch and Laewenstein, produces sentiments of partial ownership and potential loss if the object is not eventually purchased. Consumers who shopped through Facebook live video felt as if they were in an actual store, which increased impulse purchases. For internet shoppers, the option of next-day or same-day shipment, as well as simple credit, promises near-instant gratification. Reduced perceived dangers of buying can encourage impulsive purchases. Products that are advertised as "on sale" or as a "good deal" can lead to impulse purchases. Similarly, receiving unexpected or surprise coupons at the start of a shopping excursion might lead to a higher number of accidental purchases and

a higher amount spent. Impulsive purchases can also be influenced by social influence, or cues that exploit the behaviour of other users. Impulse purchases can be triggered by social comparison, such as when customers observe their peers buying a goods. Friends who post about products or local businesses on social media networks are more likely to make similar online purchases. The more "likes" a product receives on social media markets, and the larger the live video audience, the more likely a consumer will feel compelled to buy. Social proof cues, such as highlighting "popular" products, have also proven to be effective in increasing revenue for e-commerce sites. More time spent exploring in-store leads to more impulse purchases, according to studies. Similarly, time spent browsing an online business has a beneficial impact on a customer's desire to make impulsive purchases. Being exposed to online product recommender systems can increase the amount of accidental purchases made by a consumer. Entry into a competition or the promise of a "free gift with purchase" has prompted consumers to make impulse purchases. Recent research has found that making an unplanned purchase increases the likelihood of making more unplanned purchases in the future, especially for those with a medium (rather than small) budget.

Consumer purchasing behaviour is also said to be inconsistent, varying from one product category to the next (Xiao and Nicholson, 2011). Price, features, quality, brand name, durability, and social aspects all influenced consumer purchasing decisions (Li & Li, 2010). Many people, for example, look for the cheapest options when looking for an affordable product like a pen, according to surveys. Consumers purchasing a higher-value goods, such as clothes, do not go out of their way to look for cheaper alternatives (Amos et al., 2014). For decades, researchers have studied impulsive purchase from various viewpoints, yet there are still contradictions in understanding of the idea. Advertising has the power to impact people's attitudes, lifestyles, and, in the long term, the culture of a country. Advertising has the power to influence customer brand preference (Latif & Abideen, 2011). Advertising is one of the most successful strategies of integrated marketing communication for emotionally motivating consumers to acquire things (Moore, 2004). When it comes to purchasing a brand of product, consumer behaviour can be predicted based on their mindset.

Digital technology, particularly the internet, have transformed virtually every aspect of business. Digital technologies have had a noticeable impact and application on important business decisions such as product development, profitability, brand management, customer relationship management, purchasing and selling, and communication (Hudson, Roth & Madden, 2012). The success of contemporary media, according to Pearson (2013), is due to its social aspect. People all across the world are embracing digital platforms to fulfil their fundamental requirements of seeking identity and connectedness, according to the author, because social media fulfils the very basic want of communication at a cheap or no cost. Consumers' information-gathering habits have been influenced by digital channels, particularly social media (Jonathan, 2012). More buyers are seeking information from a manufacturer's website, search engines, discussion forums, YouTube, and comparison websites, among other places, in the digital environment (Ioanas and Stoics, 2014). Customers' reviews on the internet are becoming increasingly important, as over 70% of customers consult online reviews before making a purchase decision (Ludwig et al., 2013). Customers not only read and believe other customers' reviews, but they also change their purchasing decisions based on them (Geamanco & Gregoire, 2012; Funde & Mehta, 2014). According to Hausman (2014), post-purchase social media actions include sharing product experiences, making recommendations to others based on positive experiences, and criticizing or denouncing brands in the case of a negative or dissatisfactory experience after purchase.

Retailers have been fast to build their own independently branded e-commerce stores in several parts of the world. Both offline and online, India's retail sector is flourishing. Individual purchasing behaviour has a significant impact on consumer behaviour in general and among youngsters in particular. Customers are attracted to retail establishments all over the world by using exterior and internal stimuli to generate differentiation and a value offer. Significant changes have occurred in the study of consumer behaviour, particularly in the decision-making process and, as a result, in the factors influencing purchase intention. The market places differ and are characterised by heightened competition, ongoing innovation in the goods and services on offer, and an increase in the number of businesses operating in the same market. Knowing the customer well is crucial in this situation. Innovation and meeting customer expectations are made feasible by analysing the variables that directly affect consumer behaviour. For marketers to be able to enhance their campaigns and more successfully engage their target audience, this study is crucial.

#### **OBJECTIVE**

- i. To ascertain impulse buying behaviour related to selected consumer goods.
- ii. To determine factors affecting impulse buying behaviour of consumers.

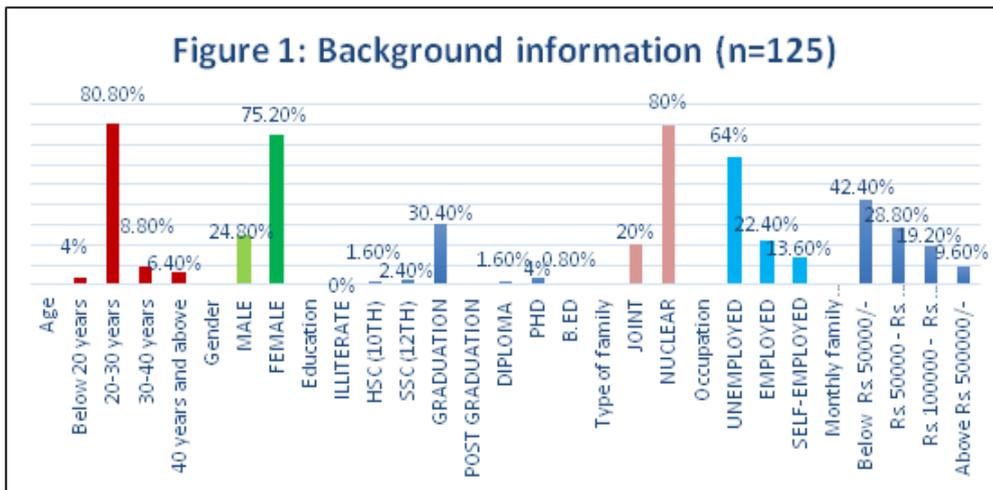
**METHODOLOGY**

The present study was conducted using descriptive research design. The data was collected from 125 consumers selected randomly from Vadodara city. The questionnaire method was used which was distributed online via Google form link. The questionnaire was enclosed with three section where section 1 contained questions related to background information of the consumers- age, gender, education, type of family, occupation and family monthly income. Section 2 elicited information related to their state of impulse buying, be it lowest, moderate or highest of the 17 selected list of consumer goods. Section 3 deals in the factors that affect the impulse buying behaviour of the respondents categorized on five groups- influence of emotions, influence of sales promotions techniques and window display, influence of advertising, visual merchandising and shopping companion, influence by income and festivals, influence of social media using the scale- strongly disagree, disagree, neutral, agree and strongly agree.

**MAJOR FINDINGS OF THE STUDY**

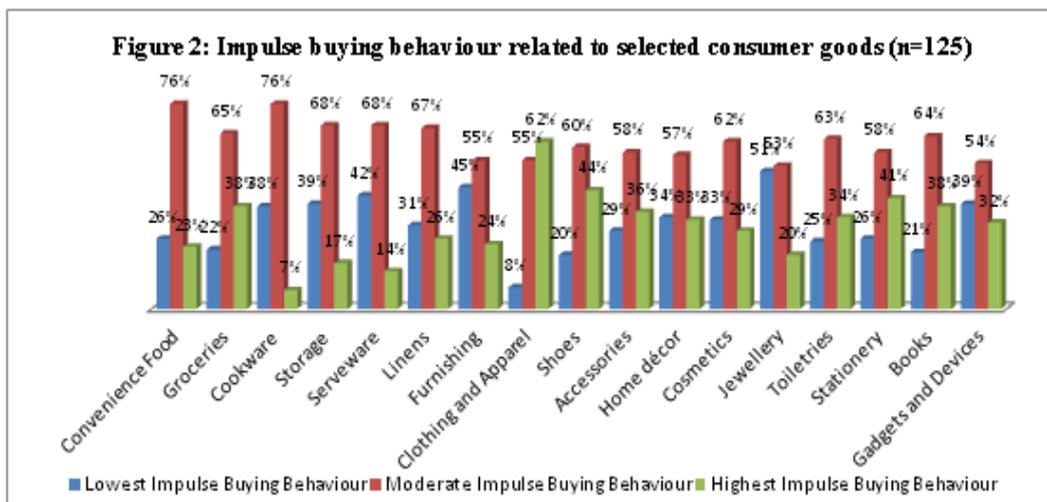
The findings obtained on the basis of the responses gathered are discussed in details here.

**1. Background Information:** This section included information related to personal and family information of the respondents viz. age, gender, educational qualification, employment status, type of family, family monthly income.



The data in fig.1 showed that majority of the respondents (80.8%) belonged to age group 20-30 years, being female (75.2%), with highest (59.2%) number of post graduates belonging to nuclear family (80%). Almost 64% of the respondents were unemployed and their family monthly income is below Rs.50000 for most of the respondents.

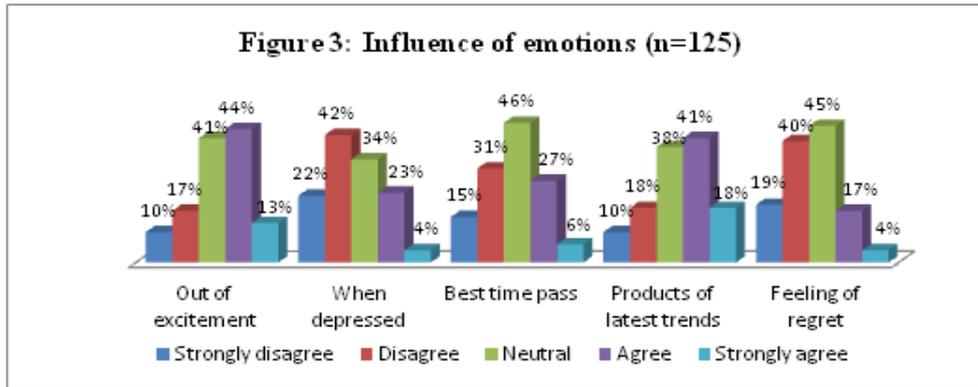
**2. Impulsive Buying Behaviour Related to Selected Consumer Goods:** This section comprises of list of consumer goods and their extent of behaviour towards the selected consumer goods.



The data in fig.2 revealed that the impulse buying behaviour was highest on clothing and apparel (62%), moderate on convenience food (76%) and cookware(76%); and lowest on jewellery(51%).

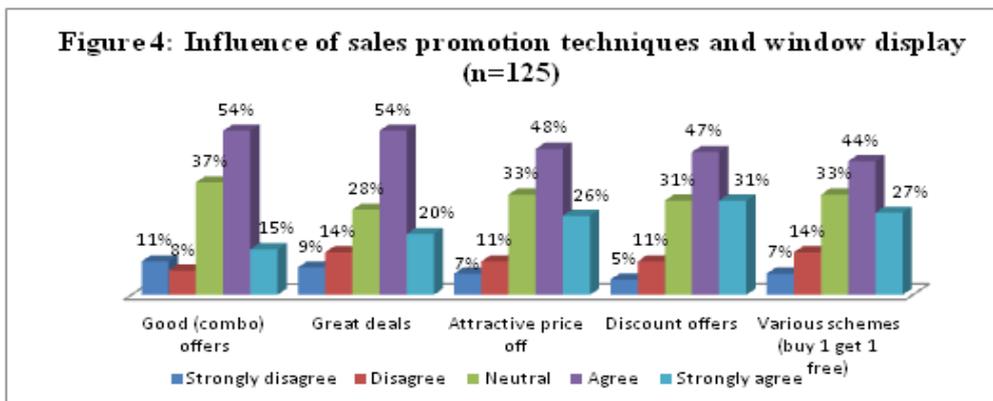
3. Factors Affecting Impulse Buying

A. Influence of Emotions: This section showed the extent of influence by emotional factors.



The data in fig.3 indicated that the highest number of respondents strongly disagreed (22%) that they do impulsive buying when depressed, disagreed (42%) when depressed, are neutral(46%) being it the best time pass, agreed (44%) that they buy impulsively out of excitement; and strongly agreed (18%) that product of latest trends influence their impulse buying.

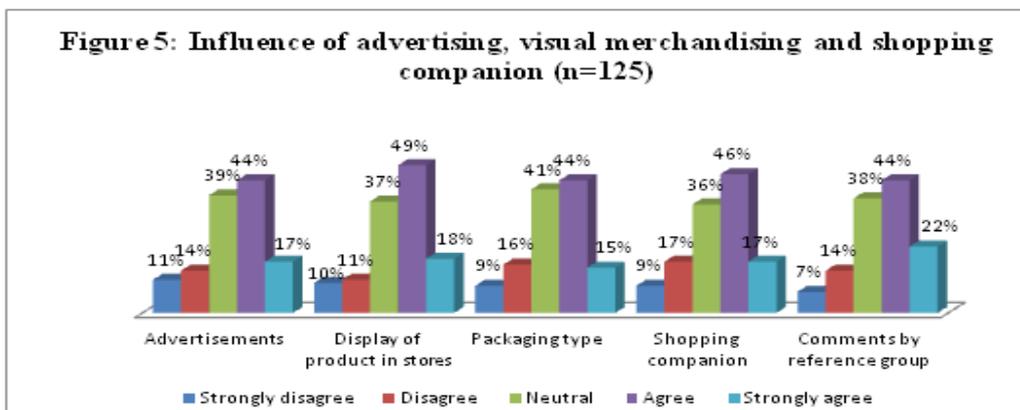
B. Influence of Sales Promotion Techniques and Window Display: This section showed the extent of influence by sales promotion techniques and window display.



The data in fig.4 indicated that the highest number of respondents strongly disagreed (11%) the influence of good combo offers on impulse buying, disagreed (14%) the influence of various schemes (buy 1 get 1 free), were neutral (37%) towards good (combo) offers, agreed that both great deal (54%) and good (combo) offers (54%) influence impulse buying; and strongly agreed (31%) that discount offers influence impulse buying.

C. Influence of Advertising, Visual Merchandising And Shopping Companion:

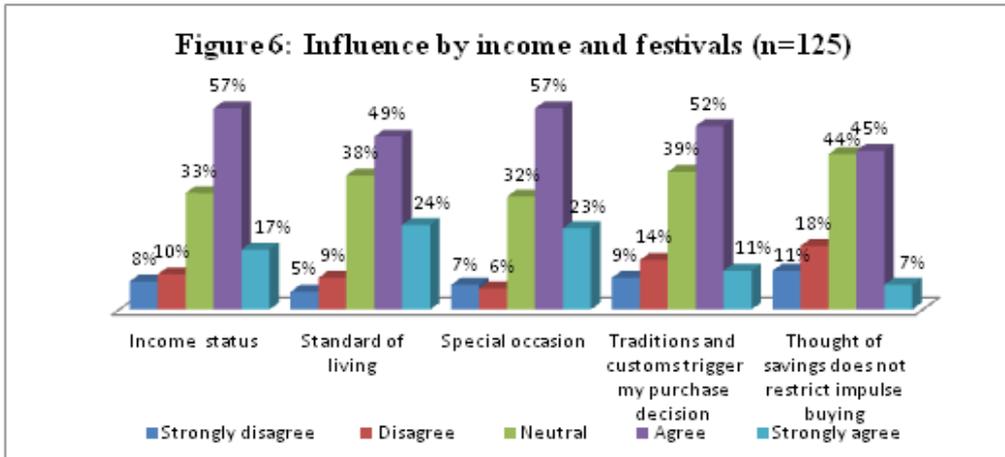
This section showed the extent of influence by advertising, visual merchandising and shopping companion.



The data in fig.5 indicated that the highest number of respondents strongly disagreed (11%) the influence of advertisements on impulse buying, disagreed (17%) the influence of shopping companion, were neutral (41%)

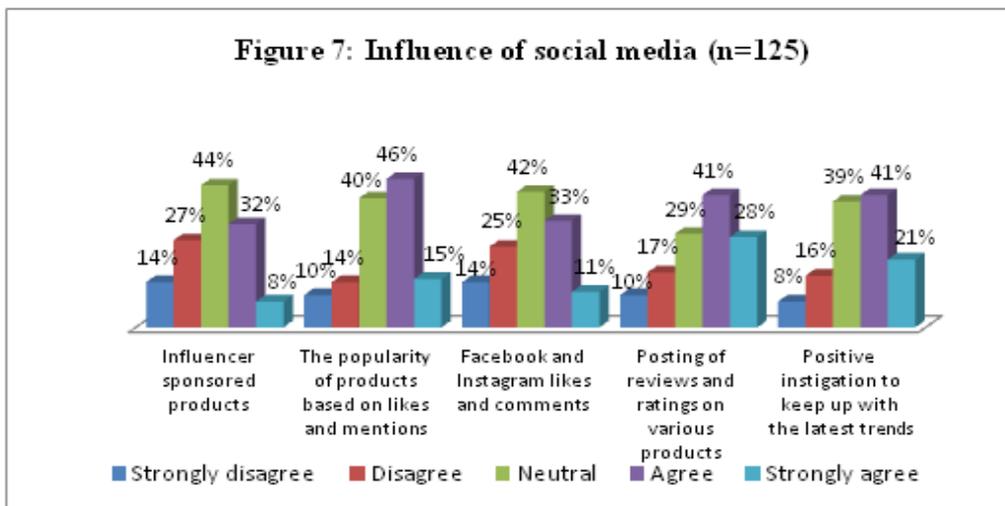
on influence of packaging type of the goods, agreed (49%) the influence of display of products in store; and strongly agreed (22%) comments by reference groups influence impulse buying.

**D. Influence by Income and Festivals:** This section showed the extent of influence by income and festivals.



The data in fig.6 indicated that the highest number of respondents strongly disagreed (11%), disagreed (18%) and were neutral (44%) that the thought of saving does not restrict impulse buying, agreed (57%) that impulse buying is influenced by income status and special occasions; and strongly agreed (24%) that standard of living influence impulse buying.

**E. Influence of Social Media:** This section showed the extent of influence by social media.



The data in fig.7 indicated that the highest number of respondents strongly disagreed (14%) the influence of influencer sponsored products and facebook , instagram likes and comments on impulse buying, disagreed (27%) and were neutral (44%) on the influence of influencer sponsored products, agreed (46%) the influence of the popularity of products based on likes and mentions; and strongly agreed (28%) that posting of reviews and ratings on various products helps the respondents and in turns they make an impulsive purchase.

**CONCLUSION**

The purpose of this study is to gain insight into consumers' impulsive shopping behaviour in supermarkets and the variables that influence or fuel those urges. There have been considerable changes in consumer behaviour, particularly in the decision-making process and, as a result, in the factors influencing purchase intention. It is important for merchants to comprehend the influence of consumers' impulsive buying behaviour and the possible financial benefits for those who can optimise this effect. Retailers or supermarket owners should therefore carefully consider these elements in order to profit from this phenomena of impulsive buying behaviour and get customers to spend more money than they had originally meant. In today's competitive environment, new marketing models are successful in assisting and understanding consumer behaviour. In the last few decades, the elements that influence consumer behaviour have shifted dramatically. Consumers in the twenty-first century are extra cautious and aware. Consumer access to information has likewise become near-instantaneous. Consumers can get information for making decisions in a matter of seconds by using the internet.

**IMPLEMENTATION**

This paper advances research into behaviour of consumers towards impulse buying. As understanding customer interests and preferences has become considerably easier than ever before in the era of big data and research, modern retail formats must ensure that they are modernised to meet the needs of their customers matching the customer's needs and the sales training tactics. Focus must be given on outstanding design concepts, innovative skills, work quality in order to affect behaviour of the consumers. To succeed in the future in the competitive economy, every marketer needs to grasp human psychology, especially that of the youth market.

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**EXPERIMENTAL AND THEORETICAL STUDIES OF SPEED OF SOUND IN SOME LIQUID MIXTURES OF 2MCH WITH O-CHLOROANILINE AND O-TOLUIDINE****K. Lakshmana Gupta<sup>1</sup>, N. Umamaheswara Reddy<sup>2</sup> and T. Kalimulla<sup>3\*</sup>**<sup>1</sup>Department of Physics, Government Degree College for Men, Kurnool, A.P, India<sup>2</sup>Department of Physics, Government Degree, College, Banaganapalle, AP, India<sup>3</sup>Department of Physics, Government Degree College, Nandikotkur, AP, India**ABSTRACT**

The ultrasonic velocity ( $u$ ), density ( $\rho$ ) and viscosity ( $\eta$ ) are reported for 2-methylcyclohexanone with O-Chloroaniline, O-Toluidine over the entire composition range from 303.15 K to 318.15 K at atmospheric pressure 0.1 MPa. The theoretical values of speed of sound in these mixtures have been evaluated using various theories and compared with the experimental values. The validity of Nomoto's theory (NOM), Impedance theory (IMP), Ideal mixing relation (IMR), Vandael and Vangeel (VDV), Junjie method (JM) and Rao's specific velocity (RAO) these theories were checked with Chi-square test for goodness of fit and calculating the average percentage error (APE). A good agreement has been found between experimental and theoretical values. Further the experimental and derived values are analyzed with FTIR spectral studies.

**Keywords:** Ultrasonic velocity, Density, Binary liquid mixture, Acoustic parameters and FTIR

**1 INTRODUCTION**

Ultrasonic velocity ( $u$ ), density ( $\rho$ ) and viscosity ( $\eta$ ) are derived thermodynamic and acoustical parameters are of considerable interest in understanding the intermolecular interactions in binary as well as in ternary liquid mixtures<sup>1</sup>. Measurement of ultrasonic velocity has been adequately employed in understanding the nature of molecular interaction in pure liquid mixtures. The practical application of mixed solvents rather than single solvent in industrial and biological process has been recognized all over the world as they provide a wide choice of solutions with appropriate properties<sup>2</sup>.

The present study deals with the thermodynamic study of mixed solvent system at 303.15 K to 318.15 K temperature<sup>3</sup>. The liquids were chosen for the present study on the basis of their general importance. 2-Methylcyclohexanone (2MCH) is an important compound used in the Dairy products and analogues, Ready-to-eat savouries and snacks. It is also used in the Salts, spices, soups, sauces, salads and protein products. On the other hand, the liquids were chosen in the present study on the basis of their industrial importance. O-Chloroaniline (O-CA) is chosen as polar solvent and self associated through hydrogen bonding of their amine group. The amino group in o-Chloroaniline is an electron-donor and the hydrogen atom in the  $\text{NH}_2$  group can also play the role of proton-acceptor centres. O-Chloroaniline is used as parent substances in the production of antioxidants, agricultural, pharmaceutical and rubber chemicals. It is also used in the manufacture of intermediate for synthetic dyes, and organic pigments especially for red color.<sup>4</sup> O-Toluidine (O-TA) may cause rupture or enhance self-association in pyridine or substituted O-Toluidine which in turn would change their respective topology.<sup>5</sup> Further, the best suitable theory for the given molecular system under study is also picked out by calculating the average percentage error and chi-square test<sup>6</sup>.

**2 EXPERIMENTAL METHODS****2.1 Materials**

Compounds used in the present study are 2-methylcyclohexanone (Sigma-Aldrich), O-Chloroaniline and O-Toluidine (Sigma-Aldrich). These compounds were purchased from S.D. Fine Chemicals Ltd. These compounds were further purified by standard methods.

**2.2. Apparatus and Procedure**

All liquid mixtures were prepared by weighing an amount of pure liquids in an electronic balance with a precision of  $\pm 0.1 \text{ kg m}^{-3}$ . The binary mixtures were prepared just before use<sup>7,8,9</sup>. The uncertainty in mole fraction was estimated to be less than  $\pm 0.0001$ . The speed of sound was measured with an ultrasonic interferometer (Mittal Enterprises, Delhi, India) working at 2MHz frequency and 303.15- 318.15 K temperature. The uncertainty in the speed of sound was found to be  $\pm 0.1 \text{ ms}^{-1}$ . An electronically digital operated constant temperature water bath has been used to circulate water through the double walled measuring cell made up of steel containing the experimental solution at the desired temperature.

The viscosities were measured with Ostwald viscometer. The viscometer was calibrated at each temperature using distilled water. The uncertainty in viscosity measurement is up to 0.001 mPa s. The flow time has been measured after the attainment of bath temperature by each mixture<sup>11, 12</sup>. The flow measurements were made with

an electronic stop watch with precision of 0.01 s. For all pure components and mixtures, 3-4 readings were taken, and the average of these values was used in all the calculations<sup>13, 14, 15</sup>.

The densities of the pure compounds and their mixtures were determined accurately using 10 mL specific gravity bottles in digital electronic balance with an uncertainty of  $\pm 0.1 \text{ kg m}^{-3}$ . The average uncertainty in the measured density was  $\pm 0.001 \text{ kg m}^{-3}$ .

### 2.3. Theoretical Details

The values of experimentally determined density, viscosity and speed of sound for the liquid mixtures of 2-methylcyclohexanone with O-Chloroaniline and O-Toluidine at 303.15 K-318.15 K over the entire composition range are given in Table 1.

**Table 01:** Comparison of Experimental Density ( $\rho$ ), Dynamic Viscosity ( $\eta$ ) and speed of sound (U) of Pure Liquids with Literature Values.

Liquid	Temp T (K)	Density( $\rho$ ) kg m <sup>3</sup>		Viscosity( $\eta$ ) mPa.S		Speed of sound (U)m.s <sup>-1</sup>	
		expt	Lit	expt	Lit	expt	Lit
2-Methylcyclohexanone	303.15	0.9196	0.9195 <sup>a</sup>	2.2241	2.2242 <sup>a</sup>	1345.20	1344.6 <sup>a</sup>
	308.15	0.9125	---	2.1739	---	1338.53	---
	313.15	0.9110	---	2.0238	---	1330.27	---
	318.15	0.9086	---	2.0172	---	1320.08	---
O-Chloroaniline	303.15	1.2026	1.2026 <sup>b</sup>	3.8262	3.8256 <sup>b</sup>	1470.20	1469.6 <sup>b</sup>
	308.15	1.1979	1.9802 <sup>b</sup>	3.4219	3.4122 <sup>b</sup>	1454.5	1453.3 <sup>b</sup>
	313.15	1.1928	1.1930 <sup>b</sup>	3.0634	3.0602 <sup>b</sup>	1436.4	1435.2 <sup>b</sup>
	318.15	1.1879	1.1884 <sup>b</sup>	2.7708	2.7621 <sup>b</sup>	1419.8	1418.9 <sup>b</sup>
O-Toluidine	303.15	0.9902	0.9902 <sup>c</sup>	3.4521	---	1577.79	1577.82 <sup>c</sup>
	308.15	0.9860	0.9860 <sup>c</sup>	3.1254	---	1558.38	1588.38 <sup>c</sup>
	313.15	0.9816	---	2.8643	---	1539.62	---
	318.15	0.9746	---	2.4217	---	1518.34	---

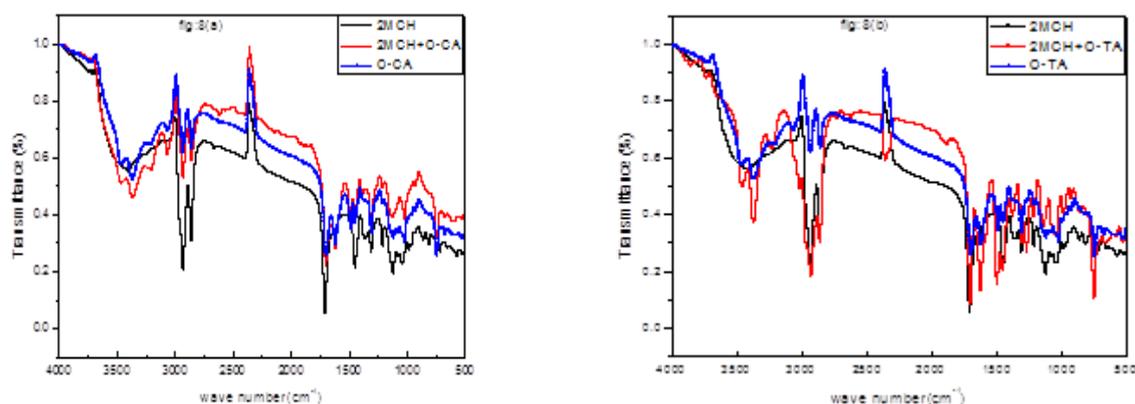
<sup>a</sup> Gowrisankar et al. [3], <sup>b</sup> D. Ubagaramary et al. [4], <sup>c</sup> Neeti sains et al. [5].

## RESULTS AND DISCUSSION

The experimental values along with the values calculated theoretically using the relations of Nomoto's theory(NOM), Impedance theory(IMP), Ideal mixing relation(IMR), Vandael and Vangeel(VDV), Junjie method(JM) and Rao's specific velocity (RAO) at the temperature of 303.15- 318.15 K are given in Tables 1-3. The validity of different theoretical formulae is checked with Chi-square test for goodness of fit and calculating the average percentage error (APE) for all the mixtures and is also given in Tables 1-3.

It can be seen from Tables 1-3, that the theoretical values of ultrasonic velocity computed by various theories show deviations from experimental values<sup>16</sup>. The limitations and approximations incorporated in these theories are responsible for it. It is assumed that all the molecules are spherical in shape, which is not true. In Nomoto's theory, it is assumed that the volume does not change on mixing<sup>17</sup>. Therefore, no interaction between the components of liquid mixtures has been taken into account<sup>18</sup>. The assumption for the formation of ideal mixing relation is that, the ratio of specific heats of ideal mixtures and the volumes are also equal. Again, no molecular interaction is taken into account. Similarly, the assumption for the Collision Factor theory, the molecules is treated as real non-elastic substances in this theory, which is not really the case<sup>19</sup>.

But on mixing two liquids, the interaction between the molecules of the two liquids takes place because of presence of various types of forces such as dispersion forces, charge transfer, hydrogen bonding, dipole dipole and dipole-induced dipole interactions<sup>20</sup>. Thus, the observed deviation of theoretical values of velocity from the experimental values shows that the molecular interaction is taking place between the unlike molecules in the liquid mixture.



**Figure:** Fourier transform infrared spectra of pure 2-methylcyclohexanone with O-Chloroaniline (a), O-Toluidine (b) at various temperatures.

FT-IR spectra of pure 2MCH, O-CA and O-TA and binary mixtures of 2MCH with O-CA, O-TA at equal concentrations are depicted in Figures 8.a and b. According to Karunakar and Srinivas,<sup>21</sup> the intensity of an absorption in the IR spectrum is related to the change in dipole moment that occurs during the vibration. Consequently, vibrations that produce a large

Change in dipole moment result in a more intense absorption than those that result in a relatively modest change in dipole. Vibrations that do not result in a change in dipole moment will show little or no absorption for this vibration. In the present FT-IR spectra liquid mixture shows very small variations in the intensity of the respective bonds, that is, dipole moment, and hence it supports that weak interactions take place between the components of liquid

Molecules in O-TA.<sup>22</sup>

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## A STUDY ON CLOUD BURST EVENTS FOR THE STATE OF UTTARAKHAND

Gagan Deep Singh<sup>1</sup> and Charu Chandra Pant<sup>2</sup><sup>1</sup>Assistant Professor SS, School of Computer Science, University of Petroleum & Energy Studies (UPES), Bidholi, Dehradun, India- 248007<sup>2</sup>Senior Lab Superintendent, Research, Consultancy and Extension, Academic Strategy, University of Petroleum & Energy Studies (UPES), Bidholi, Dehradun, India- 248007**ABSTRACT**

Uttarakhand is the hilly state of India and was constituted on 9<sup>th</sup> November 2000. The state is having its own demographic and economic challenges. The state is one of the state in republic of India. It has a high literacy rate of 78.82. The mountain region is 86% and around 65% of its area is covered with forest. There are many other challenges, but in this paper authors has mainly presented the issue of unpredictable cloud bursts. The paper presents the study of major cloudbursts that took place in Uttarakhand. The cloud burst is a natural calamity and till yet we do not have an exact technology to predict or to avoid such natural disasters. Recently, cloudburst took place near the holy shrine of Amarnath where 16 people died and 40 people reported as missing. The paper also presents the statistics of deaths caused due to cloudburst. Authors wish to highlight the critical issue of cloudburst that is faced by the people and the state. The paper also provides an introduction to Doppler Weather Radar that has been installed in Uttarakhand.

Keywords: Uttarakhand, India, mountains, forest, cloud burst, Doppler Weather Radar

**1. INTRODUCTION**

The Dev Bhoomi Uttarakhand is the state of that is full of natural beauty, dense Himalayan forests, mountains, lakes, waterfalls, holy rivers like Ganga/Yamuna and all the Char Dhams of Northern India. The state is new and was formed on 9<sup>th</sup> November 2000. Earlier it was the part of Uttar Pradesh and now it is constituted with 13 beautiful districts. Uttarakhand is also famous for its tourist attractions. The Aadhaar statistics of 2021-2022 shows that the population of Uttarakhand has reached above 11 million. The district wise details of population and area is presented as per the table 1 and this clearly shows that Haridwar district is the most populated district of the state while Rudraprayag is the least populated [1].

**Table 1:** District wise statistics

Sl. No.	District	Capital	Area (sq.km.)	Population in 2011
	<b>Uttarakhand</b>	<b>Dehradun</b>	<b>53,483</b>	<b>10,116,752</b>
01	Uttarkashi	Uttarkashi	8,016	329,686
02	Chamoli	Chamoli	7,614	391,114
03	Rudraprayag	Rudraprayag	1,891	236,857
04	Tehri Garhwal	New Tehri	4,080	616,409
05	Dehradun	Dehradun	3,088	1,698,560
06	Garhwal	Pauri	5,400	686,527
07	Pithoragarh	Pithoragarh	7,100	485,993
08	Champawat	Champawat	1,781	259,315
09	Almora	Almora	3,083	621,927
10	Bageshwar	Bageshwar	2,303	259,840
11	Nainital	Nainital	3,860	955,128
12	Udham Singh Nagar	Rudrapur	2,908	1,648,367
13	Hardwar	Hardwar	2,360	1,927,029

The state is having a high literacy rate of 78.82. The mountain region of the state is 86% and around 65% of its area is covered with forest. The state is first in production of Pear, Peach, Plum and Apricot. The state is also second in production of Walnuts while third in the production of Apple followed by Jammu and Kashmir [2]. The details of each production in lakh metric ton is presented in table 2.

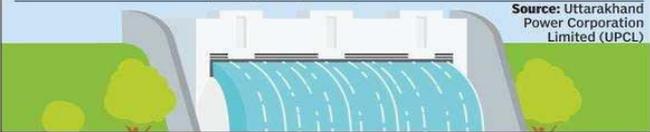
**Table 2:** Rank and production of fruits

RANK	FRUIT	Production in Lakh Metric Ton (MT)
First	Pear	0.78
First	Peach	0.579
First	Plum	0.362
First	Apricot	0.282
Second	Walnut	0.19
Third	Apple	0.62

Uttarakhand is also doing very well in hydro power projects and electricity productions. It has almost around 40 hydro projects [3] and the main projects with their capacity is shown in figure 1.

Name of the dam	Location	Year of commissioning	Capacity at installation
Tehri Dam	Tehri	2006	1,000 MW
Alaknanda Hydroelectric Project	Srinagar (Pauri)	2015	330 MW
Chilla Power Plant	Pauri	1980-81	144 MW
Chibro Power Plant	Dehradun	1975	240 MW
Dhakrani	Herbertpur, Dehradun	1965	34.5 MW
Maneri Bhali-2	Dharasu Chinyalisaur	2008	304 MW
Ramganga	Kalagarh (Pauri)	1975	198 MW

Source: Uttarakhand Power Corporation Limited (UPCL)



**Figure 1:** Major Hydropower projects with its production in Mega Watt

Though, nature has blessed this state, but it has its own issues and challenges. The most concerned are employment and natural disasters. The most part of the Uttarakhand is in high seismic zone but the heavy rain and frequent cloudbursts have raised the attention of all the researchers and scientists. The Himalayan region of Garhwal and Kumaon are the victim of cloudburst and natural disasters related to it. In year 2013 country has already observed a catastrophic disaster where lakhs of humans have lost their lives. To overcome such situations, an extensive study and solution need to be think for preventing such incidents in the near future. Uttarakhand’s most part is the Himalayan occupied region and most of the glaciers and many Perennial rivers exist here. Some high altitude lakes like Gandhi Sarovar, Kedar Tal Lakes, Santopanth Tal Lake, and Dodi Tal Lake, etc. are at a high risk zone because of sudden high rainfall or cloud burst makes them to overflow with tons of debris at the nearby villages. These types of lakes are very much sensitive towards climate change and the studies shows that the mean temperature difference from 0.75 °C to 1 °C can affect melting rate of the glaciers [4]. This is already observed in Chamoli district of Uttarakhand on 07 February 2021. The glacier melted nearby Rishi Ganga Power Project. Due to this, Rishi Ganga, Dhaul Ganga and Alaknanda river flooded out and damaged the nearby areas of river banks [5]. Global warming is affecting the glaciers of the Himalaya and this makes water evaporation of the lakes with higher rate. This create large intensity of cloud and this gets collapsed at various points of Himalayan regions can causes cloud burst.

**2. Cloud Burst in Uttarakhand**

Dev Bhoomi Uttarakhand is struggling with the high rainfall and cloudburst incident happens every year due to which, hundreds of road gets block, loss of human lives, farming land, crops, forest and its wildlife, and other civil infrastructures. Recently in 2013 a severe such incident took place at holy pilgrimage of ‘Kedarnath’ in which around more than ten thousands of people were killed. It has been recorded that pre-monsoon and monsoon of Uttarakhand has noticed frequent cloud burst events in Kumaon and Garhwal region. The decrease in annual rainfall in the past 100 years is also recorded by the metrological department for cities like Almora, Dehradun, Pithoragarh, Nainital, Srinagar, Mukteshwar, Srinagar, Pauri and even Mussoorie [6]. The mean temperature of these areas is already increased to 1 °C and this is the main reason for the melting of Himalayan glaciers [7]. The cloud burst is a process in which an intense amount of precipitation takes places within a short duration of time in a small area. This also creates a sudden thunderstorm and hailstorm with a situation of flash floods. It may result in severe damage to the properties and lives. Similarly, at cloudburst the rainfall rate can be more than 10cm in an hour. This amount of rainfall may generally takes place in 30 to 50 square km of area. The major incidents of cloudburst took place in Uttarakhand [8] is presented in a table 3.

**Table 3** Major Cloudburst incidents reported in Uttarakhand

Date of Incident	Place of Incident	Impact of Incident
2021, June 1	Augustmuni – Ramganga	No causality reported, though houses and other civil infrastructure damaged.
2019, August 18	Uttarkashi – Mori	Deaths = 21
2018, July 19	Chamoli – Niti Ghati Malari	Deaths = 2
2017, August 14	Pithoragarh – Mangi, Malpa	Deaths = 9 Missing = 18
2016, July 1	Pithoragarh – Didihat, Bastari and Naulra	Deaths = 22
2016, May 28	Tehri – Kemra and Siliara, Kothiara	Deaths = 106 Missing = 4021
2013, June 14, 15	Rudraprayag – Kedarnath	Deaths = 10,000 Missing = 7,000 Several injured
2012, September 14	Rudraprayag – Ukhimath	Deaths = 39
2010, August 18	Pithoragarh – Munisyari	Deaths = 30 Injured = 50
2010, August 19	Bageshwar – Kapkot	Deaths = 20 Missing = 30
2009, August 7	Pithoragarh – Nachni	Deaths = 38
2006, July 6	Chamoli – Near Badrinath	Deaths = 17 Injured = 28
2004, July 24	Chamoli – Near Badrinath	Deaths = 17 Missing = 18
1998, August 17	Kumaon – Kali Valley, Malpa	Deaths = 190 + 60 pilgrims of Kailash Mansarovar Yatra
1970, July	River Basin – Alakananda	Deaths = 15000 Around 80,000 houses were damaged due to flash flood.

The table clearly shows that cloudburst is the cause of around 25,321 deaths and many people were missing due these natural disasters. The record of cattle and animal deaths cannot be calculated as many were not been reported to the authorities. Hence, the cloudburst incidents can be considered as a curse to Uttarakhand. Though, the government tries it best to overcome such problems but still the technology has not been developed yet to alarm the system.

**3. Doppler Weather Radar –Step to Save Lives**

Now, there is urgently the need of Doppler Weather Radar System so that climatic activities can be observed and reported in time. Though this technology is able to predict the specific date and time in NOWCAST mode, but just before few hours of the incident [9]. So, the government administration can get time to make preventive measures and relocate the living beings at safer place. These advanced radar are the best and provide a robust alert system for heavy rain and cloudburst predictions. India Metrological Department (IMD) is in the process to install these radars in Uttarakhand. One such radar is already installed in January, 2021 at Mukteshwar which is situated in Kumaon region of Uttarakhand. This radar is already started working and its working is shown as in figure 2.



**Figure 2:** Doppler Radar Animation view (Source: mausam.imd.gov.in)

This radar is able to observe and provide the data of around 100 km in the nearby area of Mukteshwar. Two more such radars will be soon installed in Uttarakhand. One will be installed at Surkunda Devi near Mussoorie and other will be installed at Lansdowne cantonment area. These three radars will be able to fulfil the weather prediction requirement of Uttarakhand and will save lives in the near future.

#### 4. CONCLUSION

Through this paper the authors tried to highlight the incidents of cloudburst which is one of the critical issues of Uttarakhand state. The paper presented the statistics of the deaths and missing people reported during the major cloudburst incidents. There was a small introductory discussion done on Doppler Weather Radar that has been installed in Uttarakhand. Though the natural disaster cannot be avoided, but there are some technologies like Doppler Weather Radar System that can be used to minimize the death rates noted due to cloudburst. The authors also suggest to install more such system in all the Himalayan region of the country and government should develop a framework that can be deployed to save the lives of all living beings.

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**SMALL ENTERPRISES AND INDIAN ECONOMY****Mr. Khiali Ram Madhar<sup>1</sup> and Dr. H.L. Verma<sup>2</sup>**<sup>1</sup>Research Scholar and <sup>2</sup>Research Supervisor, Faculty of Management, Jagannath University, Jhajjar

Small Enterprises, although small ones but, in many crucial times, have played an important role in the development of an economy. Even sometimes during worldwide recessions, when large and heavy enterprises fail to boost an economy within a required and reasonable time, small enterprises, particularly small industries have, helped the countries to come out of their prolonged recessions. Although such roles of small entities may be small ones and have desired positive effects after a long period, they often save economies from such type of prolonged downfalls. In the case of Indian Economy, Small Scale Enterprises have always played an important role in its development and the economic growth of the country as a whole. The Tiny (Micro) and Small Scale Industries have always been an important factor in the overall development of our country where millions of persons are unemployed and most of the entrepreneurs are capable of making only small investments and there is, always, a severe crunch of resources and, thus, inability of this sector to procure and deploy sophisticated machinery and modern technology. But, in spite of all such constraints, this sector has played a strategic and significant role in promoting rapid industrial growth, providing greater employment opportunities, reducing regional imbalances and removing economic backwardness of rural and underdeveloped segments of the country. Small Scale Enterprises have been recognized as an instrument of social transformation in India. They can be said as the panacea for many socio-economic problems. Apart from generating employment opportunities per unit of investment, small scale enterprises also have importance in their performance as a tool 'working against concentration of economic power in a few hands by way of diffusing the economic resources' and thereby, to some extent, contributing in averting the hold of big corporations over Government.

The Micro and Small Enterprises (MSEs) constitute an important segment of the Indian economy. There are about 18.71 lakhs registered units in the country, contributing around 39 percent of the manufacturing output and 34 percent of its exports as in 2004-05. They also provide employment to around 29.5 million people in rural as well as in the urban areas of the country. Micro, Small and Medium Enterprises (MSMEs) have always been amongst the strongest drivers of economic development, innovation and employment. The MSME sector also contributes in a significant way to the growth of the Indian economy with its vast network of about 63.38 million enterprises. This sector contributes about 45% of the manufacturing output, more than 40% of the exports and over 28% of the GDP while creating employment opportunities for about 111 million people, which in terms of volume stands next to agricultural sector. The MSME sector in India is exceedingly heterogeneous in terms of size of the enterprises and variety of products and services, and levels of technology employed. However, the sector has the potential to grow at a faster pace. To provide impetus to the manufacturing sector, the recent National Manufacturing Policy envisaged raising the share of manufacturing sector in GDP from 16% at present to 25% by the end of 2022.

**Small Enterprises and Various Phases of Indian Economy**

Small Scale industries have been playing a significant role in India economy. Post-Independence, Governments realized and have given more focus on small scale sector. In a recent survey it has been found that around 95% of small scale industries unit are providing employment opportunities to around 20 million people which is a quite significant number. Approx 35 to 40 percent of the exports from our country are by the small scale sector. Government has also recognized and realized the significance of small scale industries in the Indian economy and seeing their importance the different governments have always endeavoured to promote the interests of small scale industries and have come up with various industry policy resolutions/ policies since the year 1948. During the nineties, the primary vision was to grow the small scale sector in order to achieve the desired level of job opportunities and to make Small Scale sector instrumental in order to reduce poverty level in Indian economy. Further to substantiate the growth of small scale industries various policy measures have been initiated like de-licensing the Small Scale industries with the aim to help and speed up working of the Small Scale Industrial establishments. Major focus was to remove all unwanted hurdle from economy and encourage more youth and entrepreneurs to start their business. This is also a part of the Small scale industries development policy and it's attracting dynamic and young entrepreneurs with increasing faith and potential in them. Government is always trying to remove all the fetters and is in the process of constant review of policy in order to make the small scale sector a more successful sector and particularly the new units/ start-ups.

In the year 2009 The Prime minister of India announced the setting up of a Task force on the representation and demand of the Small Scale Industries regarding their issues and concerns. Principal Secretary to Prime Minister Shri T.K.A. Nair was assigned the task to examine the issues and concerns raised by the associations and

formulates action point agenda after consultation with all the stake holders. The members of discussion board were planning commission members, secretaries of concerned government department, RBI Governor and MD, SIDBI and other representative of MSME associations. The preliminary help line support for MSME called an "Udyami Helpline" was set up which was a call centre for the Small Scale Industries with a toll free number in order to provide information, sources, support, guidance and assistance support for start-up entrepreneurs as well as existing entrepreneurs. The Udyami helpline provided value added support by providing information and support on various promotional and attractive promotion policies. Small Scale sector and entrepreneurs have promoted decentralized development of industrial sector and helped to remove regional disparities by industrialization of backward and rural areas. Small scale industries have also helped urban areas to reduce on traffic congestion, reduction of slums and decongestion of urban population by providing job opportunities as well as income source at rural area. Small entrepreneurs are serving as an anti-inflationary force by providing goods for daily use on a large scale. Small scale industries are also playing complementary role to large scale industry acting as ancillaries units by providing accessories, components and parts. It is providing independent living style with very less resources which is an important aspect of society and social life. This sector has always helped in improving the life style across the rural areas.

### **Govt Policies and Small Scale Industrial Units.**

Keeping in mind the role performed by the small enterprises in the development of Indian economy, the Government has been creating different platforms and launching various schemes under which benefits, particularly the tax benefits, have been extended to the SSI units. The following are some of the areas of tax benefits and concessions given to small scale units i.e. (i) Income Tax, (ii) Excise Duty, (iii) Central and State Sales Tax (iv) Electricity Duty, and (v) Octroi. A brief description of these concessions and incentives for promoting the SSIs is made here under.

#### **Income Tax Concessions:**

The following concessions in respect of small scale industries have been introduced under Income Tax:

1. Under Section 80-1A, the benefits of tax holiday were applied to small-scale industrial undertaking for an initial five assessment years to a tune of 100 percent of the profits derived.
2. Under Section 80 HHA, a newly established SSI unit located in backward area was allowed as a deduction of 20 percent on its profits and gains under certain conditions.
3. Under Section 35D, Indian companies and resident persons were allowed deductions for some specified expenditures. The aggregate amount of expenditure allowed to be deducted is limited to 1/10<sup>th</sup> of the total cost of the project.
4. Expenditure incurred on the acquisition of patent rights and copy right: Under Section 35A, any expenditure incurred on the acquisition of a patent right or copyright used for business has been allowed as deduction in 14 equal installments over a period of 14 previous years commencing from the previous year in which the expenditure is incurred.
5. Under Section 36, the amount of interest paid in respect of capital borrowed for the purpose of business or professionals is allowed as deduction.
6. The income of an institution established as a trust or society for the purpose of development of khadi and village industries (not for profit), for the production, sale or marketing of khadi or products of village industries, have been exempted under Section 23B.
7. Income of khadi and village industries or boards established in a State by or under a State or Provincial Act, for the development of Khadi or village industries in the State, have been fully exempted under Section 23BB.
8. Profits of newly established industrial undertakings in free trade zone were not to be included in the total income of the assessee for any five consecutive years falling within a time frame of 8 years beginning with the assessment year relevant to the previous year in which the industrial undertaking begins to manufacture or produce articles, under Section 10A,
9. Any profits or gains derived by an assessee from newly established 100 percent export oriented undertaking were not to be included in the total income of the assessee under Section 10B.

### **Entrepreneurship Development Program Under Tiny and SSI Sector**

India embarked on a massive program of entrepreneurship development, in 1971 particularly, among educated youth and specially those trained in technical subjects or commercial skills. The objective of the program has

been to identify persons with entrepreneurial quality, to motivate them and to train them through structural training converge so as to enable them to set up their SSI/Tiny units with assistance available from different agencies. SIDO through the network of Small Industry Service Institute (SISIs) has been the pioneer in conducting such EDPs for various target groups. These courses generally have duration of 4 to 6 weeks. Product oriented courses such as hosiery, food products, leather products, herbal cosmetics, electronics, etc. have found to be useful by the trainees.

Entrepreneurship training is now conducted by a network of institutes, viz., National Institute for Entrepreneurship and Small Business Development (NIESBUD), the National Institute of Small Industry Extension Training (NISJET) and Small Industries Service Institute (SISI) etc.

#### **A. Activity Reservation and Introduction of FDI in Small Scale Sector:**

Efforts were started to introduce Foreign Direct Investment in the Small Scale sector during the year 2006. Foreign direct investment was also envisaged in some brands of retail trading with the condition of minimum thirty percent value procurement requirement to purchase thru small scale industries.

Some of the products reserved for the manufacturing by the Small Scale industries for the period from 2007-08 to 2011-12 are as follow:

**Food and Allied Industries:** Pickles and Chutneys, Bread, Mustard Oil, Groundnut oil, Wood and wood Product, Exercise books and registers etc.

**Chemical and Products:** Wax Candles, Laundry soap, Safety matches, Fireworks, Agarbatties.

**Metallic industrial products:** Steel and rolling shutters, Steel Chairs, Steel tables, Steel furniture, Padlocks, Stainless steel utensils.

**Aluminium products:** Aluminium utensils, Aluminium small hold products.

**Glass & Ceramics:** Glass bangles and other glass house hold tems.

#### **Some Mechanical Engineering Products**

##### **‘Make In India’ Initiative and Role of Small Scale Sector**

The Government of India has launched the ‘Make in India’ programme in order to strengthen and as a boost to the Indian industry and its products. The focus of the mission is to manufacture in India and sell it worldwide. This mission, in turn, can also provide a boost to the Start-ups, make the High Tech Infrastructural availability and to make the business process compliance an easy affair. In this ‘Make in India’ initiative, small scale sector has also been considered to play an important role as they are the best example for this Make in India initiative. They focus on the mission to manufacture in India and sell the products worldwide which can help in creating more demand for their products from all over the world and , in turn, strengthening the Indian economy.

In an article “How can Small Scale Industries Contribute towards Success of Make in India,” dated 30 Aril,2017, by M/s Wani Industrial Products Pvt. Ltd., it has been written that the ‘Make in India’ initiative of the Government of India which is mainly aimed at the improvement of the conditions of India from within has its primary emphasis on the manufacturing of all goods and equipments within the country, which in turn will help in generation of more employment, stopping of brain drain towards other countries and strengthening the overall economic conditions of the country. The other objective of this ‘Make in India’ Plan is to develop and establish India as a manufacturing hub. There are various ways by which the ‘Make in India’ programme as well as the Small Scale Sector, both, can be benefitted and it can be done more successfully with a positive and better approach of small scale sector towards this initiative. Under this initiative, the Small scale enterprises can get support and acquire enough resources which will enable them to be in a more competitive position vis-a-vis other sectors. The small scale sector will also be advantageous and play an important role on account of various Govt policies and initiatives which are already in its favour and the new boosters introduced for its development in the ‘Make in India’ programme. Under this initiative, with main thrust being on the specialization, any small scale entity can become a specialized and skilled unit, which in turn will lead to further progress in their business activities and it can also be in a position in shedding their age old constraints imposed in case of this sector since long times.

The small scale enterprises have the chance to grow and contribute heavily in the success story of this ‘Make in India’ initiative. With already having the 45% share in total industrial output, the medium and small scale entities have a brighter chance of growing under this initiative and consequential contribution to make this initiative successful and also the overall economic growth of Indian economy. Considering the fact that the Small and Medium Scale industries can operate on low investment itself, there is better scope for higher margin

of profits and, further, with the introduction and adoption of latest technology this sector can flourish at a very high rate consequentially making the Make in India initiative a success. As we expect Make in India initiative to be a successful programme of the government of India, India can soon be seen on the path of becoming a hub for hi-tech manufacturing activities. The Small Scale Industries can also play a pivotal role in the betterment of the initiative with the better nurturing and better focus on technological and industrial development. It can be seen that many European giants have laid a deep eye on the development of small scale industries of India and this sector, thus, is expected to gain huge support in terms of their annual turnover. Need is there for a proper boosting and better support for the small and medium sector so that it gains from this initiative and is also able to grow and become globally competitive.

The small scale sector has large potential for generating employment opportunities and keeping in view the initiatives for investment in this sector and various MOUs being signed, it is expected that this sector can further provide more than 1.16 lac employment opportunities particularly in the case of skilled labour, IT sector, Retail and Power etc. both in rural as well as urban areas. Further as the small scale sector has a good command over Indian market, it can contribute in generation of new entrepreneurship skills under the Make in India programme under new schemes of things and workings. As the Small and medium sectors have around 80% of the total industrial workforce, is the second largest sector after agriculture in terms of employment generation and accounts for around 35% of the total exports of India, it can be contribute to a large extent in making the make in India' programme a successful project. As the small scale industries possess various positive factors like labour intensiveness, skill development, large investment opportunities etc, this sector has the huge capacity to take the Indian economy to the new levels. Apart from this, this sector always have unique contribution in the fields of elimination of poverty, equitable distribution of resources, development of entrepreneurial skills, mobilization of resources, promotion of better and cordial industrial relations which in turn can also support the growth of large industries, promotion of exports and the indigenization of the industrial activity.

In an article "Atamirbhar MSMEs: How Modi Govt's Make in India 2.0 is gateway to self-reliance for small businesses" by Mr. Sandeep Varaganti published in the Financial Times dated 08 July, 2020, it has been pointed out that during the year 2019, when the whole world nations were engaged to save their masses from the effect of Covid-19 Pandemic, a situation arose when most the nations of the world have formed an adverse opinion against China and some nations also said not to make use of Chinese goods. In India, it was opined that the Covid-19 pandemic has brought an opportunity for India and Indian industry and the same should also be utilized properly. At that time the Government of India considered that the India should get the benefit of the prevailing situation. In background of this, India launched the 'Atamirbhar Bharat' initiative which was taken as having provided India an opportunity for making itself a self-reliant nation. In 2014 the 'Make in India' programme was started by the Indian Govt. But in 2020, the situation was considered to be an opportune time to utilize the prevailing circumstances arising due the COVID-19 and make the idea of 'Make of India' a successful by executing Atamirbhar Bharat initiative. It was also considered that MSME sector will also be benefitted from the prevailing situation and help in making the idea of Atamirbhar Bharat a successful one. The small and medium sector has always been making contribution of 40% to the GDP of India and also helping India in maintaining its level of exports and, hence, has always played a significant role in the overall performance of the Indian Industry. Various policies of the Govt of India, while being formed and implemented, have taken into account the MSME sector as the backbone of the Indian economy. With the engagement of small and medium enterprises in the Make in India initiative it has been considered that they will help in decentralization of the industrial initiatives of the Government, contribute in popularizing local brands and will build and enhance capacity of Indian economy in generating more employment opportunities which already is second to the agriculture in employment generation in India. These sectors have also contributed for earning of foreign exchange for India by significantly contributing towards its exports. And it is the opportune time to utilize the potential of this sector and get itself benefitted by the favorable time and policies of Make in India programme and help this sector to flourish from the post Covid-19 situation. By a contemporary survey it has been pointed out the MSMEs are suffering for the shortage of working capital and it may hinder its initiatives during the post Covid period. In order to alleviate MSME fears, the Govt of India has introduced Fund of Funds as a booster for this sector during the post Covid period. This scheme has been introduced with the objective of helping MSMEs to cope with their problems of shortage of growth capital which can be more aggravated during post Covid period apart from the idea that it will help them to meet their immediate needs in respect of their operations and logistics and also for revival of their business. The make in India has been taken as an opportunity for the MSME sector which is under tremendous distress due to capital and marketing problems brought into by the Pandemic. Although Make in India programme has been introduced about 5 years back, it is

first time that a sustainable planning, supply of funds and availability of resources has been made available for making Make in India initiative a self-reliant. And it is now upto the these Small and Medium enterprises to get the most from these recently introduced initiatives and move itself on the track of self-reliance and make their dreams successful ones. The small and medium enterprises have to analyze the prevailing situation and identify the areas which have lot of scope for utilization of local raw materials, local manpower and proper marketing opportunities in their respective areas of activities.

It has also been seen that most part of Chinese imports are of low-tech goods which were manufactured earlier in India but are still manufactured in India but in small quantities due to higher costs of production and low market demand for them. With the situation brought into by the Covid-19 and the opportunities available in the form of Make in India initiative, the MSMEs can utilize the opportunity by making goods at competitive costs and , thus, creating demand for their locally produced goods. It can be a golden opportunity for many small enterprises which have suffered from low demand for their products and also from the working capital issues. Apart from government initiatives introduced for the development of this sector, this sector can also get the benefit of getting partnership opportunities from the large organizations which may be helpful for them in a long ways.

The Govt of India having introduced Make in India initiative, also, to help MSMEs by facilitating investment, fostering innovation, enhancing their skill development, generating required and skilled work force and by building a favorable and sustainable system for the MSMEs, it is , now, for this sector to avail the opportunities brought into for this industry and to capitalize on the same towards their aim of becoming self-reliant. It is up to to the small and medium sector to understand properly the current situation of the Indian economy and utilize the available resources to bring them on the path of making them successful in post Covid period. The MSMEs can form long term planning to utilize available resources and data and build their businesses on a sustainable path and overcome the problems and crisis which have been hindering their development since a long time. Making in India will make the ‘Make in India’ a success and boost the economy and, ultimately, in making Atamnirbhar Bharat a success.

The Small Scale sector has an important role to play in making the ‘Make in India’ programme a success. The small scale sector is already working and pursuing the concept of Make in India and has its worldwide market sphere. What is the need is congenial atmosphere and some incentives which should provide the boosting effect to its activities. Now some incentives have been introduced and made available for this sector under the recently launched programme ‘Make in India’ also under the Atamnirbhar Bharat. It is, now, for the small enterprises to avail these opportunities and get most from them and contribute accordingly for bringing the Indian economy on the path of fast track and help it in achieving a higher and better rate of economic development. It is the right time for the small enterprises to avail these opportunities and become Atamnirbhar.

## CONCLUSION

The small scale sector has always played an important part in the development of Indian economy. The small and medium enterprises have been instrumental in promoting rapid industrial growth, generating employment opportunities, development of rural segments and reducing regional imbalances. As this sector is labour intensive, the employment opportunities provided by this sector are relatively at small costs. The MSME sector also plays an important role to meet increased demand for consumer goods. This sector also plays an important role in skills and resource mobilisation which may have remained unutilised in rural areas. The small scale sector also contributes in raising incomes and standard of living of small artisans, craftsmen and small entrepreneurs. The MSMEs are contributing about 40% of the manufacturing output, 34% of the exports and providing employment to about 29.5 million people in rural and urban areas. Keeping in view the role of Small enterprises, the government is also making various incentives and introducing concessions for their development. The number of backward areas, where incentives and concessions are introduced, have also increased. The introduction of these concessions for backward areas will help in boosting growth of small entities as well as in the infrastructural development of backward areas. The MSME sector also have an important role to play in making the ‘Make in India’ programme a success which is expected to take the Indian industry to the new horizons at world level.

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**DETECTION OF LEUKEMIA & ITS STAGING USING IMAGE PROCESSING; ARTIFICIAL INTELLIGENCE**

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**Sannihitha Peetala and Dr. B Leela Kumari**

Department of Electronics and Communication, University College of Engineering, Jawaharlal Nehru Technological University Kakinada Andhra Pradesh, India

**ABSTRACT**

*Leukemia or blood cancer is a life-threatening ailment of blood. It originates in bone marrow, & causes the formation of large number of abnormal cells. Leukemia is classified as Acute Lymphoblastic Leukemia (ALL), Acute Myeloid Leukemia (AML), Acute Myeloid Leukemia (ALL), Chronic Lymphatic Leukemia (CLL) & Chronic Myeloid Leukemia (CML). This Dissertation will aim at automated detection & staging of leukemia using combination of image processing & artificial intelligence technique. Also, detection of white blood in blood stain image, accurately, is crucial for prediction of leukemia with accuracy. This dissertation also aims of improving the accuracy of WBC detection using combination of contrast enhancement morphological area operation & Hough transform to find circles. WBC segmented by both the above methods. The outputs were then processed by Levenberg–Marquardt algorithm, which is pre trained with number of samples using artificial neural network to classify the blood stain as leukemia or non-leukemia and provide staging.*

*Keywords: White Blood Cells, Leukemia, Microscopic images, Morphological area, Hough transform, artificial neural networks*

**I. INTRODUCTION**

Over the last decade, medical imaging has grown to be one of the most essential means of visualizing and interpreting biology and medicine. During this period, there has been a great increase in the creation of new, powerful medical imaging tools. As a result, the use of digital image processing techniques to solve medical problems has grown significantly. The development of clinically useful integrated systems for medical imaging is the most difficult part of the field's work. In order to successfully design, develop, and validate sophisticated medical systems, physicians and engineers must work together closely. The primary goal of image analysis is to gather information, detect disease, diagnose disease, regulate and treat, monitor and evaluate. and to obtain information.

Leukemia, a form of blood cancer, is the most lethal of all blood illnesses. Because of the urgency of early and precise detection of leukemia, this research focuses on this topic. Because leukemia spreads rapidly, it necessitates early discovery, frequent testing, and close monitoring in order to keep it under control and appropriately assess treatment options.

A hematologist uses a microscope to diagnose leukemia in a patient. Manual testing has some limitations, such as being time-consuming and expensive. Hematologist experience and fatigue may have an impact on the outcome. Images are inexpensive and don't require expensive testing or lab equipment because of the automated process.

The bone marrow creates aberrant white blood cells in leukemia. When compared to regular white blood cells, aberrant ones do not die as quickly. As a result, the number of aberrant white blood cells increases, preventing regular white blood cells from carrying out their duties. As a result, the human body's blood system becomes unbalanced.

**II. EXISTING TECHNIQUES**

**Deepika Kumaret. All (2021)** A CNN-based early detection method for acute lymphoblastic leukemia was proposed and implemented in this research using a mix of center-cropping, image augmentations, and class rebalancing. The CNNs were proven to be more accurate in detecting all images when the images were cropped in the middle, rather than when the complete image was used. The ensemble model for image classification outperforms the single candidate model with significantly lower training sample counts. As a result, the aggregate results of the ensemble model can be improved by weighting models according to their performance. Despite the promising results of the microscopic cell picture categorization, the results, particularly for the Hem class, require further refinement. To address imbalance issues in the future, the adversarial network can generate synthetic data. As DL models are increasingly used in medical image interpretation scenarios, future research will examine the influence of data imbalance and properly accounting for subject information. [1]

**Revella E. A. Armya ET. All (2021)** Machine learning and classification algorithms will be used to increase the accuracy of leukemia diagnosis. The microarray Leukemia dataset was classified using the J48, KNN, SVM,

Random Forest, and Nave Bayes methods. According to the results, the Nave Bayes classifier has the highest accuracy (98.61%), whereas the J48 classifier has the lowest (83.33 percent). SVM and Random Forest are the final two classifiers with accuracy ratio of 87.5 percent and 95.83 percent for SVM and 88.5 and 95.4 percentage points for Random Forest. Future work in this area will lead to the assessment of the efficacy of treatment provided to leukemia patients through the effective application of appropriate machine learning classification algorithms for all varieties of leukemia, which can be carried out in parallel for greater reaction time and accuracy. [2]

**Prasidhi G. Fal Desai ET. All (2018)** Leukemia cells can be detected and classified using an automated method described in this article. Pre-processing, segmentation, feature extraction, and classification are the four important processes in the proposed approach. This technique was put to the test using data from the Goa Medical College (GMC) and an online leukemia dataset. For improved segmentation, images are transformed to the HSI color model. The K-means algorithm can produce accurate segmentation results. It splits all four types of cells correctly. To get better results, further testing might be done with different algorithms. More study can automatically determine the number of clusters. [3]

**Jan-Niklaseckardt ET. All (2020)** in cancer research, machine learning (ML) is becoming increasingly popular. To better understand cancer, machine learning algorithms that can deal with big medical datasets are needed. Acute myeloid leukemia (AML) has been employed as a model disease in a number of recent research because of ML's ability to incorporate data from many diagnostic modalities and functions to predict prognosis and offer therapy methods. Rapid diagnosis, precise risk classification, and effective treatment can be achieved by integrating these machine learning algorithms into various AML management platforms. The limitations of these techniques necessitate a strict regulatory system to ensure that machine learning is used properly. Current advances in machine learning approaches in AML management as a model illness for hematologic neoplasms are highlighted and examined in this comprehensive review to allow academics and clinicians to objectively assess this potentially game-changing technology. [4]

**Supun S. Chandrananda ET. All (2019)** each patient was evaluated for cell count by taking five photos. Testing revealed an accuracy rate of 86.7%, with a processing time of under 8 seconds. The classifier's trained sample to test sample ratio is higher since the training data contains 130 photos and the test data contains 250 photos. A high number of photos is required in the training sample in order to improve accuracy. Using caching for the classifier saves 95.32 percent of your time, proving it to be an excellent strategy (30.5 seconds). Apply image processing techniques to identify ALL and CLL from digital microscope images, then extract morphological features. The nucleus of the cell was measured for dimensions including diameter, radius, area, and perimeter to determine the type of leukocyte. On the image data set tested, the system had an accuracy rate of 91.76 percent. Upgrading to a fully automated system for cancer hospitals is likely to be easier with the help of Sri Lankan medical experts. [5]

**Nizar Ahmed ET. All (2019)** White blood cells and bone marrow are attacked by leukemia, which weakens the immune system. A common diagnostic approach is the examination of blood smears (small blood cells). For the first time, a new method for identifying leukemia from microscopic blood images utilizing a CNN architecture has been described. Our model was able to deal with a limited number of image samples because to the use of data augmentation techniques. To show that CNN surpasses earlier machine learning algorithms and tested it on one leukemia type (ALL samples) and found it to be 88% accurate, while it was 81% accurate for all other leukemia subtypes. Our tests also included cross-validation. It's true that classifying medical images takes time, but it's crucial to check whether the model under consideration remains stable during the classification process. [6]

**Viswanathan P (2015)** Leukemia is frequently missed in routine checkups because to the difficulties in interpreting blood smear images and the appearance of comparable symptoms in other diseases. In addition to being more time demanding, the diagnostic procedure is also more prone to errors. As a result, this research proposes a fuzzy C means cluster optimization for leukemia detection using morphological contour segmentation. This study's innovative approach to leukemia diagnosis includes nuclei contrast enhancement, morphological contour segmentation, and fuzzy C means. Basic addition and subtraction are used to raise the contrast required for nuclei separation. This technique uses morphological contour segmentation to eliminate the normal white blood cells from a microscopic blood picture so that nuclei's edges may be clearly seen (MCS). As a strategy to speed up the difficult and time-consuming procedure of finding leukemia, an entire slide image of leukemia WBCs has been proposed. To improve WBC segmentation from blood microscopic images, morphological contour processing of nuclei and leukemia has been improved. In order to produce an accurate leukemia rating, we trained a fuzzy C mean classification model using extracted features row vectors

such as perimeters, densities, and percentages from segmented nuclear images. Leukemia will be clearly separated from normal blood in the suggested method because of this. By using the method proposed, researchers established a large-scale automated system for detecting and classifying normal and aberrant WBCs. [7]

**Ashwini Rejintal ET. All (2016)** The visual examination of microscopic pictures by hematopathologists is a time-consuming and complex process that leads in delayed detection. An autonomous image handling framework is needed to overcome these limitations in visual inquiry, enabling for the early diagnosis of disease and cancer kinds. The proposed method has been successfully applied to a large number of photos, resulting in accurate findings even when the image standards have changed. MATLAB is used to perform a variety of image processing computations, including picture augmentation, clustering, mathematical method, and labelling. Using some of the most powerful image processing methods, can identify and slice disease cells. The segmentation is useful in identifying the cancer cell's exact size and shape, as well as its immediate surroundings. The picture's contrast and pixel values were first improved using image improvement methods. Using cell segmentation and feature extraction and hope to identify cancer cells. Angular second moment (energy), contrast, auto correlation, Entropy (variation), disparity (difference), homogeneity (homogeneity), cluster prominence (prominence of clusters), and the Inverse Difference Moment are all factors to consider for accurate identification. The k mean approach yields the best segmentation results, as shown by the data. It is also easier to obtain a completely separated core since MATLAB-based calculations are less sensitive to variations in the image. [8]

**Dr. P V Rama Raju ET. All (2017)** An expert examines microscopic images in order to identify leukemia manually. This is a labor-intensive process that relies on the individual's knowledge and skill and cannot be generalized. This proposed method for leukemia diagnosis uses Image j as a tool to understand the entire detection process. Preprocessing and segmentation are also included in this tool. You may use this program to convert RGB images to grayscale images and to directly convert grayscale images to binary files. This tool's leukemia identification procedure is made easier by the use of macros installed at each phase. Java, Python, MATLAB and other programming languages all support the creation of macros. Leukemia can be diagnosed and classified as ALL or CLL based on a cell count and other factors including area and perimeter (or) In this way, nope. [9]

**Satvikdasariraju ET. All (2020)** in an effort to overcome the limits of manual diagnosis for AML, automated leukocyte recognition and categorization was created. The algorithm was able to appropriately detect immature leukocytes based on its 93 percent accuracy and 0.98 AUC-ROC. This new model was able to successfully categories each of the four immature leukocyte categories during multiclass classification, which is a considerable improvement over earlier research. For classification purposes, the expected color characteristics of the nucleus in the B channel of LAB color space are crucial, whereas the N:C ratio was found to be relevant for both detection and categorization. This study has two purposes. The proposed approach can be utilized to assist doctors in the diagnosis of AML, saving both time and money. In order to expedite the selection of potentially malignant cells for further examination by a professional, the model's high binary classification accuracy may be utilized. To save lives in impoverished countries where diagnosis can take weeks, the proposed technique identifies immature leukocytes. When discovered early, those who have AML have a better chance of responding to treatment. Immature leukocyte classification may also help with therapy and prognosis options, which can differ depending on the type of malignant cell. This study can be utilized to improve classification performance in future investigations by utilizing the most relevant traits that were calculated and provided as features. [10]

III.METHODOLOGY

3.1 Ann Flow Chart

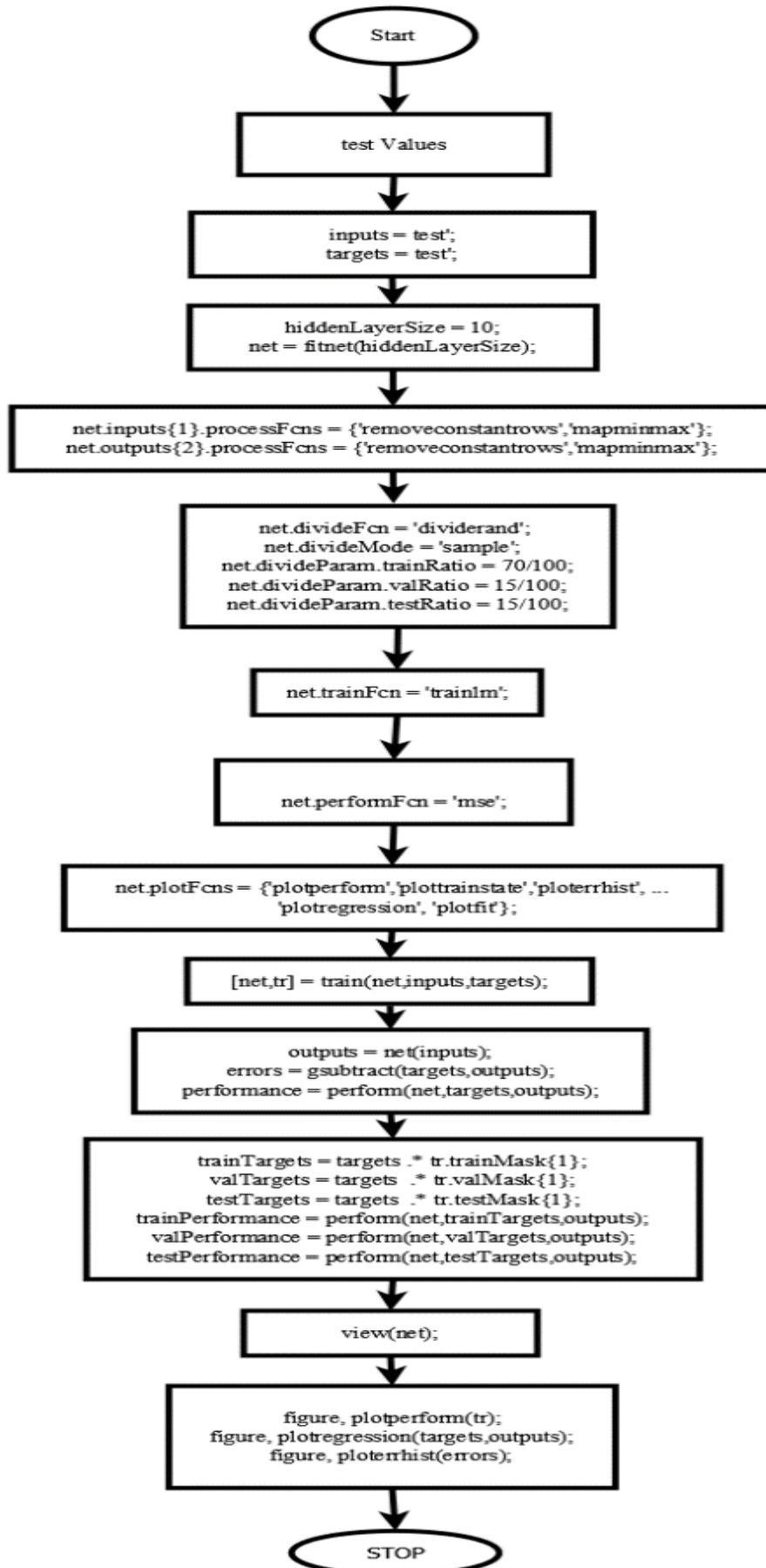


Figure: 3.1 ANN Flow Chart

The term "neural networks" refers to a class of adaptive systems that use a layered structure resembling a human brain to learn by connecting nodes or neurons (also known as artificial neural networks). Pattern recognition, classification of data, and forecasting of future events can all be taught to neural networks.

An artificial neural network processes the data and creates a series based on the input. To learn to recognize patterns in voice or images, for example, it may be taught to use many samples like a human brain does. How the system's components are linked together and the weights attached to each link determine its behavior.

**3.2 Proposed Methodology Block Diagram**

In the system block diagram, it can be seen 1st then input blood sample image then input image is processing then by blob analysis method WBC count 1 and by Hough transform RBC count 1 then by imfind circle method total number of cell count. And then RBC count 2 and bicolour differentiation & area condition WBC count 2.

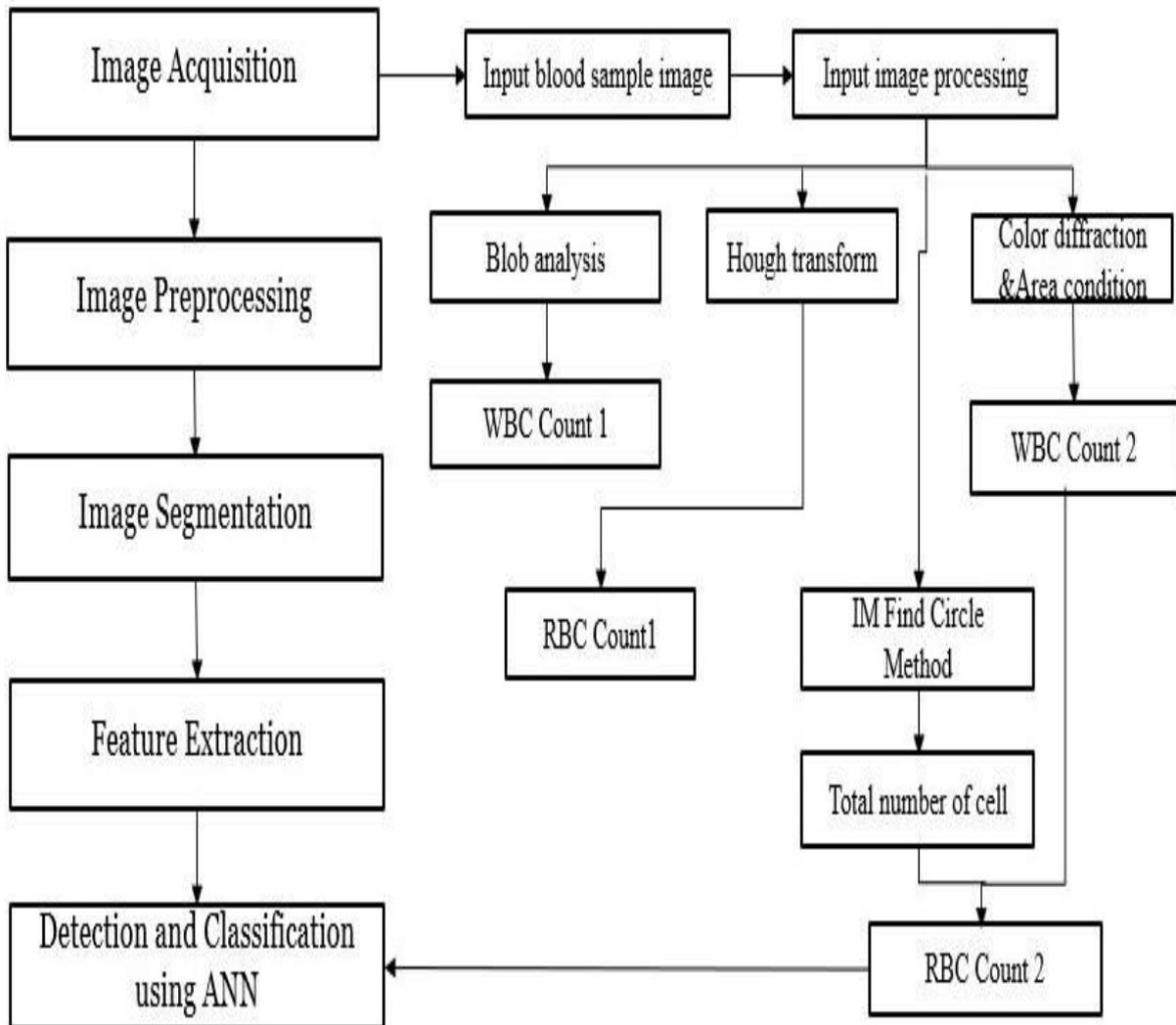


Figure: 3.2 Proposed Block Diagram

**3.3 Flowchart of Wbc Count Detection Using Blob Count Method**

The WBC count detection operation is start with the input image. So 1<sup>st</sup> take a input image as Blood Cell Image and this image is stored as BO Img. After this process this input image is converted into the BC Img. Grayscale Image and this image is stored as BG Img. Then apply Linear contrast stretching on Grayscale Image and store as BL Img. After this, apply Histogram Equalization Process on BL Img. And stored as BH Img. Then by applying background Brightening on BH Img. Then by applying Background brightening on BH Img. And stored. Then obtain highlighted components by subtracting BH Img. From BB Img. And It stored as the BHL Img. Then remove other components of the image by using image addition of BB Img. And this is stored as BR Img. Then applying 2-D order statistic filtering on this BR Img. And stored as BF Img. Then compliment BBW Img. And Stored BCBW Img. Then by applying morphological operation on BCBW Img. And stored this as BMC Img. Then applying area condition operation on WBC and remove ourcts having are less then and this stored as BMC img. Then all connected label is computed and compute number of WBC by number of observed connected components.

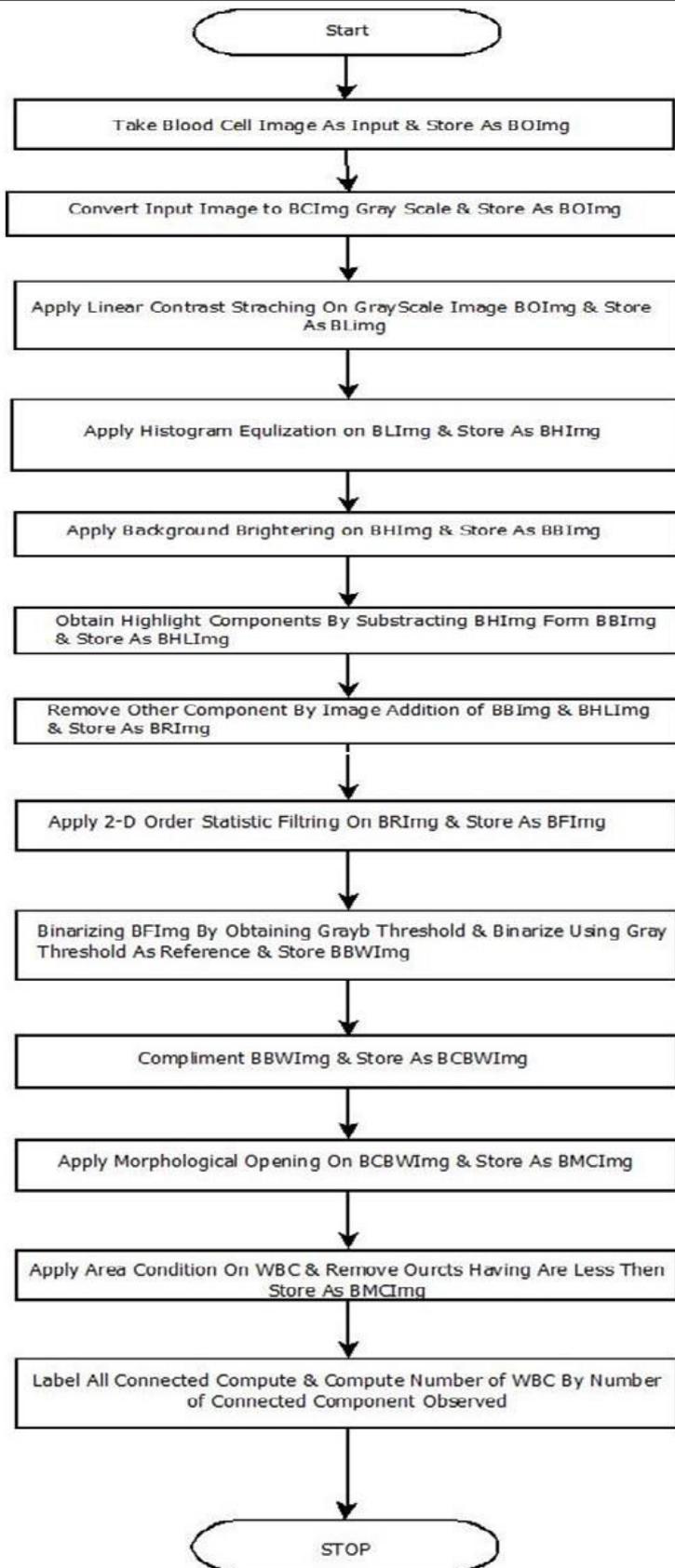


Figure: 3.3 Flowchart of WBC Count Detection

### 3.4 Flowchart of Rbc Count Detection:

1<sup>st</sup> Extract Green Channel from Original Image. Then Apply Adoptive Histogram Equalization. Then Apply Circular Hough Transform BOGCHE Img. Then Get NO. Circles Radius Then Assigns RBC Count. Then it assigns as RBC Count.

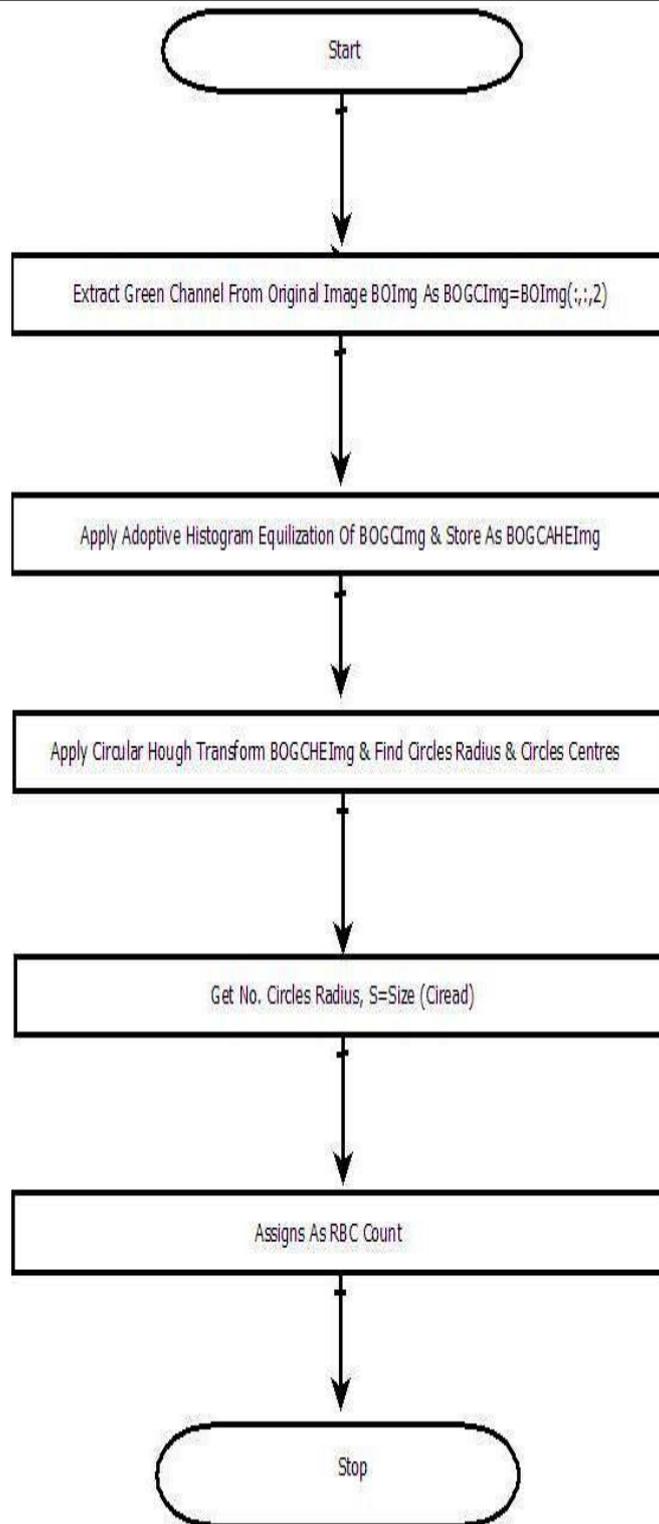


Figure: 3.4 Flowchart of RBC Count Detection

### 3.5 Wbc Detection Using Color Area Differentiation Method

First, it is seen a grayscale image of a stained blood cell slide in this flowchart. Then use the `Im adjust` function to apply linear contrast stretching to a grayscale image. Finally, using image addition, combine the `Im adjust` and histogram equalized images to achieve background brightening. Then, to normalize the image's histogram, then subtracted the background to brighten the highlight component. Then, using image addition, brighten the image by removing non-interesting elements. Then apply 2-D order statistic filtering technique using 1<sup>st</sup> order and domain a unity matrix of size 3X3. Then by using Otsu's method binaries filtered image. Then obtain complement of the binary image using image compliment technique. Then apply morphological opening on the image with structural element disk of radius 9Pixels. Then use connect component analysis to count number of objects in binary compliment image and remove objects from list whose area is less than 5000 pixels. Then display detected WBC Image.

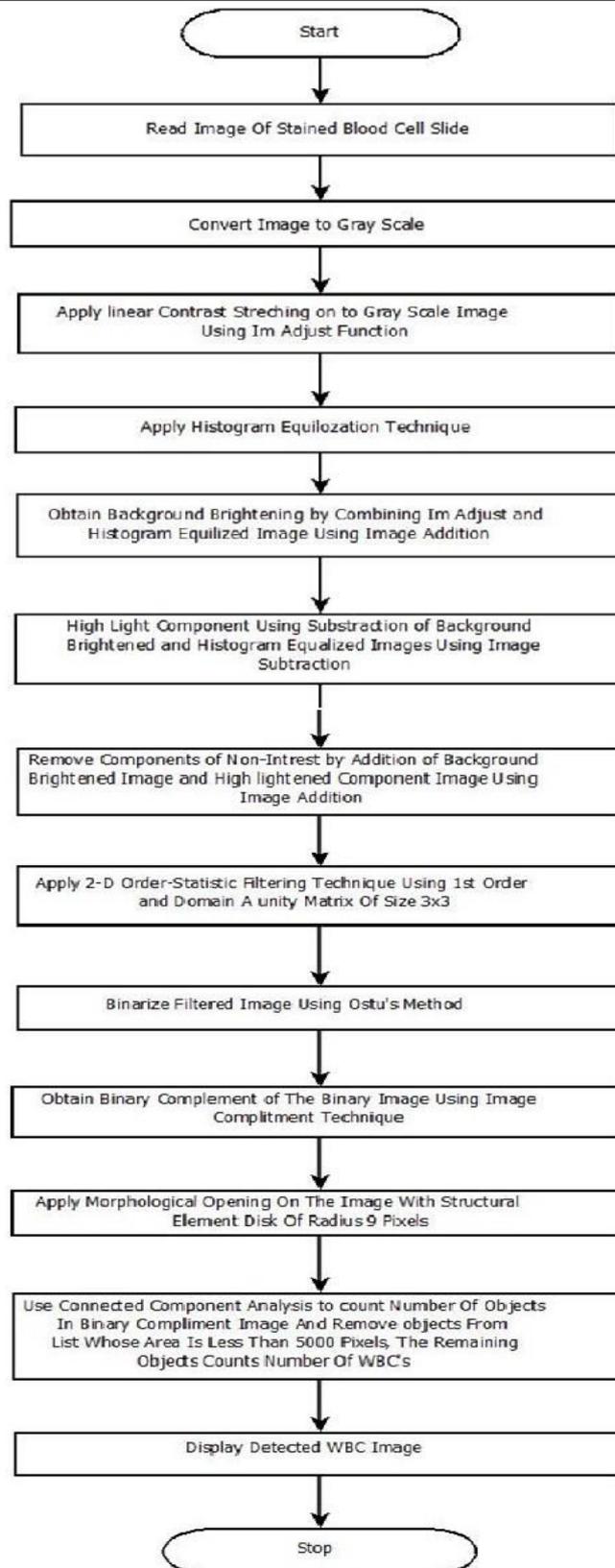


Figure: 3.5 WBC Detection Using Color Area differentiation Method

#### IV. RESULTS

The first step of the system is the acquisition of images. Retrieving photographs from sources that automatically capture input images is part of this process. The raw image is first turned into a grayscale image during pre-processing, which is the following step after image acquisition. Afterward, the noise is eliminated by employing a median filter to remove it. There are a number of ways to improve the process's outcomes:

- “New initialization of the network parameters or multiple trainings”.

- “Successive increasing of the number of hidden neurons. This concern is of prime importance, when defining the network structure, and will be explained later in more detail”.
- “To train the network with different learning algorithms”:

Learning functions such as Levenberg-Marquardt and back propagation were also employed to train the network during this stage (BP). When it comes to fitting issues with a ANN trained data, LM theoretically provides the results.

The three methods outlined above are used to train the network until it was able to generalise to the greatest extent possible. Using the early-stopping-approach, the network is generalised. We obtain data for training, validation, and testing in our network. Weight adaptation is the method to train the Artificial neural network. To avoid overfitting, this error rises and the weights are calculated based on this minimum error.

When the number of LM-algorithm hidden neurons is increased to 20, the mean square deviation drops. It was decided to use a network having 10 hidden neurons with Algorithm to keep the network's complexity less and prevent the risk of overfitting the network. The diagram depicts the network's structure.

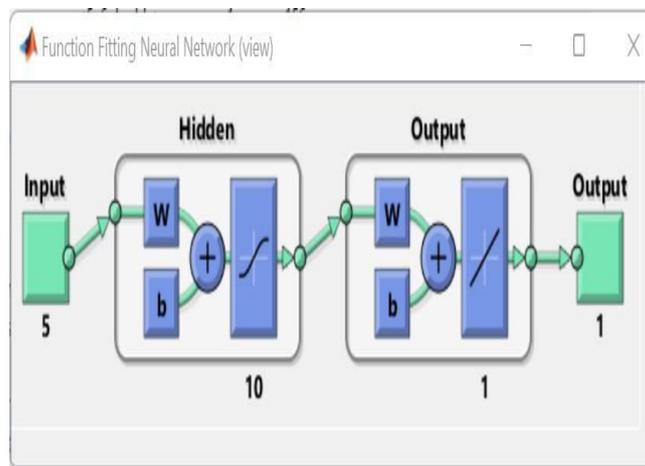


Figure: 4.1 Structure of the chosen network

Few attempts were made to get the performance curves of training, validation, and test data to follow a nearly identical path. “There is a correlation between the three curves if the network's response to learning data, validation and testing data is similar.

Overfitting is therefore less likely, but it is not completely eliminated. It is shown in Figure 4.2 that the network with 10 hidden neurons trained in LM algorithm.

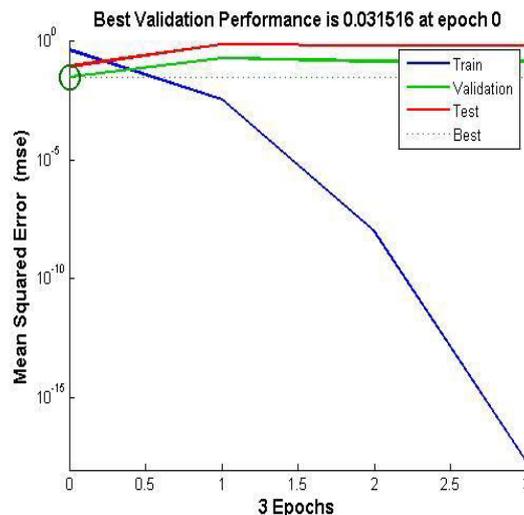
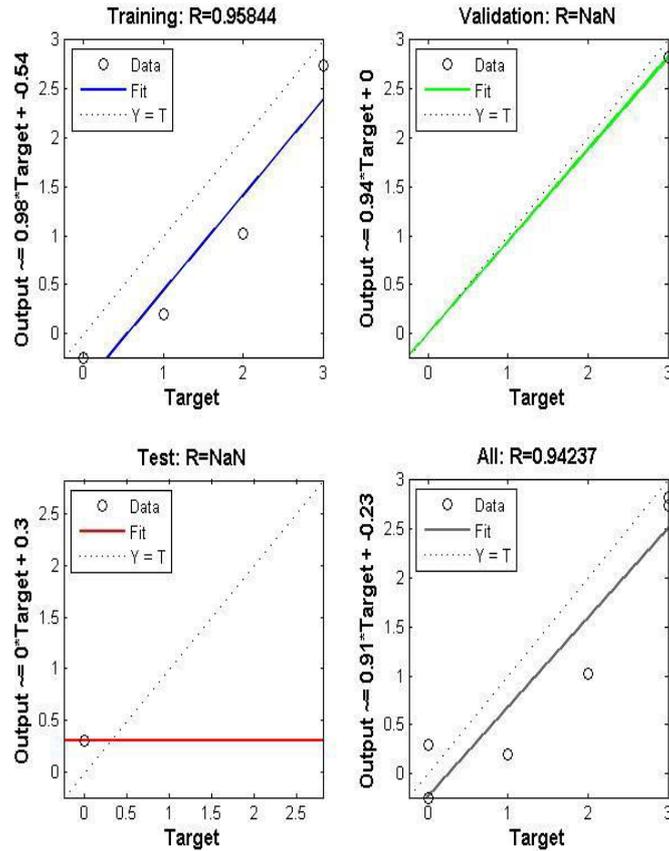


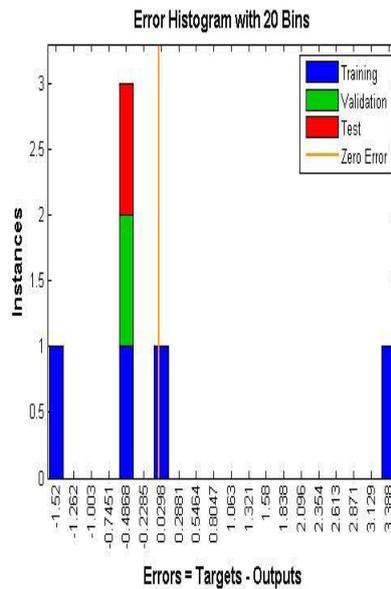
Figure: 4.2 Performance-plot of the chosen network

The process to evaluate the generalization of a network is a regression analysis between the output and the targets, which typically is represented by a regression factor (R ) With a perfect network performance R should be three but Figure 4.3 shows the regression plot with R=2.1



**Figure: 4.3** Regression plots of the chosen network

The quality of network is trained using error histogram which indicates the distribution of the residuals between target and output. This histogram is able to indicate outliers. It checks if the quality of the learning data is bad or if these outliers are different from the test data.

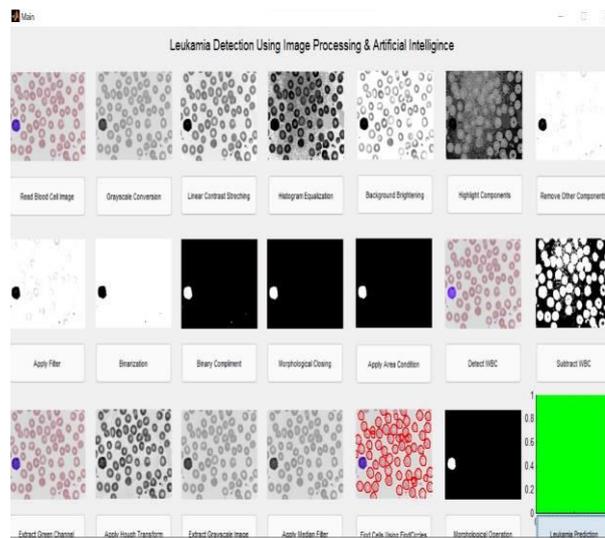


**Figure: 4.4** Error histogram of the chosen network

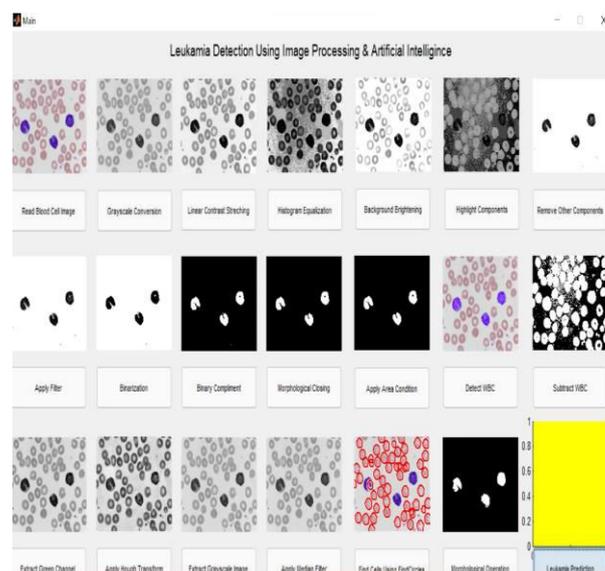
Obtained count of RBC and WBC using Morphological operation, Linear contrast stretching. Circular transform for RBC is carried and by subtracting the RBC from Total number of cells WBC is obtained, with these parameters which are used for train the neural network hence it is estimated whether Person exist leukemia or not.

**GUI Outputs for Leukemia Detection and Staging:**

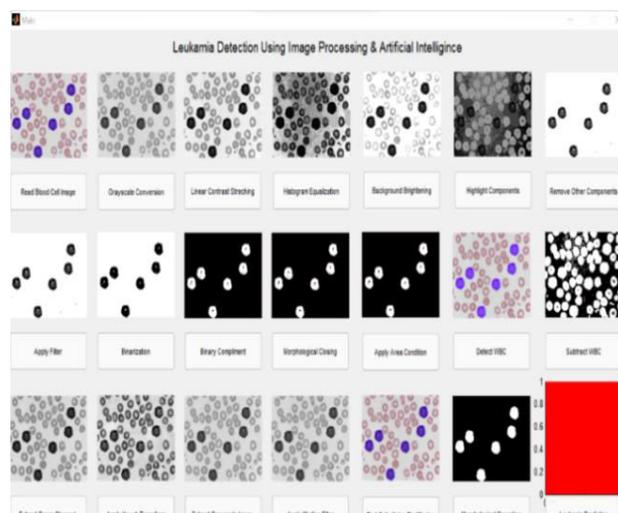
Here using color leukemia is classified representing stage of leukemia, if the red color is displayed it indicate third stage of leukemia, yellow indicate that patient has early stage of leukemia and green indicate non leukemia.



**Figure: 4.5** Non leukemia detection



**Figure: 4.6** Early stage detection



**Figure: 4.7** Third stage leukemia Detection

**V. CONCLUSION**

Computed blood cell count, which measures the density of various blood cells in a person's body, is an essential tool for diagnosing anemia, infection, and leukemia, among other conditions. By automating this process, we can improve diagnosis times while significantly lowering treatment costs. For the total blood cell count on blood smear images, we use a artificial neural network in this paper. In this paper, we presented a low cost detection of leukemia & its staging using image processing and artificial intelligence.

**Comparison with Base Paper**

S. No.	Parameters	Base Paper	Proposed Work
1.	Title	Automated Complete Blood Cell Count and Malaria pathogen detection using convolution neural network	Leukemia detection using image processing & artificial intelligence
2.	Techniques Used	Convolution neural network to perform this complete blood cell count on blood smear image. Convolution neural network detection of malarial pathogens.	Dual method WBC count using color differentiation with area condition & blob analysis. Dual method RBC count using Hough transform & Im find circles. Levenberg Marquardt function fitting neural network for leukemia prediction.
3.	WBC Count Method	Common convolution neural network for complete blood cell count & malarial parasite detection.	<ul style="list-style-type: none"> <li>• Color differentiation with area condition.</li> <li>• Blob detection &amp; parameter analysis</li> </ul>
4.	RBC Count Method	Color differentiation with area condition. Blob detection & parameter analysis.	<ul style="list-style-type: none"> <li>• Hough Transform</li> <li>• Imfind Circles</li> </ul>
5.	Disease Detected	Malaria parasite	Leukemia
6.	Staging or Severity	No Staging or severity information	Staging & severity predicted by Levenberg Marquardt ANN

**Table: 1** Proposed Work Comparison with Base Paper

**Vi. Future Work**

1. Detection of WBC Geometry such as shape size also apart from count value for enhancement of prediction accuracy.
2. Analysis of RBC population area coverage to estimate canvas area (reference area) & use WBC area occupied parameter, to enable WBC oversize/ undersize detection & further input to ANN to improvise prediction accuracy.
3. Simulation of various treatment choices such as radiotherapy, chemotherapy, naturopathy, electropathy & their variants & combination.
4. Automatic prediction of prognosis treatment choice, hospitalization time etc.

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**IN SILICO ANALYSIS OF 2-CYANO-3-HYDROXYBUT-2-ENAMIDE DERIVATIVES OF AMINOHYDROXYBENZOIC ACIDS, AMINOBENZOIC ACIDS AND AMINOPHENOLS****Madhavi Kuchana**

Department of Pharmaceutical Chemistry, Institute of Pharmaceutical Technology, Sri Padmavati Mahila Visvavidyalayam (Women's University), Tirupati-517502, Chittoor, Andhra Pradesh, India

**ABSTRACT**

The prediction of molecular properties and bioactivity score of computationally developed 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols was carried out using Molinspiration Cheminformatics. The pharmacokinetics, drug-likeness, bioavailability score, lead-likeness, synthetic accessibility and toxicity risks of all the compounds were evaluated computationally using SwissADME and Osiris Property Explorer. All the developed compounds obeyed Lipinski rule of five and considered as drug-like molecules. All the compounds under investigation showed better pharmacokinetics, drug-likeness, synthetic accessibility and low toxicity risks similar to the standard drug Teriflunomide. Among all the compounds, 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids were identified as good enzyme inhibitors than the standard drug Teriflunomide.

*Keywords:* 2-Cyano-3-hydroxybut-2-enamide, Aminohydroxybenzoic acids, Aminobenzoic acids, Aminophenols, In Silico analysis.

**INTRODUCTION**

Aminohydroxybenzoic acids, aminobenzoic acids and aminophenols are more important chemical moieties, some of which acts as therapeutic agents. Aminosalicyclic acids and hydroxyanthranic acids belongs to the class of aminohydroxybenzoic acids. Among aminosalicyclic acids, Masalazine and para-aminosalicylic acid (PAS) are known to treat inflammatory bowel disease, some forms of arthritis and tuberculosis [1-3]. Aminobenzoic acids and related compounds possess several pharmacological actions such as anti-inflammatory, antioxidant, antibacterial, antimutagenic, anticoagulant, fibrinolytic and immunomodulating activities [4]. Aminophenols and their derivatives are widely used in photographic, pharmaceutical and chemical dye industries [5].

Teriflunomide, an active metabolite of Leflunomide, is a 2-cyano-3-hydroxybut-2-enamide derivative of 4-(trifluoromethyl)aniline used for the treatment of multiple sclerosis. It is an immunomodulatory drug inhibits pyrimidine de novo synthesis by blocking the mitochondrial enzyme dihydroorotate dehydrogenase. Further, a recent review reported that teriflunomide have antiviral response and does not negatively affect the disease course of covid-19 [6]. The literature survey on 2-cyano-3-hydroxybut-2-enamide derivatives of substituted aromatic amines revealed the generation of novel antileukemic agents targeting Bruton's tyrosine kinase [7]. Based on the above observations, the present in silico study aimed to develop 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols. The objectives of the study include estimation of molecular properties, bioactivity score, pharmacokinetics, drug-likeness, bioavailability score, lead-likeness, synthetic accessibility and toxicity risks of newly developed compounds using free web based computational tools.

**MATERIALS AND METHODS**

The software used for the in silico analysis of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids, aminophenols and standard drug Teriflunomide include:

- ChemDraw Ultra 12.0
- Molinspiration Cheminformatics
- SwissADME
- **Osiris Property Explorer**

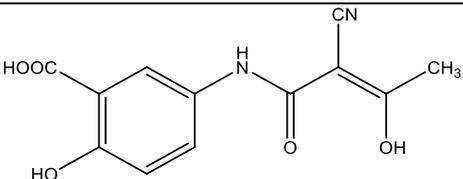
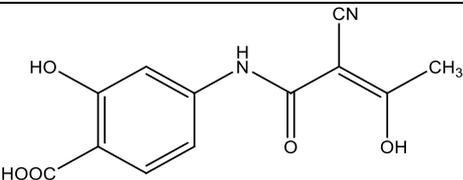
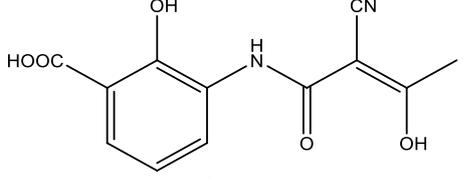
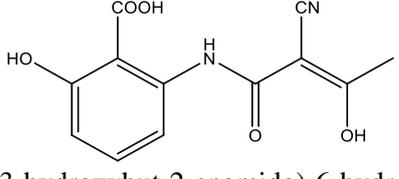
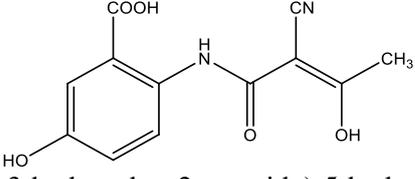
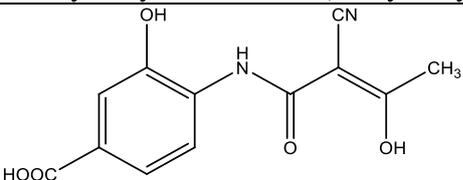
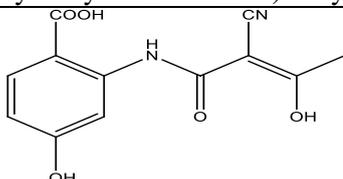
ChemDraw Ultra 12.0 used for the generation of structure and nomenclature. Molinspiration Cheminformatics (<https://www.molinspiration.com>) was used to calculate molecular properties like Log P, molecular weight, number of hydrogen bond acceptors and hydrogen bond donors. These properties are considered under Lipinski's rule of five for the assessment of drugability. In addition, the Topological Polar Surface Area (TPSA) of compounds was calculated to assess the gastro intestinal (GI) absorption and blood brain barrier (BBB) penetration. Molinspiration Cheminformatics was also used to predict the bioactivity score of computationally developed compounds as GPCR ligands, ion channel modulators, kinase inhibitors, nuclear receptor ligands, protease inhibitors, and enzyme inhibitors. SwissADME (<http://www.swissadme.ch>) was used to evaluate

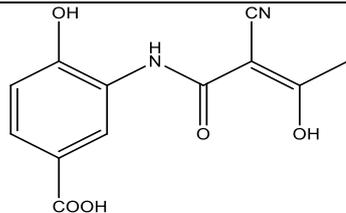
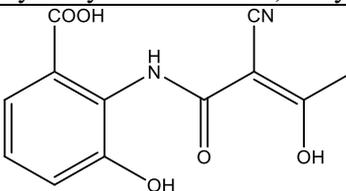
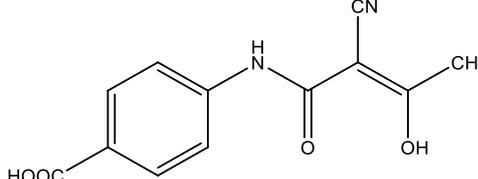
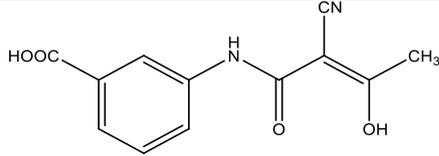
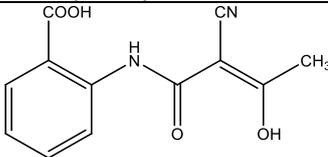
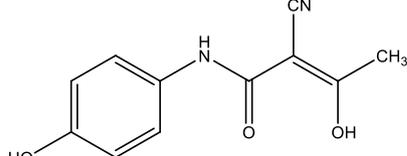
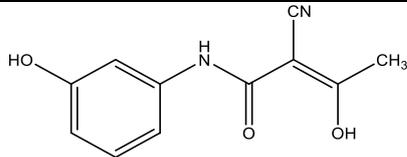
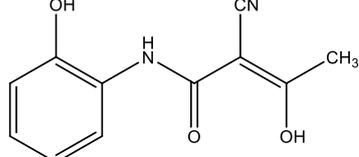
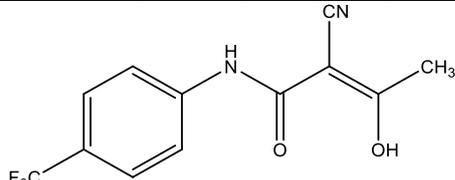
individual ADME behavior and drug-likeness of the compounds under investigation. SwissADME web tool also used to predict medicinal chemistry friendliness properties such as lead-likeness and synthetic accessibility. (Daina et al., 2017). Toxicity risks like mutagenicity, tumorigenicity, irritant effect and reproductive effect were predicted using Osiris Property Explorer.

## RESULTS AND DISCUSSION

The structures of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids (AHB), aminobenzoic acids (AB), aminophenols (AP) and standard drug Teriflunomide were drawn using ChemDraw Ultra 12.0. Their nomenclature generated and presented in Table-1.

**Table-1:** Structure and Nomenclature of 2-Cyano-3-Hydroxybut-2-Enamide Derivatives of Aminohydroxybenzoic Acids, Aminobenzoic Acids and Aminophenols

Sl.No	Compound No. (C.No.)	Structure and nomenclature
1	AHB1	 (Z)-5-(2-cyano-3-hydroxybut-2-enamido)-2-hydroxybenzoic acid
2	AHB2	 (Z)-4-(2-cyano-3-hydroxybut-2-enamido)-2-hydroxybenzoic acid
3	AHB3	 (Z)-3-(2-cyano-3-hydroxybut-2-enamido)-2-hydroxybenzoic acid
4	AHB4	 (Z)-2-(2-cyano-3-hydroxybut-2-enamido)-6-hydroxybenzoic acid
5	AHB5	 (Z)-2-(2-cyano-3-hydroxybut-2-enamido)-5-hydroxybenzoic acid
6	AHB6	 (Z)-4-(2-cyano-3-hydroxybut-2-enamido)-3-hydroxybenzoic acid
7	AHB7	 (Z)-2-(2-cyano-3-hydroxybut-2-enamido)-4-hydroxybenzoic acid

8	AHB8	 <p>(Z)-3-(2-cyano-3-hydroxybut-2-enamido)-4-hydroxybenzoic acid</p>
9	AHB9	 <p>(Z)-2-(2-cyano-3-hydroxybut-2-enamido)-3-hydroxybenzoic acid</p>
10	AB1	 <p>(Z)-4-(2-cyano-3-hydroxybut-2-enamido)benzoic acid</p>
11	AB2	 <p>(Z)-3-(2-cyano-3-hydroxybut-2-enamido)benzoic acid</p>
12	AB3	 <p>(Z)-3-(2-cyano-3-hydroxybut-2-enamido)benzoic acid</p>
13	AP1	 <p>(Z)-2-cyano-3-hydroxy-N-(4-hydroxyphenyl)but-2-enamide</p>
14	AP2	 <p>(Z)-2-cyano-3-hydroxy-N-(3-hydroxyphenyl)but-2-enamide</p>
15	AP3	 <p>(Z)-2-cyano-3-hydroxy-N-(2-hydroxyphenyl)but-2-enamide</p>
16	TERIFLUNOMIDE	 <p>(Z)-2-cyano-3-hydroxy-N-(4-(trifluoromethyl)phenyl)but-2-enamide</p>

Molinspiration Cheminformatics web tool was used for the calculation of molecular properties of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids, aminophenols and standard drug Teriflunomide. The data presented in Table-2. The results revealed that all the compounds obeyed the Lipinski's rule of five (Log P<5, molecular weight <500, the number of hydrogen bond acceptors <10 and hydrogen bond donors < 5), thus indicating drug-likeness. The miLogP values of all compounds were less than standards drug Teriflunomide. This may be due to the substitution of phenyl ring with more polar carboxyl and phenolic hydroxyl groups. The estimated TPSA for all the designed compounds was between 93.35 and 130.65 indicating good GI absorption but no BBB penetration. Considering TPSA values the percentage of absorption (%ABS) was calculated and the values were found between 76.79 and 63.93. The data revealed that 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids (AHB) have high TPSA and low percentage of absorption as they possess both carboxyl and phenolic hydroxyl groups. The data also indicated 2-cyano-3-hydroxybut-2-enamide derivatives of aminobenzoic acids (AB) and aminophenols (AP) possess relatively low TPSA and high percentage of absorption.

**Table: 2** Prediction of molecular properties of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols

Compound	milogP	MW	nON	nOHNH	nViolations	nrotb	Volume	TPSA	%ABS
AHB1	1.31	262.22	7	4	0	3	219.30	130.65	63.93
AHB2	1.31	262.22	7	4	0	3	219.30	130.65	63.93
AHB3	1.08	262.22	7	4	0	3	219.30	130.65	63.93
AHB4	0.86	262.22	7	4	0	3	219.30	130.65	63.93
AHB5	0.94	262.22	7	4	0	3	219.30	130.65	63.93
AHB6	1.02	262.22	7	4	0	3	219.30	130.65	63.93
AHB7	0.94	262.22	7	4	0	3	219.30	130.65	63.93
AHB8	1.02	262.22	7	4	0	3	219.30	130.65	63.93
AHB9	1.18	262.22	7	4	0	3	219.30	130.65	63.93
AB1	1.31	246.22	6	3	0	3	211.29	110.42	70.91
AB2	1.29	246.22	6	3	0	3	211.29	110.42	70.91
AB3	1.44	246.22	6	3	0	3	211.29	110.42	70.91
AP1	0.92	218.21	5	3	0	2	192.30	93.35	76.79
AP2	0.90	218.21	5	3	0	2	192.30	93.35	76.79
AP3	1.13	218.21	5	3	0	2	192.30	93.35	76.79
TER	2.30	270.21	4	2	0	3	215.58	73.12	83.77

(MiLogP: partition coefficient, MW: Molecular weight, nON: Hydrogen bond acceptor, nOHNH: Hydrogen bond donor, nViolations: Number of violations, nrotb: Number of rotatable bonds, TPSA: Topological polar surface area, %ABS: Percentage of absorption)

The bioactivity of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols along with standard drug Teriflunamide was predicted by Molinspiration Cheminformatics. The values were listed in Table-3. A molecule having bioactivity score more than 0.00 expected to be active, while values between -0.50 and 0.00 are expected to be moderately active and if the score is less than -0.50 considered as inactive. The bioactivity prediction results revealed that all the compounds were moderately active as enzyme inhibitors. Among all the compounds, 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids (AHB) were estimated as good enzyme inhibitors than the standard drug Teriflunamide. Except few, all the compounds were inactive as GPCR ligands, ion channel modulators, kinase inhibitors, nuclear receptor ligands and protease inhibitors.

**Table: 3** Prediction of bioactivity scores of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols

Compound	GPCR ligand	Ion channel modulator	Kinase inhibitor	Nuclear receptor ligand	Protease inhibitor	Enzyme inhibitor
AHB1	-0.71	-0.56	-0.72	-0.47	-0.74	-0.16
AHB2	-0.70	-0.55	-0.71	-0.50	-0.74	-0.15
AHB3	-0.65	-0.65	-0.83	-0.63	-0.74	-0.20
AHB4	-0.71	-0.53	-0.75	-0.41	-0.64	-0.08
AHB5	-0.70	-0.51	-0.78	-0.37	-0.82	-0.16

AHB6	-0.73	-0.73	-0.79	-0.49	-0.86	-0.19
AHB7	-0.70	-0.50	-0.76	-0.40	-0.81	-0.17
AHB8	-0.74	-0.73	-0.78	-0.48	-0.86	-0.20
AHB9	-0.67	-0.67	-0.83	-0.56	-0.78	-0.11
AB1	-0.82	-0.59	-0.87	-0.61	-0.83	-0.22
AB2	-0.83	-0.61	-0.86	-0.62	-0.84	-0.24
AB3	-0.84	-0.56	-0.91	-0.62	-0.89	-0.24
AP1	-0.99	-0.61	-0.98	-0.82	-1.06	-0.31
AP2	-1.00	-0.62	-0.96	-0.86	-1.09	-0.33
AP3	-1.03	-0.85	-1.04	-0.95	-1.19	-0.36
TER	-0.63	-0.41	-0.63	-0.46	-0.68	-0.22

SwissADME web tool was used to estimate the pharmacokinetics, drug-likeness, bioavailability score and medicinal chemistry friendliness of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols. The data was presented in Table-4. The prediction data indicated that all the designed molecules have high GI absorption and no BBB permeation. All the computationally developed compounds were identified as non-substrates for the permeability glycoprotein (P-gp). Among all, (Z)-2-cyano-3-hydroxy-N-(2-hydroxyphenyl)but-2-enamide (AP3) was recognized as CYP1A2 inhibitor and non-inhibitor of CYP2C19, CYP2C9, CYP2D6 and CYP3A4 similar to standard drug Teriflunomide. All other compounds were identified as non-inhibitors of CYP1A2, CYP2C19, CYP2C9, CYP2D6 and CYP3A4. The estimated Log  $K_p$  values of all the compounds were highly negative indicating less skin permeation. All the compounds were analyzed as oral drug candidates by five different rule based filters Lipinski, Ghosh, Veber, Egan and Muegge. The calculated bioavailability score of all the compounds was 0.56 indicating the probability of 56 % oral bioavailability.

SwissADME also used to estimate some medicinal chemistry aspects like identification of potentially problematic fragments, lead-likeness and synthetic accessibility of compounds. The potentially problematic fragments are indicated by PAINS (Pan Assay Interference Compounds) and Brenk alerts. The leadlikeness can be assessed by applying PAINS and Brenk filters along with other physicochemical filters. In the present investigation, 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids (AHB) were identified as lead like compounds. According to SwissADME, synthetic accessibility score ranges from 1 to 10. The lower score indicate very easy synthesis and the higher score indicate very difficult synthesis. The synthetic accessibility score of all the evaluated compounds was between 2.00 and 2.27, comparable with the score of standard drug Teriflunomide. This indicates all the compounds can be prepared by following appropriate synthetic route.

**Table-4:** Prediction of pharmacokinetics, drug-likeness, bioavailability score, lead-likeness and synthetic accessibility of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols

C.No	Pharmacokinetics				Drug-likeness	Bioavailability Score	Lead-likeness	Synthetic Accessibility
	GI absorption	BBB permeant	P-gp substrate	Log $K_p$ (cm/s)				
AHB1	High	No	No	-5.83	Yes	0.56	Yes	2.16
AHB2	High	No	No	-5.83	Yes	0.56	Yes	2.15
AHB3	High	No	No	-6.40	Yes	0.56	Yes	2.24
AHB4	High	No	No	-6.40	Yes	0.56	Yes	2.25
AHB5	High	No	No	-6.79	Yes	0.56	Yes	2.20
AHB6	High	No	No	-6.79	Yes	0.56	Yes	2.17
AHB7	High	No	No	-6.79	Yes	0.56	Yes	2.25
AHB8	High	No	No	-6.79	Yes	0.56	Yes	2.23
AHB9	High	No	No	-6.79	Yes	0.56	Yes	2.27
AB1	High	No	No	-6.44	Yes	0.56	No	2.01
AB2	High	No	No	-6.44	Yes	0.56	No	2.13
AB3	High	No	No	-5.94	Yes	0.56	No	2.14
AP1	High	No	No	-6.19	Yes	0.56	No	2.00
AP2	High	No	No	-6.19	Yes	0.56	No	2.12
AP3	High	No	No	-6.19	Yes	0.56	No	2.11
TER	High	Yes	No	-5.63	Yes	0.85	Yes	2.07

Toxicity of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acid, aminobenzoic acids and aminophenols was calculated using Osiris Property Explorer. The results presented in Table-5. Except

compound AHB3, (Z)-3-(2-cyano-3-hydroxybut-2-enamido)-2-hydroxybenzoic acid, all the compounds have low risk of mutagenicity, tumorigenicity, irritant and reproductive effects. The compound AHB3 has medium risk of irritant effect and low risk of mutagenicity, tumorigenicity and reproductive effect. These results revealed that all the designed compounds may be developed into acceptable drug candidates with minimum toxicity.

**Table-5:** Prediction of toxicity of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acid, aminobenzoic acids and aminophenols

Compound	Mutagenic	Tumorigenic	Irritant	Reproductive effect
AHB1	Low	Low	Low	Low
AHB2	Low	Low	Low	Low
AHB3	Low	Low	Medium	Low
AHB4	Low	Low	Low	Low
AHB5	Low	Low	Low	Low
AHB6	Low	Low	Low	Low
AHB7	Low	Low	Low	Low
AHB8	Low	Low	Low	Low
AHB9	Low	Low	Low	Low
AB1	Low	Low	Low	Low
AB2	Low	Low	Low	Low
AB3	Low	Low	Low	Low
AP1	Low	Low	Low	Low
AP2	Low	Low	Low	Low
AP3	Low	Low	Low	Low
TER	Low	Low	Low	Low

## CONCLUSION

The in silico analysis of 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids, aminobenzoic acids and aminophenols was carried out using free web based computational tools Molinspiration Cheminformatics, SwissADME and Osiris Property Explorer. All the designed compounds were identified as drug-like on the basis of Lipinski rule. All the compounds under investigation showed better pharmacokinetics, drug-likeness, synthetic accessibility and low toxicity risks similar to the standard drug Teriflunomide. Among all the compounds, 2-cyano-3-hydroxybut-2-enamide derivatives of aminohydroxybenzoic acids were appeared as good enzyme inhibitors than the standard drug Teriflunomide. Therefore, there is a scope for the screening of these compounds as enzyme inhibitors by molecular docking studies. Further, the designed compounds may be synthesized and developed into drug candidates for the treatment of bacterial, fungal and viral infections as well as inflammation and cancer.

## CONFLICT OF INTEREST

The author has no conflict of interest regarding this investigation.

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**MULTILINGUALISM AND THE POWER OF LANGUAGE IN NEW EDUCATION POLICY INDIA  
2020**

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**Dr. Sindhu Varghese**

Assistant Professor, Loyola Academy, Alwal, Secunderabad

**ABSTRACT**

*To understand the reason why English as a language or medium of instruction had preeminence. And the inclusion of mother tongue and the possible challenges it might incur. Secondary data was collected from the education policy of India older versions, and observation was made to put forward the various thoughts and apprehensions.*

*It was found that the potential of the mother tongue as medium of education was neglected and even to this day the impact of this move is being felt in Indian education. The chances of it becoming the language of commerce through the seas of east are very bright. English language was introduced by the British to train, Indians to help them in administration also for charity.*

*This paper tries to justify the introduction of multilingualism in Education Policy. English truly has opened opportunities to Indian students, be it Higher education in foreign countries, Jobs abroad this language has propelled the career prospects of Indian students. English language was introduced by the British to train, Indians to help them in administration also for charity. We owe to the British for enabling Indians to access the outer world which was adept with English. India must leverage its indigenous languages with a balance not to lose its grip of this foreign language. This will pave way for the upliftment of vernacular languages in the mainstream. This paper is to understand and justify how English happened to be the language of Instruction, and the main aim of Multilingualism in the new Education Policy of India.*

*Keywords: National Education Policy, English Language, Multilingual,*

**INTRODUCTION****EDUCATION POLICY**

Education is very important to achieve national development. The vital resources in this context is human resources and education is what it is required to facilitate a good workforce. These human resources bring prosperity and ownership equally, inclusion of all without any discrimination and transform society by utilizing their full potential. India had three instances where education policy was reviewed, the first national education policy in India came in 1968 and the second in 1986; the national education policy of 1986 was revised in 1992. The third national education policy came in the recent year of 2020. (Thakur & Kumar, 2021)

Education policy is an important function many of the governments. Education is considered as the tool for economic prosperity. There is a need to understand what drives this policy parameters. (Kennewell et al., 2006)

The important principles guiding are ,recognizing, identifying, and fostering the unique capabilities of each student, by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres.; in flexibility, so that learners have the ability to choose their learning trajectories and programs, and thereby choose their own paths in life according to their talents and interests; multidisciplinary and a holistic education ;creativity and critical thinking logical decision-making and innovation; promoting multilingualism and the power of language in teaching and learning; life skills such as communication, cooperation, teamwork, and resilience; focus on regular formative assessment for learning rather than the summative assessment that encourages today's 'coaching culture'; technology in teaching and learning. ;Indigenous inclusion .;synergy in curriculum across all levels of education from early childhood care and education to school education to higher education.; The importance of services continuum teacher and student. ;Importance to research as a factor for education and development.; continuous review of progress based on sustained research and regular assessment by educational experts.; a rootedness and pride in India, and its rich, diverse, ancient and modern culture and knowledge systems and traditions.; Every child be given right to education.; Facilitate community participation.(NEP, 2020)

**THE BACKGROUND**

The Charter of 1698 clearly stated that it was the duty of English ministers of religion to give education along with their primary duty of spreading the Gospel. But the East India Company had realized the political significance of a policy of religious neutrality and therefore refrained from carrying out the directions of the

Charter of 1698. However, the Company encouraged educational activity by establishing schools with liberal grants-in-aid. (Singh 2005).

In 1781, Sir Warren Hastings, the first Governor-General of India established the Calcutta Madrasa for the cultivation of Arabic and Persian studies, and he also founded the Benares Sanskrit College in 1791 to promote classical studies in Sanskrit. One of the prominent motives of establishing these institutions was to train Indian assistants to English Judges, to explain the principles of Hindu and Muslim laws (Basu 1982).

The Christian missionaries started providing education to Indian masses in the beginning of 18th century. But, they were allowed to preach and teach in India only after the passage of the Charter Act of 1813, which actually committed the East India Company to allow Christian missionaries to carry on their educational activities in India.

The Act laid down the condition that the British Government shall set apart a total amount of 1 lakh of rupees for the education of Indians (Basu 1979). This was the first time in India that a formal educational policy was put in place for directing the course of education in the country.

Differences of opinion between the Classicists and Anglicists cropped. While the Classicists were keen on promoting education through Sanskrit, Arabic and Persian, the Anglicists wanted that English education be given. It must be mentioned that in this conflict the potential of the mother tongue as medium of education was neglected and even to this day the impact of this move is being felt in Indian education. Indian reformers such as Raja Ram Mohan Roy and others felt the need for a new type of education and were of the view that the introduction of English education in India would lead the country towards an age of renaissance. In 1823 the Committee of Public Instruction was set up to give a shape to the new educational policy of the government and initiate steps for its implementation. The Committee was guided by two major principles: a) win the confidence of the educated and influential classes, by encouraging the learning and literature they respected, b) use the limited funds that were available for promoting higher education of the upper classes with the thrust being on appeasement. The Anglicist and Orientalist controversy had already taken deep roots by the middle of the 19th century. The Orientalists who had a genuine love for oriental culture wanted that education must be imparted through the medium of classical languages such as Sanskrit, Arabic or Persian. On the contrary, the Anglicists opined that education had to be imparted in through the medium of English, since they believed that modern knowledge, which the Indians desired could be imparted only through the medium of English. This controversy dragged on till the end of 1834. In fact, no educational policy could be implemented during this period. It was at this juncture that Lord T.B. Macaulay came to India as the President of the Committee of Public Instruction. He was a pro-Anglicist and supported the education of the classes. He made a vigorous plea for spreading western education through the medium of English (Gosh 2007).

Macaulay in his Minutes stated that the aim of promoting knowledge of the sciences could only be accomplished by the adoption of English as the medium of instruction. He brushed aside the claims of the mother-tongue on the ground that Indian languages were not equipped to serve as media of this knowledge transmission. He rejected the claims of Arabic and Sanskrit as against English. Macaulay's unjust criticism of classical Indian languages was primarily rooted in his ignorance of the richness of these languages and attracted widespread resentment among not only admirers but also those who were aware of the strength of these languages. However, Macaulay believed that English education would have a positive effect on the Indian minds and advocated its implementation strongly. Macaulay's arguments in favor

of English language were as follows: English is a modern language and is more useful than Arabic or Sanskrit. Among the languages of the west, English occupies a pre-dominant position. In India it is the language of the ruling classes. Further, the chances of its becoming the language of commerce through the seas of east are very bright. Just as Greek or Latin brought about renaissance in Europe, English would do the same in India. The native Indians are willing to be taught in English and are not eager to learn Sanskrit or Arabic.

It is possible to make the natives of India good scholars in English. It is possible through English education to bring about "a class of persons Indian in blood and color but English in taste, in opinions, in morals and intellect", and English education would result in a filter down effect by separating the classes from the masses (Gosh 2007) In 1835 the minutes were endorsed by Lord William Bentinck, the then Governor General. The result of this action was that in future teaching in high-schools and colleges under government control would be in English. This momentous decision has had its effect on educational policy in India right down to the present time. The rulers of those days had foreseen that the introduction of western education would bring Indians into closer contact with western ideas of government and democracy and lead to the rise of Indian nationalism. The Constitution makers recognized that the stability and progress of the country which adopts a democratic course

depends to a large extent on a well-educated electorate. The Constitution not only emphasized the principle of 'equality of educational opportunity' but also the achievement of social justice through a policy of 'positive discrimination'.

The Mudaliar Commission was followed by the appointment of the Indian Education Commission under the chairmanship of D. S. Kothari. Popularly known as the Kothari Commission, it was entrusted with the task of dealing with all aspects and sectors of education and to advise the Government on the evolution of a National System of Education. It is in accordance with the recommendations of this Commission that the National Educational Policy of 1968 was formulated. In its opening paragraphs, the report of the Kothari Commission on Education observed that "the destiny of India is now being shaped in her classrooms. In a world based on science and technology, it is education that determines the level of prosperity, welfare, and security of people. On the quality and number of persons coming out of our schools and colleges will depend on our success in the great enterprise of national reconstruction whose principal objective is to raise the standard of living of our people" (Report of the Education Commission 1964-66. Vol. 1). In the Commission's view education had the power to work as a powerful instrument of social, economic, and political change. Therefore, educational objectives have to be related to long term national aspirations. If the change is to be achieved without any violent revolution, the only instrument, the Commission noted was education.

Education policy has played an immensely important role in the development of an educational system in India since pre-independence days. Since education policies reflect the approaches of those in power towards education, they have a close bearing on the goals and strategies of the education system that is in existence at that point of time. From courses to curriculum to pedagogical practices, education policy sets the framework within which an educational system takes shape. In India the thrust of educational policies has been changing from time-to-time in response to the emerging socio-economic needs of the country. (Patel, 1968)

### **OBJECTIVES**

1. To understand the advent of English as a medium of Instruction
2. To justify the introduction of mother tongue in primary education as a main medium of Instruction.

### **REVIEW OF LITERATURE**

There is a danger of Indigenous languages going into oblivion. The intrusion of mother tongue as a basic language is to be observed. We have in our education system have been trained to work for Than create job opportunities. The student once chosen any subject must choose careers based on that subject. In the NEP 2020 4.11. high-quality bilingual textbooks and teaching-learning materials for science and mathematics, so that students are enabled to think and speak about the two subjects both in their home language/mother tongue and in English. As so many developed countries around the world have amply demonstrated, being well educated in one's language, culture, and traditions is not a detriment but indeed a huge benefit to educational, social, and technological advancement. India's languages are among the richest, most scientific, most beautiful, and most expressive in the world, with a huge body of ancient as well as modern literature (both prose and poetry), film, and music written in these languages that help form India's national identity and wealth. For purposes of cultural enrichment as well as national integration, all young Indians should be aware of the rich and vast array of languages of their country, and the treasures that they and their literatures containPg-14(MHRD, 2020)

The national education policy recommends reorganizing primary education, but it fails to address the question of students' learning abilities. According to the Pratham-Annual Status of Education survey from 2018, 73 per cent of students in class 8 are unable to read books above the second-grade level, and only 44 per cent can do simple arithmetic. The shortage of qualified teachers and the lack of the necessary number of teachers in schools are the main causes. In govt. schools most of the students do not have the minimum required facilities to ensure quality education. The schools are lacking in chairs, tables, and sanitary facilities, especially for girls. In secondary education, the government has focused on skill education. Such schooling will cater to blue-collar work only and continue to deepen inequalities since these are at the bottom of the workplace ladder. Focus on skill preparation at such a young age will restrict social mobility and limit the students to reach their full intrinsic value and potential. In 1964, the Kothari Commission recommended that 6% of GDP should be allocated to education but unfortunately, India never spent that recommended percentage of GDP on education. This has led to enter private players into education. The proliferation of private players and the lack of a fee cap can lead to education being inaccessible to all sections of society, especially the poor and marginalized. In terms of economic development and educational size, nations around the world make significantly more public investment (expenditure) than India.(Thakur & Kumar, 2021)

The introduction of western education was an event of great historical significance for the emergence of an education policy in India. Before the introduction of modern education, opportunities for learning were generally confined to a very small portion of the population. Those from castes and classes placed lower down in the social hierarchy had hardly any access to education. The pioneering work in the field of education under the British was done by missionaries. They did make efforts to spread education but often it was motivated by the desire for the spread of Christianity among the natives of India. One important result of the great efforts by missionaries was to stir up governments both in England and in India to realize that it was their duty to do something for the education of the people under their rule (Keay 1972).

**DISCUSSION**

The services of Indian students are most sought after all over the world. Be it USA for information technology, the health care workers all around the world, Indian education system has its own followers. The government of India has come out with the new education policy. A relook at it. The British have conquered the world. The language English has united continents and nations. Even India with its 54 states before independence is united with English. There is a danger of Indigenous languages going into oblivion. The intrusion of mother tongue as a basic language is to be observed. We have in our education system have been trained to work for ... Than create job opportunities. The student once chosen any subject must choose careers based on that subject.

It is a matter of fact that Indians have embraced the language of English. Not only the language but the dressing and greetings.

**The languages of India**

There are 60 languages, Mother tongue in India. It becomes a herculean task for the policy makes reformist and educationist to translate and author books in this language.

Language ↕	Total speakers (millions) ↕
Hindi	615
Bengali	265
Urdu	170
Punjabi	126
Marathi	95
Telugu	93
Tamil	81
Gujarati	61
Kannada	56
Odia	38
Malayalam	38
Assamese	15
Santali	7
Sanskrit	5

*Source:* [https://en.wikipedia.org/wiki/Languages\\_of\\_India](https://en.wikipedia.org/wiki/Languages_of_India)

**OBSERVATION**

It is a phenomenon that the majority speaker will dominate. The education system. The languages and cultures of Indians are very vast. The domination in Indian subcontinent, before ages is a well-known fact about the varnas, and caste system. Many questions need to be answered, whether we have many educationists to translate the various concepts to the minority mother tongue/ language.

The potential of the mother tongue as medium of education was neglected and even to this day the impact of this move is being felt in Indian education. Indian reformers such as Raja Ram Mohan Roy and others felt the need for a new type of education and were of the view that the introduction of English education in India would lead the country towards an age of renaissance. Macaulay in his Minutes stated that the aim of promoting knowledge of the sciences could only be accomplished by the adoption of English as the medium of instruction

English is a modern language and is more useful than Arabic or Sanskrit. Among the languages of the west, English occupies a pre-dominant position. In India it is the language of the ruling classes. Further, the chances of it becoming the language of commerce through the seas of east are very bright. The native Indians are willing to be taught in English and are not eager to learn Sanskrit or Arabic.

### CONCLUSION

The introduction of western education was an event of great historical significance for the emergence of an education policy in India. Before the introduction of modern education, opportunities for learning were generally confined to a very small portion of the population. Those from castes and classes placed lower down in the social hierarchy had hardly any access to education. The pioneering work in the field of education under the British was done by missionaries

Since education policies reflect the approaches of those in power towards education, they have a close bearing on the goals and strategies of the education system that is in existence at that point of time. From courses to curriculum to pedagogical practices, education policy sets the framework within which an educational system takes shape. English language was introduced by the British to train, Indians to help them in administration also for charity. We owe to the British for enabling Indians to access the outer world which was adept with English. India must leverage its indigenous languages with a balance not to lose its grip of this foreign language. As I, an Indian am expressing my views in English. This will pave way for the upliftment of vernacular languages in the mainstream.

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**EMPLOYEE ENGAGEMENT: A REVIEW STUDY ON FACTORS AFFECTING EMPLOYEE ENGAGEMENT**

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**<sup>1</sup>Monika, <sup>2</sup>Kirti and <sup>3</sup>Dr. Nisha Pawaria**<sup>1,2</sup>Research Scholar, Department of Commerce, Maharshi Dayanand University, Rohtak,<sup>3</sup>Assistant Professor in MBA Department, Vaish College of Engineering, Rohtak, Haryana**ABSTRACT**

*In today's era of globalization and industrialization, where there is intense scale rivalry in the business sector on a national and international level, human resource strategies have grown particularly crucial for the survival of companies. The success and failure of an organization heavily depend upon employees. In past research studies, engaged employees are one of the most important aspects of any organization. Many factors regarding employee engagement have been identified through a literature review, and these factors also impact employee performance and wellbeing. In modern times technology dominates, and human resources and management of human resources are receiving more attention in the time of competition. A company must adapt to the shifting demands of the environment if it hopes to grow and prosper. The most recent human resources best practise that every organisation has implemented globally is employee engagement. Employees or the human resource of any organization or company are considered the most crucial resource for success. This paper aims to understand the concept of employee engagement and to find out the influencing factors of employee engagement. The finding of this research study shows that employee engagement is an important aspect for employers and organizations. Rewards and recognition, leadership, pay and benefits, supervisor support, organization commitment, job characteristic, positive attitude, communication, job and resources, participatory culture and organizational culture are the most influencing factors of employee engagement.*

*Keywords: Engagement, Leadership, Communication, Management, Rewards.*

**INTRODUCTION**

In recent years, there has been a dearth of knowledge regarding staff management, particularly with employee engagement. In 1990, the impact of employee engagement was identified. The forefront of management theory and practise has been employee engagement. There are currently multiple books on employee engagement (Albrecht, 2010), special journal issues focused on engagement (Shantz, 2017), review articles (Saks and Gruman, 2014), and even several meta-analyses, in addition to the growing number of published studies (Christian et al., 2011; Halbesleben, 2010). As a result, much has been learned about employee engagement, and it still piques the interest of experts, professionals, researchers, and organisations, especially in light of reports on all levels of employee engagement around the world and its potential to help an organisation gain a competitive advantage. (Albrecht et al., 2015). Employee involvement is important and should not be undervalued. Employees who are highly motivated and enthusiastic about their work, the institution, and all other employees and managers involved, are said to be engaged. Employees that are highly engaged perform better for their organisations, produce better products and services, are more adaptable to change, have lower attrition rates, and engage in more activities.

Employee engagement is the term used to describe a worker's commitment to and interest in the values of their employer. It is a measurable indicator of how well or poorly a person feels about their job, coworkers, and organisation, and it has a big impact on how ready they are to learn and contribute at work. To begin, Kahn coined the phrase "employee engagement" in 1990, describing it as "employee involvement in the hospitality industry in India. Overview 377 is unlike other employee role conceptions such as job participation, commitment, or intrinsic motivation, it focuses on how people's psychological experiences at work influence how they present and absent themselves throughout task performances"(Khan1990). The company must raise and grow employee engagement practices, which requires a two-way association among the employer and the employees (Saks, 2006). Employee engagement can be enabled by creating an organizational atmosphere that encourages good emotions like involvement and pride. (Robinson,2006). Many researchers have proved in their research studies that a higher level of employee engagement completely reflects efficiency and other business performance result (Markos & Sridevi, 2010; Macey & Schneider, 2008; Vance, 2006; Gallup Incorporation, 2017; Baumruk & Gorman, 2006; Lockwood, 2007; Aon, 2012; Towers Watson, 2012). Similarly, different employee engagement measurement models developed, verified and recommended by researchers (Kahn, 1990; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002; Towers Watson, 2012; GP Strategies, 2013; Vance, 2006; Gallup Incorporation, 2017; Aon, 2011; Yuan & Lee, 2011).

**OBJECTIVES:**

The objective of this research paper is to understand the concept of employee engagement and identify influencing factors of employee engagement.

**METHODS:**

This research study is based on the literature review method. Through the literature review, researchers have come up with many factors that are commonly mentioned in these research studies.

**REVIEW OF LITERATURE**

1. (Srikanth & Saraswathi, 2018) This research study was based on the existing review of the literature. Employee engagement acts as a driver for the progress of an organization. Literature review had proved that employee engagement was an important aspect of human resources and played an important role in the over-development of an organization. This study also explained that employee engagement is required in different sectors like information technology, tourism, hospitality and retail industries, etc., according to working for environment and team. Workers' relationships were two main key factors of employee engagement and employee engagement is an essential antecedents for innovative outcomes. Employee engagement develops the employee satisfaction and satisfaction of employees directly related to organization performance; engaged employees are emotionally attached with the organization and continuous employee engagement always results in better performance.
2. (Llorens et al., 2018) This research study aimed to determine the association between employee performance and transformational leadership. This research study also examined the moderating effect of employee engagement in the relationship of these variables. According to this research, leadership is a major factor of employee performance and engagement and this research study was conducted in Bangladesh. Responses were collected from 200 employees working in SMEs in Bangladesh. This study showed that transformational leadership behaviours and employee performance are positively related. Confirmed that employee engagement plays a mediation role among these two variables.
3. (Osborne & Hammoud, 2017) The major goal of this research study was to understand the communication tactics some business leaders employed to involve their workforce. Four communication company leaders in Jackson, Mississippi, with at least a year of successful employee engagement experience, made up the study population. Interviews that were semi-structured were used to gather responses. After analysing the data, it was discovered that incentives and recognition, employee empowerment, forging relationships between leaders and staff, and engaged staff improved organisational and individual performance..
4. (Basbous & Malkawi, 2017) The goal of this study was to identify the antecedents of employee engagement that affect how a company performs as it gradually disintegrates due to high turnover, a challenging workplace climate, high absenteeism, and low loyalty. It was an exploratory research study. Employees in the banking sector were the subject of the study to ascertain the relationship between the predecessors consisting of employee engagement, employee communication, and employee development. Data were gathered using a standardised questionnaire, and statistical inference and multiple regression were used to analyse the data and test the relationship between the variables. According to this study, there are strong correlations between the factors employee engagement, employee development, and communication.
5. (Du et al., 2016) The research study examined the effect of creative process engagement on performance and also focused on the supportive working environment of employees given by the supervisors. In this research study, data were collected through a questionnaire and the population included four companies in China. In this research study, confirmatory factor analysis and Pearson correlation were used for data analysis. According to this research, study companies can motivate employees for more attention to creative process engagement to increase role performance.
6. (Popli & Rizvi, 2015) The main aim of this research paper was to explain the roles of employee engagement and leadership style as key drivers of service orientation. This research study examined three models' influence on service orientation. This research was studied empirically in nature and used a cross-sectional descriptive design. Data were collected from 400 employees of five service sector firms situated in Delhi – National Capital Region and regression and mediation analysis were used. The results of this study revealed that direct and indirect relationships between these variables and employee engagement is a crucial variable influencing employees' service orientation.

7. (Soni, 2015) According to this research study, engagement of employees was expressed as a strong barometer and highly valued by any business in any industry sector. Assessing the position of the organization's effectiveness and employee engagement proved an excellent measure. This research study found that if Organizations created a positive organizational working environment and offered rewards to their employees for appreciation from time to time, this leads to actively engaged employees. This research study also concluded that good organizational culture affected employee engagement. This research study was based on secondary sources of data.

## **INFLUENCING FACTORS OF EMPLOYEE ENGAGEMENT**

### **Communication:**

Employee retention, as well as engagement, is ultimately counting on productive communication. Employee retention is tough to attain with the lack of effective communication. Employee participation in decision-making and open, responsive, two-way communication are critical factors in retaining and engaging skilled people. Information can be shared in various forms, both material and immaterial. It is very crucial for the productive functioning of the organization and is an inspirational factor for the employees. The organization should follow the policy of open doors. Using efficient communication methods in the organization should allow for upward and downward communication. Employee engagement is expected to be vital if the employee is entitled to indulge in the decision-making process and has the chance to be witnessed by his supervisor. An employer-employee connection can only grow to its full potential and be firm only if both parties maintain a constant flow of communication. Internal communications play an essential role in employee engagement. To improve employee engagement it is essential to understand various methods to collect employee feedback and analyze it to work on engagement drivers. He says that, for the expansion of any company, it is essential to keep its consumers and members of the workforce satisfied, it can't bear to overlook internal communication as a vital aspect. As a result, the manager should encourage genuine employee relationships and internal communication. The main key to engage the employees in their work is effective internal communication; as a result, they promote output, yield, retention, and gain or profit of the company.

### **Leadership:**

Dominant leadership behaviour and potential support of the supervisor is the components of leadership. Influencing leadership behaviour increases followers' engagement, and reflects transparency and self. It was discovered that leadership is an essential antecedent of involvement. This component comprised indicators of effective leadership behavior and perceived supervisor support (PSS). Self-awareness, information sharing, transparency, treating people with respect, and upholding the organization's ethical standards are all characteristics of effective leadership behavior that promotes engagement. The literature on employee engagement claims that inspirational motivation is also a part of leadership. Leaders provide their team members' job purpose and challenge, as well as intellectual stimulation by encouraging employees' adaptability and innovation in a judgment-free environment. Employees feel more confident in their managers and leaders as a result, and they show their appreciation by trying harder to fulfill their duties inside the company. Psychological safety, which entails confidence in the boss, encouragement from the boss, and fostering a blame-free work environment, promotes employee engagement. proactive and adaptable behavior, Good leadership is critical for the organization's seamless operation. The quality of leadership in human resource managers directly impacts the organizational environment. Employee Engagement is a skill that a leader should possess to boost employee engagement. Without effective leadership, a business will not survive for an extended time. Leaders must actively demonstrate the organization's principles and goals. They must connect themselves with the company's principles and foster an open and equitable working environment for all employees.

### **Policies and Procedures**

Both HR policies and practices are included. Hiring methods, flexitime, regulations of balance between work and life, performance management, and security issues are all covered by HR policies and procedures. The managerial strategies and HR must work hand in hand while engaging with employees to build engagement culture in the workplace. Engaging necessitates working with a member of the workforce right from the initial interview until the termination of the agreement to maximize the person-job fit, which is critical for continued employee engagement. If we look at the bigger picture, work-life balance can be explained as a suitable level of involvement or 'fit' between the various roles performed by a person.

On the other hand, flexitime permits the workforce to change their initial and final timings as long as they are working for a specified number of hours. Flexitime and work-life balance and employee engagement are all linked together. A holistic measure that improves employee engagement is the management of performance which establishes relevant objectives and lays the foundation of engagement trust between employer-employee.

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**Work Life Balance**

Work-life balance refers to sufficient involvement or 'fit' between various roles. If management allows workers to work flexitime, starting and stopping their job according to their workload is much easier. It entails the upkeep and creation of welcoming and healthy work environments that enable employees to strike a balance between their professional and personal commitments, boosting loyalty and worker productivity. Individuals, their families, and communities are under a lot of stress as a result of the numerous competing responsibilities of today's workers, including childcare, housework, marriage, employment, and elderly parent care. Work-life balance is a crucial topic that has an impact on the workforce, businesses, and communities. The costs of overworked employees, including operating and productivity costs, absenteeism, punctuality, devotion, and performance, are coming to the attention of employers. Employers need to understand that effective employees are people who are both physically and psychologically fit.

**Perceived Organizational Support (POS)**

The common belief that a company values the contributions made by its members of the workforce and cares about their wellbeing is referred to as Perceived Organizational Support (POS). Perceived organizational support makes the workforce feel responsible for caring about the firm's welfare and helping the firm achieve its goals, as evidenced by higher work success and engagement with the company. Employees feel obligated to reciprocate when their employers do good things for them. Companies that naturally support their workers, are proud of them, and care about their needs will see a rise in perceived organizational support, as evidenced by a sense of trust and duty over time. Perceived organizational support is associated with several beneficial outcomes for the company. POS increases employees' engagement in their work to help the administration reach its objectives. POS increases in-role and extra-role performance and decreases absenteeism and turnover.

**Compensation:**

According to Khan, "good compensation policies increase the morale of the employees towards their job and Compensation also is considered to have a major influence on employee engagement." It comprises financial and nonfinancial elements like workforce assistance programmes, subsidized cafeterias, and travel discounts. Employees can be motivated to work in the organization if the organization has a proper compensation management system and a proper policy for compensation diminishes the cost of employment and the problems of attrition. To increase the level of engagement of the members in the organization, certain compensations and benefits should be provided by the organization.

**Training and Career Growth**

Training and career growth a crucial construct of engagement and is very beneficial for ambitious employees. Training, development, and learning can all be viewed as intrinsic motivators that support employees' personal growth goals by gratifying their need for relatedness and autonomy. It can also be seen as an extrinsic incentive because it gives employees the knowledge, abilities, and other resources they need to succeed on the job and improve their careers. Job resources such as encouragement from coworkers, useful remarks, and encouraging acts from the leader/supervisor, for example, can help employees minimize their physiological and psychological expenses at work, allowing them to execute their tasks more efficiently. It is an additional crucial factor in employee engagement. The interest in aspects of the profession that were previously dull and meaningless may be rekindled by learning new skills. Employees who improve their skills through training are more likely to participate completely in their work because they obtain satisfaction from mastering new activities. Both newly hired and current employees receive the knowledge and skills they need to accomplish their jobs properly.

According to Khan, "training and development activities are now equally important like other HR functions." It focuses on transmitting information and abilities for a particular job. Training allows you to improve the prominence of your organization's development operations. Training and development enable workforce members to perform successfully at the workplace, and therefore movement aids in the reduction of attrition. If an individual is hired for a certain job, they should get appropriate training for that position. One of the reasons for the member of the workforce turnover has been noted as a lack of abilities, emphasizing the need for training, retraining, and multi-skill training.

**Reward and Recognition:**

The firm should have a rich reward and identification system and specific remuneration and perks. The exact meaning of the word "reward" is "anything delivered by the firm to the members of the workforce in exchange for their production and contributions required of them. A reward can be monetary or in the form of incentives, and it can be intrinsic or extrinsic. A certificate or recognition, such as a commendation certificate or a worker of the month award, can be given as a reward. Rewards are given in the workplace in various ways, including

recognition, monetary incentives, prizes, no-expense trips, and free Employee Engagement items. However, "a reward is anything that a business provides in response to an employee's effort to incentivize them to do well and exhibit positive behaviour in the future (Khan 1990)."

### Health and Safety:

The organization should prioritize the employees' health and safety as it boosts their confidence and motivates and engages them in their work. HR managers are responsible for looking after the health and safety of employees at their workplace. If the organization doesn't take the initiative for the employees' health and safety, employee engagement levels will be low. Suppose there are appropriate methods and systems for the health as well as the safety of the members of the workforce. In that case, it highly affects the organization's productivity as the employees will feel secure while working in the organization. Their perceptions of safety and wellbeing determine employees' level of participation in the organization. Employees who are completely healthy and feel comfortable at work may devote their full powers and potential to their jobs. As a result, promoters must show concern for their employees' safety, health, and wellbeing to keep them motivated. When working circumstances are poor, employees are more likely to consider the costs of staying and being engaged with the company to be higher than the costs of quitting.

### Career Development Opportunities:

Career development opportunities greatly aid employee engagement. The company should ensure that the employees' jobs align with their career objectives. If this is the case, the workforce members will be happy and engaged. Employees at high-engagement firms have more chances to progress their skills, acquire new knowledge, and reach their full latent career development impacts on employee engagement, retention of the best employees, and opportunities for personal growth.

### Factors Influencing Employee Engagement

In this context, there is an incredible amount of diversity. Many authors have given their view point's regarding factors influencing employee engagement. Some of them are as follows:

**Table1.1 : Factors influencing employee engagement**

Sr. No.	Author's Name	Factors
1.	(Abukhalifeh & Som 2013)	Rewards and Recognition
	(Alarcon et al, 2010)	Leadership
2.	Kahn, W. A. (1990)	Pay and benefits
3.	Saks(2006), Kahn, W. A. (1990)	Supervisor support
4.	Saks(2006)	Organization Commitment
5.	Hackman & Oldham (1980)	Job Characteristic
6.	Richman & Saks (2006)	Positive Attitude
7.	Kahn, W. A. (1990)	Communication
8.	Vance (2006), Aon (2011)	Job and Resources
9.	Khan (1990), Aon (2011)	Participatory Culture
10.	Towers Watson (2012)	Organization's image

### CONCLUSION

The study also demonstrates that employee engagement decreases employees' intentions to leave their jobs and increases in innovative work-related behaviour. No matter how high-quality a training programme may be, engaging employees requires a long-term strategy and cannot be achieved in one training session. Organizations may increase employee engagement by boosting employee commitment, decision-making, and opportunity thinking. Employers must foster in their staff a sense of camaraderie, involvement, and good feelings about their work. Employee ideas should be prioritized, and opportunities should be offered for them to be heard. Transparency from senior leadership will also open up the workplace environment.

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**SOIL QUALITY AND SOIL HEALTH: A REVIEW****Dr. Sangita Kanawade Dandwate**

Department of Chemistry, S.M.B. S.T College Sangamner, Ahmednagar- 422605, India

**ABSTRACT**

The soil sample from Irrigated Areas of Sangamner Taluka in Ahmednagar district (M.S.) were analysed for selected physico chemical parameters to know their fertility status. For this purpose total 30 soil samples were collected scientifically as well as on the basis of topography from 10 villages of Sangamner Tahasil. Due to increasing demand for cash crops the practice of monoculture cropping pattern have further helped to deteriorate water as well as soil quality. The present study was conducted to characterize the morphological and physicochemical properties of soil. Soil samples were collected from region irrigated from Sangamner taluka were analysed. On the basis of these values average values of parameters analysed. The Physico-chemical soil properties viz pH, electrical conductivity, calcium, magnesium, sodium, calcium carbonate, organic carbon, organic matter and available NPK, particle size distribution, water holding capacity from command areas were studied in summer 2019. The clay percentage ranges from 25.51 to 51.53%. On the basis of particle size distribution three texture group i.e. clay, sandy clay and silty clay and analysis water holding capacity values ranges from 37.16 to 55.97%. The organic carbon content of the study area ranged from low to moderate (0.45 to 0.60%). Total nitrogen, available phosphorous and available potassium of the soils were in the range of 120.40 to 289.54 kg/ha, (10.41 to 38.6 kg/ha) and (312.2 to 770.4 kg/ha) respectively. Accordingly, they were rated as low to medium, very low to low, high to very high. The concept of organic farming is getting more popular due to its eco-friendly qualities and able to sustain the soil and food quality. Therefore, it is essential to evolve and adopt a strategy of integrated nutrient supply by using a combination of chemical fertilizers, organic manures and biofertilizers.

**Keywords:** Soil health, Physical and chemical parameters, irrigated region.

**INTRODUCTION**

Sangamner area is located in the northern part of the Ahmednagar district of Maharashtra State. Ahmednagar district is one of the largest districts of Maharashtra state. The Sangamner tahsil lies between 18° 36' N and 19° 1' N latitude and between 74° 1' W and 74° 56' W longitude. The Sangamner town is located on the confluence streams of Pravara and the Mhalungi rivers which is at a distance of 150 km from Pune, on Pune-Nasik National Highway No. NH-50. The area is drained by the Pravara river, which originates in the hilly region of Western Ghats at Ratangarh. Geologically, basalts underlay the Pravara basin. The Pravara river originates in the hilly regions of Akola tahsil. The river drains the study area along with its major tributaries Mula, Mhalungi and Adhala. The Adhala and Malungi originate on Patta fort in the western part and flow in an east to south-east direction before meeting the Pravara river at Sangamner. Due to Arther Lake and Ozar weir sufficient availability of ground water has helped to develop agriculture. Main water resources of tahsil

Sugarcane is a dominant crop and other vegetables like tomato, brinjal, chilli, bhendi, methi, etc. The villages, which are located on bank of Pravara river, practice cultivating of cash crops, vegetable which has lead to salty water due to chemical fertilizers. For study purpose we distribute Sangamner area into two regions Pravara basin and Mula basin

Sangamner tahsil includes the total 172 villages out of which nine villages have been selected for the study. The study area divided into three zones. In view the three types of areas for present work Agricultural practices using irrigation, agricultural areas with non irrigation and agricultural area using semi irrigation. In recent years agriculture development has been changed from conventional and traditional farming methods too more intensive practices using chemical fertilizers and pesticides with irrigation facilities. Continuous use of chemical fertilizers slowly changed soil properties; ultimately the production in long run is reduced [1,2]

**MATERIALS & METHODS:**

The quality test survey of the soil was conducted 2019. Thirty representative samples were collected in the depth of soil from different places of the city. Pravara agriculture land is distributed in three parts, irrigated area, non irrigated area and semi irrigated area. In all 30 soil sampling stations, from irrigated area were selected. While collecting soil samples the upper layer of vegetation, surface litter, stones stubble if any were cleared away and then layer of soil immediately below (0-20 cm) was collected in polythene bag.[3],[4] The list of 30 soil sample stations collected (Table 1) from study area Pravara region in summer.[5-8] The collected samples were analysed for physico-chemical soil quality parameter like soil pH, electrical conductivity (EC), organic

carbon (OC), available nitrogen (N), phosphorus (P), potassium (K) and particle size distribution of soil were characterised to assess the texture. The analytical methods used for soil analysis shown in Table 3.

**Table 1:** Soil sampling stations

Sr. No.	Name of the locality	Total no. of samples	Name of the samples
1	Khandgaon	3	S1
2	Nimaj	3	S2
3	Sangamner Kh	3	S3
4	Gunjalwadi	3	S4
5	Ghulewadi	3	S5
6	Sangavi	3	S6
7	Sukewadi	3	S7
8	Ashvi Kh.	3	S8
9	Jorve	3	S9
10	Kolhewadi	3	S10

**Table 2:** Analytical method adopted for analysis of soil

Sr. No.	Soil parameter	Method
1	pH	Potentiometer ( Richards 1968)
2	Electrical conductivity	Conduct meter ( Richards 1968)
3	Organic carbon	Wet oxidation(Jackson ,1973)
4	Available nitrogen	Alkaline perm agnate ( Subbiah and Asija 1956)
5	Available phosphorous	Olsen’s (Olsen’s et al1954)
6	Available potassium	Flame photometer (Jackson ,1973)

**Table 3** Textural analysis of soil from Pravara basin summer 2019 ( Average of 3 samples)

Parameter	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>	S <sub>8</sub>	S <sub>9</sub>	S <sub>10</sub>	Mean
Coarse Sand %	8.84	7.12	12.47	15.56	33.69	22.34	13.33	9.82	8.42	23.95	<b>13.16</b>
Fine sand %	35.71	39.69	30.78	12.78	12.37	11.05	10.41	13.56	18.13	12.15	<b>19.66</b>
Silt %	22.46	13.27	22.58	26.16	23.61	26.31	33.25	19.40	33.75	25.29	<b>24.60</b>
Clay %	25.51	34.12	26.13	38.60	27.65	38.75	37.15	51.53	43.17	34.79	<b>35.74</b>
Textural class	Sandy clay loam	Sandy clay loam	Clay loam	Clay loam	Sandy clay loam	Clayey	Clay loam	Clayey	Clay loam	Silty clay	-
Maximum water holding capacity %	37.16	39.10	49.09	50.45	37.26	48.10	50.79	51.31	55.97	50.52	<b>46.97</b>
Apparent specific gravity gcm <sup>-3</sup>	1.08	1.15	1.23	1.16	1.02	1.22	1.32	1.31	1.43	1.27	<b>1.21</b>
Absolute specific gravity gcm <sup>-3</sup>	1.90	1.85	2.16	2.12	1.95	2.26	2.07	2.06	2.80	2.35	<b>2.15</b>
Pore space %	44.10	46.85	56.66	60.29	42.15	57.65	56.77	50.59	65.28	56.44	<b>53.68</b>
Volume expansion%	8.01	5.81	7.81	8.14	7.68	6.75	7.50	6.52	10.45	16.52	<b>8.51</b>

**Table 4:** Chemical properties of soil from Pravara basin summer 2019 (Average of 3 samples)

Sr. no.	Name of the samples	pH (1:2.5)			Electrical conductivity (EC) ds-1			Organic carbon(O.C) %		
		Ave.	Min	Max.	Ave.	Min	Max.	Ave.	Min	Max.
1	S1	8.30	8.28	8.36	0.78	0.75	0.81	0.52	0.48	0.55

2	S2	8.40	8.34	8.48	0.41	0.36	0.45	0.45	0.41	0.50
3	S3	8.19	8.12	8.25	0.26	0.21	0.30	0.50	0.45	0.54
4	S4	8.40	8.30	8.53	1.10	0.95	1.20	0.58	0.52	0.68
5	S5	8.02	8.00	8.05	4.32	3.98	4.51	0.47	0.50	0.72
6	S6	8.40	8.34	8.48	0.81	0.72	0.92	0.55	0.45	0.66
7	S7	8.50	8.45	8.53	2.78	2.70	2.87	0.51	0.41	0.62
8	S8	8.21	8.18	8.27	0.94	0.87	1.05	0.60	0.45	0.68
9	S9	8.20	8.15	8.28	2.59	2.52	2.68	0.41	0.31	0.52
10	S10	8.31	8.27	8.37	1.85	1.79	1.90	0.55	0.47	0.64

Table 4: Continue

Sr. no.	Name of the samples	Available nitrogen (N) kg/ha			Available phosphorous (P)kg/ha			Available potassium (K)kg/ha		
		Ave.	Min	Max.	Ave.	Min	Max.	Ave.	Min	Max.
1	S1	148.52	135.11	161.94	16.04	10.60	21.48	365.11	360.1	370.12
2	S2	120.40	117.20	123.61	10.41	10.30	10.53	390.22	325.27	455.17
3	S3	210.11	208.31	211.92	17.24	14.0	20.49	611.7	608.39	615.0
4	S4	110.42	104.40	124.0	33.0	27.11	36.42	370.40	365.0	380.4
5	S5	145.16	148.20	134.45	28.0	28.77	29.50	509.62	488.0	514.8
6	S6	130.42	125.0	137.11	38.6	25.30	47.50	770.4	769.20	772.0
7	S7	283.90	277.20	285.45	31.8	24.10	38.92	312.2	309.0	319.13
8	S8	145.0	130.0	147.81	12.59	10.0	18.20	610.3	602.21	638.00
9	S9	289.54	273.50	290.50	16.0	11.70	16.78	680.2	679.53	687.0
10	S10	150.51	147.0	152.22	31.6	29.30	35.6	693.65	683.34	695.20

**RESULTS:**

This includes set of parameters like pH, electric conductivity organic carbon, nitrogen, phosphorus, potassium are considered, because of adsorption in regarded as a function of physical and chemical properties of soils. Some of the important chemical properties of the soil from the area have been described. Soil is useful in many respect for plant growth<sup>[9],[11],[12]</sup>. The clay percentage ranges from 25.51 to 51.53% On the basis of particle size distribution three texture group i.e. clay, sandy clay and silty clay. The soil of S1,S2 and S5 village are sandy clay loam textural class, and the soils from S3,S4,S7. and S9village were clay loam While pore space water holding capacity values ranges from 42.15 to 60.29 % and 37.16 to 55.97% ( Table 3).

Soil analysis of Pravara basin from irrigated, soil samples the  $p^H$  was observed above 7. It ranges from 8.02 to 8.50 reflecting alkaline nature of soils. It is observe a narrow range of variation in  $p^H$  in the area. (Table 4). Soil showed higher values from S2 ,S4 ,S6 and S7 in irrigated areas from Pravara basin respectively Electrical conductivity indicates total soluble salts content of the soils. It is used as a rapid method of appraising soil salinity<sup>[17-19]</sup>. In general low values of electrical conductivity. Soils from Pravara basin, irrigation area EC values ranges from 0.41 to 4.31 ds-1, lower values of EC recorded from Soil having alternating cropping pattern.

The organic matter is an important component of the soil that contributes to soil fertility. It is obtained by estimating organic carbon from the soil<sup>[12]</sup> The organic matter in a soil comes from remains of plants, animals it also includes grasses trees, bacteria, fungi, earthworm and animal manure organic matter assists in improving the soil fertility in variety of ways<sup>[21]</sup>. The data given in Table 4 shows that organic carbon ranges from 0.41 to 0.60 % . Conclusively from irrigation area soil sample show medium proportion of organic carbon content irrigated area in Pravara basin. Therefore, the soil requires fertilization through organic manure, farm yard manure.

Total nitrogen, available phosphorous and available potassium of the soils were in the rang of 120.40 to289.54 kg/ha),(10.41to 38.6 kg/ha) and (312.2 to 770.4 kg/ha) respectively. .Accordingly, they were rated as low to medium, very low to low, high to very high. ( Table 4) Conclusively from study area soil sample show low proportion of organic carbon. The higher nutrient fertility status in irrigation fields might be associated with intensive cultivation and plantation of cash crops like sugarcane, cotton, fruit crops etc. in which use of fertilizers as practiced by the cultivators Classification criteria the study area soils showed alkaline pH. The majority of soil samples low status of available phosphorous was found in all soil samples the generated nutrient status information can serve as an effective tool for farmers and policy makers in adoption of site specific nutrient management practices

**CONCLUSION**

Conclusively from irrigation areas, soil samples show a medium proportion of organic carbon. The higher nutrient fertility status in irrigation fields might be associated with intensive cultivation and plantation of cash crops like sugarcane, cotton, fruit crops, etc. in which use of fertilizers as practiced by the cultivators

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**CAUSES OF ANGER AMONGST MIDDLE AGED WOMEN****Dr. Mona Mehta**

Assistant Professor, Department of Family and Community Resource Management, Faculty of Family and Community Sciences, the Maharaja Sayajirao University of Baroda, Gujarat

**ABSTRACT**

*In the chaotic world of today, day to day life situations are filled with lot of negative emotions leading to anger. Fear, insecurity, threats, disappointments, and frustration are common problems in almost every society, which generate a lot of anger in human mind. Anger is a serious condition that can impact every area of a person's life. It can affect the social life, relationships, career, marriages, the workplace, parent-child interactions and sense of self-worth and purpose. Anger is associated with interpersonal conflicts, negative evaluations by others, erratic driving, occupational maladjustment, inappropriate risk taking, accidents. In today's fast growing, competitive, and technologically advanced life, positive emotions like self confidence, high self esteem have lost their meanings. The middle-aged women play a vital role of a homemaker, mother, housewife, employee in the office, which affects a number of aspects in their life and emotional expression including anger being one such aspect. In today's fast growing, competitive, and technologically advanced life, positive emotions like self confidence, high self esteem have lost their meanings. Many negative emotions especially insecurity, fear, worry, anxiety and tension can be transformed into the emotion of anger. Anger Management involves learning how to understand, manage and express anger in a way that neither an individual nor another is verbally, physically, emotionally or financially abused. It empowers people by teaching them about anger, how to have a healthy relationship with their own self and with others anger as well as gaining practical tools that can be used every day to help to stay in control and express anger in a 'clean', non-damaging way. Anger management teaches people to recognize frustrations early on and settle them in a way that allows them to express their needs, while remaining calm and in control. Coping with anger is an acquired skill which involves unlearning some of the bad behaviours that result from frustration. The research design of the present study was descriptive in nature. The study was conducted in Vadodara city. The study comprised of 120 gainfully employed middle-aged women who were in the age group from forty five to sixty years and who were working in various sectors like Banks, Multi- National companies and Academics- schools. They were selected through purposive sampling method. The data was collected through survey method by personally distributing the questionnaire to the respondents who willingly agreed to give the data. The data were analysed by applying descriptive (frequencies, percentages and means) as well as relational statistics ('t' test, Analysis of Variance and Co-efficient of Correlation). The weighted mean scores obtained by the respondents on the data revealed that amongst the different causes of extent of expression of anger experienced by the respondents, the weighted mean score on the personal causes was found to be most prominent as compared to the family and work cause. The statistical findings concluded that there was a significant relationship between the personal monthly income of the respondents with the extent of expression of anger. The findings of the present research would benefit the middle-aged women, academicians and organisations, psychologists and psychotherapists, counselling centres, behavioural scientists and meditation centres in identifying the causes of anger, the physiological and psychological effects of anger and the coping techniques to be followed to deal with anger among the middle-aged women in a better way.*

**INTRODUCTION**

Anger is a natural, adaptive response to threats; it inspires powerful, often aggressive, feelings and behaviours, which help people to fight and to defend themselves when they are attacked (Spielberg, 2013).

Anger is a serious condition that can impact every area of a person's life. It can affect the social life, relationships, career, marriages, the workplace, parent-child interactions and sense of self-worth and purpose. Anger is associated with interpersonal conflicts, negative evaluations by others, erratic driving, property destruction, occupational maladjustment, inappropriate risk taking, accidents (Howard Kassinove, 2015). The causes of uncontrollable anger are rooted in a variety of physiological, emotional, and mental health issues in woman.

Anger Management involves learning how to understand, manage and express anger in a way that neither an individual nor another is verbally, physically, emotionally or financially abused. It empowers people by teaching them about anger, how to have a healthy relationship with their own self and with others anger as well as gaining practical tools that can be used every day to help to stay in control and express anger in a „clean“, non-damaging way. Anger management teaches people to recognize frustrations early on and settle them in a way

that allows them to express their needs, while remaining calm and in control. Coping with anger is an acquired skill which involves unlearning some of the bad behaviours that result from frustration.

Anger may be caused due to various reasons. Anger includes mental, social and physical manifestations. The middle-aged women undergo a delicate but most important phase of their life on which their total future depends a lot and so they need to identify, control and learn to cope with their anger for improving their individual, family and for their work life. With the growing competition among the women in their life and the race for achieving the goals faster, the research on anger has become an important area to explore which motivated the researcher to conceptualize the present research in the selected locale. The findings of the study will be useful for the middle-aged women in managing their anger and could also benefit the other groups like youth or elderly in coping their anger and become healthy.

### **JUSTIFICATION**

Family is the basic unit of the society and it is primarily responsible for the nurture and development of its members and to a degree for the quality of surrounding atmosphere and the community in which it lives. Women play an important part in the life of the family. Their value is beyond measure and no amount of money can adequately compensate a woman for her work, and the bonding that she creates amongst her family members.

Women in their middle-age group are found to be working in demanding settings with long work hours, tight deadlines and professional pressures in competitive environments. Probably the women do not get time to fulfill her children's demands as well as performing regular home-making activities after working outside and returning home which creates feelings of anger and frustration over a period of time. This high intensity of anger when uncontrolled for a long period of time leads to many psychological and physiological problems like cardiovascular diseases, high blood pressure, asthma and chronic obstructive pulmonary diseases, diabetes, persistent arthritis and psychological effects like emotional disorders and stress, depression, frustration which affects her relationship with husband, children and parents, and also relationship with her colleagues at the work place. Anger also has various physiological and psychological reactions on women's health like; increased risks of hypertension and stroke, heart disease, gastric ulcers, and bowel diseases, as well as slower wound healing and a possible increased risk of some types of cancers. Proneness to anger has to be examined with regard to thoughts, physiological reactions and physical activity. With regard to the physiological reactions, some people are easily aroused and quickly respond to aversive stimuli. They rapidly become angry by bad smells, excessive heat and annoying noises. Others are slow to react and seem not bothered by such stimuli. Physical expressions of anger can be expressed in terms of sulking (to be silent, bad temper out of annoyance), banging the desk or hitting the wall (Howard Kassinove, 2015).

Since these causes are likely to affect a women's personal, family and work life, there is a need to control anger. Therefore the present investigation was carried out keeping the following objectives in mind.

### **OBJECTIVES OF THE STUDY**

1. The find out the extent of expression of anger experienced by the selected gainfully employed middle- aged women in specific related to family, work and personal causes.
2. To assess the extent of expression of anger experienced by the respondents regarding general causes.

### **DELIMITATIONS OF THE STUDY**

1. The study was limited to the middle-aged women between forty five to sixty years.
2. The study was limited to the gainfully employed middle-aged women of Vadodara city only.
3. The study was limited to the middle-aged women who were married.

### **HYPOTHESES OF THE STUDY**

1. There exists an association between the selected personal, family and situational variables and the extent of expression of anger by the selected gainfully employed middle- aged women.

### **METHODOLOGY**

The research design of the present study was descriptive in nature. The study was conducted in Vadodara city. The study comprised of 120 gainfully employed middle-aged women who were in the age group from forty five to sixty years and who were working in various sectors like Banks, Multi- National companies and Academics- schools. They were selected through purposive sampling method. The data was collected through survey method by personally distributing the questionnaire to the respondents who willingly agreed to give the data. The data were analysed by applying descriptive (frequencies, percentages and mean) as well as relational statistics („t“ test, Analysis of Variance and Co-efficient of Correlation).

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**MAJOR FINDINGS OF THE STUDY****1. Background Information**

More than one- half of the respondents were aged between 50 years to 55 years. The mean age of the respondents was found to be 51 years. Majority of the respondents were graduates. More than one- half of the respondent's personal monthly income was ₹ 26,001 to ₹ 38,000.

With regards to the type of family it was found that one-half of the respondents lived in the joint family and the remaining of the respondents were found to be residing in nuclear family. Almost one- half of the respondents lived in a medium sized family. Little less than one- half of the respondents had their monthly family income ranging between ₹ 70,001 to ₹ 90,000.

About two- third of the respondents had 3 years to 9 years of work experience at their workplace. Majority of the respondents had one hired help available in their home. Little less than two- third of the respondents distance of workplace from home was up to 2 kilometres.

It was also found that majority of the respondents were having good health status.

**2. Information About Extent of Expression of Anger in Specific Related to Family, Work and Personal Causes.**

The findings reflected that majority of the respondents experienced extent of expression of anger to a great extent due to family financial problem, unable to fulfil the demands of children, rigid and orthodox nature of family members, unable to manage time and energy due to hectic schedule and unable to fulfil the roles of a wife, mother and a daughter-in-law.

The data also indicated that majority of the respondents had experienced extent of expression of anger to a great extent due to feeling angry while performing lots of work at workplace, lack of appreciation for the efforts done, not getting recognition for the duties performed, feeling angry when boss or senior authority is being partial, unable to fulfil the demands at workplace and unable to meet the deadlines at workplace.

The findings further revealed that majority of the respondents had experienced extent of expression of anger to a great extent due to feeling angry when someone criticizes, unable to get enough freedom to take decisions, monotony of routine work at home and workplace, feeling angry while completing lots of work at home and workplace and not getting time for own self, unable to get recreational resources, feeling angry when taken for granted by others and feeling frustrated when excuses are given for not completing the work.

**3. Information about extent of expression of anger experienced by the respondents regarding general causes**

It was found that less than one-tenth of the respondents had experienced high extent of expression of anger. The major reasons experienced as revealed by the respondents for the above were due to things not going according to their way of thinking, felt like running away from the situation, were angry when others tried to take their undue advantage, were unable to compete with others at workplace and when they were blamed due to others mistakes. Whereas more than one- third of the respondents had experienced moderate level of extent of expression of anger when they had to wait for others to get their things done and were unable to control one's own temper.

**IMPLICATIONS**

- The findings of the investigation would make valuable contribution to the knowledge base concerning the anger management techniques embedded in the middle-aged women in employment and family organisations.
- The data of the present study would also be beneficial to the field of Family and Community Resource Management as women could gain effective anger management skills to deal with her anger provoking situations awaking in her personal and family life, so that her resources could be used in a productive direction while performing her home making tasks.
- The findings will be beneficial to the psychologists and counselling centres to know about the extent of anger faced by the women and help them to solve it by engaging in effective anger

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**THROUGH AN ARTIFICIAL INTELLIGENCE: CREATING AN EMPLOYEE EXPERIENCE PLATFORM**

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**Rajini G<sup>1</sup>, Sivasakthi Kumar<sup>2</sup> and Rahul Chandrasekar<sup>3</sup>**<sup>1</sup> Professor & Head /MBA (General), Director-Institutional Collaborations & MOUS,<sup>2</sup> Doctorate Research Scholar<sup>3</sup> Alumni MBA Integrated, School of Management Studies and Commerce, VELS Institute of Science, Technology and Advanced Studies (Deemed to be University), Chennai.-117, TamilNadu, India**ABSTRACT**

**Background:** *with the pandemic coming to a close, work technology is in more demand than ever before. Companies are scrambling to implement solutions that can help them manage employees better in these increasingly digital work environments. The Employee Experience Platform (EXP) aims to tackle this problem.*

**Method:** *Pulse surveys, Artificial Intelligence (AI) based decision making and a ubiquitous access web platform are all the requirements for an EXP. By gathering Employee voice – their individual opinion on the company, we can ascertain their satisfaction levels on the various aspects of the company or their motivation to continue their job. By hearing their voice, the company can find the chinks in their armor and bolster their employee engagement policy.*

**Findings:** *The study sheds light on the benefits of using employee voice as a metric in decision making. An order of operations for how an EXP should function was established. From the creation of surveys to the action plans on improving the current situation. EXPs are cyclic in nature and a well implemented one should have little maintenance.*

**Application:** *based on this study, EXP can be implemented on all companies regardless of size. They aid in understanding the employees and boosting their engagement towards the company*

**Keywords:** *Employee Voice, Employee Engagement, Employee Experience Platform*

**1. INTRODUCTION**

Human resource has mostly been seen as an onboarding and grievance handling division of a company. HR has evolved in the last 2 decades to ensure that the companies' most valued resource, the workforce, is able to perform at their best. But with the complex needs of modern jobs, HR teams lack the resources to tackle these problems. Through an integration of technology for all their processes keeps them nimble and able to deliver high value.

Artificial Intelligence or AI has risen in popularity in the last decade. It enables technological solutions that can automate tasks that require human input or intervention. Through Machine Learning (ML) we can train an AI to do highly specialized tasks like accurately monitoring performance of employees or predicting the trends in their behavior.

In creating an Employee Experience Platform, the HR and IT sides of the company have their work cut out.

The HR team is responsible for finding areas of focus for their company, the questions that will determine the state of the area and their response to the current state of the area.

The IT team will work in parallel, understanding the goals of the EXP, provide feedback on a technical level, formulate algorithms to dispense questions, set up ways to gather responses, store the survey data and finally, create a wrapper around the whole package to make it accessible by all the managers.

**2. MATERIALS AND METHODS****Employee Voice**

It is the employees' ability to express their opinion and them having a say on things that happen in the organization. Be it positive or negative, it is important for the employees that their voice is heard and actions are taken based on their input. Kwon & Farndale<sup>2</sup> say that "Employee voice is a behaviour intended to induce change and challenge the status quo, albeit to improve performance".

**Employee Experience Platform**

Josh Bersin<sup>4</sup> defined Employee Experience Platform as a "company-wide initiative to help employees stay productive, healthy, engaged, and on track". Bersin<sup>3</sup> also states that "EXPs shield employees from complex and heterogeneous backend systems and give employees a single place to go for a wide range of services. EXP

platforms can also enable AI, mobile apps, and cognitive interfaces to make employees' work lives more productive and engaging."

EXPs act as a "middleware" connecting various business processes, encompassing the entire employee journey, from onboarding to off-boarding and every touchpoint in between. It is holistic, focusing on all aspects of employees' day-to-day activities, from helping get work done to ensuring physical and mental wellbeing.

Anna Tavis<sup>1</sup> states that "Employee Experience (EX) has evolved from being primarily an HR project to coming into the centre of organizational strategy bringing together members of the leadership team". She believes that the impact of the pandemic has boosted the relations between HR and IT thanks to the necessity of remote work

Michael Rudnick<sup>5</sup> believes that the pandemic has transformed businesses and that the likelihood of going back to the previous ways of work is highly unlikely. He also said, "Employee Experience Platform (EXP) has been the perfect moniker to address many of these previously unrelated aspects of work"

### **THE NEED FOR AI IN HR**

HR and AI have not been used in the same sentence since the last 5 years. AI technology has improved to the point of commercial viability and the demand for such technology from the market has given rise to HR-AI platforms that offer complete insight of the company and its employees. As Pandey & Khaskel<sup>6</sup> put it, "From facilitating the employee onboarding process to handling their records right until their exit from the organization, AI is enabler to many employees' engagement tools that can help organizations retain its valuable assets, its talent."

## **3. ELEMENTS OF AN EMPLOYEE EXPERIENCE PLATFORM**

### **3.1 Surveys**

The Employee Experience Platform works on the principle of pulse surveys. These are short surveys that cover 1 or 2 areas that can be answered quickly. They are to rate the questions on a scale of 1-10, "1" being the most negative and "10" being the most positive. This helps in identifying the core strengths and weaknesses that the company has and sets a path of action.

The rationale behind choosing the focus areas is based on the traditional HR surveys and their target areas. The survey areas can include: Engagement, Diversity & Inclusion, Health & Wellbeing, Growth, Organizational Culture, Recognition, Reward or Pay & Benefits

The size and frequency of the pulse surveys are dependent on organizational size and their willingness on taking said surveys. The more frequent surveys are, the sooner trends in management emerge. These trends are used for long term regression analysis.

### **3.2 Analysis Using Enps**

ENPS or Employee Net Promoter Score is a derivative of the customer facing NPS system used to measure customer satisfaction. ENPS cannot be used in all focus areas. It is primarily used to measure satisfaction and loyalty factors. The key for eNPS is the study of 3 parts, dividing the respondents into 3 categories: Detractors, Passives and Promoters. Detractors are those who score 0-6, Passives who score 7-8 and Promoters that score 9-10. The formula for deriving an NPS score is: percentage of promoters - percentage of detractors = NPS Score

Since all the calculations are based on percentages, it is possible for an eNPS score to range from -100 to 100.

The overall NPS scores or team NPS score is derived from NPS scores of employees. The employees' responses to all the questions are averaged and a score is obtained. This score is used to put them into NPS categories. This is then used as the basis for the team NPS score

For a good eNPS score, anything over 0 is a positive sign. Around 10 is good and around 30 is excellent.

### **3.3 Data Processing**

Processing data quickly and efficiently is one of the goals of the Employee Engagement Platform. For this, Python serves as the best choice.

Python is a general-purpose programming language that has been used extensively in the field of AI and ML. It has all the necessary code to create an AI in the form of a "code library". Python runs and compiles fast. This is critical in an environment where software needs to be

Rapidly prototyped. Python also has the advantage of being interoperable between the 3 most popular Operating Systems, Windows, Mac and Linux.

An ingest process is done to load the platform with questions. During the ingest process, the questions for the survey are presented to the AI along with all the options that can be responded to with. The answers will also need to have weights/values assigned. The most positive response will have the highest weight and the most negative response will have the lowest weight.

The HR team selects the focus area that they want to target for the periodic survey. The AI then chooses the questions according to their last time presented. The ML algorithms can find this “last sent” data and allocate 4-5 questions per area.

The responses given are stored in a MySQL database. MySQL is a popular database storage solution. The responses given to the survey are automatically stored in the database, processed by the AI and await until the periodic survey ends.

The comments that are left by the employees are processed through AI sentiment analysis. Sentiment analysis allows the manager to understand the mindset of the employees and is therefore vital for the EXP. The comments are analyzed and through key words analysis like “satisfied” or “dislike”, we can quickly understand their sentiments. AI represents various sentiments as “positive”, “neutral” or “negative” to the manager.

### **3.4 Action Repository**

The term Repository is predominantly used in the field of software development. It is used as a term to denote the data structure of the files that the program uses. Much like how a repo keeps track of the files in a software, the action repo tracks the situation and the action to be taken.

The Action Repository contains all the actions that need to be taken for the responses that could be given. Creation of the repo is vital for a quick response from the management team. While these action plans are meant to tackle the problem, managers are free to implement their own solution if they feel like.

For every survey question, a set of action plans are drawn. These action plans are suggested based on the scoring for the question. If the net score is positive and shows no sign of problem, no action will be suggested. If the situation is adverse, a series of action plan steps are suggested to improve the situation.

By creating a comprehensive repo, it ensures that the feedback received is actively put to use to improve the employee experience and that their feedback matters. It is important that these changes that are implemented are followed through and they reflect positively in the next round of the survey.

### **3.5 Creating the Platform**

The “platform” part of the Employee Experience Platform comes last but it is the portion that the employees and the managers will interact with the most. Web-based platforms have exploded in popularity in the last decade thanks to the popularity of social media websites that have given rise to web-based solutions for all industries.

A platform built with a mix of JavaScript (JS) and Cascading Style Sheets (CSS) is the best way forward. JS acts as the backend to parse the response and structure the platform. While CSS helps decorate the platform. Since JS and CSS are ubiquitous throughout the internet, the platform can be accessed through any web browser.

A dashboard layout detailing the scores of the focus areas will be visible to the manager. They can then drill down to the individual questions to see the scores. They can define action plans of their own or accept the plans pre-defined as per the current survey cycle. Here the managers will have access to the comments that the employees leave on the survey.

## **4. CONCLUSION**

The demand for HR enabled IT services or Work technology has seen a sharp growth during the COVID-19 pandemic. Industries that were a sapling saw tremendous upturn, giving them utmost priority in a company’s growth strategy. The concept of employee voice has been around for over 2 decades but has risen in popularity due to the increasingly harsh economic conditions that we have been facing since 2008. Employees now demand more recognition, better communication and have become more self-aware. Factors like work life balance, mental health and fitness have now become talking points during hiring.

These increasingly complex requirements need a solution that is era appropriate, understand and respond to these demands. Establishing an Employee Experience Platform may be a start for companies that have a workforce that are not as engaged, motivated or feel that their concern is not heard out by the management.

IT has found its way into several of the management processes. It is now time that HR and IT synergize to create a system that better understands the employee, puts them in focus and listens to what they have to say.

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A company's number one strength is not their Fixed assets, nor their Intellectual Property or their customers, it is their Employees.

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**VASTITUDE OF DANIEL GOLEMAN'S SCALE FOR EMOTIONAL INTELLIGENCE ON JOB PERFORMANCE OF NURSES**

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**<sup>1</sup>Dr. Rajini G and <sup>2</sup>Aishwarya K**

<sup>1</sup>Professor & Head /MBA (General), Director-Institutional Collaborations & MoUs, School of Management Studies and Commerce, VELS Institute of Science, Technology and Advanced Studies (Deemed to be University), Chennai.-117, TamilNadu, India

<sup>2</sup>Alumni, School of Management Studies and Commerce, VELS Institute of Science, Technology and Advanced Studies (Deemed to be University), Chennai.-117, TamilNadu, India

**ABSTRACT**

*The research study tends to find out the Influence of Daniel Goleman's scale of emotional intelligence on job performance of nurses at a medical Centre at Chennai. How employees manage their emotions in the workplace that positively trigger employees to higher their performance. The objective of this study examined the relationship between emotional intelligence and job performance. Research design adopted for this study is descriptive research. The sampling that is chosen is convenience sampling size is 120 which is obtained through this study. The responses were recorded by conducting a survey with the help of questionnaire. The questionnaire has been designed in such a way so as to bring out the most accurate, which will enable the study to get the close vicinity of its objectives. The data collected by the survey has been appropriately analyzed and has been interpreted in a meaningful way to offer some suggestions and recommendations. The data has been put through a series of statistical tools (descriptive, regression, correlation coefficient) that will close down distance on the objective of the study. According to the hypothesis, the study reveals that emotional intelligence positively impacts job performance of nurses. The emotional intelligence is high and the employee performs their job more effectively and efficiently. Detailed data analyses, discussion and conclusion with limitation is directed.*

*Keywords: Emotional Intelligence, Job Performance, Nurses, Daniel Golman, Medical Centre, Hospital Management, Health Care*

**INTRODUCTION**

In the 1920 the organization elected people only based on intelligence quotient (IQ) after the theory of peter Salovey in 1990 the organization realized the importance of emotional intelligence. Emotional intelligence is the sum of IQ and EQ which drive the organization to a successive future. The definition of emotional intelligence "tis he ability to monitor one's own and other people's emotions, to discriminate among them and to use this information to guide one's thinking and action" (Salovey Mayr). Emotional intelligence is the factor in which the individual is aware, manage and respond to their emotion and of others.

During a crisis, practices are turbulent, and an individual's interest is often at odds with collective interests. The concept of emotional intelligence (EI) is normally associated with practice, and particularly within the scope of nursing, reflective of traumatic impact on various job experiences. Currently, EI is widely regarded as a central measurement affecting job performance (JP). This could be demonstrated as EI describes an individual's ability to manage emotions alongside cognitive processes as a means of motivating themselves with respect to both distal and proximal goals.

Emotional intelligence is a very complex construct which looks very easy on the surface, but it's not easy to deeply understand and not easy to develop.

Daniel Goleman, produced framework for emotional intelligence, this framework consists of five element motivation, self-awareness, self-regulation, empathy and social skills.

To manage and work with one's emotions, the effective practice of EI is something that can be taught, and Goleman argues that it ought to be a dominant component of professional development initiatives. He is convinced that job-specific expertise alone cannot improve performance. Rather, increased levels of EI are necessary to allow individuals to use novel skills successfully. Improving EI can thus drive balanced increases in both professional success and social performance. Goleman's effort has been the subject of significant research over the last two decades. A review of the current literature indicates that fundamental levels of EI may vary among practitioners of different professions, especially among healthcare professionals.

In addition, some components of EI are individual-centered; everyone is intrinsically motivated by certain psychological stages like confidence, confrontation, and the nature of stressors such as absenteeism and traumas. The same is true for healthcare providers, who rely on EI to a high degree. This is absolute for those

especially in positions requiring direct contact with patients, like physicians and nurses. Each healthcare position requires a specific set of competencies, and particularly human resources for employees to function adequately, and EI plays a substantial role among these.

In the healthcare context, in order to understand the factors driving institutional success, it is also imperative to accurately assess levels of JP. This can be understood as an attitude reflecting how an employee feels about their current job, and normally summarizes how the individual relates to the various aspects of their position. Additionally, JP is a reflection of how healthcare providers contribute effectively to their teams and is regarded as contingent on both internal satisfaction and EI. In social and professional psychology, EI is regarded as a fundamental predictor of organizational outcomes, especially JP.

For instance, emotions play a vital role in the practice of nursing, which demands both technical and psychological forms of expertise in patient care. Therefore, an individual who can thrive in a nursing role, and coordinate closely with doctors and other healthcare providers, is necessarily someone with sufficient EI to recognize and take advantage of his/her sentiments and thoughts.

In addition, the nursing profession is predominantly female, and previous studies indicate that women have higher average EI than men. The relationship between EI and JP is not a novel topic of study, as several previous investigations have attempted to better understand EI's involvement in moderating performance in the workplace. Several studies have explored quantifiable links between the indices and other characteristics that collectively lead to productive, professional, and economic activity. Also, previous studies have dealt primarily with management in general, but some have addressed healthcare services, including the field of nursing. In both contexts, EI is considered to be one of the main elements responsible for shaping performance. However, agreement is less widespread beyond this basic point. Since the emergence of EI as a concept, some health organizational behavioral researchers have reported varying results with respect to its effects on organizational culture. Some studies have argued that EI is more valuable than technical skills or cognitive abilities. For instance, social consciousness and relationship management are indispensable skills for successful leadership in any domain. These skills include elements of cooperation, team awareness, conflict management, and sympathy.

According to EI theory, leaders evincing these abilities have far-reaching effects on their organizations. Senior healthcare executives with high EI influence intermediate managers, who in turn influence on-the-ground staff members; in hospitals, these are the front-line caregivers. Trivellas et al investigated the impact of EI on organizational performance among nursing staff working in the healthcare sector and found a strong impact of EI on organizational performance linked directly to retention and job commitment. However, more exposure to crisis may lead to less EI among nurses, and in particular those in medical sections.

The Indian healthcare system confronted a pandemic in early 2020; the government has taken serious measures to minimize risks including partial, then full, curfew, and encouraging social distancing policy. This has led to pressure on healthcare professionals, particularly nurses, as they represent the first line against such risk. Their personal and social needs were drastically affected by many patients admitted to the hospitals.

Generally, Indian nurses are reticent in explicitly expressing how they feel; this is particularly the case in medical settings where behavior is often more formal. Emotional skills, and their effects on JP, are seldom addressed in Saudi health organizations. Thus, within Indian hospitals, EI is not a widely understood element of job performance among nurses working in various departments. Simply, previous research has demonstrated that nurses' intrapersonal and interpersonal motives affect their job preferences. The present work is designed to be the first to consider such influence during pandemics.

Additionally, this research introduces the impact of different constructs on different nurses' professions. The primary objective of this study was to explore the impact of EI on JP among nurses directly treating patients diagnosed with confirmed cases of COVID-19.

The performance of the individual defines their capability but the way the employer handles the emotion of the employee intelligence which makes the bridge more successive. The nurses gives best when they are satisfied mentally. Every individual behavior is influenced by environment and interacting and reciprocal with people.

## **REVIEW OF LITERATURE**

**Wadi B Alonazi (2020)** in his study of "The Impact of Emotional Intelligence on Job Performance During COVID-19 Crisis: A Cross-Sectional Analysis" stated that the study found clear evidence of strong links between nurses' levels of EI and their reported JP. It is recommended that EI may be treated as a valuable asset among nurses, and that it could be incorporated into healthcare practice guidelines and performance evaluations.

**Menges I Jochen (2009)** “Organizational emotional intelligence and performance”. This study investigated the impact of organizational emotional intelligence on performance. They proposed that organization emotional intelligence is composed of average levels of individual and collective shared norms, believe that shape the interaction, the 156 samples were collected and found that emotional intelligence is positively associated with operational performance, financial performance and innovation of a performance and negatively associated with involuntary absence.

**Sadovyy, Max (2021)** “Covid 19- how the stress generated by the pandemic may affect work performance through the moderating role of emotional intelligence”. The study aims to assess the moderating effects of emotional intelligence in the direct impact of the stress generated by the pandemic which impacts in job performance, the 1048 sample is taken from a multi occupational field. The essence showed that the high EI and low covid stress gained productivity. The result obtained the importance of emotional intelligence on improving productivity and reinforcing the role of EI as a protective variable that safeguard the worker and its moderating effect between the stress and the both indicators of EI and job performance by using Wong and Law emotional scale.

**Feather R. (2009).** Emotional intelligence in relation to nursing leadership: does it matter? The aim of the study is to Discuss the importance of studying emotional intelligence (EI) of nursing leaders and the job satisfaction of nursing staff. They study states that there is a need for further research in the area of EI of nurse managers in their role as leaders and the impact they have on the job satisfaction level of their nursing staff.

**Bratton (2011)** “The impact of emotional intelligence on accuracy of self -awareness and leadership performance”. This study aims to investigate the relationship between the emotional intelligence and job performance of the managers. The study found that the managers who overestimate their leadership abilities have a negative impact on their performance. There is a negative relationship between emotional intelligence and leadership performance for managers who overestimate their leadership abilities.

**Mojtaba Rafiee (2013)** “Investigating the effect of job stress and emotional intelligence on job performance”. This study was conducted by scholar management and behavioral science to find the factors which influence the rate of job performance. The study found that job stress influences emotional intelligence, organizational and moral intelligence but not on job performance and resulted that organizational and moral intelligence influence job performance but emotional intelligence does not influence job stress.

**Gerace, A., & Rigney, G. (2020).** Considering the relationship between sleep and empathy and compassion in mental health nurses. They examine how sleep may influence nurses' ability to empathize and provide compassionate care, both of which are fundamental aspects of their work. They begin by considering the unique challenges nurses face as shift workers and the impact of sleep on physical and psychological functioning. They examine how empathy and compassion drive nurses' attempts to understand consumers' perspectives and experiences and motivate them to want to help those in their care. Work directly investigating the relationship between sleep and these processes indicates emotional recognition and experience are hampered by poor sleep, with greater compassion towards oneself or from others associated with better sleep. Much of this work has, however, been conducted outside of the nursing or health professional space.

## **RESEARCH METHODOLOGY**

The research strategy used for the study of this project is by conducting survey. Survey is the collection of data from given population for the purpose of analysis of a particular issue. Here questionnaire is given to the respondents and made interaction with them for getting information. Questions were formed on both dependent variables (Job performance) and independent variables (Emotional intelligence).

Sample size refers to the number of items to be selected from the universe to constitute the sample. 120 samples have been taken for the purpose of this study. The research is restricted to conduct only among the nurses of Dr. Rela institute and medical centre (rimc). The questionnaire will have open ended questions and close ended questions.

Convenience sampling was adopted in this study. Convenient Sampling Technique is one of the Non-Probability Sampling Techniques.

## **QUESTIONNAIRE DESIGN:**

Section I: demographic details.

Section II: The standard tool of Emotional intelligence Scale devised by Daniel Goleman.

Section III: Self-reported questionnaire on individual job performance scale devised by Koopman.

**Reliability Test**

The reliability is the ability of an instrument to measure the variables used in the study consistently. The reliability of a research instrument can be defined as the extent to which the research produces same results on repeated measurements. The Cronbach’s co efficient alpha test is conducted to measure the consistency of the attributes used in the study. The higher value of Cronbach alpha indicates a greater consistency between the measures. it is observed that overall Cronbach alpha reliability is said to be 1.000 which is above threshold of 0.6. Hence, questionnaire is said to be reliable.

**Correlation Result**

In this study Pearson Correlation was applied to check the nature of relationship between self-awareness, motivation, empathy, self-management, relationship management and job performance.

**Table: 1**

		Total SA	Total SM	Total M	Total E	Total RM	Total JP
Total Self-Awareness	Pearson correlation	1					
	Sig.(2-tailed)						
Total self-management	Pearson correlation	.760**	1				
	Sig.(2-tailed)	<.001					
Total Motivation	Pearson correlation	.692**	.736**	1			
	Sig.(2-tailed)	<.001	<.001				
Total Empathy	Pearson correlation	.681**	.579**	.669**	1		
	Sig.(2-tailed)	<.001	<.001	<.001			
Total relationship management	Pearson correlation	.746**	.701**	.735**	.635**	1	
	Sig.(2-tailed)	<.001	<.001	<.001	<.001		
Total job performance	Pearson correlation	.898**	.777**	.783**	.672**	.803**	1
	Sig.(2-tailed)	<.001	<.001	<.001	<.001	<.001	

The result of the correlation shows that Self-awareness with respect to all the variables including dependent and independent, the value of P<0.001 which is significant. Self-management with respect to all the variables including dependent and independent, the value of P<0.001 which is significant. Motivation with respect to all dependent and independent variables, the value of P<0.001 which is significant. Empathy with respect to all dependent variables, the value of P<0.001 which is proved to be significant. Relationship management with respect to all dependent and independent variables, the value of P<0.001 which is significant. Job performance with respect to all dependent and independent variables, the value of P<0.001 which is significant. From the above, we can say that overall significance value is less than 0.001 which is positive. Hence, we accept alternate hypothesis. From this we can conclude that all the variables are positively correlated and there exists positive relationship between emotional intelligence and job performance.

**Regression Analysis**

The first hypothesis, the dependent variable is job performance on the independent variables are self-awareness(X<sub>1</sub>), self-management(X<sub>2</sub>), empathy(X<sub>3</sub>), motivation(X<sub>4</sub>) and relationship management(X<sub>5</sub>).

$$Y_1 = C_1 + A_{1a}X_1 + A_{1b}X_2 + A_{1c}X_3 + A_{1d}X_4 + A_{1e}X_5$$

Where c<sub>2</sub> is constant, A<sub>1a</sub>, A<sub>1b</sub>, A<sub>1c</sub>, A<sub>1d</sub>, A<sub>1e</sub> are regression coefficients. Thus the regression coefficients were executed.

H: Job performance does not depend on self-awareness, self-management, empathy, motivation and relationship management.

**Table No: 2.1** Model summary-1 self-awareness, self-management, empathy, motivation, relationship management and job performance.

Model	R	R square	Std. error of the estimate	R square change
1	.933	.864	3.59161	.870

a. Predictors: (Constant), relationship management, empathy, self-management, motivation, self-awareness.

From the above Table, provides inference that the ability of prediction for model was articulated by R value 0.933 and R<sup>2</sup> value 0.864 which shows 86.4% of variance exist in the dependent variable is from the independent variables. F- value is 152.702 showing that there exists a relationship between self-awareness, self-management, empathy, motivation, relationship management and job performance.

**Table No: 2.2** ANOVA - self-awareness, self-management, empathy, motivation, relationship management and job performance.

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	9849.027	5	1969.805	152.702	<.001 <sup>b</sup>
	Residual	1470.564	114	12.900		
	Total	11319.592	119			

a. Dependent Variable: job performance

b. Predictors: (Constant), relationship management, empathy, self-management, motivation, self-awareness.

**Table No: 2.3** sCoefficients-1 self-awareness, self-management, empathy, motivation, relationship management and job performance.

Model		Unstandardized coefficients		Standardized Coefficients	t	Sig.
		B	Std. error	Beta		
1	(Constant)	12.955	2.078		6.234	<.001
	Self-awareness	1.596	.171	.579	9.328	<.001
	Self-management	.161	.156	.061	1.036	.302
	Motivation	.524	.143	.216	3.657	<.001
	Empathy	-.047	.141	-.017	-.335	.739
	Relationship management	.496	.159	.181	3.124	.002

a. Dependent variable: job performance

From the above Table, it is inferred that the beta value is <.001 for variable 1 (self-awareness) and .302 for variable 2 (self-management) and <.001 for variable 3 (motivation), .739 for variable 4 (empathy) and .002 for variable 5 (relationship-management). There is a significant relationship between self-awareness and job performance (P value = .000). There is a significant relationship between motivation and job performance (P value = .000). There is a significant relationship between relationship management and job performance (P value = .000). Which is <0.05. There is no significant relationship found empathy and job performance since the P value is >0.05 Which is .739. there is no significant relationship found self-management and job performance the P value is >0.05 which is .302. Thereby the final regression equation is derived by the incorporating the coefficients as follows

$$\text{Job performance} = 12.955 + 1.596(\text{self-awareness}) + .161(\text{self-management}) + .524(\text{Motivation}) - .047(\text{empathy}) + 0.496(\text{relationship management}).$$

**CONCLUSION**

The research finding shows the impact of emotional intelligence on job performance among nurses, the purpose of study is based on objectives, to determine the relationship between emotional intelligence and job performance of employee and also key objectives of present study were examining the role of emotional intelligence on employee’s job performance and to analyse whether more emotionally intelligent people tend to show greater job performance.

Emotional intelligence on employee’s job performance and to analyse whether high emotionally intelligent people tend to show greater job performance. The result of present study reveals that employees with high level of emotional intelligence have higher level of job performance and these results are supporting the previous

studies. The study reveals that the employees with higher level of emotional intelligence are more adapt using their emotions to facilitate their performance at job. Employees with higher level of emotional intelligence more aware of how certain emotions influence their behaviour and their work performance at job and high EI employees more adapt to regulate their emotions in such a way that are associated with task requirement. so that employee are able to identify their own emotions, identify the emotions of other, regulate his/her emotions and also regulate emotions of others and also use his/her emotion to increase the productivity and achieve both individual and organization goal.

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**APPLICATION OF DATA MINING TECHNIQUES IN BANKING SECTOR MEDICLAIM INSURANCE**

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**Mr. Pratik Biswas**

Assistant Professor, ICFAI University, Jharkhand

**ABSTRACT**

*Among all types of insurance healthcare insurance is the most important one next to life insurance. Various insurance companies whether private or public are providing health insurance to their customers. Medici claim insurance is one of them. In recent years banks are also providing health insurance to their customers, popularly known as banking sector Medici claim insurance. It is a joint venture of bank and insurance companies, where bank acts as a beneficiary. In India private and public banks have few thousand branches, and few crore customers, which produce huge amount of data every year. To extract knowledge from this huge data a lot of data handling is required. Data mining may prove itself, fit for this purpose. This paper discusses how insurance companies, providing health insurance and bank as a channel selling this can benefit by using data mining tools and methodologies and thereby reduce costs, increase profits, acquire new customers, retain current customers and develop a relationship between customer and the employee.*

**1. INTRODUCTION**

In India insurance has a deep-rooted history. “The Oriental Life Insurance Company” was established in Calcutta in the year of 1818, the banking insurance came into existence in 1990.

Medici claim, also referred as Medici claim insurance, is a particular type of healthcare insurance policy. It provides hospitalization benefit to the bank customers. It is offered by public and private sector general insurance companies. In general, Medici claim insurance covers the expenses of hospitalization/domiciliary hospitalization in case of sudden illness or surgery/an accident/ surgery during the policy tenure. Medici claim insurance provided by bank to their customer is known as banking sector Medici claim insurance. Medici claim insurance is a contract between the insurance company and the bank customers (insured person) to cover the medical cost that might arise from illness, accidental injuries, surgeries and other medical complications. We need not require to have an accident to realize, that we should have a health insurance. If we visit any hospital or nursing home, we can easily see how insecure we are. No one is aware of diseases or accidents that can happen. It is always unexpected and unwanted incident. This can happen with anybody: educated /uneducated, service holder / business man or professionals. Traditional distribution channels of insurance companies are costlier. Since the population of insurable persons in our country is huge, it is not possible for them to distribute policies with their limited resources, due to cut throat competition among the insurers, companies have to face heavy distribution expense. Insurance companies with their relatively limited infrastructure were unable to sell their products throughout the country. To overcome this problem, they started using the distribution channel of banks and started selling the insurance products through it. Here banks play the role of beneficiary. The Medici claim insurance is useful for the banks, the insurance companies and the customers. Since this whole process required enormous data handling, and extract interpretation of data, the tools and techniques of datamining may prove best fit for that.

**2. LITERATURE REVIEW**

Due to merging of global financial markets, development of new technologies, universalization of banking industries and with the expansion of non-banking activities, the insurance industry has globally brought in new channels of distribution into existence. This has given rise to a new form of business wherein two big financial institutions have come together and have integrated all their strength and efforts to generate new means of marketing for encouraging their products and services. When these two join together it gives birth to “BANCASSURANCE”, it is the allocation of insurance products through the huge network of banks whereby, banks act as a distribution channel for providing varieties of banking and investment products and services [1]. Here banks and insurance companies both are in win – win position. The advantages for banks are: Productivity of the employees increases, customers get both the services under one roof, they can improve overall customer satisfaction resulting in higher customer retention levels, can leverage on face-to-face contacts and awareness about the financial conditions of customers to sell insurance products. the advantages for insurance companies are: Insurers can exploit the banks’ wide network of branches for distribution of products. The penetration of banks’ branches into the rural areas can be utilized to sell products in those areas, customer database like customers’ demographic profile, financial status, purchase and investment habits can be used to customize Medici claim Insurance and sell accordingly, again, since banks have already established relationship with

customers, conversion ratio of leads to sales is likely to be high. Further, service aspect by the bank employee can also be tackled easily [2]. Traditionally, insurance products were sold only through individual agents and they accounted for a major chunk of the business in retail segment. With the opening up of this sector to private players, competition has become more intense. Insurance industry specially, health insurance in India has been progressing at a rapid pace since opening up of the sector to the entry of private companies in 2000[3]. Thus, we can see that in order to sell, Medici claim a special type of health insurance, provided by the banks exclusively for their customers required few things: bank employee has to understand their customers properly, agents of the insurance companies tied up with the banks have to keep proper touch with the banks and after selling of Medici claim to the customers, they have to provide good service to them, in time of need. One thing is clear from the above discussion; it requires proper handling of huge amount of data. Here the success of both banks and insurance companies, provided health insurance to the bank customers required not only handling a lot of data, but at the same time to extract knowledge from those data. On the other hand, Data mining can be defined as the process of selecting, exploring and modeling large amounts of data to uncover previously unknown patterns. In the insurance industry, data mining can help firms gain business advantage. For example, by applying data mining techniques, companies can fully exploit data about customers' buying patterns and behavior [4]. On the other hand, satisfaction of the customer is must. Here also data mining technique can be used to convince them. Now a day's Customer Relationship Management (CRM) systems are adopted by various organizations in order to get success in the business. This also helps to formulate business strategies, and can be formulated based on the predictions given by the data mining tools. Data mining is a new technology which helps organization /businesses to predict future trends and behaviors. It also allows them to predict knowledge-driven decisions on the basis of data base/ data warehouse [6]. On the basis of the above discussion, we can see that, to study the purchasing behavior of the customer towards Medici claim insurance, it is required to understand customer's priority and the motivating factors, which motivate customers to opt for purchasing Medici claim insurance. The aim of this study is to analyze how data mining tools and methodologies can be used to study and predict, what are the different factors that affect a customer's preference over Medici claim insurance.

### **3. MEDICLAIM INSURANCE**

In India insurance has a deep-rooted history. "The Oriental Life Insurance Company" was established in Calcutta in the year of 1818, the banking insurance came into existence in 1990.

Medici claim, also referred as Medici claim insurance, is a particular type of healthcare insurance policy. It provides hospitalization benefit to the bank customers. It is offered by public and private sector general insurance companies. In general, Medici claim insurance covers the expenses of hospitalization/domiciliary hospitalization in case of sudden illness or surgery/an accident/ surgery during the policy tenure. Medici claim insurance provided by bank to their customer is known as banking sector Medici claim insurance. Medici claim insurance is a contract between the insurance company and the bank customers (insured person) to cover the medical cost that might arise from illness, accidental injuries, surgeries and other medical complications.

Traditional distribution channels of insurance companies are costlier. Since the population of insurable persons in our country is huge, it is not possible for them to distribute policies with their limited resources, due to cut throat competition among the insurers, companies have to face heavy distribution expense. Insurance companies with their relatively limited infrastructure were unable to sell their products throughout the country. To overcome this problem, they started using the distribution channel of banks and started selling the insurance products through it. Here banks play the role of beneficiary. The Medici claim insurance is useful for the banks, the insurance companies and the customers.

### **4. DATAMINING**

Data mining can be defined as the process of selecting, exploring and modeling large amounts of data to uncover previously unknown patterns [4]. Again, data mining software allow the users to analyze data from different dimensions, categorize it and summarize the relationships, identified during the mining process. Different data mining techniques are used in various fields of insurance sectors [6].

Now days every information is a data. It may be in the form of documents, graphical formats, and video or may be records. As the data are available in different format, it is very difficult to extract knowledge from these data. Data mining technique not only analyze these data but also take a good decision and maintain the data. So that, when the information is required the data is available and can be retrieved from the database and make a better decision .This technique is actually known as data mining or Knowledge Hub or simply KDD(Knowledge Discovery Process)[7][8].

## 5. RESEARCH METHODOLOGY

In general research methodology refers to the scientific and systematic way accepted to solve the research problem. The purpose of methodology is to decide method of solving the chosen research problem and the methods, tools and techniques used to find a solution to the outlined problem. The research methodology is undertaken in such a way that it will minimize errors in both the collection of data and analysis of the collected data. It is always possible that different problems on the same subject may be subjected to different types of analysis and there can be more than one approach to solve the problem. Choosing the right methodology can help suitability, efficiency and accuracy of the research.

### 5.1 RESEARCH QUESTIONS

On the basis of the findings of the literature review discussed above, the study attempts to find relevant answers to the following research questions:

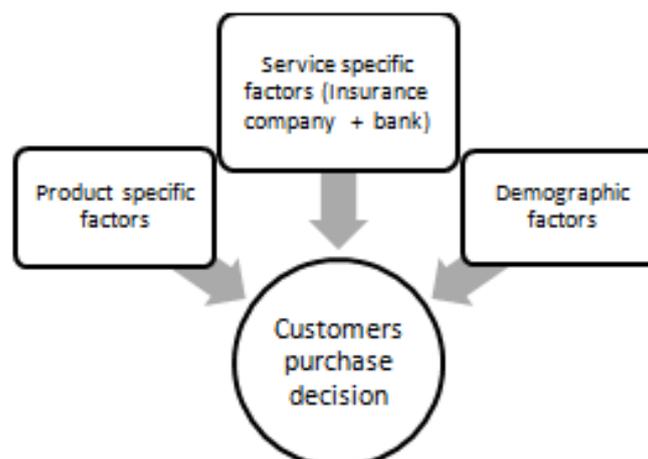
1. How do demographic factors like gender, occupation, academic qualification, age group impact intentions of purchasing Mediciclaim Insurance?
2. What are the factors which influence a bank customer to opt for Mediciclaim insurance?
3. Do all factors have a direct impact on intentions of customer? Are there any indirect but significant effects on intentions?
4. Is there any factor which has the maximum influence on the customer?
5. What are the product-specific and service specific factors which influence the bank customer?

### 5.2 Application Data Mining to Mine the Data

In order to get the answer, the above questions, we will see how various data mining tools and techniques help to provide required information about bank, bank customer and insurance company.

Building a mining model is part of the data mining process, which includes everything from the beginning. It includes task like asking questions about the customer data, creating a model(questionnaire) to answer the questions and finally to organize the model into a workable environment. This process can be explained by the following six basic steps:

1. Define the Problem: Here to understand the research question's objective, hypothesis properly so that what researcher wants to know from the target customer can be transparent, there should not be any ambiguity.
2. Prepare the Data: Here, on the basis of objective defined data is arrange from the response of the target customer. Here data cleaning is also done by rejecting incomplete questionnaire.
3. Explore the Data: Here the collected information from data set (response given by the customers) is arranged in the excel sheet for further calculation. This is done by keeping same type of information together. Here it is done by either clustering or by classification.
4. Build mining Models: Here in this part a conceptual model is prepared, which in general represent the relation among different factors related to the topic concerned. In case of Mediciclaim insurance, since it is a product, thus the influence of product specific factors, service specific factor and demographic factors for purchasing Mediciclaim insurance can be represented as follows:



5 .Explore and Validate the Models: Once the model is developed its validity is checked, so that the data can be processed using the model. Validation is the process of assessing how well our mining models perform against real data. It is important that we validate our mining models by understanding their quality and characteristics before we deploy them into a production environment. Here three points checking is very important, namely: accuracy, reliability, and usefulness.

6. The last step in the data mining process is to deploy the models to a production environment. Deployment is important because it makes the models available to users so that we can perform any of the following tasks:

We can use the models to create predictions and make business decisions.

We can create reports that let users request predictions, view trends, or compare models.

## **6. CONCLUSION**

Data mining is the process of sifting through large datasets in search of patterns and valuable information. It employs various methods of statistical analysis and uses machine learning techniques to turn massive amounts of data into meaningful insights. A simple example: by comparing the different customer's requirement, their paying capacity, gender, educational qualification, number of family member of different customers being treated for the same condition, the software can help bank employee to identify the right customer, who is willing to purchase Mediclaim insurance. At the same time insurance agency can identify the best insurance plan on the basis of knowledge acquired from the datamining technique.

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## FAST DISSOLVING ORAL FILM: AN EMERGING NOVEL DRUG DELIVERY SYSTEM

Dhengle Ashwini B, Miss. Gaikwad V. M<sup>\*</sup>, Dhengle Abhishek B, Kamble Sumedh P and Dhengle Abhijeet B

Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

## ABSTRACT

Oral route is most common and most simple route of administration. various formulations like tablets, capsules, lozenges, solutions, suspensions emulsions are administered through this route. Now a day, fast dissolving oral film is one of the novel most convenient dosage form for pediatric and geriatric patients. Fast dissolving films become more acceptable because of its ease of administration, fast onset of action, increased bioavailability as well as therapeutic efficacy. A number of drugs can be formulated as fast dissolving films, for example Antiemetics, neuroleptics, cardiovascular drugs, analgesics, antihistamines, antiasthmatic and drugs for erectile dysfunction etc. Various techniques are invented for the formulation of Fast dissolving film. Out of which, Solvent casting method is most preferable and easy method. Various polymers, plasticizers, colouring, flavouring agents are used for the formulation of film. This review describes about formulation methods of oral films used for motion sickness, technologies, evaluation parameters and at last applications of Film.

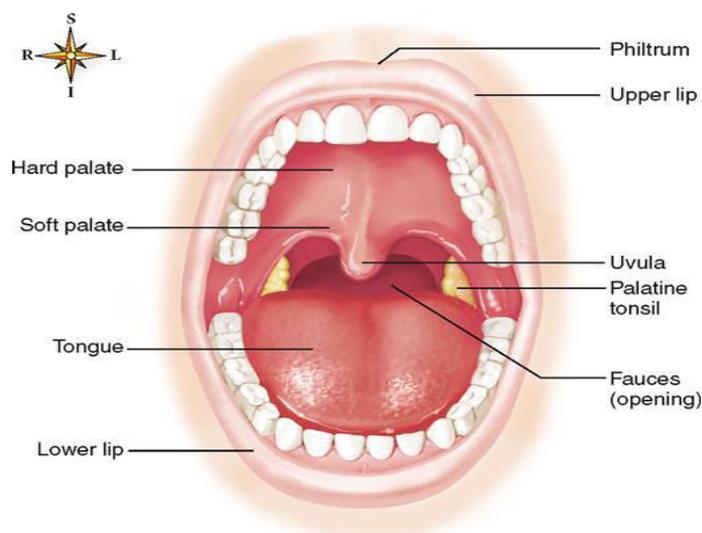
Keywords: Fast dissolving oral Film, Solvent casting method, bioavailability.

## INTRODUCTION

Oral drug delivery is one of the most preferred / accepted route of drug delivery. It is due to its easy administration, Patient compliance and cost effectiveness. Fast dissolving oral film is one of the recent formulations given through oral route. The oral film is a dosage form that employs a water dissolving polymer which allows the dosage form to quickly hydrate by the saliva, adhere to mucosa, and disintegrate within a few seconds, dissolves and releases medication when placed on tongue or oral cavity. Oral film is used for local action in mouth such as toothaches, oral ulcer, sore throat, cold or local anaesthetic etc. Many drugs like cough remedies, antiasthmatics, antihistaminic, erectile dysfunction drugs, motion sickness drugs, gastrointestinal disorders, nausea, pain and CNS drugs can be incorporated.

Paediatric and geriatric patients have difficulty to take tablet orally because of fear of choking, difficulty in swallowing tablets. To overcome the issues related to tablets, a new drug delivery system for the oral delivery of the drugs, was investigated which is known as Fast dissolving films.

## Structure of Oral Cavity:



## ➤ Mouth

**Mouth** is also called **oral cavity** or **buccal cavity**. It is divided into two parts i.e the vestibule, the area between the cheeks and the teeth, and the oral cavity. The oral cavity and vestibule are entirely lined by mucous membranes containing number of small glands along with the three pairs of salivary glands, they keep it moist. Specialized membranes form both the gums, which surround and support the teeth, and the surface of the tongue, on which the membrane is rough in texture, containing many small papillae containing taste buds.

### ➤ Salivary Gland

The organs that secrete saliva, a substance that moistens and softens food, into the oral cavity. Salivary glands may be serous, mucous, or mixed in secretion. Mucus is a thick, clear, and slimy substance. Serous secretion is liquid opalescent fluid containing water and proteins, such as the digestive enzyme amylase. The permeability of oral mucosa is 4–1000 times greater than skin. Drugs delivered through oral mucosa can bypass first pass metabolism and increase systemic bioavailability of drug.

### ADVANTAGES OF FAST DISSOLVING ORAL FILM:

The **Fast Dissolving Oral Film** Have Various Advantages Which Are:

- It can be taken without water.
- No risk of choking.
- More convenient for paediatrics, geriatric and dysphasic patients having difficulty in swallowing.
- Useful in situations such as motion sickness, acute pain, sudden allergic attack, asthmatic attack and coughing, where a rapid onset of action is required.
- More stable.
- Accurate dosing is possible.
- Drug can disintegrate and dissolve rapidly in the oral cavity because of larger surface area of films.
- Rapid onset of action.
- Increase bioavailability due to bypassing first pass effect.
- Reduce dose, enhances the efficacy and safety of the drug with low side effects.

### .Disadvantages

- High dose of drug cannot be incorporated into the oral film.
- Oral films are hygroscopic in nature.
- Dose uniformity is a technical Problem.
- Drugs which may irritate the oral mucosa cannot be administered by this route.
- They require special packaging for the stability and safety of product.
- Drugs which are unstable at mouth pH cannot be administered.

### Ideal Characteristics of Drug Used for Film Formulation:

- The drug to be incorporated should have low dose up to 40 mg.
- The drug should have smaller molecular weight.
- The drug should have agreeable taste.
- The drug should have good stability and solubility in saliva as well as water.
- It should have ability to permeate easily into the oral mucosal tissue.

### Components of Fast Dissolving Film:

Following ingredients are required for the preparation of fast dissolving film

Sr.No	Ingredients	Conc.
1	Drug	1-25%
2	Polymers	40-50%
3	Plasticizers	0-20%
4	Colouring, flavouring agents	0-40%

1. Drug (API)
2. Film forming water soluble polymers.
3. Plasticizers.

4. Saliva stimulating agents.
5. Surfactants
6. Sweetening agents
7. Flavouring Agents and Colours

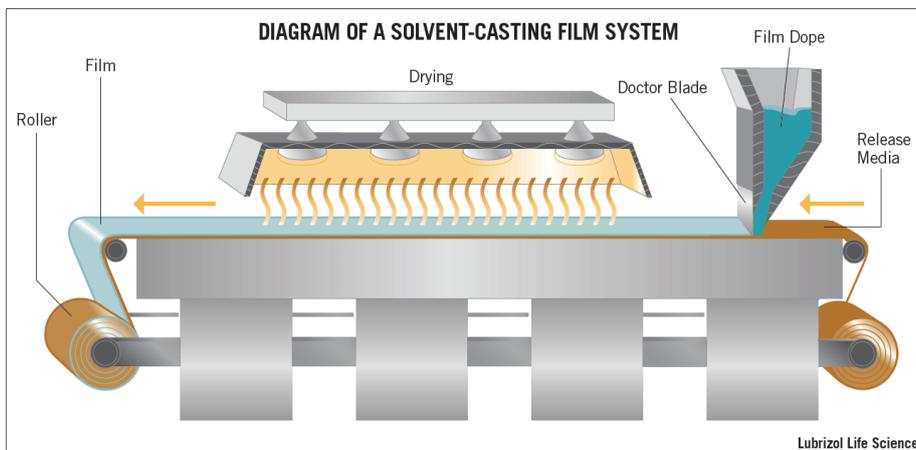
**Methods of Preparations of Fast Dissolving Film:**

Fast dissolving film can be prepared by following methods

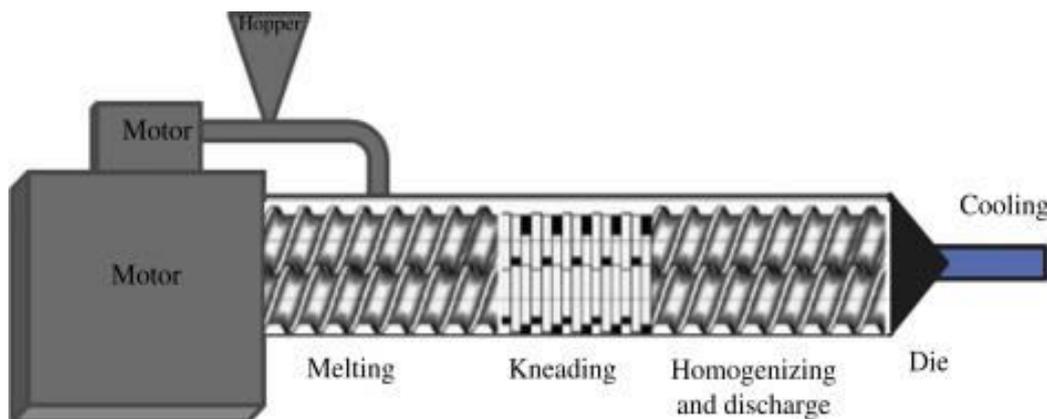
1. Solvent casting
2. Hot melt extrusion
3. Semisolid casting
4. Solid dispersion extrusion
5. Rolling method

**1. Solvent Casting Method:** This is the most commonly used method of preparation fast dissolving film. In solvent casting method, Fast dissolving films are formed by dissolving water soluble ingredients to form a clear viscous solution and the drug along with other excipients is dissolved in suitable solvent then both the solutions are mixed properly and finally casted in to the Petri dish and dried, the formed film is then cut into pieces of the desired size.. The final step, drying the film, removes the solvent and helps to obtain the finished product .The selection of the proper type of dryer is required in the final step of drying. Once the films are dried, cutting, stripping, and packaging of film is done.. The commonly available sizes of oral films are 3 x 2 cm<sup>2</sup> and 2 x 2 cm<sup>2</sup>.

Figure 1



**2. Hot Melt Extrusion Method:** Hot melt extrusion is widely employed method for the formulation of granules, sustained release tablets; transdermal and transmucosal drug delivery system. Film Formulation involves shaping a polymer into a film by using the heating process. the hopper is filled with drug carrier mix and is conveyed, mixed and melted by the extruder. Then die shaped melt in the desired film form. Melt extrusion was used as a manufacturing tool in the pharmaceutical company as early as 1971.



- 3) Semisolid Casting Method:** In this method, firstly a solution of water soluble film forming polymer is prepared. The resulting solution is added to a solution of acid insoluble polymer which can be prepared in ammonium or sodium hydroxide. Then appropriate amount of plasticizer is added so that a gel like mass is obtained. Finally the gel like mass is casted in to the films by using heat controlled drums. The thickness of the film is near about 0.015-0.05 inches.
- 4. Solid Dispersion Extrusion Method:** It is the dispersion of one or more active pharmaceutical ingredients in a solid State in the presence of hydrophilic amorphous polymers. The drug is dissolved in a suitable liquid solvent. Then the solution is incorporated into the polyethylene melt. Glycol, which can be obtained below 70° C finally the solid dispersion are formed into the oral films by means of dies.
- 5. Rolling Method:** In this method a solution containing drug is rolled on a carrier. The solvent is water or a mixture of water and alcohol. The film is dried on the rollers and cut into desired size and shape.

#### Characterization of Fast Dissolving Films:

**Ph of Film:** The pH was measured by using pH meter in which the electrodes are placed in contact with surface of the oral film which was previously wet with the help of water.

**Thickness:** Thickness of film is measured by using an electronic micrometer, by micrometer screw gauge or by digital Vernier callipers. The thickness of the film sample should be measured at five different locations (center and four corners), and the mean thickness is calculated. This is necessary to determine uniformity in the thickness of the film.

**Content Uniformity:** Content uniformity film is determined by any standard assay method described for the particular API in the standard pharmacopoeia. Content uniformity is determined by estimating the drug content in individual strip. Limit for content uniformity is 85–115 percent.

**Folding Endurance:** Folding endurance is determined by folding film repeatedly at the same place until the it breaks. The number of occasions without breaking, the film is folded and calculated as value of folding endurance.

**Tensile Strength:** Tensile strength is the amount of load or stress that can be handled by film before it stretches and breaks. It is calculated by the applied load divided by the cross-sectional area of the film as given below:

$$\text{Tensile Strength} = \frac{\text{Load at failure} \times 100}{\text{film thickness} \times \text{film width}}$$

**Percent Elongation** The selected films were cut into 2×2 cm<sup>2</sup> area and were pulled by two clamps to opposite side, placed over a scale, from both the sides till it cracked. The elongation was determined by checking the increase in length of the film. The percentage elongation of film was calculated by using formula

$$\% \text{ Elongation} = \frac{\text{increase in length} \times 100}{\text{original length}}$$

**Swelling index:** Each film sample is weighed and placed in a pre-weighed stainless steel wire mesh. Then the mesh containing film sample is submerged into 15ml medium (simulated saliva solution) in a plastic container. Increase in the weight of the film was determined at preset time interval until constant weight was observed.

**Degree of Swelling =  $W_t - W_0 / W_0$**

Where,  $W_t$  is weight of film at time  $t$ , and  $W_0$  is weight of film at time zero.

**Weight Variation:** Weight variation is studied by individually weighing 10 randomly selected films and by calculating the average weight of film.

**Disintegration Time:** disintegration test apparatus is needed to check Disintegration time of orally fast dissolving films. Disintegration time for ideal fast dissolving film is about 5 to 30 secs.

**In Vitro Dissolution Study:** The drug release studies are performed with the help of USP dissolution test apparatus (Paddle type). The temperature is maintained at 37 ±1°C and stirred at rate of 50 rpm. Each film is fixed on a glass slide. Then the slide is immersed in the vessel containing 500 ml of phosphate buffer pH 6.8. The aliquots of one ml are withdrawn at predetermined time interval of 2, 4, 6, 8, 10 minutes and replaced with equal volume of fresh buffer. The sink conditions are maintained throughout the study. The absorbance is checked by U.V. Spectrophotometer.

**Stability Studies:** stability of fast dissolving oral film is carried out by checking the effect of temperatures and humidity on the stability of the drug. films are stored in an aluminum foil and subjected to stability at room temperature. The sample can withdraw at 3 months and 6 months then after the % drug release and in vitro

dissolution studies were carried . Any change in % drug release and in vitro dissolution were noted .If there no major changes are seen, then it is stable.

#### Marketed formulations of fast dissolving oral film:

Brand name	Manufacturer/ distributor	API (strength)	Uses
Eme film	Delvin formulations,Pvt Ltd	Ondansetron 4 mg	Nausea&vomiting
Listerine cool mint pocket packs	Pfizer	Mint crystals	Mouth freshener
Niquistin stripes	Omega pharma ltd	Nicotine 2.5 mg	Anti-smoking
Zupelnz stripes	Monosol Rx	Ondansetron 8 mg	Ondansetron
Spiromont	Monosol Rx	Montelukast 10 mg	Asthma& allergy
Tadalafil stripes	Alpha pharma health care	Sildenafil 20 mg	Erectile function
Vitamin D3	Zim laboratories	Calciferol 2,000 I.U	Calcium supplement
Benadryl MC	Neil consumer health care	Diphenhydramine 25mg	Antihistamine
Triaminic	Novartis	12.5 mg	Antiallergic
Donepezil Rapid film®	Labtec	Donepezil Hydrochloride	Treatment of mild to moderately severe dementia of the Alzheimer's type
Suppress®	InnoZen®, Inc	Menthol	Mouth fresheners
Gas-X	Novartis	Simethicone	Anti Flatuating
Chloraseptic®	Prestige	Benzocaine 2mg	Local anesthetic
Suboxone	Reckitt Benckiser Pharmaceuticals Inc.	Buprenorphine and Naloxone	Sublingual film indicated for maintenance treatment of opioid dependence
Zelapar	ValeantPharmaceuticals International Inc.	Selegiline HCl	Treatment for Parkinson's disease.
Theraflu	Novartis	Dextromethorphan HBr	Anti allergic
Listerine	Pfizer	Cool mint	Mouth fresheners
Klonopin Wafer	Solvay Pharmaceuticals	Clonazepam	Treatment of anxiety
Setofilm	BioalliancePharm	Ondansetron	Prevention of Nausea and Vomiting
Sudafed PE	Wolters Kluwer Health Inc.	Phenyleprine	Relieving Congestion

**Table No. 2:** Examples of marketed oral thin films

#### Applications of Fast Dissolving Oral Film

The application of fast dissolving oral thin films is not only limited to oral fast dissolving system, but also expands to other applications like gastro retentive, sublingual drug delivery systems.

Fast dissolving oral film have number of applications, some of them are given below:

**Taste Masking:** Fast dissolving oral film dissolves in patient's mouth, it releases drug in mouth which comes in contact with taste buds, hence drugs having unacceptable taste should be masked by using various taste masking agents . In taste masking, drugs having unacceptable bitter taste can be microencapsulated into pH sensitive acrylic polymers by solvent evaporation and solvent extraction techniques. These polymers microspheres showed efficient taste masking property and complete dissolution in a short period.

**Controlled and Sustained Release Film:** Sustained release oral film is applicable in hospital preparations and various polymers like chitin and chitosan derivatives are used as a excipients. They contribute to expansion of application, decrease toxicity, wound dressings, oral mucoadhesive and water-resisting adhesive by virtue of their release characteristics and adhesion.

**Vaccines:** Fast dissolving oral films can be delivered in the form of vaccine which is cost effective, stable at room temperature so it is quickly dissolved in mouth and in saliva.

Currently, there are some vaccines in film dosage forms that are being developed. These vaccines include measles vaccine, salmonella vaccine, live bacterial typhoid fever vaccine, diphtheria toxoid vaccine, tetanus toxoid vaccine, poliomyelitis vaccine, rotavirus vaccine.

Fast dissolving oral film is used in the treatment various diseases like Hypertension, Diarrhoea, Allergy, Vitamins deficiencies, Vomiting Motion sickness etc.

**Topical Applications:** The use of dissolvable films may be feasible in the delivery of active agents such as analgesics or antimicrobial ingredients for wound care other applications.

**Gastro Retentive Dosage Systems:** Dissolution of the films could be triggered by the pH or enzyme secretions of the gastrointestinal tract, and could be potentially used to treat gastrointestinal disorders.

**Diagnostic devices:** Dissolvable films may be loaded with sensitive reagents to allow control release when exposed to a biological fluid or to create isolation barriers for separating multiple reagents to enable a timed reaction with diagnostic devices.

**Packaging:** Packaging of fast dissolving film in the pharmaceutical company is vital that the package selected preserve the integrity of the product. Expensive packaging, special care and specific processing are required during manufacturing and storage to protect the dosage of other fast dissolving dosage forms. A various packaging options are available for fast dissolving films. Single packaging is mandatory for films, which are pharmaceutical products; an aluminium pouch is the most commonly used packaging material. APR- Labtec has developed the Rapid card, a proprietary and patented packaging system, which is designed for the Rapid films. The selected materials must have the following characteristics

- They must protect the preparation from environmental conditions.
- They must be FDA approved.
- They must meet applicable tamper-resistant requirement
- They must be non-toxic.
- They must not be reactive with the product.
- They must not impart to the product tastes or odours.

#### **Packaging Materials:**

- **Foil, Paper or Plastic Pouches** The flexible pouch is can provide sufficient tamper resistance and high degree of environmental protection. A flexible pouch is formed during product filling by either vertical or horizontal forming, filling, or sealing equipment. The pouches may be single pouches or aluminium pouches.
- **Single Pouch and Aluminium Pouch:** Fast dissolving oral thin film drug delivery pouch is a peelable pouch for fast dissolving soluble films with high barrier properties. The pouch is transparent for product display. The foil lamination has zero rate of transmission for both gas and moisture. The single dose pouch provides protection for both product and dosage form. Aluminium pouch is one of the most commonly used pouch.
- **Blister Card with Multiple Units:** The blister container consists of two components a) Blister, which is the formed cavity that holds the product b) Lid stock, which seals the blister .The blister package is formed by heat softening a sheet of thermoplastic resin and then vacuums drawing the softened sheet of plastic into a contoured mold. After cooling, the sheet is removed from the mold. Then it passed to the filling station of the packaging machine. The previously formed semi rigid blister is filled with the product and bounded with the heat sealable backing material. The material used to form the cavity is plastic, which protect the dosage form from moisture absorption.
- **Barrier Films** Many drug preparations are highly sensitive to moisture and therefore require high barrier films. Several materials used to provide moisture protection such as polychlorotrifluoroethylene film, polypropylene. It is an excellent barrier to vapour and gas. But the drawback is lack of clarity.

#### **CONCLUSION**

The present study conclude that the fast dissolving oral film is more acceptable dosage form than other conventional dosage form .They are considered as a most important drug delivery system today due to their rapid disintegration and improved dissolution, bioavailability and efficacy etc. FDOF dosage form becomes an ideal dosage form for children and geriatric patients. It used effectively in the treatment of Motion Sickness,

Allergy, Asthma and also they have great importance during emergency conditions whenever immediate onset of action is required. This drug delivery is a good tool to pharmaceutical company for product life cycle management for increasing the patent life of existing product and it can be better option to increase therapeutic efficacy of various drugs in future.

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EFFECT OF SHORT FOOT EXERCISES ON LUMBAR PROPRIOCEPTION

Jyoti<sup>1</sup> and Meenu<sup>2</sup>

<sup>1</sup>MPT (M), Assistant Professor, Physiotherapy Department, Jagannath University, Bahadurgarh,

<sup>2</sup>Sports Physiotherapist, MPT(S)

ABSTRACT

*Background: Pes Planus (Flat-foot) is the most common conditions observed in the health practice. The objective of the study was to find out the effect of short foot exercises on lumbar proprioception among pes planus individuals.*

*Methodology: The study was conducted with sample of 30 subjects on the basis of inclusion and exclusion criteria. The subjects with pes planus undergone through the lumbar repositioning error test. All the subject performed short foot exercises for 3 weeks.*

*Results: The parametric test is used to check the difference between pre and post readings. Paired t-test is used to check the difference. The data analysis was done by statistical tests performed using SPSS software version 17.0. The value is 1.69 at the sig. Level  $p > 0.05$  for lumbar proprioception which is a significant level.*

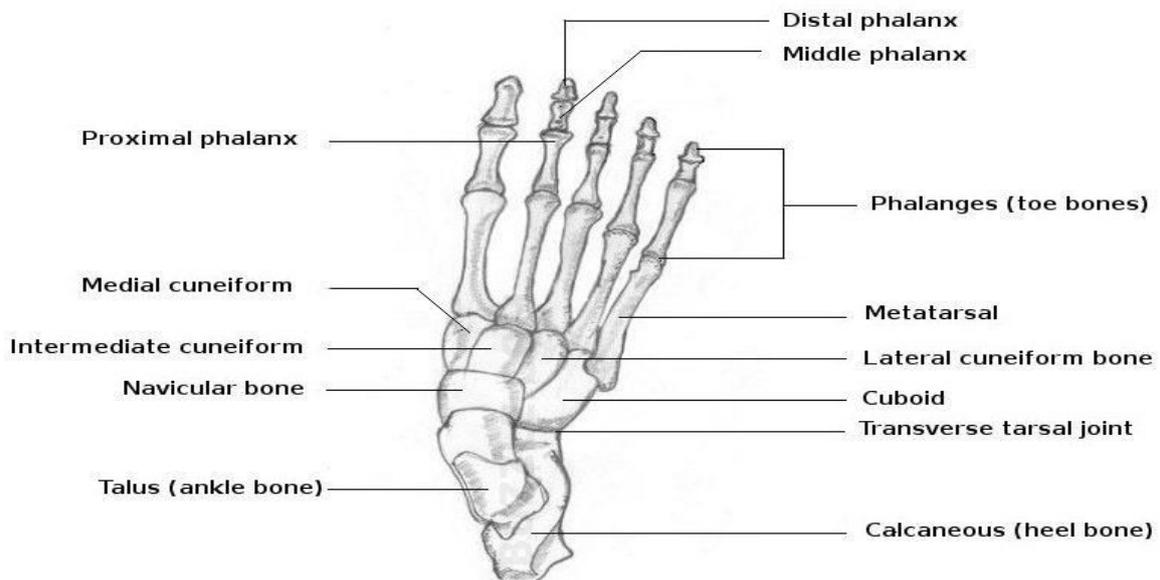
*Conclusions: Clinicians should recognize that pes planus foot has effect on lumbar proprioception. With regard to this study results, we concluded that based on kinetic chain system there is a significant effect of short – foot exercises on lumbar proprioception with pes planus individuals. So, we can ask the patient to do this exercise to improve lumbar proprioception.*

*Keywords: Lumbar Proprioception, Short foot exercises, Pes Planus, Repositioning error.*

INTRODUCTION

The foot is an important and complex element for the body structure, mainly for the postural system, as it is a means of confluence with the ground, and therefore calls for adaptations to the irregularities arising from the body or from the external environment. Approximately 80% of the general population has alterations in the feet, such as: calcaneal valgus, foot hyper pronation, flatfoot, heel valgus, mild subluxation of subtalar joint, calcaneal eversion and forefoot supination leads to pain in the lumbar spine can arise from changes in the plantar arch, either its decrease or increase<sup>1,2</sup>.

It is a complex structure with many articulations and multiple degrees of freedom that plays an important role in static posture and dynamic activities. The evolutionary development of the arch of the foot was coincident with the greater demands placed on the foot as humans began to run. The movement and stability of the arch is controlled by intrinsic and extrinsic muscles. The 26 bones of each foot, in addition to the tibia and fibula, are constructed such that they form a series of arches in the foot. The tarsals (comprising the calcaneus; talus; navicular; cuboid; and medial, intermediate, and lateral cuneiforms), metatarsals and phalanges—normally interlock to form medial and lateral longitudinal arches.<sup>3</sup>



Illustrated by Mukulika Mukherjee

Normal biomechanics of the foot and ankle can be divided into static and dynamic components. The static structures include the bones, joint surface congruity, ligaments and fascia. The dynamic components include the arthrokinematics of the tarsal bones and muscle function. The complex motions of the foot and ankle which promote the interdependence of the joint movement are called pronation and supination. The functional biomechanics of the foot and ankle are important in the weightbearing position or the closed kinetic chain. 60% of the gait cycle is weightbearing, better described as the stance phase. During the stance phase of gait the foot does not rotate. The tibia rotates medially at the heel strike and then talus follows resulting in pronation of the subtalar joint or a valgus heel.<sup>4</sup>

Upon weight acceptance, the foot moves into pronation and achieves maximum pronation in midstance. With pronation, the midtarsal joint, which consists of the talonavicular and the calcaneal cuboid articulations, unlocks with subtalar joint pronation and the foot becomes more flexible to adjust the underlying surface, assisting in maintaining balance.<sup>4,5</sup> It is a passive activity, in the closed kinetic chain that results from internal rotation of the lower limb and a medial shear to the foot. Pronation is initiated at the heel strike and controlled by an eccentric contraction of the supinators. Conversely, the midtarsal joint becomes locked in supination to maximize foot stability and provide a rigid lever for push off.<sup>5</sup>

Abnormal pronation and supination indicates excessive or restricted motion within the foot and ankle, secondary to soft tissue and/or bony abnormalities. A compensation for the deformity is necessary to allow the foot to function correctly during the gait cycle. A large majority of the time the compensation occurs at the subtalar joint. Consequently, the normal amount of pronation and supination required during the stance phase of gait occurs in addition to the amount needed to overcome the deformity. This is considered excessive pronation or supination.<sup>6</sup>

There are two basic types of abnormal pronation or supination. The first type of foot remains pronated or supinated throughout the stance phase of gait. This type of foot never re-supinates or re-pronates. The second type re-supinates or pronates at the wrong time in the stance phase. As a result of changes in the joint mobility, connective tissues changes occur, in addition to alterations in muscle function.<sup>6</sup> In terms of biomechanics, the body movement system is a set of kinetic chains working together to make up a motion. Kinetic chains are impaired due to postural disorders, poor physical conditions, repetitive patterns of movement, lack of core stability, reduced flexibility, biomechanical deformations, severe limb movements etc., which can predispose patients to complications such as LBP, sacroiliac joint pain, hip pain, and knee pain etc.<sup>2</sup>

Proprioception is thought to have a key role in maintaining normal spinal movement and stability. There are two sub modalities of proprioception: the sense of the stationary position of the limbs (limb-position sense) and the sense of limb movement (kinaesthesia)<sup>8,9</sup>.

The fundamental anatomical basis for the connection between the brain and limbs was first identified in 1826 by Charles Bell who said that “between the brain and the muscles there is a circle of nerve; one nerve (ventral roots) conveys the influence from the brain to the muscle, another (dorsal roots) gives the sense of the condition of the muscle to the brain.

Proprioceptive disturbances had the most significant effect in increasing repositioning-error among healthy subjects<sup>10,11</sup>. There are so many protocols or exercise programmes which is used in treatment of pes planus like arch taping and ankle bracing, insoles, foot orthotics, footwear, surgical correction and rehabilitation etc. the intrinsic muscles are largely ignored by clinicians and researchers, recently, SFE, which takes appropriate foot positioning into consideration, has been widely accepted by physiotherapists. Janda and Va Vrova found that SFE contracted the intrinsic muscles of the foot to increase the inner arch of the foot, thereby shortening the longitudinal arch of the foot.<sup>7</sup>

## **METHODOLOGY**

The study included 30 subjects aged 18-25, as the incidence of the pes planus has been reported to be 11.25% in a population of 18-25 years old students, who satisfied the inclusion criteria i.e Subjects having pes planus, Presently asymptomatic, subjects were excluded from the study having non- mechanical or pathological low back pain, Foot surgery, lower limb pain or any condition affecting measurement, Any neurological, traumatic, pathological and musculoskeletal disorder, Lumbar radiculopathy, Lumbar disc herniation, any spinal pathology i.e. lumbar spondylosis or stenosis.

## **PROCEDURE**

30 subjects of age 18-25 years were taken. Upon approval, a consent form was obtained from each of the subject prior to participation in the study. They were given verbal instructions for the study before taking their

consent. The subjects were assessed and included into study according to the inclusion and exclusion criteria. Pes planus was measured by navicular drop test and lumbar proprioception was measured by dual gravitational inclinometer. Then, those who all are included in the study were performed short foot exercises for 3 weeks. After completing 3 weeks, again the assessment was taken for lumbar proprioception.<sup>13</sup>

### Navicular Drop Test

The NDT is a highly reliable test method with an intra-class correlation coefficient of 0.971 and serves as a highly valuable measurement method that can determine injury and weakness of the musculoskeletal system that may cause changes in MLA height. The NDT measures the height of the navicular tuberosity by using a small rigid ruler, from the bottom in a non-weight bearing state, as the subject was in sitting position with both the feet on the floor and subtalar neutral position and in a relaxed position and then subsequently determines the degree of pronation of the feet by measuring the navicular height again while bearing weight as in standing and was instructed to keep equal weight on both feet. If there is a difference of more than 10mm, it is diagnosed as foot pronation<sup>13,14,15</sup>.



**Figure 1:** Measuring pes planus by navicular drop test

### Lumbar Proprioception

The upper edge of the sacrum and the lower edge of the T12 vertebra were palpated in subjects in a standing position. The subject was asked to stand in a comfortable position with his hands hanging without any effort toward the ground. Then two gravitational inclinometer are used to measure lumbar proprioception.

The middle of one inclinometer was put on the spinous process of T12, and the second inclinometer was set on the spinous process S1. The subjects were then asked to actively flex and when desired position was obtained, the subjects were told to hold the position for 10 seconds. While doing this his knees should be straight. The subjects were then moved in neutral position and asked to return the original position. The process was repeated three times and mean of the absolute value of these three measures was recorded.<sup>12,23</sup>



**Figure 2:** Measuring Lumbar Proprioception (pre reading)

### Short Foot Exercises

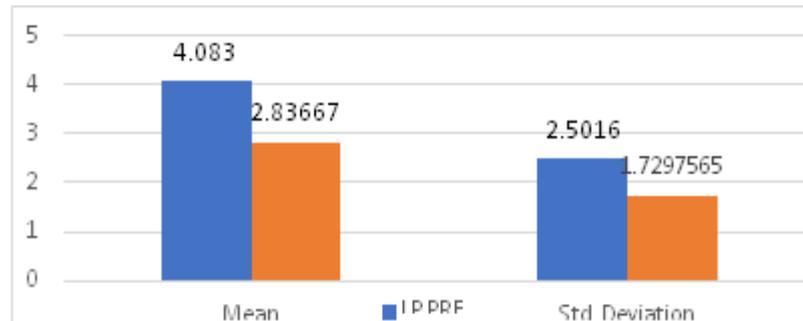
The patient was positioned in sitting and the exercise is demonstrated by the therapist to the subject. Then, the subject was instructed to pull the first metatarsal head toward the heel without toe flexion (Antero - posterior direction). Exercise protocol was given by 1 session/ day for 5 days/week for 3 weeks<sup>16</sup>.

### Data Analysis

The parametric test is used to check the difference between pre and post readings. Paired t-test is used to check the difference. The data analysis was done by statistical tests performed using SPSS software version 17.0.

**RESULT**

The descriptive data of 30 subjects with flexible flat foot either one or two, were an average age of 20.1 years old ( $\pm 1.074$ ) ; height of 154.74 cm ( $\pm 5.388$ ) ; weight 52.9 kg ( $\pm 3.067$ ) and BMI 22.1 kg/m<sup>2</sup> (1.254). The pre ( $4.08 \pm 2.50$ ) and post readings of ( $2.83 \pm 1.72$ ) of lumbar proprioception showing that there is an improvement in lumbar proprioception after short foot exercises. The t-value is 1.69 which was sig. at Level  $p > 0.05$  for lumbar proprioception which is a significant level.



**Graph 1:** showing pre and post reading of lumbar proprioception

The participants demographic characteristics in the study group, which consisted of 30 female subjects with flexible flat foot either one or two, were an average age of 20.1 years old ( $\pm 1.074$ ) ; height of 154.74 cm ( $\pm 5.388$ ) ; weight 52.9 kg ( $\pm 3.067$ ) and BMI 22.1 kg/m<sup>2</sup> (1.254). The study included 30 subjects aged 18-25, as the incidence of the pes planus has been reported to be 11.25% in a population of 18-25 years old students, who satisfied the inclusion criteria. Only female subjects were evaluated to avoid other sex confounding factors. Abtahian and Farzan in his study showed that females are most affected than males and also a study was conducted by Kachooosangh et al. showed that prevalence of flat foot in girl and boy students were 75.2% and 72.6% respectively, but this study was not significant.<sup>18, 20, 21.</sup>

The most important findings of this study were that a 3 week short-foot exercises program that significantly improved lumbar proprioception showing mean  $\pm$  sd of pre and post readings are  $4.08 \pm 2.50$  and  $2.83 \pm 1.72$  respectively. The result have supported the experimental hypothesis that there is improvement in lumbar proprioception with short- foot exercises performed for 3 weeks. Paired t-test was used to analyze the effect of intrinsic muscle strengthening on flat foot and showed that there was significant improvement in the lumbar proprioception.

To the best of our knowledge, there is no documented evidence describing any effect of pes planus on lumbar proprioception. However, studies shows that there is a relationship between pes planus and low back pain and low back pain and lumbar proprioception.

Knowing that the human body is a multi-segmental series where all the segments act together in closed kinematic chain activities and any change in the alignment of one segment is associated with compensatory changes in the alignment of nearby segments and joints. According to Myers, the anatomical and functional connections between the foot and the upper part of the body is the superficial back line. It contains the plantar fascia and short toe flexor, the achilles and the triceps surae, the hamstrings, the sacrotuberous ligament, the fascia of the sacrolumbar area, the erector spinae and the epicranial fascia. Due to significant role of the plantar intrinsic foot muscles, not only in relation to the foot, but also indirectly to the whole biokinematic chain, correct and optimal training of these muscles seems very significant. Previous studies have also indicated the presence of continuity and connectivity between fascia or muscle that may be anatomically distant from each other<sup>17</sup>.

The alteration in the foot mechanics can cause alteration in the whole body mechanics including, an internal rotation of the tibia and femur and consequently at the hip joint (Botle, 1981; Khamis and Yizhar, 2007). This internal rotation may make the head of femur move posteriorly. In order to regain postural balance, the trunk moves anteriorly to shift the centre of mass anteriorly and this forces the pelvis to tilt anteriorly in the saggital plane causing tension in the iliopsoas muscle and hip joint capsule, as a result of hip internal rotation, produced anterior pelvic tilt (Botte, 1981 ; Pinto et al, 2008) . Thus, the internal rotation of hip joint brought the greater trochanter forward and outward, that stretches the piriformis muscle that pulled the sacrum in antero- inferior position leading to anterior pelvic tilt in saggital plane (Schafer, 2000)<sup>27</sup>. The pelvis bone is an important segment situated in the center of the body and connects the movement of the lower limbs to the segmental motion of the spine, and is a functional link through which loads are transferred in a proximal and distal manner. Although suggested often, its position and movement both are related to foot posture<sup>23</sup>.

Understanding the relationship between a balanced pedal foundation and total postural health improves the effectiveness of individual case management. Forces of gravity work through the interrelated linkages of the feet, knees, and legs into the spine and pelvis. These forces also influence the patient's ability to respond to and maintain adjustments. The body functions as a closed kinetic chain, where movement at one joint influences movement at other joints.<sup>26</sup> Botte suggested that unilateral foot pronation produce SI joint dysfunction as well. Asymmetrical pronation, not just excessive pronation, could actually be the cause of low back pain due to the over-rotation at the pelvis needed to correct for the asymmetry in the distal limb. This over-rotation produces muscle imbalances, as one side of the body compensates for the dysfunction in the contralateral side which causing lower body kinetic dysfunction<sup>25</sup>.

The foot act as a terminal element in the kinetic chain. Hence, changes in the feet can be responsible for causing postural imbalance, as they adjust to the imbalances originating from overlying structures. According to Lin et al. kinematic changes and the resulting gait deviations may lead to lower extremity and lumbar pathologies later in life<sup>19</sup>. Nowadays, it is considered that the problem as a whole, from the feet to the head, is linked to postural adaptations throughout the body, which determines or is determined by the poor posture or some algic manifestation resulting from a specific condition<sup>1</sup>.

The kinetic chain theory of Professor Yanda says that, a disorder in one limb can affect other limbs and joints in the body. Joints away from the area affected by structural or functional disorder usually compensate for the disorder and therefore interfere with the normal pattern of weight bearing and inappropriate distribution of pressure and chronic damages especially in the musculoskeletal tissues. The structure and function of the ankle and foot when absorbing force and applying pressure have a large influence on the upper parts of the lower extremities and trunk<sup>2</sup>.

Proprioceptive training is important in any comprehensive rehabilitation program. As proprioceptive deficits may predispose the subject to reinjure through, decrements in the inhibition of complete rehabilitation. As with respect to lower extremity, mechanoreceptor located within the joints are most functionally stimulated when the extremity is positioned in a closed kinetic chain orientation and perpendicular axial loading of the joint is permitted, these exercises should be performed at various positions throughout the full range of motion because of the difference in the afferent response, that has been observed at different joint positions. Training to enhance proprioception or muscle strength is effective in promoting joint stability and maintaining balance<sup>26</sup>.

Stabilization training aiming to restore muscle and movement control has become an integral part of rehabilitation for the low back pain. Within these exercise programs, there is an emphasis on the neutral spine posture as the desired spinal position for both specific muscle activation techniques as well as for retraining patterns of trunk muscle co contraction.<sup>21</sup> SFE should be included early in proprioceptive re-training following an ankle injury, as it stimulates the neurocircuitry in the sole of the foot, which improves postural and core stability<sup>24</sup>. Janda and Va Vrorra stated that SFE maintains the position of body segments and improves trunk stability by stimulating the somatosensory afferent pathway from the sole. It was described as the first step in proprioception training. SFE produced more effective results and also, improved results for ankle instability were shown only SFE. The position sense of the ankle decreases with deformation of the foot, such as flat foot and foot pronation.<sup>13</sup>

There are various exercises designed to restore the neuromuscular control of the lumbar spine such as, proprioceptive training of the lower back, stabilization or coordination exercises. In Panjabi's model of the stabilizing system of the spine, an impairment within the passive support system may lead to joint instability, and has to be compensated by the coordinated action of the spinal musculature. Panjabi's model suggests that inadequate lumbar proprioception may contribute to impairments in the passive support system, and may also perpetuate the joint instability, leading to chronic pain. Lumbar stabilization exercises have gained popularity and credibility in patients with non-acute low back pain. Previous research provides more support to strength/resistance and coordination/stabilisation programs. Some authors also suggest adding strength/resistance training following motor control exercises.<sup>28</sup> There are various treatment interventions for the correction of pes planus including arch taping and ankle bracing, insoles, foot orthotics, footwear, surgical correction and rehabilitation. Several exercises have been used to strengthen foot muscles by decreasing the MLA angle in pes planus, such as picking up objects, unilateral balance activities, shin curls, toe towel curls and short- foot exercises<sup>21,22</sup>.

There exist several methods for measuring pes planus like visual inspection which includes direct visual inspection, visual inspection of foot photographs, visual assessment of foot prints; anthropological measurements of the foot; calculation of arch height index (AHI) as a predictor of the arch height; plain

radiography; footprints analysis; three dimensional (3D) motion capture system – oxford foot model, but the method which we used in this study is simple and easy to use, the navicular drop test<sup>7</sup>.

The instrument used in the study was simple and easy to use. The inclinometer was checked prior to data collection and it was made sure that it was zero. The procedures used to obtain and measure were quite simple, and were practiced before the final proceeding were done. The procedures used for the measurement of pes planus and lumbar proprioception have a high degree of reliability. The study was also limited to clinical measurement methods taken by a single therapist. The benefit of this is use of identical measurement method on each subject, thus reducing the potential sources of measurement error.

Due to the paucity of studies on the relationship between the kinetic chains and in the musculoskeletal system, pain and proprioception in musculoskeletal disorders, it is recommended that further studies be conducted in this area. Future studies with large sample size could have brought more clarity in observed trends. Research can be done on different working population and both genders. Research can be performed on different mechanical and pathological conditions of back. Duration of treatment protocol may be long to see the good effect of exercise.

### CONCLUSION

With regard to this study result, we concluded that based on kinetic chain system there is a significant effect of short – foot exercises on lumbar proprioception with pes planus individuals. So, we can ask the patient to do this exercise to improve lumbar proprioception. With this exercise one can improve their lumbar proprioception.

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**ANALYSIS OF ESSENTIAL MEDICINE PRICES IN A NORTH INDIAN STATE: USING WHO-HAI METHODOLOGY**

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**Miss. Manjeet Kaur**

Research Scholar, Department of Economics, Arts Block- 3, Panjab University (160014), Chandigarh

**ABSTRACT**

*Medicines play a very important role for saving the human race from various communicable and non-communicable diseases. They have helped the entire mankind to stay healthy. Even the human capital formation and growth of an economy is dependent on good health. Medicine prices played a very important role in determining compliance to treatment. Medicine prices are considered as an important factor for ensuring universal health coverage. So, in the present paper efforts have been made to analyze the public and private sector essential medicines prices in the state of Punjab, India. We have used the WHO – HAI methodology measuring medicines prices in the survey area. In the case of public sector the procurement prices (the prices at which the government procures medicines for free distribution) and the price of medicines prevailing in the surveyed Jan Aushadhi Kendras (JAKs) has been examined. For private sector the prices of Most Sold Brands and Lowest Priced Generic prevailing in the private medicine outlets / chemist shops has been evaluated. On an average the essential medicines' prices were reasonable. The essential medicines had been procured at reasonable prices in Punjab. Patient prices in the Jan Aushadhi Kendras were not excessive in the terms of Median Price Ratios (MPR). For 81 and 97% of the items/ products the medicine prices were acceptable (MPR  $\leq$  2.5) in the private sector MSBs and LPGs, respectively. It has been suggested to adopt more efficient procurement policies, increase consumer awareness about the efficiency of generic drugs and improve prescribing policies of doctors so that required medicines can be afforded by everyone.*

*Keywords: Essential Medicines Prices, Median Price Ratio, Procurement Prices, Jan Aushadhi Kendra (JAKs) or Generic Drug Stores, Private Pharmacy/Chemist Shops, Price Comparison, WHO – HAI methodology*

**INTRODUCTION**

One third of the global population lacks reliable access to needed medicines. (WHO, 2004) The situation is even worse in the poorest countries of Africa and Asia, where as much as 50% of the population lacks such access. While some 10 million lives a year could be saved by improving access to essential medicines and vaccines – 4 million in Africa and South-East Asia alone – a major obstacle to achieving this has been price. (Government of United Kingdom, 2004) High medicine prices are a major element behind the inadequate access to essential medicines. The major obstacle that limited the access to the required medicines is the increase in medicine prices in the private sectors that could not be afforded by most of the people. (Mendis et al., 2007)

In the constitution of World Health Organization (WHO, 2006) health is defined as “the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”. Health status of population has become a very important determinant of economic development of every nation. India's health sector lags far behind even to provide the basic aspects of health-care to its vast population. However, some of the health indicators have improved over time. For example, the life expectancy at birth for male and female population has respectively increased from 37.2 and 36.2 during 1951 to 68.4 and 70.9 during 2019. The infant mortality rate (IMR) has reduced to 32 in the reference year 2018 from 129 in 1971 and other indicators like under five mortality rate, the maternal mortality rate and crude death rate too have experienced significant decrease (World Bank, 2021 & Sample Registration Survey - SRS 2020). Health, being a basic need (Streeten et al., 1984), a consumption as well as an investment good (Bloom & Canning, 2003) is considered as a state subject and a very important component of United Nation's Millennium Development Goals, and hence constitutes an important determinant of development of a nation.

The COVID-19 pandemic has emphasised the importance of the healthcare sector and its inter-linkages with other key sector of the economy. It has showcased how a healthcare crisis can get transformed into an economic and social crisis. Health standard of the population is considered as an important indicator of development but quantitatively inadequate health services (Planning Commission, 12<sup>th</sup> FYP) and heavy burden of diseases lead to thirty two and a half million people to fall below the national poverty line in a single year. (Garg and Karan, 2005) Hence, medical expenditure can have an impoverishing effect. (Niëns et al., 2010) In India, expenditure on medicines accounts for 50% to 80% of treatment costs. (Srinivasan, 2011) The medicines form a large component of the healthcare out-of-pocket expenditure. (Dror et al., 2008; Engelgau et al., 2012)

It is argued that medicines are the most significant tool that society possesses to prevent, alleviate, and cure disease and a very large part of the world's population has inadequate or no access to essential and life-saving medicines. (UN Millennium Project, 2005) The role and relevance of medicines, vaccines and other supplies are critical, as these are considered to be important elements of the health-care system. (Bigdeli et al., 2013)

### Essential Medicines

The concept of “essential medicines” has evolved from military tradition, where medicines were very important part of goods to be carried into the battle zones (Greene, 2011). Before the participation of WHO in the essential medicine concept, governments had initiated task to fulfill the therapeutic needs of their residents by the provision of essential medicines (Mirza, 2008). In 1963, Cuba launched a list of basic medicines (Wirtz et al., 2017). The Maurice King's revolutionary book in 1966 provided an international checklist of basic medicines (King, 1966). After this, Tanzania and Peru introduced its national lists in 1970 and 1972, respectively. (Wirtz et al., 2017). In 1977, WHO published the first WHO Model List of essential medicines, including 212 medicines. (World Health Organization, 1977) WHO (2004) defines essential medicines as those which fulfill the healthcare needs of the majority of the population and are selected with due regard to disease prevalence, evidence on efficacy and safety, and comparative cost- effectiveness. The Declaration of Alma Ata (1978) included the provision of essential medicines as an element of primary healthcare (World Health Organization, 1978). Also essential medicines were considered as fundamental tool for preventing and treating diseases that are affecting millions of individuals throughout the globe. (Pillon, 2016) In 1977, WHO adopted the first Model List of Essential Drugs. (World Health Organization, 1977) The WHO Model List of Essential Medicines has been updated and revised in every 2 years by the WHO Expert Committee on Selection and the Use of Medicines. The latest (21<sup>st</sup>) Essential Medicine List was published in 2019. It includes 460 drugs that meet priority health needs globally. (World Health Organization, 2019).

In India, the first National Essential Medicine List was developed in 1996 (Sharma et al., 2010) and it has been revised over the period of time according to the disease pattern, prevalence and other factors. Current (4<sup>th</sup>) National Essential Medicines List of India was published in 2015 and comprised of 376 medicines categorized under thirty sections. (Ministry of Health and Family Welfare, 2015)

The present paper has been presented under the below given headings:

1. Data and Methodology
2. Essential medicine prices in the state of Punjab: An Overview
3. Essential medicines' Procurement prices in the Public Sector of Punjab
4. MPR of Patient Prices in the Public Sector Jan Aushadhi Kendras (JAKs) of Punjab
5. MPR of Patient Prices in the Private Sector MSBs or Most Sold Branded medicines
6. MPR of Patient Prices in the Private Sector for LPG or lowest priced generic equivalents
7. Summary

### 1. DATA AND METHODOLOGY

Punjab is a North Indian state with area of 50,362 square kilometers and population of about 27.7 million. The literacy rate is 80.4% in males and 70.7% in females. About 37.48% of the population live in urban areas. (Government of India, 2011) At the time of the present study there were 22 districts in Punjab and for collecting primary data; we have selected a sample of six districts. These districts have been selected on the basis of level of development and for this purpose district per capita income has been taken as an indicator. The per capita income data has been taken from Punjab- At a Glance Report (District – Wise) released in 2016 by the Economic Adviser to Government Punjab. On the basis of this data, the 22 districts were placed in three different categories i.e. High developed districts, Medium developed districts and Low developed districts. In the present study the medicine price related information has been collected from 29 private pharmacies located in the selected districts of Punjab. In the case of public sector the procurement prices (the prices at which the government procures medicines for free distribution) and the price of medicines prevailing in the surveyed Jan Aushadhi Kendras (JAKs) has been collected. (Table no.1)

**Table no. 1** Description of Surveyed Chemist Shops and Jan Aushadhi Kendras (JAKs)

District	Number of surveyed Chemist Shops (29)	Number of working JAKs	Surveyed JAKs (18)
Shaheed Bhagat Singh Nagar	5	2	2

Moga	4	1	1
Amritsar	5	7	4
Barnala	5	4	4
Mansa	5	4	2
Ludhiana	5	8	5

*Source:* Primary data

### 1. Essential medicine prices in the State of Punjab: An Overview

Overall median price ratios of surveyed medicines to MSH reference prices varied from 0.01 to 11.53 i.e. the prices of medicines to a patient in Punjab (India) varied between 79.03 times less to 11.53 times more than the price listed in the International Reference Price guide. Innovator Brand products or Most Sold Branded medicines showed a great variation from 0.04 to 11.53. The Lowest Priced Generics showed lesser variation ranging from 0.02 to 3.36. 78 of the 84 (93%) medicines found in the public sector Jan Aushadhi Kendras (JAKs) have MPR less than 1 which indicates that the patients are purchasing these medicines at very reasonable rates. The Punjab govt. has been procuring medicines (107 medicines for which price data was available) at the median MPR of 0.29. This indicates that the govt. is procuring medicines at very reasonable/efficient prices. (**Table no.2, Figure no.1**) 24 (19%) out of 127 Innovator Brand or Most Sold Brand products and 3 (3.33%) LPGs out of 90 products fell into excessively priced medicines. (**Table no.3**)

**Table no.2:** Median Prices Ratios (MPR) in Public and Private Sector

Sector	Type and No. of medicines	Median MPR	25th percentile	75th percentile	Minimum MPR	Maximum MPR
Public	JAK ( n = 84 )*	0.45	0.22	0.75	0.01	1.89
	Procurement ( n = 107)	0.29	0.17	0.41	0.02	3.82
Private	MSBs ( n = 127 )	1.13	0.60	1.93	0.04	11.53
	LPGs ( n = 90)	0.68	0.33	1.03	0.02	3.36

*Source:* Field survey

Note: Jan Aushadhi Kendras are denoted as JAKs

Most Sold Branded Medicines are denoted as MSBs

Lowest Priced Generic medicines are denoted as LPGs

\*the number in the parenthesis indicates the number of medicines/items for which the median prices or the results has been compared.

The collected data on medicine price has been compared with the International Reference Prices (IRP) given by Management Sciences for Health (MSH) (**Frye, 2016**) that serves as an external standard to facilitate national and international comparison. At the time of this survey, there were 218 essential medicines listed in the Essential Medicine list of Punjab (**Government of Punjab, 2017**). For 137 International Reference Prices were available. Unfortunately the International Reference Prices (IRP) given by Management Sciences for Health (MSH) has not been published since 2016 (2015 Edition published in 2016). So we have to adjust the International Reference Prices for the year 2018. For this purpose we have used the Wholesale Price Index (WPI) for Manufacture of pharmaceuticals, medicinal chemical and botanical products. (For calendar year 2015-2018) The data collection was started in the month of October, 2017. So, the average exchange rate for the month of October, 2017 has been used to convert the IRP into Indian Rupees. According to the WHO's survey methodology the exchange rate prevailing on the first day of data collection is used to convert the IRP into respective currencies. Since, the present study used a large number of medicines (as compare to WHO's 50 medicines) for which data has been collected by a single person instead of team, so it took around one year to collect the data. Majority of the data has been collected in the earlier months of 2018. For each available medicine, their median price has been calculated on per tablet basis, in the case of tablets or capsules and per milliliter or ml in the case of injections etc and then they have been compared with the IRP expressed as Median Price Ratios (MPR). By patient prices we mean the prices, a patient pays when he/she buys a medicine from a public or private sector pharmacy.

For 84, 127 and 90 medicines in the public sector outlets, MSBs and LPGs IRP data was available. In the case of Public procurement of medicines, for 107 items IRPs were available. So the MPR has been compared for this number of medicines only.

Medicine prices has been presented as median price ratio (MPR) i.e. the median unit price across the surveyed outlets divided by the International reference price, both in local currency. If MPR is 2, it means that the local medicines prices are two times greater than the international reference prices. (WHO-HAI, 2008)

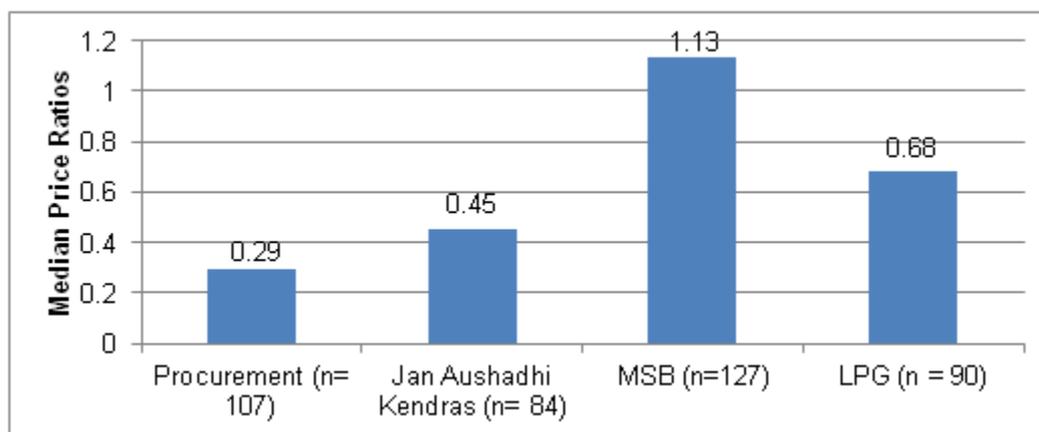
$$\text{Median Price Ratio (MPR)} = \frac{\text{Median Local unit price}}{\text{International Reference unit price}}$$

MPR is the standard indicator to present the data that allow international comparisons.

The following cut-off points MPRs given by Gelders et al. (2006) represent acceptable local price ratios:

- Public sector – patient price:  $\text{MPR} \leq 1.5$
- Private retail pharmacy – patient price:  $\text{MPR} \leq 2.5$

MPRs above these values to represent excessive local prices.



Source: Field Survey

Figure no.1: Median Price Ratios in the Public and Private sector of Punjab

Table No.3: Comparison of number of medicines with different range of median MPR in both sectors

MPR	Public Procurement	Public Sector Outlets (JAK) (84)	MSBs (127)	LPGs (90)
≤ 1	105 (98%)	78 (93%)	56 (44%)	66(73%)
> 1 to 2	–	6 (7%)	40 (31%)	17 (19%)
> 2 to 2.5	1 (1%)	–	07 (6%)	04 (4%)
≥ 2.5	1 (1%)	–	24 (19%)	03 (3%)

Source: Field survey

The top five MSBs products with the highest MPR were Tab. Diclofenac Sodium (50 mg) 11.53, Tab. Glimipride (2 mg) 9.73, Tab. Folic Acid (5mg) 6.40, Tab. Olanzapine (5 mg) 5.90 and Miconazole Cream 5.48. (Table no.4) For the lowest priced generics the highest MPR were found for Tab. Diclofenac Sodium (50 mg) 3.36, Tab. Glimipride (2 mg) 2.95, Tab. Paracetamol (500Mg) 2.75, Tab Zinc Sulphate Dispersible (20mg) 2.41 and Tab. Folic Acid (5mg) 2.36. Three medicines had highest MPR namely Tab. Diclofenac Sodium (50 mg), Tab. Glimipride (2 mg) and Tab. Folic Acid (5mg) as both MSB and LPG.(Table no.5)

Table no.4: Top five MSBs with highest MRP

Sr. No.	Therapeutic Category	Item Name	IRP*	MSBs	MSBs/IRP
181	14	Miconazole Cream 2%	0.75	4.13	5.48
164	27.1	Tab. Olanzapine 5 mg	0.62	3.66	5.90
139	10.1	Tab. Folic Acid 5mg	0.21	1.36	6.40
93	21.4.1.1	Tab. Glimipride 2 mg	0.58	5.60	9.73
121	2.1	Tab. Diclofenac Sodium 50 mg	0.30	3.43	11.53

Source: Field survey

\*International Reference Price

Table no.5: Top five LPGs with highest MRP

Sr. No.	Therapeutic Category	Item Name	IRP	LPG	LPG/IRP
139	10.1	Tab. Folic Acid 5mg	0.21	0.5	2.36

143	20.6.2	Tab. Zinc Sulphate Dispersible 20mg	1.22	2.93	2.41
81	2.1	Tab. Paracetamol 500Mg	0.29	0.8	2.75
93	21.4.1.1	Tab. Glimipride 2 mg	0.58	1.7	2.95
121	2.1	Tab. Diclofenac Sodium 50 mg	0.30	1	3.36

*Source:* Field survey

**Table no.6:** Top five Public Sector JAK's medicines with highest MRP

Sr. No.	Therapeutic Category	Item Name	IRP	PUB	PUB/IRP
112	6.1.1.1	Cap Amoxycillin 250 mg	1.06	1.25	1.18
199	20.6.1	ORS Powder	5.62	7	1.24
99	6.2.1.1	Cap. Amoxycillin 500 mg	1.98	2.9	1.46
81	2.1	Tab. Paracetamol 500Mg	0.29	0.5	1.72
68	31	I.V Normal Saline	0.07	0.13	1.89

*Source:* Field survey

The top five Public sector JAK's products with the highest MPR were I.V. Normal Saline 1.89, Tab. Paracetamol (500mg) 1.72, Cap. Amoxycillin (500mg) 1.46, ORS Powder 1.24 and Cap Amoxycillin (250 mg) 1.18. (**Table no. 6**) For the Public procurement sector the highest MPR were found for Plasma Volume Expander 3.5% Polygeline infusion (Hemaccel) (500 ml) 3.82, Heparin Sodium Inj. IP 5000 IU/ml (IM/IV USE) 2.29, Tab. Methyldopa IP (250mg) 0.93, Tab. Hyoscine Butyl Bromide (10mg) 0.92 and Tab. Paracetamol (500Mg) 0.83. (**Table no.7**)

**Table no.7:** Top five Public Procurement Items with highest MRP

Sr. No.	Therapeutic Category	Item Name	IRP	Procurement	PRCR/IRP
81	2.1	Tab. Paracetamol 500Mg	0.29	0.24	0.83
148	20.4.2	Tab. Hyoscine Butyl Bromide 10 mg	4.90	4.53	0.92
146	12.3.6	Tab. Methyldopa IP eq. to Methyldopa anhydrous 250 mg	2.14	2.00	0.93
65	10.2.2	Heparin Sodium Inj. IP 5000 IU/ml (IM/IV USE)	47.12	107.81	2.29
50	11	Plasma Volume Expander 3.5% Polygeline infusion (Hemaccel) 500 ml	0.76	2.90	3.82

*Source:* Field survey

## 2. Essential medicines' Procurement prices in the Public Sector of Punjab

For 137 items the IRP were available. The public sector procurement prices were available for 107 items out of these 137 items. In the case of 25 items the procurement tender was under process (T.U.P) and the remaining five items were not included in the Essential Drug List of Punjab 2018. The median MPR for these 107 items was 0.29. (**Table no.2**) In the case of 105 items the MPR (Median Price Ratio) was very reasonable / efficient (less than 1). For the remaining 2 items was 2.29 and 3.82. (**Table no.3**) The MPR for public sector procurement ranged from 0.02 to 3.82. The 75% inter-quartile range showed that 75% of the medicines had an MPR of 0.41 or less. In other words, these essential medicines had been procured at reasonable prices.

## 3. MPR of Patient Prices in the Public Sector Jan Aushadhi Kendras (JAKs) of Punjab

In the case of Public sector for 89 out of 132 items IRPs were available. The median MPR for these 84 items was 0.45. (**Table no.2**) Out of these 89 items 84 was available with at least one medicine outlet or in other words 5 products were not encountered in any survey outlet. So the price comparison was conducted for 84 items. In the case of 78 items the MPR (Median Price Ratio) was very reasonable / efficient (less than 1). For the remaining 6 items it ranged from 1 to 2. (**Table no.3**) The MPR for public sector generics ranged from 0.01 to 1.89. The 75% inter-quartile range showed that 75% of the medicines had an MPR of 0.75 or less. In other words, these essential medicines had no excessive local prices.

## 4. MPR of Patient Prices in the Private Sector MSBs or Most Sold Branded medicines

In the case of private sector MSBs 127 out of 137 items was available with at least one medicine outlet or in other words 10 MSB products were not encountered in any survey outlet. So the price comparison was conducted for 127 items. The median MPR for these 127 items was 1.13. (**Table no.2**) In the case of 56 items the MPR (Median Price Ratio) was very reasonable / efficient (less than 1). For 40 items it ranged from 1 to 2. For the remaining 07 items the local prices ranged between were 2 to 2.5. (**Table no.3**) For 24 items the local prices were 2.5 to more than 11.53 times higher the International Median Prices. The MPR for private sector

MSBs ranged from 0.04 to 11.53. In other words, for 103 items/ products the medicine prices were acceptable ( $MPR \leq 2.5$ ). For the remaining 24 items, the local prices were 2.5 to more than 11.53 times higher the International Median Prices. In other words, they had excessive local prices.

The price of Tab. Frusemide 40mg ( $MPR = 1.16$ ) in the present study has been lesser than the price ( $MPR = 2.3$ ) observed by **Tripathi et al. (2005)** for innovator brand product. The price of Tab. Amoxicillin Dispersible 250mg ( $MPR = 3.68$ ) and ORS Powder ( $MPR = 3.20$ ) in the present study has been lesser than the prices ( $MPR = 5.91$  and  $4.12$ , respectively) observed by **KR et al. (2011)**. Tab. Folic acid ( $MPR = 6.40$ ) has been among the highest priced medicines as MSB as well as LPG in present study similar to **KR et al. (2011)** study where it had  $MPR$  of 20.88 for all type of medicines. In the same study price of ORS Powder of both lowest and highest priced products has been higher than the present study. Similarly Tab. Diclofenac Sodium 50mg has also been amongst the highest priced medicine (MSB and LPG  $MPR$  11.53 and 3.36, respectively) in the present study similar to studies conducted in Rajasthan (**Kotwani et al., 2003**), Maharashtra (**Patel et al., 2006**) and West Bengal (**Tripathi et al., 2005**). The price of Tab. Paracetamol 500mg ( $MPR$  MSB = 3.09 and LPG = 2.75) in the present work has been less than the prices encountered in Rajasthan (**Kotwani et al., 2003**), and Maharashtra (**Patel et al., 2006**). The price of Tab. Ibuprofen 400mg ( $MPR$  MSB = 1.28 and LPG = 0.81) and Tab. Albendazole 400mg ( $MPR$  MSB = 1.53 and LPG = 0.96) in the present study has been less than the price ( $MPR = 1.45$  for Innovator Brand, Highest and Lowest priced generic products) observed by **Kotwani et al. (2003)** and **Tripathi et al. (2005)**. The price of Tab. Atenolol 50mg ( $MPR$  MSB = 2.62 and LPG = 1.01), Tab. Phenytoin Sodium 100mg ( $MPR$  MSB = 2.29 and LPG = 1.94), Tab. Ciprofloxacin 500mg ( $MPR$  MSB = 1.42 and LPG = 0.61) Cap. Amoxicillin 250mg ( $MPR$  MSB = 1.89 and LPG = 0.94), Cap. Fluoxetine 20mg ( $MPR$  MSB = 1.24 and LPG = 0.70), Tab. Carbamazepine 200mg ( $MPR$  MSB = 1.10) and Syrup Cotrimoxazole (Paediatric) ( $MPR$  MSB = 0.69 and LPG = 0.66) in the present work has been less than the prices encountered in Rajasthan (**Kotwani et al., 2003**), Maharashtra (**Patel et al., 2006**) and West Bengal (**Tripathi et al., 2005**). The price of Tab. Phenobarbitone 30mg ( $MPR$  MSB = 2.41) in the present work has found to be very reasonable as compare to less than the price ( $MPR = 7.01$  and  $7.08$  for Branded and LPG, respectively) encountered in Maharashtra (**Patel et al., 2006**). The price of Tab. Amoxicillin Dispersible 150mg ( $MPR$  MSB = 2.40 and LPG = 1.53) in the present study has been lesser than the price ( $MPR = 8.5$ ,  $7.33$  and  $6.93$ , for Innovator brand, highest and lowest priced product respectively) observed by **Tripathi et al. (2005)**. The price of 13 antibiotics in the present study has been lower than the price encountered in Delhi (**Kotwani and Holloway, 2013**).

The price of Tab. Ranitidine 150mg ( $MPR$  MSB = 0.48 and LPG = 0.46), Tab. Glibenclamide 5mg ( $MPR$  MSB = 3.24) and Cap. Nifedipine 10mg ( $MPR$  MSB = 1.24) in the present work has been higher than the price encountered **Kotwani et al., (2003)** but lower in **Patel et al., (2006)** and **Tripathi et al. (2005)** studies.

The price of Tab. Metformin 500mg ( $MPR = 1.91$ ), Tab. Cephalexin Dispersible 250mg ( $MPR$  MSB = 4.52) and Tab. Acyclovir 200mg ( $MPR = 4.09$ ) in the present work has been greater than the price encountered in Rajasthan (**Kotwani et al., 2003**) for most sold and lowest priced generic products. The price of Tab. Cotrimoxazole ( $MPR = 1.76$ ) in the present study has been higher than the price ( $MPR = 1.45$ ) observed by **KR et al. (2011)**. Similarly the price of Injection Ceftriaxone 1gm ( $MPR$  MSB = 1.90 and LPG = 1.23) and Tab. Losartan 50mg ( $MPR$  MSB = 0.71 and LPG = 0.36) in the present study has been higher than the prices encountered in Rajasthan (**Kotwani et al., 2003**), Maharashtra (**Patel et al., 2006**) and West Bengal (**Tripathi et al., 2005**). In these three states the  $MPR$  for all type of products ranged from 0.35 to 0.67 and 0.09 to 0.11 for the Injection and Tablet respectively.

The price of Tab. Ranitidine 150mg in the private sector of Delhi has been found to be higher ( $MPR = 0.57$ ) as compare to the present work ( $MPR = 0.48$ ). In the present work the highest  $MPR$  (11.53) has been observed for MSB Tab. Diclofenac Sodium 50mg similar to the study conducted in Delhi (**Kotwani, A., 2011**) where  $MPR$  was as high as 16.51.

##### 5. $MPR$ of Patient Prices in the Private Sector for LPGs or lowest priced generic equivalents

In the case of private sector LPGs 90 out of 137 items was available with at least one medicine outlet or in other words 47 LPG products were not encountered in any survey outlet. So the price comparison was conducted for 90 items. The median  $MPR$  for these 90 items was 0.68. (**Table no.2**) In the case of 66 items the  $MPR$  (Median Price Ratio) was very reasonable / efficient (less than 1). For 17 items it ranged from 1 to 2. For four items the  $MPR$  was between 2 to 2.5 times higher than the International Median Prices. Three items had  $MPR$  between 2.75 to 3.36. (**Table no.3**) The  $MPR$  for private sector lowest priced generics ranged from 0.02 to 3.36. In other words, for 87 items/ products the medicine prices were acceptable ( $MPR \leq 2.5$ ). For the remaining 03 items, the

local prices were 2.75, 2.95 and 3.36 times higher the International Median Prices. In other words, they had excessive local prices.

The price of Tab. Cotrimoxazole (MPR = 0.68) and Syrup Amoxicillin 125mg + Clauvanic Acid 31.25mg (MPR = 0.68) in the present study has been half of the price (MPR = 1.36 and 1.48, respectively) observed by **KR et al. (2011)**. The price of Tab. Ofloxacin 200mg (MPR = 0.91) in the present study has been less than half of the price (MPR = 2.15) observed by **Swain et al. (2015)**. The price of Tab. Glibenclamide 5mg (MPR LPG = 0.95) and Cap. Nifedipine 10mg (MPR LPG = 1.03) in the present study has been lesser than the prices encountered in Rajasthan (**Kotwani et al., 2003**), Maharashtra (**Patel et al., 2006**) and West Bengal (**Tripathi et al., 2005**). The price of Tab. Amoxicillin Dispersible 250mg (MPR = 0.65) and ORS Powder (MPR = 1.78) in the present study has been lesser than the price (MPR = 5.73 and 3.91, respectively) observed by **KR et al. (2011)**.

The price of Tab. Metformin 500mg (MPR = 1.51) in the present work has been greater than the price encountered in Rajasthan (**Kotwani et al., 2003**), Maharashtra (**Patel et al., 2006**) and West Bengal (**Tripathi et al., 2005**).

## DISCUSSION

According to **Kotwani et al. (2007)** the prices at which State governments procured medicines for free distribution at public facilities were found to be reasonable. In a similar study conducted by in Odisha (**Swain et al., 2015**) observed that child specific medicines were being procured by the govt. at half (MPR of 0.52) of the International Reference Prices. In Odisha the lowest and highest priced products had the MPR of 1.46 and 1.83, respectively. Another study concerned with children's medicines showed that public procurement agency in Chhattisgarh (**KR et al., 2011**) had reasonable level of purchasing efficiency as they have been procuring the medicines at MRP of 0.96 (for 13 medicines). It also observed that patient prices for lowest and highest priced products were 1.38 (median MPR of 30 medicines) and 1.82 (median MPR of 21 medicines) times higher priced than the IRP, respectively. A study conducted in NCT (National Capital Territory), Delhi (**Kotwani, A., 2011**) revealed that the govt. of NCT and Municipal Corporation of Delhi has been procuring medicines at MPR of 0.61 and 0.59 37, respectively. In the case of private sector retail pharmacies, patient prices were 4.71, 5.38 and 2.83 times higher priced than the IRP for the branded (n = 16), highest priced (n = 28) and lowest priced (n = 43) medicines, respectively.

## CONCLUSION

The present paper examined the essential medicines' prices in 18 Jan Aushadhi Kendras, 29 private medicine outlets/ chemist shops and their public procurement prices in the study area. It has been observed that on an average the essential medicines' prices were reasonable across sectors. The government of Punjab has been procuring the essential drugs at reasonable prices. Only 19 and 3% of the medicines had excessive local prices in the form of MSBs and LPGs, respectively. At first these results looks very impressive because as compare to International Reference Prices, the local medicine prices are very low and seems affordable. But only low medicine prices will not serve the purpose of universal health coverage. Many other things are important for objective, such as :

- 1. Ensure and maintain sufficient supply of medicines :** Since, the public sector health facilities are the primary source of medicines for the poor population and availability of free medicines is very crucial for achieving universal health care, the level of medicine availability in the public sector must be increased and drug stock should be maintained in each facility. Quality of services at government facilities should be timely evaluated and monitoring mechanisms should be used to keep track of the stock and use of drugs. This will improve the functioning of public health facilities as well as reduce the medicines' bill and hence, the chances of incurring catastrophic health and medicine expenditure will also decline to a significant extent. The state government of Punjab can adopt the schemes that has been proved beneficial in other states like Tamilnadu, Kerala and Rajasthan. (**Revikumar et al., 2010; Singh et al., 2013; Selvaraj et al., 2014**)
- 2. Reduce the doubts regarding the efficiency or effectiveness of generic drugs :** Generally, people had this notion that whatever medicines are being dispensed by public health facilities are ineffective / cheap/ sub standard/ fake. So, they have to visit private health care providers. They also believe that costly drugs provided by private health care provider are more effective. Patients should be made more aware about the prices and quality of generic medicines so that if they have to buy a medicine in the private pharmacy, they can save their money or at least buy it within their financial constraints. A study by **Singal et al. (2011)** found that price to patients for branded medicine was higher (14% to 41%) than the 'branded-generics'

equivalents whereas the quality of branded and branded-generics was found to be same. The doctors and medicine prescribers should be motivated to prescribe generic drugs.

3. **Greater investment in Procurement of medicines :** The condition of health services in the country chiefly depends on the resources allocated to the health sector. People prefer to private health facilities because there is a lack of nearby government medical institutions or the inability of government facilities to provide the quality of care that is perceived better at private facilities. Both issues can be solved by greater investment in public health facilities as well as the medicines. The recent National Health Policy, 2017 include both these aspects and is aimed to increase the central government spending on health from the current level of 1.15% to 2.5% of GDP and also to reduce the proportion of households incurring catastrophic health expenditure from the current level by 25%, by the year 2025. (**Ministry of Health and Family Welfare, 2017**)
4. **JAKs should be publicized:** It is very important to spread awareness about these stores and the effectiveness of generic drugs in the urban as well as rural areas. Also there is a need to open more JAKs. At present, majority of the existing JAKs are located in urban areas. The medicine supply in these stores should be properly maintained. The government should provide incentives so that people / entrepreneurs are encouraged to open these stores and run them properly. The monitoring mechanisms should be used to keep track of the stock and use of drugs in JAKs.

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**PRIORITIZATION OF KEY PERFORMANCE INDICATORS FOR B2B E-COMMERCE WEBSITES USING PRINCIPAL COMPONENT ANALYSIS**

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**Pragya Tiwari<sup>1</sup> and Murali Krishna M<sup>2</sup>**<sup>1</sup>M.Tech Scholar and <sup>2</sup>Assistant Professor, Mechanical Engineering Department, Gyan Ganga Institute of Technology & Sciences, JBP**ABSTRACT**

*The growing use of Internet services in India provides a developing prospect of online shopping for end consumers. In view of this, in order to improve increase online shopping among end users and Indian online shopping, a research framework was proposed. The proposed framework considers five key dimensions efficiency, system availability, fulfillment, privacy and service quality with the sub key parameters for online shopping website. To gather initial data, end consumers were asked. A random data was collected from 200 end consumers. The evaluation responses were calculated. Further, using principal component analysis approach all parameters in hierarchy were ranked.*

*Keywords: Key performance indicators, Performance Assessment, B2B e-commerce, MCDM, PCA,*

**1. INTRODUCTION**

In recent years, online shopping became the more suitable option for many users due to the demand and preference of consumers. The amount of interest in online shopping is progressive because of the offers to its vendors and customers similarly.

India moved ahead towards advanced information, communications based on the increasing trend internet users in the last few years and multimedia services. It has become increasingly common for consumers as well as companies to buy products and services this way, owing to the easy accessibility of high-quality products and services in an overall context of convenience in which time- and money savings are maximized. According to the nature of its business transactions, e-commerce can generally be classified into five types: business-to-business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), consumer-to-business (C2B), and business to government (B2G) ( D.C. Chou., 2001)

First, B2B e-commerce involves companies doing business with each other. Representative example is Alibaba. It is an inter-enterprise e-commerce. Second, B2Be-commerce consists of businesses selling to the general public. An example of this is Amazon. It is a business to users of e-commerce. Third, C2C e-commerce is similar to the retail market, and the aim of this is the end-user shopping. Example of this includes eBay. It is a person to person e-commerce. Fourth, in C2B e-commerce, consumers post a project with their budget in online, and companies bid on the project. Then, the consumer reviews the bids and selects the company. Elance can be an example of this. It is a person-to-business e-commerce. Lastly, B2G e-commerce is a business model that refers to businesses selling products, services or information to governments or government agencies with online transactions. (Yoo & N. Donthu, 2001)

B2G e-commerce provides a way for businesses to bid on government projects or products that government might purchase or need for their organizations. Among these types of e-commerce, B2B e-commerce has become an important retailing channel rivaling even traditional brick-and-mortar outlets; indeed, many of the very considerable number of B2B e-commerce websites already established are enjoying continuously increasing sales volumes. The startlingly rapid emergence and success of this new information-technology-based commercial paradigm raises core issues with respect to the customer's continued satisfaction with, and trust for, B2B e-commerce websites (C.-C. Sun & G.T. Lin, 2009). Thus, in this study, we specifically focused on the evaluation of B2B e-commerce websites to better meet customer needs. (C.-C. Sun & G.T. Lin, 2009)

**B2B E-commerce:** Business-to-business (B2B), also called B-to-B, is a form of transaction between businesses, such as one involving a manufacturer and wholesaler, or a wholesaler and a retailer. Business-to-business refers to business that is conducted between companies, rather than between a company and individual consumer (F. Kong & H. Liu., 2005)

**2. LITERATURE REVIEW**

Assessment of service quality by considering the "customer's voice" is vital to the improvement of service quality and the enhancement of customer satisfaction. In other words, after delivering a service, service providers should assess how well the customers' expectations had been fulfilled. For this purpose, an extensive research has been conducted by various authors using various multi criteria decision making methods, both

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extensively and in depth. The following literature review helped to identify the key parameters and sub key parameters to select for the assessment of performance.

Erdogan et.al.,(2007) Reviewed the literature and provided a structured hierarchical model for logistic information technology evaluation and selection based on the premise that the logistic information technology evaluation and selection problem can be viewed as a product of tangible benefits, intangible benefits, policy issues and resources. They developed a multi-attribute decision making model for evaluating and selecting among logistic information technologies.

G.R. Heim and J.M. Field (2007) studied operational practice, examining relationships between e-service process attributes and e-service quality dimensions to identify potential drivers of e-service quality that managers may use as levers to improve their operations. The study employed a cross-sectional regression analysis of publicly available data collected from an online rating site. The results identified operational drivers associated with customer ratings of e-service quality, and provide guidance for future research on drivers of e-service quality.

C.-C. Sun and G.T. Lin (2009) explored how shopping websites to establish their competitive advantages through consideration of technology acceptance factors, website service quality and specific holdup cost factors dimensions. They adopted the fuzzy TOPSIS as the analytical tool that determines the weights of each criterion. They showed in the research results, the security and trust are the most important factors for improving the competitive advantage of shopping website. Moreover, the PCHome and Yahoo Taiwan rank the first two positions for shopping websites.

F. Li and Y. Li (2011) evaluated business to customer (B2B) websites in China according to the usability criterion. Two questionnaires were designed and verified to capture the evaluation index when customers operated the B2B websites. The first one was used to choose the appropriate factors in questionnaire scale and the second one was used to evaluate the importance of the chosen factors. Finally, the usability indices were used to evaluate the characteristic of two main China B2B websites. The results obtained would help the designers of B2B electronic commerce to improve their websites.

X. Huang et.al.,(2011) proposed an evaluation model based on analytic hierarchy process (AHP), fuzzy sets and technique for order performance by similarity to ideal solution (TOPSIS), to tackle the ranking e-commerce websites in fuzzy environment. The AHP is applied to analyze the structure of ranking problem and to determine weights of the criteria, fuzzy sets is utilized to present ambiguity and subjectivity with linguistic values parameterized by triangular fuzzy numbers, and TOPSIS method is used to obtain final ranking. Case analysis is conducted to illustrate the utilization of the model for the problem. It demonstrates the effectiveness and feasibility of the proposed model.

T.-C. Han et.al.,(2011) attempted to fill the gap in the current literature by establishing a fuzzy weighted SERVQUAL model for evaluating the airline service quality. A case study of Taiwanese airline is conducted to demonstrate the effectiveness of the fuzzy weighted SERVQUAL model. Finally, some interesting conclusions and useful suggestions are given to airlines to improve the service quality.

A. Panahi et.al.,(2011) presented a hybrid approach based on SERVQUAL and fuzzy TOPSIS for evaluating service quality of urban transportation systems. The proposed approach consists of three steps. The first step involves development of a SERVQUAL based questionnaire to collect data for measuring transportation service quality. The participants provide linguistic assessments to rate the service quality criteria and the alternatives. In step 2, the linguistic ratings are combined through fuzzy TOPSIS to generate an overall performance score for each alternative. The alternative with the highest score is finally chosen. In step 3, sensitivity analysis is conducted to evaluate the influence of criteria weights on the decision making process.

The strength of the proposed approach is its practical applicability and ability to provide solution under partial or lack of quantitative information. An application of the proposed approach for evaluation of service quality of metro in Montreal is provided.

Deng et.al.,(2012) proposed a new model to assist E-Commerce practitioners in the assessment of E-Commerce security based on Analytical Hierarchy Process (AHP) and Dempster–Shafer (DS) theory of evidence. First, according to the characteristics of E-Commerce, a hierarchical structure of E-Commerce security is established to calculate the weights of relevant issues using AHP. Then Dempster–Shafer theory of evidence is applied to combine all the issues, regarded as evidences, in order to derive a consensus decision for the degree of E-Commerce security.

Li et.al.,(2013) proposed a new hybrid Multiple Attribute Decision Making (MADM) model, combining the Decision Making Trial and Evaluation Laboratory (DEMATEL), DEMATEL-based Analytic Network Process (DANP), and VIšekriterijumsko KOMPromisno Rangiranje (VIKOR) methods to address e-store business. They provided e-store managers with a knowledge-based understanding of how to create marketing strategies that reduce the performance gaps of dimensions and criteria to satisfy consumers' needs and encourage customers to purchase more.

Zhang et.al.,(2013) investigated business-to-customer (B2B) electronic commerce services from a quality management perspective and proposed a novel quality management approach that is based on human factors engineering to manage e-commerce service quality and operate according to customer needs. They also demonstrated the experimental results that operating practices can help managers understand e-commerce service quality and have useful implications for companies in the management of e-commerce service quality.

Ahin et.al.,(2013) proposed a novel fuzzy Multiple Attribute Decision Making (MADM) model for modeling and solving truck selection problem of a land transportation company. They proposed A systematic methodology by integrating "fuzzy DEMATEL" and "fuzzy hierarchical TOPSIS" method for evaluating the weights of the criteria and for assessing the alternatives according to criteria.

Li et.al.,(2014) proposed a new hybrid gray relational model to enhance strategies by adopting innovation and creativity to achieve the aspiration level in each dimension/criterion of satisfying/promoting human life and convenient service. As such, the contribution made by this research will be to produce the best strategies for e-store managers to improve their business model in order to meet customers' needs, encourage them to repurchase, and to enable stores to provide the most effective and efficient service for their customers.

Tarun Gupta and Murali Krishna. M(2018) had conducted a comprehensive study to identify all economic and technical indicators that influence the performance of SMEs in Jabalpur using integrated PCA-DEA method. These performance indicators are equipment productivity, efficiency, effectiveness, and profitability. Standard factors, such as downtime, mean time between failures, time to repair, operating time, value added, and production value, were considered as shaping factors.

### **3. METHODOLOGY**

The approach to this study will be descriptive and quantitative and survey method is used to collect the necessary information for performance measurement or evaluation which will provide with an opportunity to uncover the factors that influence B2B e-commerce websites performance and at the same time uncover strategies that influence the same. In selecting a performance measure, it is important to keep in mind the measures suitability to the control system objectives, the measures complexity and invasiveness. Thus, while selecting an appropriate range of performance measures it will be necessary to balance them and to make sure that different dimensions of B2B e-commerce websites performance are considered.

To achieve the objectives of this study, a comprehensive study was conducted to locate all indicators that influence organization performance.

The sample population for data collection was picked from end customers and they were further interviewed as per the well structured questionnaire, at the end of the interview 200 responses were obtained. The convenient sampling method is highly favored and would be practical to the study. Also, the scalar style of questions would be used, which is the adoption of Kano Questionnaire where users are judged on a specific question, usually corresponding to a measure of agreement or disagreement and may be in ascending or descending order of importance, also a "yes" or "no" question was included to get affirmative answer from the respondent. The analysis for the survey data will be done by properly going through the various responses.

First the identification of B2B e-commerce websites which are to be studied is done following the ranking and also they are analyzed. Second, all the standard indicators for this study were identified through a global study and principal component analysis is used to identify the factor loadings to evaluate the prioritization of key performance indicators.

#### **3.1. THE CASE STUDY**

The most extensively used B2B e-commerce websites are selected from owing to data collection limitations, 20 indicators were selected for the purpose of this study as shown in Table 1. The 20 indicators are categorized into 5 categories. The first category reflects the Efficiency of the site and is measured by indicators number E1-E4. The second category deals with system availability measured by the indicators number SA1 to SA4. The third category represents fulfillment by the web sites measured by the indicator numbers F1 to F4. The fourth category represents privacy measured by the indicator numbers P1 to P4. The fifth category represents service quality measured by the indicator numbers SQ1 to SQ4.

The selected indicators for the case study are listed as follows:

**Table 1:** Key indicators for measurement of performance

E	<b>Efficiency</b>
E1	B2B e-commerce website makes it easy to find what is sought.
E2	B2B e-commerce website makes it easy to navigate.
E3	B2B e-commerce website enables quick completion of transaction.
E4	Information at B2B e-commerce website is well organized.
SA	<b>System availability</b>
SA1	B2B e-commerce website is always available.
SA2	B2B e-commerce website launches and runs immediately.
SA3	B2B e-commerce website does not crash.
SA4	Pages at B2B e-commerce website do not freeze after entry of order information.
F	<b>Fulfillment</b>
F1	B2B e-commerce website delivers items when promised.
F2	Items for delivery at B2B e-commerce are made available within a reasonable time frame
F3	B2B e-commerce website promptly informs about important situations (payments).
F4	Actual stocking of items claimed to be in-stock
P1	Protection of information on customers' Web behavior
P2	Non-sharing of customer information with other sites
P3	Protection of customers' credit card information
P4	Accessibility
SQ	<b>Service Quality</b>
SQ1	Trust
SQ2	Reliability
SQ3	Responsiveness
SQ4	Empathy

Table 2 representing the data of responses collected from the end consumers for the selected key parameters for the assessment of key performance indicators of B2B e-commerce websites through the survey questionnaire and the evaluation memberships are calculated for further assessment using MCDM tools.

**Table 2:** Evaluation responses and memberships

Criteria	Sub-Criteria	Evaluation Responses					Evaluation Memberships				
		VS	SA	GE	DS	VD	VS	SA	GE	DS	VD
<b>Efficiency</b>	E1	52	17	28	84	19	0.260	0.085	0.140	0.420	0.095
	E2	16	78	22	70	14	0.080	0.390	0.110	0.350	0.070
	E3	48	24	22	86	20	0.240	0.120	0.110	0.430	0.100
	E4	16	84	14	72	14	0.080	0.420	0.070	0.360	0.070
<b>System Avialability</b>	SA1	60	23	15	84	18	0.300	0.115	0.075	0.420	0.090
	SA2	16	84	14	72	14	0.080	0.420	0.070	0.360	0.070
	SA3	48	23	27	84	18	0.240	0.115	0.135	0.420	0.090
	SA4	21	84	9	72	14	0.105	0.420	0.045	0.360	0.070
<b>Fulfillment</b>	F1	44	22	26	86	22	0.220	0.110	0.130	0.430	0.110
	F2	14	80	14	78	14	0.070	0.400	0.070	0.390	0.070
	F3	48	21	19	84	28	0.240	0.105	0.095	0.420	0.140
	F4	21	84	9	72	14	0.105	0.420	0.045	0.360	0.070
<b>Privacy</b>	P1	48	16	28	84	24	0.240	0.080	0.140	0.420	0.120
	P2	22	77	24	60	17	0.110	0.385	0.120	0.300	0.085
	P3	70	26	15	75	14	0.350	0.130	0.075	0.375	0.070
	P4	22	78	22	64	14	0.110	0.390	0.110	0.320	0.070
<b>Service Quality</b>	SQ1	54	24	18	84	20	0.270	0.120	0.090	0.420	0.100
	SQ2	16	84	14	72	14	0.080	0.420	0.070	0.360	0.070
	SQ3	54	32	30	74	10	0.270	0.160	0.150	0.370	0.050
	SQ4	16	84	18	68	14	0.080	0.420	0.090	0.340	0.070

**3.2. Principal component analysis (PCA)**

Principal component analysis (PCA) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The number of distinct principal components is equal to the smaller of the number of original variables or the number of observations minus one. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component in turn has the highest variance possible under the constraint that it is orthogonal to the preceding components. The resulting vectors are an uncorrelated orthogonal basis set. PCA is sensitive to the relative scaling of the original variables.

**Table 3: Standardized Matrix**

	<b>VS</b>	<b>SA</b>	<b>GE</b>	<b>DS</b>	<b>VD</b>
E1	1.615	4.941	3.000	0.365	1.118
E2	4.375	0.897	3.182	0.875	0.179
E3	1.792	3.583	3.909	0.417	0.833
E4	4.500	0.857	5.143	0.875	0.167
SA1	1.400	3.652	5.600	0.300	0.783
SA2	4.500	0.857	5.143	0.875	0.167
SA3	1.750	3.652	3.111	0.375	0.783
SA4	3.429	0.857	8.000	0.667	0.167
F1	1.955	3.909	3.308	0.500	1.000
F2	5.571	0.975	5.571	1.000	0.175
F3	1.750	4.000	4.421	0.583	1.333
F4	3.429	0.857	8.000	0.667	0.167
P1	1.750	5.250	3.000	0.500	1.500
P2	2.727	0.779	2.500	0.773	0.221
P3	1.071	2.885	5.000	0.200	0.538
P4	2.909	0.821	2.909	0.636	0.179
SQ1	1.556	3.500	4.667	0.370	0.833
SQ2	4.500	0.857	5.143	0.875	0.167
SQ3	1.370	2.313	2.467	0.185	0.313
SQ4	4.250	0.810	3.778	0.875	0.167

The aim of this step is to understand how the variables of the input data set are varying from the mean with respect to each other, or in other words, to see if there is any relationship between them. Because sometimes, variables are highly correlated in such a way that they contain redundant information. So, in order to identify these correlations, the covariance matrix computed as shown in Table 4.

**Table 4: Covariance Matrix Computation to Identify Correlations**

	<b>VS</b>	<b>SA</b>	<b>GE</b>	<b>DS</b>	<b>VD</b>
E1	0.290	0.941	0.375	0.313	0.745
E2	0.785	0.171	0.398	0.748	0.120
E3	0.322	0.683	0.489	0.356	0.556
E4	0.808	0.163	0.643	0.748	0.111
SA1	0.251	0.696	0.700	0.257	0.522
SA2	0.808	0.163	0.643	0.748	0.111
SA3	0.314	0.696	0.389	0.321	0.522
SA4	0.615	0.163	1.000	0.570	0.111
F1	0.351	0.745	0.413	0.428	0.667
F2	1.000	0.186	0.696	0.855	0.117
F3	0.314	0.762	0.553	0.499	0.889
F4	0.615	0.163	1.000	0.570	0.111
P1	0.314	1.000	0.375	0.428	1.000
P2	0.490	0.148	0.313	0.661	0.147
P3	0.192	0.549	0.625	0.171	0.359
P4	0.522	0.156	0.364	0.544	0.120
SQ1	0.279	0.667	0.583	0.317	0.556

SQ2	0.808	0.163	0.643	0.748	0.111
SQ3	0.246	0.440	0.308	0.158	0.208
SQ4	0.763	0.154	0.472	0.748	0.111

For each case and each component, the component score is computed by multiplying the case's standardized variable values by the component's score coefficients.

**Table 5: PCA scores and Ranking**

E1	0.181	19
E2	0.609	8
E3	0.347	15
E4	0.785	4
SA1	0.455	11
SA2	0.785	5
SA3	0.262	17
SA4	0.940	1
F1	0.295	16
F2	0.885	3
F3	0.410	12
F4	0.940	2
P1	0.174	20
P2	0.468	10
P3	0.392	14
P4	0.478	9
SQ1	0.403	13
SQ2	0.785	6
SQ3	0.214	18
SQ4	0.660	7

Eigenvalues >1.0 were considered as significant and subsequently varimax factors (VFs), which are the new groups of variables are generated. The VFs values which are greater than 0.75 (> 0.75) is considered as “strong”, the values range from 0.50-0.75 (0.50 ≥ factor loading ≥ 0.75) is considered as “moderate”, and the values range from 0.30-0.49 (0.30 ≥ factor loading ≥ 0.49) is considered as “weak” factor loadings.

Table 5: depicting the analysis of ranking using PCA. The B2B e-commerce key performance indicators SA4, F4, F2, E4, SA2 and SQ2 are considered as strong, where the factor loadings are above 0.75. SQ4 and E2 are lying in between 0.50 and 0.75, which will be considered as moderate. The performance indicators P4, P2, SA1, F3, SQ1, P3, E3, F1, SA3, SQ3, E1 and P1 are below 0.49, which are considered as weak factor loadings. The B2B e-commerce websites which are selected for the survey has to work on these indicators so that the performance of these websites can be improved.

**4. CONCLUSION**

In recent years B2B e-commerce websites are considered as vital constituent of economic development of any country. In a competitive environment B2B e-commerce websites must try to use its resources in the most productive ways. In the present study, 20 B2B e-commerce key performance indicators are evaluated considering various input and output criteria. The study proposes to measure the performance of B2B e-commerce key performance indicators working and rank them accordingly using PCA.

Computation of result shows the best performing B2B e-commerce key performance indicators, which will become a benchmark for other sites to improve their performance. The result also indicates SA4 and F4 are ranked first using PCA. It becomes a benchmark for other B2B e-commerce websites. The results provide the B2B e-commerce website managers and the researchers with useful insights in measuring performance of B2B e-commerce websites.

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**MARAVANTHURUTH TOURISM PROJECT: A SUSTAINABLE DEVELOPMENT MODEL**

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**Dr. Amisha Antony**

Assistant Professor, Department of Tourism Administration and Hospitality, MES College, Marampally, Aluva

**ABSTRACT**

*Tourism is considered as a force for economic and social good, yet the impact on climate and environmental change, escalate the role of global community to consider sustainable type of tourism. To curb the environmental risks in tourism activities, sustainable tourism takes its form. STREET (Sustainable, Tangible, Responsible, Experiential, Ethnic Tourism) project is one such sustainable initiatives by the Responsible Tourism Mission under Kerala tourism. The project aims at developing thematic streets in new or transform tourism destinations based on thematic zoning through collaborating with local community and Local Self Government.*

*Maravanthuruth tourism project is the first of its kind under Kerala Tourism's STREET project to give a makeover to state tourism under experiential tourism. This initiative is based on the water street theme on account of its geographical peculiarity. The study investigates the conceptual characteristics and benefits of the water street followed in Maravanthuruth. This paper tries to study the potential of Street project in Maravanthuruth and to identify the scope of thematic tourism zoning. A qualitative analysis on secondary and primary data is implemented for the study. Observation and opinion of local communities and LSG (Local self-governing) officials on the strength and weakness of the project forms the basis of primary data. The project have the potential to offer innovative experiences of experiential tourism by establishing streets for art and culture, village life experience, and agri tourism. This project can truly considered under the norms of STREET initiative and project also helps in bring community to the forefront of Kerala tourism industry.*

*Keywords: Sustainable, STREET, Responsible, Community, Maravanthuruth*

**INTRODUCTION**

Tourism has become vast share of our global culture that allows to reconnoiter different areas of the world, meet populaces, and experience new traditions, culture and events. Although tourism is considered as a force for economic and social good, the impact on climate and environmental change, escalate the role of global community to consider sustainable type of tourism. It is found that between the year 2009 and 2013, tourism's global carbon footprint has increased from 3.9 to 4.5 GtCO<sub>2</sub>e, four times more than previously estimated, accounting for about 8% of global greenhouse gas emissions (Lenzen et.al, 2018). Initiatives that seek to understand and minimize the environmental risks in tourism activities came in place as sustainable forms of tourism.

Sustainable tourism is defined by the UN Environment Program and UN World Tourism Organization as "tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities." One major difficulties faced by the recognized tourism destinations is over concentration of tourism activities in a confined space that result in exceeding destination's physical carrying capacity. It prevent tourism benefits to a major number of local people.

Tourism Department of Kerala convened by Responsible Tourism Mission puts forth creation and development of sustainable villages through tourism. Major destinations in Kerala fails in providing a specific products like culture or agriculture or local cuisine or exceptional souvenirs or other tourist specialties, instead offers a mix of all these products. Therefore, product diversification and novel experiences foster tourist flow, while thematic zoning experience will shrink the tourist density.

This paper tries to study the potential of Street project in Maravanthuruth and to identify the scope of thematic tourism zoning. The project aims at developing thematic streets in new or transform tourism destinations based on thematic zoning through collaborating with local community and Local Self Government. This initiative targets to highlight the distinctive geographical, cultural features of the destination with host community participation. The study investigates the conceptual characteristics and benefits of the water street followed in Maravanthuruth.

**REVIEW OF LITERATURE**

Sustainable tourism is defined by Middleton, (1998, ix, cited in George and Frey, 2010, 13) as "achieving a particular combination of numbers and types of visitors, the cumulative effect of whose activities at a given

destination together with the actions of the servicing businesses, can continue into the foreseeable future, without damaging the quality of the environment on which activities are based". Bressers (2004) recommends strongly that when dealing with the policy implementation for sustainable development, three factors such as motivation, power and information are required for understanding the social interaction process. Author implies on an approach in knowing what, where, when and how a successful tourism development happens at a destination. Sinclair and Stabler (1997) mentions that the pattern of tourism consumption can be affected, if there is social alteration and social unrest at tourist destination. Cost effective methods for computing tourism demand and appropriate marketing strategies for each destination are strongly suggested by Malhotra (1998). Therefore, in keeping local communities' interest in destination development, stakeholders must consider feelings of host and its impact on destination.

### **IMPORTANCE OF THE STUDY**

As UNWTO focuses on inclusive growth in tourism, the relevance of Street project in Maravanthuruth could not be exempted. As project aims at the economic growth through tourism that allows its benefits and opportunities to be fairly distributed in the society, this study gains a momentum. The unique opportunity of project to identify the tourism's ability that no one is left out when considering beyond the statistics and strengthening the involvement of local communities and widening its supply chain based on sustainable social and environmental practices. Also, sustainable and planned development has to be followed from the initial stages of a new or a developing destination. Therefore, the current study is conducted with the specific objectives.

### **OBJECTIVES OF THE STUDY**

Stated below are the objectives of the study:

- To explore the potential of sustainable tourism in the study area.
- To understand the scope of Street Project implemented in study area.

### **METHODOLOGY**

A qualitative analysis is used for the study, based on both secondary and primary data. Secondary data collected constitute of government and organization reports, journals, web pages and websites. Primary data was collected during the field visit using a structured questionnaire circulated among local communities and LSG (Local self-governing) officials for taking the opinion on the strength and weakness of the project. Also an inconspicuous observation was done by the researcher for the status of tourism in the area.

### **Street Project**

STREET means **Sustainable, Tangible, Responsible, Experiential, Ethnic Tourism Hubs**. This project is a participatory tourism development initiative by the Responsible Tourism Mission under Kerala tourism. Based on the UNWTO's new theme, 'Tourism for Inclusive Growth', project selected ten places of Kerala for developing or rebranding these destinations into theme-based streets. It also focused on flaring the area of tourism activities, which

helps in limiting the tourist concentration in the major destinations and to transform these places into a Sustainable Living Responsible Tourism Villages based on a thematic zone style. The specialties of the destination like farms, water stretch, livelihood activities, local food diversities, etc. will be exposed to the tourists and they can choose the destination based on their interest.

### **The List of Destinations under Street Project**

- Kadalundy
- Tritala
- Pattithara
- Valiyaparamba
- Chekadi (Pulppally)
- Maravanthuruth
- Manchira (Aimanam)
- Pinarayi
- Anjarakkandy
- Kanthalloor

**List of Thematic Zoning of the Streets**

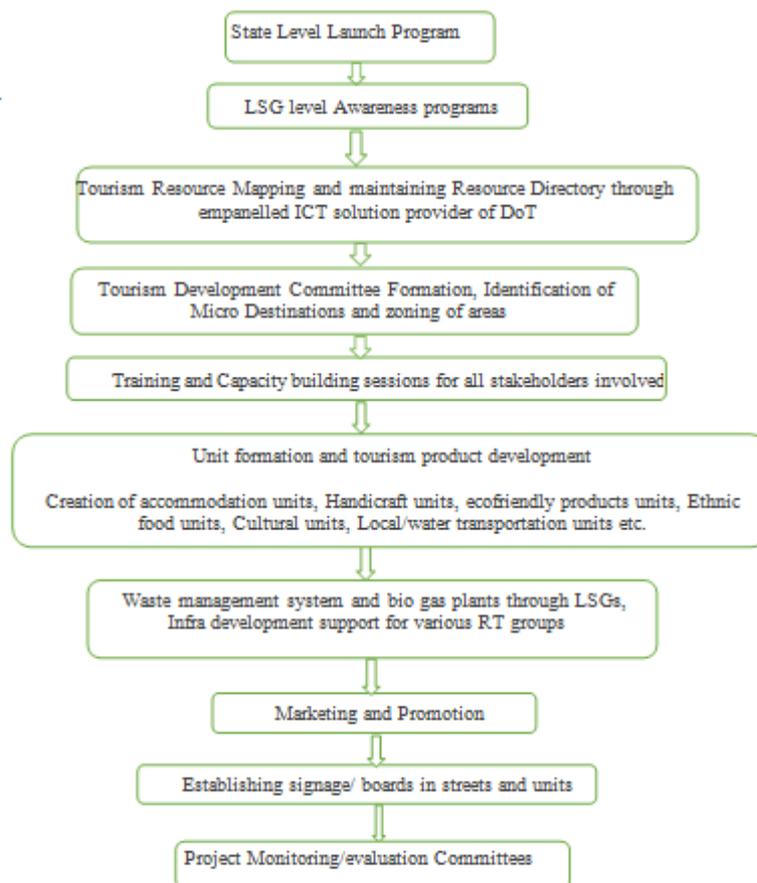
- Farm Tourism/ Agri Tourism Street
- Village Life Experience/ Experiential Tourism Street
- Art Street
- Cultural Street
- Green Street
- Water Street( Backwater Street, Canal Street, River Street)
- Food/ Cuisine Street

Based on the destination peculiarities, minimum three theme streets will be clubbed under each LSG.

This venture intends to transform the destinations with the existing facilities, preserving and protecting natural habitats and ecosystem and aiding in rural development. Additional income generation among the local community and women empowerment are also the focus of their objectives.

**Project Launch Process**

The various theme streets under the project will be implemented at state level, followed by program awareness workshops conducted at new LSGs. The figure 1 depicts the stages of street project implementation.



**Figure 1: Street Project Launch Process**

*Source: Author*

For efficient project implementation, the concerned LSGs must put on a lead role for ensuring community participation, work close association with STREET Project, formulation of monitoring Committee and coordinating with other stakeholders.

**Maravanthuruth as Street Project**

Maravanthuruth tourism project is the first of its kind under Kerala Tourism’s STREET project to give a makeover to state tourism under experiential tourism. Maravanthuruth is a small village in the Kottayam district of Kerala, India, surrounded by the river Muvattupuzha. This integral part of this place is a 3-km-long 'Arival thodu' which means the stream is shaped like a sickle, has a rich history at the times of royal rule. The stream

connects two tributaries of Muvattupuzha river at Aattuvelakadavu and Panjippalam. Later this stream turn to a garbage dumping area and its water course got disrupted. This grama panchayat set an example through implementing the STREET project by the 'responsible' contribution of local people through reviving the canal. Under the Responsible Tourism Mission and people's drive to implement the project, Kerala Tourism Department focus on taking tourism deep into the cores and rural vicinities of Kerala.

Maravanthuruth are based on the water street theme on account of its geographical peculiarity. Only a small proportion of this initiative is funded by Maravanthuruthu panchayat council, the rest expenses have to be taken care by the residents. The island with vast polder coverage and well-connected canal network, and proximity to places such as Kochi, Alappuzha and Kottayam, has many local attractions and unique cultural tradition to attract tourists.

**Water Street-** The stretches of rivers, natural canals and backwaters will be under the project and is open to tourists by different modes of water transportation and transportation services in moving/floating units. This initiative constitute of backwater street, river street and canal street, all centered on 'Arival thodu. Following are the water based tourism activities under the project.

- Large Backwater Stretch/ Rivers/ Natural Canals- It will be a Water Based Tourism Circuits
- Water Based Activities
- Kayaking and night safari expeditions
- Country Boat trips
- Shikkara (Rowing / Mechanized) Trips
- House Boats
- Floating Restaurants by Women Groups
- Performing Theaters (Floating Koothambalam)
- Floating Markets
- Traditional and Modern Fishing experiences.

To safeguard the tourists visiting the destinations, there are lifesaving or floating rescue teams to ensure smooth and safe running of the project.

## FINDINGS OF THE STUDY

### Sustainable Tourism in Maravanthuruth

The diverse effect due to encroachments and garbage piling, which slowly into a health hazard, created growing concern among the host community to take on the initiatives of STREET project for its revival of the canal. Tourists will experience canal sail on the crystal clear water, enjoy the beauty of the village life, adore traditional artforms and watch flora and fauna enroute. On the river banks, villagers planted mangroves, chembarathi (hibiscus), chethi (jungle geranium or jungle flame), kadali (Malabar melastome) and similar plants. Tourists could explore farming as this projects covers farmlands growing twelve varieties of plantains, paddy, nutmegs, and other agriculture crops. The tourism department in liaison with local people operates country boats, kayaking and pedal boats for the visitors. The project aims at creating residents as ultimate beneficiaries of tourism. Under STREET project, the practice of responsible tourism would reach out to more destinations and tourists. Less explored destination will be under limelight of sustainable tourism which involves societal development and community participation. Similar destination streets will emerge in ten selected local bodies across the state where Maravanthuruth project will be model project. As the project was inaugurated recently in 2022 and its implementation phase is about four years, Maravanthuruth project is showing a progressive advancement in sustainable tourism activities.

### Project Outcome

Project is focused on planning a people-centric tourism destination, where all activities are functioned principally by residents. The local self-governing agencies and local residents would play a major role in this process, which was envisaged as a public-private partnership project. The project aims at creating residents as ultimate beneficiaries of tourism.

The project have the potential to offer innovative experiences of experiential tourism by establishing streets for art and culture, village life experience, and agri tourism.

**VLE/ Village Life Experiences**

- Tourists could explore the vast area of farmlands that portray rural life and workpractices.
- Tourists can experience canal sailing to enjoy village life, explore traditionalartforms and watch flora and fauna enrout.
- Beautification on the river banks by the villagers by planting mangroves and flowerplants are of support to rich biodiversity and climate resilience toolkit.
- Water based tourist activities give a picturesque life of country side villages.
- Experience of floating Markets, where travelers can purchase goods and souvenirsfrom boats bring back the role of water transport in olden days.
- Traditional and modern fishing experiences gives a chance to satisfy adventure hunt and lifetime experience.

**Art and Culture Street**

- Package offers exploration of traditional and religious rituals that showcase its cultural heritage to travelers.
- Kerala Murals paintings by local artists display an abounding traditions dating back.
- Performing Theaters (Floating Koothambalam) opens the opportunity to explore theancient ritualistic art forms and ethnicity.

**Agri Street**

- Paddy farms, banana farms, fish farms, farm tourism units, home stead farm units, offers peaceful, sizzling, fresh air and serene atmosphere and healthy walk to tourists.
- Cultivation also serves treat for tourists' treat buds and offers a healthy diet and shopping natural products from farm houses.

The drawbacks of this initiative cannot be measured effectively as it is in its initial phase of implementation. Only in long run and project reviewing committees report, we can elucidate on infrastructure requirement, financial resources, stakeholder participation, conflict and corruption, waste management, social inequalities, etc.

**CONCLUSION AND RECOMMENDATIONS**

The progressive phase of Maravanthuruthu tourism is giving a new face of the village as part of the STREET project. This project could impart new facets of experiential tours and also helps in bring community to the forefront of Kerala tourism industry. The evidence indicate that tourists are not specifically demanding the so-called "green" or "eco labels" on the product that they select, but they will not return to destination which fails to offer environmental quality as a part of tourism experience" (Middleton and Hawkin, 1998). Unravelling the tourism ecosystem potential, vast value chain and investment assistance delivers an inclusive and sustainable growth in newly developed destinations constituting the marginalized communities.

Maravanthuruth can be truly considered as a Sustainable, Tangible, Responsible, Experiential, Ethnic Tourism Hubs based on the following characteristic followed:

- It is a responsible travel that attempt to limits its impact on the environment.
- It is an alternative to mass tourism.
- Create a unique and enjoyable experience for tourists.
- Educate tourists about travelling responsibly.
- Hope for a long-term environmental sustainability.
- Travelling usually to remote areas of natural beauty.
- Creates Social/Cultural Sustainability through promoting local food, local history and culture, ensure community participation.
- Focus on economic development to buy local products/souvenirs so as to supportlocal economy.

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**REMEDIAL STEPS FOR SOCIAL SET-UP UNDER MAHARAJA HARI SINGH****Ab Rehman Wani<sup>1</sup> and Dr. Seema Parihar<sup>2</sup>**<sup>1</sup>Research Scholar, (Regd no. 72011768) and <sup>2</sup>Supervisor, Department of History, School of Humanities and Physical Education, CT University, Ludhiana, Punjab**ABSTRACT**

*Maharaja Hari Singh believed in the notion of social justice and thus considered every religion and culture equal. It is quoted to be said by him, "For me all communities, religions and races are equal. All religions are mine and justice is my religion".*

*It is said that his reign in Jammu and Kashmir saw the steady introduction of democracy as all the public institutions were being democratized with changing demands of the changing time. Maharaja Hari Singh as a ruler was modernist in approach and was passionate about the notion of uprooting menace(s) like illiteracy, social evils / social stratification and inequality from Jammu and Kashmir. He was a generous and considerate ruler and was particularly touched by the misery of agriculturists of Jammu and Kashmir who composed around eighty percent of the population size . Hari Singh is known to have been against gender-biased practices and hence improved the societal status of women under his regime. He, as a ruler, fought malpractices like female infanticide and dowry culture. The concept of polyandry which was highly prevalent in areas like Ladakh was duly abolished in 1941. Laws were made and enacted to limit and eradicate immoral trafficking in women and steps were taken in an appreciable sequence and intensity for their reintegration in the social fabric through schemes aimed at rehabilitation. These women were taught and trained in handicrafts so that they could be financially sound, self - reliant, and self - sufficient. Some were also made to take respectable refuge in families of high and honorable order. Maharaja Hari Singh believed that social mobility and de-stratification of societal classes is a direct product of literacy and education. Education to him was enlightenment and rightly so. Education considerably progressed throughout the regions and the Maharaja particularly introduced Urdu as a medium of instruction so as to make schooling in particular and education in general accessible and convenient for subjects under him.*

*Keywords: Justice; Reformation; Harijan; Praja-sabha; Juvenile; Infanticide*

**INTRODUCTION**

Maharaja Hari Singh ascended the throne on the death of his uncle Maharaja Pratab Singh on September 23, 1925. He rose as a luminous star on the firmament of reformation in Indian history. His reign was primarily an Age of Reformation.

In his first public speech in January 1926 he decided: "If I am worth governing this state, then I will say that for me all communities, religions and races are equals. As a ruler I have no religion, all religions are mine and my religion is justice. It is possible that while dispensing justice I may commit mistakes. To err is human. One who says that he does not commit a mistake is not speaking truth. Only God is free from error. My duty is to look at every one with equality. I shall work with justice as far as possible."

He realized that social justice was the most important and significant in human affairs. The Maharaja did his best in the field of social reform, and his naturally clashed with orthodox people. While he worked for progress, the orthodox were all for reaction. But he faced it and overcame the opposition. Much earlier than Maharaja Hari Singh, Raja Ram Mohan Roy, and much later Mahatma Gandhi had tried to eradicate untouchability. But they had not been able, with all their efforts, to eradicate it completely.

Maharaja Hari Singh had studied in Ajmer and was nourished on western progressive and liberal ideas. He had studied books on history, politics and social subjects and had realized that our society condemned the Harijans to a life of filth and degradation. They lived in hovels, yet they continued to render valuable services to the society for a mere pittance. Even the small minority of Harijans should feel secure, happy and free and with his characteristic zeal set the force of his great personality in support of Harijan upliftment

The depressed classes in the state were subjected to great humiliation. Harijans were not allowed to draw water from a common well or tank and their children could not study at schools where upper class children received education. This discriminatory treatment was obnoxious and pernicious and the Maharaja could not allow such unjust treatment to be meted out to this section of his subjects. He therefore ordered that no discrimination should be shown to the depressed classes in any of the government institutions and threw open all public wells, tanks, temples and schools to them. The district officers had ordered that they should supervise and see that these instructions were followed in the letter and spirit, and punish those who violate them.

**Doors of Temples Opened for Harijans**

Maharaja Hari Singh made a formal proclamation on October 31, 1932 in which he declared that the Harijans would be allowed to enter and worship in all the temples. He also ordered that the proclamation should be published in the Gazette Extraordinary of the Government and the order should be communicated to the minister of Religious intuitions, Head Pujars of Raghunath Temple Srinagar and Jammu, for information of the public. This proclamation was vociferously opposed by public. The head priest of the Raghunath Temple Jammu resigned in protest. The Maharaja had great regard for the Head pujari as he had been associated with the Dogra House for many years and made efforts to dissuade him from giving up his job. But the Pujari was adamant and Maharaja accepted his resignation but did not withdraw the proclamation. The decision of Maharaja Hari Singh earned him the unprecedented credit of being the first ruler in India to have taken such a bold step for the emancipation of the Harijans.

**Harijan Upliftment**

Maharaja Hari Singh was intelligent enough to realize that these reforms had no value for men with empty stomachs. So economic assistance was also granted to the depressed classes. Their children were granted special scholarships and preferential treatment was accorded to them in recruitment to various government services. Seats were reserved for their representatives in local bodies and the state legislature, called Praja Sabha, when it was established later on. If Maharaja had waged no struggle other than this against untouchability even then he would have earned immortality.

**Child Marriage Unlawful**

Maharaja Hari Singh had heard many horrifying stories of child marriages in Hindu society particularly. It was considered a two edged sword which caused many health hazards to the couple. If the girl became a child-widow under the Hindu custom, she could not remarry. Thus the great misery was caused as a result of this evil custom. Maharaja soon after his accession to the throne enacted a law in 1928, called the Infant Marriage Prevention Regulation under which the age of marriage for girls was fixed at minimum of 14 years and for boys minimum of 18 years. If anyone found following the pernicious practice of marrying the child below these ages or sided or abetted such marriages, he was imprisoned for one year with or without a fine which could extend upto Rs 1000. At the same time, this law forbade incompatible marriages by providing that a man above 50, marrying a girl below 15 would make the man and his father-in-law besides his accomplices liable to be punished with imprisonment up to four years with or without a fine which could be extended to Rs. 2,000. The statutory measure paved the way for ending the child and unequal marriages and thus it brought peace and happiness to the people of the state.

**Widow Remarriage**

A Hindu woman, however young, could not remarry when her husband died. In 1933 Maharaja Hari Singh passed a law whereby a widow had the right to remarry without any hurdles. The Purpose of this law was explained by his highness in these words, "in spite of the fact that a lot of changes has come in the Hindu society and the majority of the Hindus feel that for the Hindu widows to remarry is right, still some people consider widow remarriage harmful for the Hindu society at large. Taking into consideration in fact that the world is becoming progressive and women in other parts of India also are advancing, it is my opinion that there should be no restriction on Hindu widows marrying again. This widow remarriage would result in the benefit of the public".

**Prohibition of Polygamy**

Maharaja Hari Singh decried polygamy among Hindus. Moreover from ancient times there was a tradition among the Buddhist of Ladakh that all the brothers of one family could marry one woman and a married woman had a right to keep another husband with or without the consent of her husbands. In 1941 a law was made whereby it was considered a crime for a woman to keep more than one husband.

**Prostitution Suppressed**

Another law was passed in 1934 which was called the Suppression of Immoral Traffic in Women Regulation by which the brothels were closed and public prostitution was considered immoral—a sin and grave offence. It was very difficult to execute this law but the Maharaja was determined to do away with this curse. So he adopted measures whereby these unfortunate and outcast women could either be absorbed in respectable families or were given training in some kind of handicraft which would make them economically self-supporting.

**The Demand for "RUM" Illegal**

The Maharaja got a law passed in the Praja Sabha in 1940 whereby none could accept Rum a certain amount of cash, kind, land and cattle which was taken from the side of bridegroom by the bride's side at the time of betrothal or marriage. To obtain Rum was now regarded as a legal offence and punishable under the law.

**Infanticide among the Rajputs**

The custom of infanticide was long prevalent among the Rajput's. The moment a girl was born, she was strangled to death and buried inside the compound of the house. The original cause of the heinous crime was an economic one. The poor among Rajput's could not afford to pay the heavy dowry demanded by the parents of the boy. The practice was prevalent even during the time of Maharaja Hari Singh. So he proclaimed that for every daughter, born in the Rajput family, her parents would be granted an acre of state land and financial help at the time of her marriage. The maharaja also established a regular fund called the Dhandevi Memorial Fund in memory of his deceased wife for this purpose. In this way the sinful practice was eradicated.

**Smoking among Children**

In 1929 Maharaja Hari Singh promulgated a law the Juvenile Smoking Regulation whereby smoking among young children was forbidden and anybody below 16 years of age could not sell tobacco.

**Reforms among Rajput Community**

There were some caste distinction among the Rajputs, The Maharaja had done away with the distinction of high and low class system prevailing among them. He declared that the Rajput's whether high or low should sit together and interdine. There was a strange tradition among the Rajputs according to which if a Rajput tilled the land he could not marry his son to the daughter of Suvran Rajputs, though he could give away his daughter to them. In order to stop this practice Maharaja Hari Singh held a function and himself ploughed the land in front of an assembled crowd at the Ranbir Mahal. He issued strict instructions that there should be no distinction between one Rajput and another one so far as social status and social intercourse were concerned.

**Discrimination against Women**

Maharaja Hari Singh took some measures which benefited the people. Primary education for boys in the cities of Srinagar and Jammu was made compulsory. Maharaja Hari Singh was a staunch advocate of educational system and girls' education. He opened girls schools and allowed the girls to receive higher education in colleges. There was no bar in their entry in the government services. Many women were appointed on government jobs, mostly in education and medical departments. A separate branch of the education department was also established for the advancement of the girls' education.

**Medical Reforms**

As Maharaja Hari Singh wished that more and more people should receive free medical aid, he reformed whole medical system. He had a central medical hospital building constructed in Ja Jammu at the cost of Rs.8 lakh and another at Srinagar at the cost of Rs 35 lakh. A total of about one hundred hospitals and dispensaries were opened in the state. Five hospitals were opened for the T.B. patients. Many students were granted scholarships for getting medical training in foreign countries and were later given appointments in the state. Moreover, a scheme for the eradication of plague in Jammu and another for the eradication of cholera in Kashmir were formulated. As a result of these both the diseases completely disappeared from the state.

**Respect for All Religions**

Maharaja Hari Singh avowed that all religions were equal before God. He was therefore tolerant towards all religions and there was complete freedom of religious practice in the state. He used to participate in the festivals and religious factions of all the religions, and respected their sentiments. At the time of Id festival, he used to visit the Id ground and congratulate the Muslims and remained there so long as they were engaged in the worshipped. His cosmopolitan and liberal outlook surpassed all in those times of narrow vision. It is since then the practice of participating in each other's religious festivals have been continuing which helps in the emotional integration.

Maharaja Hari Singh was indeed a pioneer in many respects. He was eager to make his state a welfare one. The true fact about him is being realized by the people only with the passage of time. As ill luck would have it the turn of events took him away to exile in Bombay where he died like a hero of a Greek Tragedy; his tragic flaws' If it was a flaw, being his love for self-respect and dignity.

**CONCLUSION**

From the study it can be concluded that the initial attempt to build an empire out of the remnants of the Sikh rule. The Sikh rule in Kashmir was somewhat in its declining phase. With the onset of the Dogra Rule the masses at large gave a mixed response towards the administrative policy of the Dogras. In the initial years of the Dogra rule the administration dealt with the iron hand to curb all the hindrances in its rule. Later the Policy witnessed a shift towards more people centric policies that made possible the inclusion of all the subject and build a strong empire.

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**REVIEW OF EFFECTS OF EXTERNAL FACTORS ON NBFCs IN INDIA FROM THE PERSPECTIVE OF GOING CONCERN****<sup>1</sup>Dr. Sanjay Sonawane and <sup>2</sup>CA Shilpa Alshi**

<sup>1</sup>Research Guide, University of Mumbai, Sanskar Sarjan Education Society's D.T.S.S. College of Commerce, Malad (East), Mumbai - 400097 HOD & Professor in Accountancy, Sathaye College, Member of Board of Studies Accountancy, Mumbai University, Mumbai – 400057

<sup>2</sup>Research Scholar, University of Mumbai, Sanskar Sarjan Education Society's, D.T.S.S. College of Commerce, Malad (East), Mumbai - 400097

**ABSTRACT**

*This study aims to explain Non-Banking Financial Companies from the perspective of Going Concern. Assumption of Going Concern is considered an important one not only from the survival and futuristic view for the entity but also from the point of view of current reporting to the stakeholders. A company can be reported as a going concern only when there is an assurance that the company will last forever. In India, there was a significantly speedy growth of Non-Banking Financial Companies (NBFCs) after the structural changes in the financial sector. But later NBFCs have gone through the turmoil of external challenges like the IL & FS, DHFL Crisis & COVID-19 uncertainty to name a few. During these challenging situations, it was tough to fight back against these turmoils and revive again in this competitive financial sector. This study is an attempt to understand the journey of struggle and survival & revival of NBFCs through these challenges to keep its Going Concern Status intact and also to study the angle of RBI and Union Budget's impact from the NBFCs' point of view.*

*Keywords: Non-Banking Financial Companies (NBFCs), Going Concern, Liquidity Crisis, IL & FS Crisis, COVID-19 Crisis.*

**INTRODUCTION**

In an economy like India, in the financial sector, regardless of the dominant role of the Banking Companies, Non-Banking Financial Companies (NBFCs) have emerged and grown after the structural changes in India after 2010. This was the era of post-2008, i.e. after the global financial crisis. There was also a substantial growth of Mutual Funds in that era. In Nov 2016, there was a sudden announcement of demonetization that brought out an unexpected increase in liquidity all around. There were already reduced rates of interest in the banking sector and this unexpected liquidity, was the perfect situation for the growth of NBFCs. After the steady growth then started the impact of external factors on NBFCs.

**OBJECTIVES:**

1. To Comprehend the concept of Going Concern with respect to NBFCs.
2. To understand the external factors and their effects on NBFCs to hold the going Concern Status.
3. To draw the conclusion & give suggestions for the road ahead for NBFCs for Going Concern.

**RESEARCH METHODOLOGY:**

This is a descriptive paper and the Secondary sources of data have been used to analyze the assumptions of Going Concern for NBFCs. The data has been taken from various publications, Working papers, Academic papers, Big Fours' Reports, Business newspapers' reports, the Official website of Regulators, the Annual Reports of the Companies, and Audit Reports.

**REVIEW OF LITERATURE:****What is going Concern?****Government of India, Ministry of Corporate Affairs' Notification (June 2021)**

MCA in its Accounting Standards states that "Going Concern, is an essential assumption of accounting while preparing the Financial Statements. It is considered as being followed while preparing Financial Statements. It further states, for Companies, that any company is considered as a Going Concern when in predictable future there is no intention of that company to close down or no necessity to liquidate that company. Also, the company is not significantly reducing the scale of operations. It means that the company is considered as in ongoing operations. This is a basic assumption and disclosure is needed only when there is any doubt in the ongoing operations of the company."

**The Institute of Chartered Accountants of India (ICAI) Standards:**

To explain the assumption of Going Concern further, ICAI states that “There are a few indicators that provide hints regarding the continuity of the company that could be doubtful. There are a few financial indicators and a few operating indicators. Generally, for Companies, common Indicators are Bad Liability position, Continuous Losses, Bad Loans, Adverse Key Financial Ratios, no dividends, no new Projects, Arrival of dominating competitors, Adverse Changes in Government policy, or any enactment, Key Managerial personnel resigning, etc.”

**GOING CONCERN WITH RESPECT TO NBFCs:****KPMG Global-Insights to IFRS (Nov 2020 Updated March 2022):**

It is suggested that additional information has to be provided in the financial statements for the following:

Liquidity risk control measures have to be reported and if there are any non-payments during the period against any debts then those have to be informed to the stakeholders-(IFRS-7.18-19,39(c))

**Care Ratings: (Oct 2020 Review):**

As per the methodology adopted by CARE ratings for NBFCs are mainly considered as going Concern when they keep the following aspects under control.

Profitability is one of the aspects which is to be analyzed while assessing the rating for any NBFCs. Operating income is being assessed to produce profitable results over the period, then only the NBFC will be considered as a going concern. It is very important to generate profits as an internal source of capital which is indirectly the indicator of growth in the future.

Dividend policy decisions would be based on the ease of operations of the business at which it is being carried out.

In the case of NBFCs, unsecured debt/junior debt ratings would be treated at par with the other senior debts if the company is considered a going concern. But to keep the going concern status intact NBFCs should balance the proportion of unsecured debt to the secured part.

Capital adequacy norm specified by the Reserve Bank of India is one aspect but practically to survive in the uncertainty, NBFCs should keep the add-on quantum of Capital to sustain the losses.

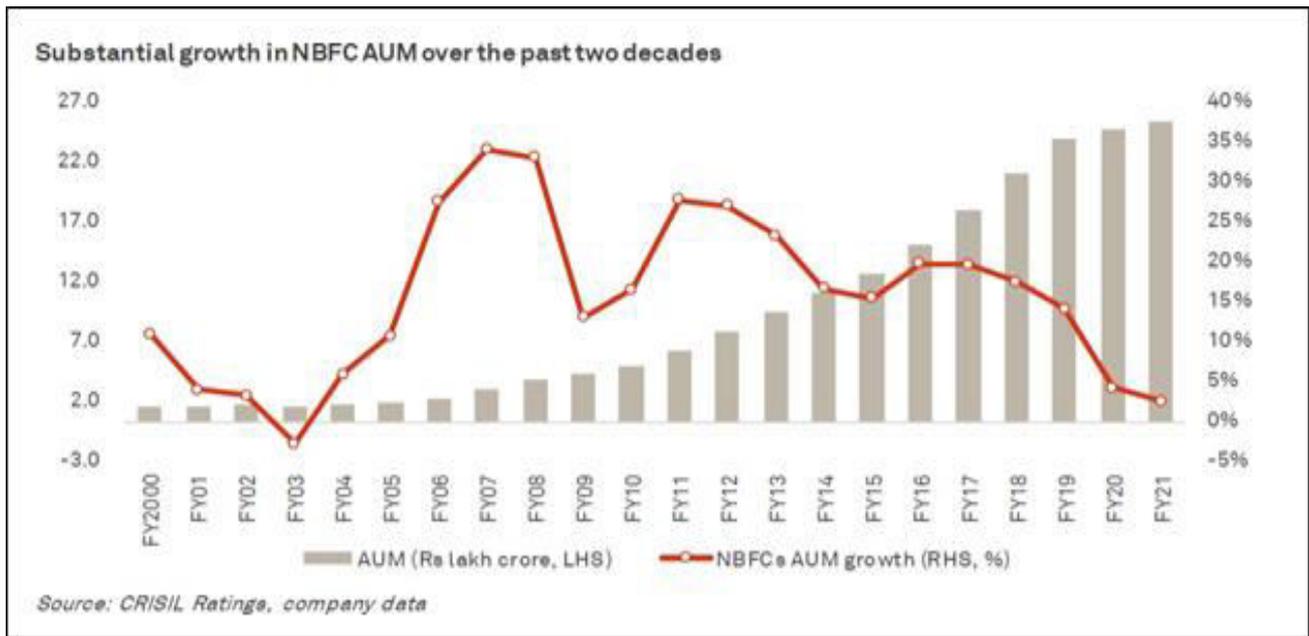
Another important factor in the case of NBFCs to hold its Going Concern Status would be the quality of their assets. Control on Credit Cost, and keeping it within limits is an immense important criterion to survive through the alarming situation of NPAs. It is important for the overall operations of NBFCs as it would help to keep the profit levels at the required level to manage risk comfortably.

Sometimes there is internal mismanagement and sometimes there are external factors that may have a huge impact on the functioning of the Companies.

**IMPACT OF SUBSEQUENT EVENTS AND GOING CONCERN****Ey Report (April 2020)**

COVID-19 created substantial doubts on continuity of operations for holding the Going Concern Status. They further stated that the companies under Indian Financial Sector are required to confirm that they have the expedient system to gauge the impact and assess the significant events which may have an impact on the continuing operations e.g. Borrower's insolvencies, liquidation, etc. other operating issues in the businesses especially MSME and Real estate sectors.

ANALYSIS & DISCUSSION:

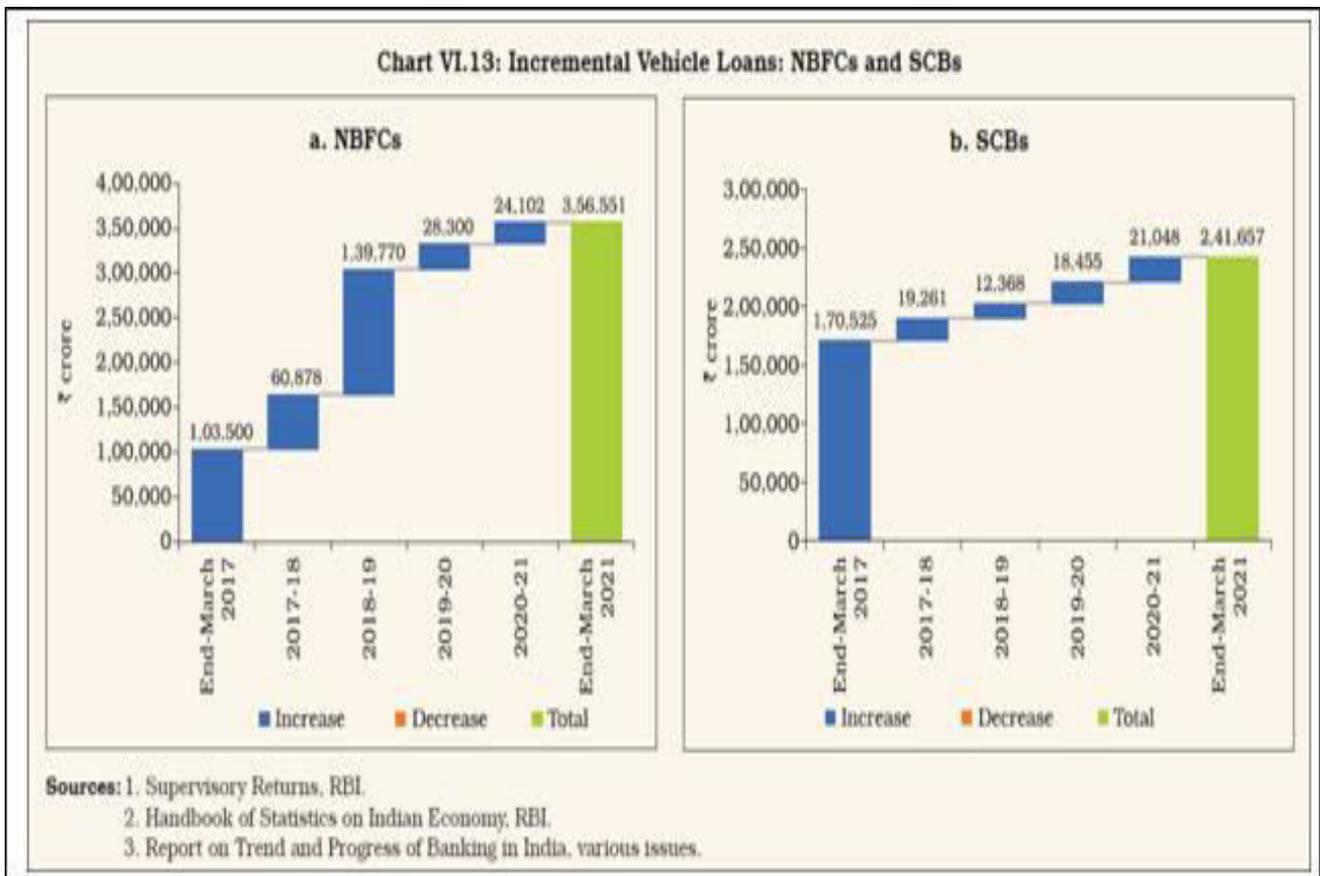


Source: CRISIL Ratings, Company Data

RBI Publication For Nbfcs (28<sup>th</sup> Dec 2021)

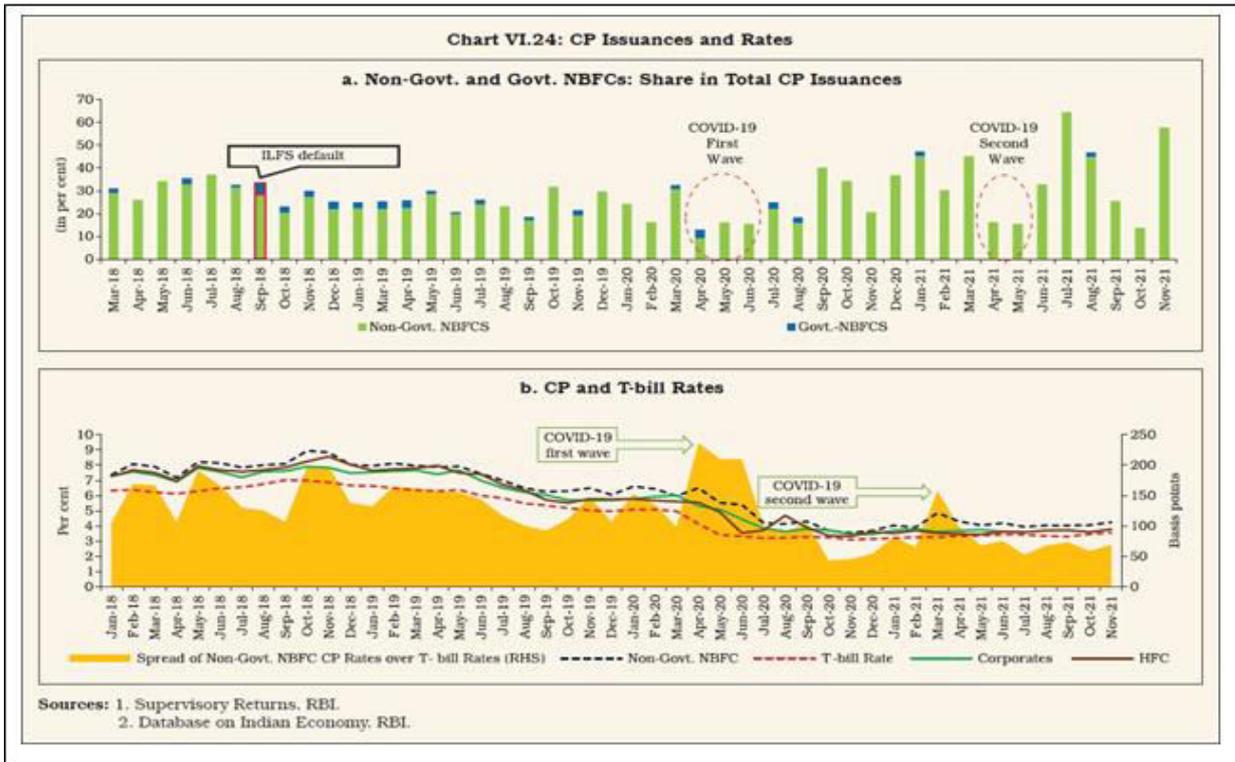
Growth of Non-Banking Financial Companies (NBFCs) despite there were Scheduled Commercial Banks in India (SCBs):

From the below comparison it is evident that as Compared to the SCBs, NBFCs have grown in the Vehicle loan category during pre- Crisis period 2017-18 and 2018-19 even though there was an existence of a formal channel of finance by SCBs. Throughout the period despite turmoils after turmoils NBFCs are showing steady growth over SCBs in this sector.

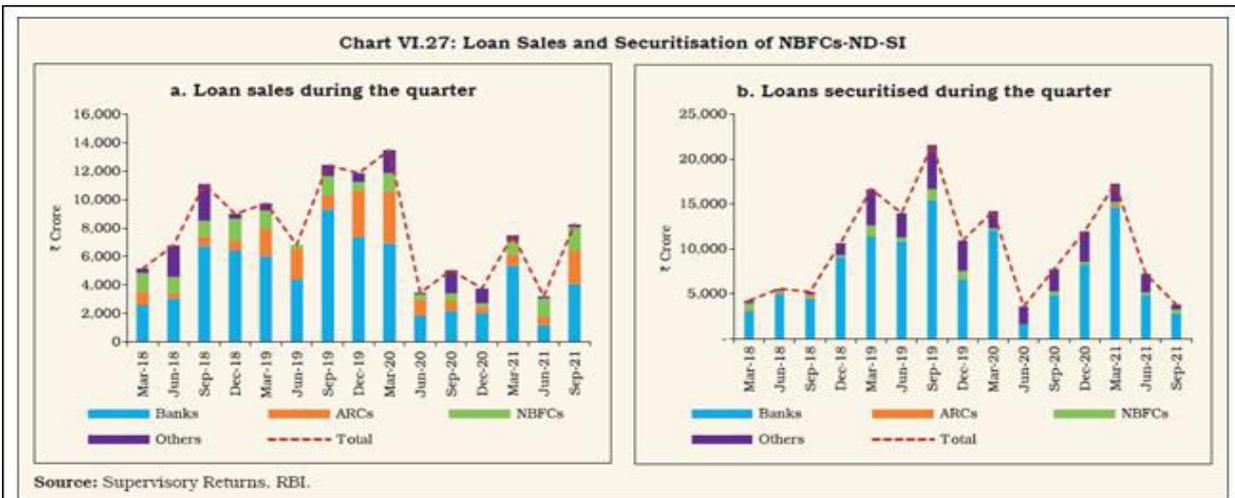


Source: RBI Publication for NBFCs (28<sup>th</sup> Dec 2021)

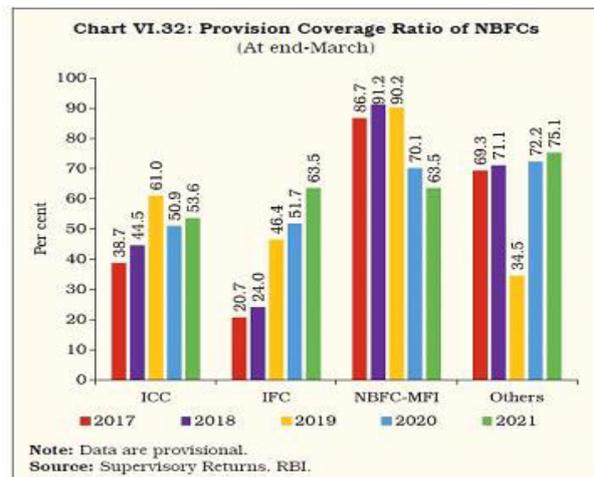
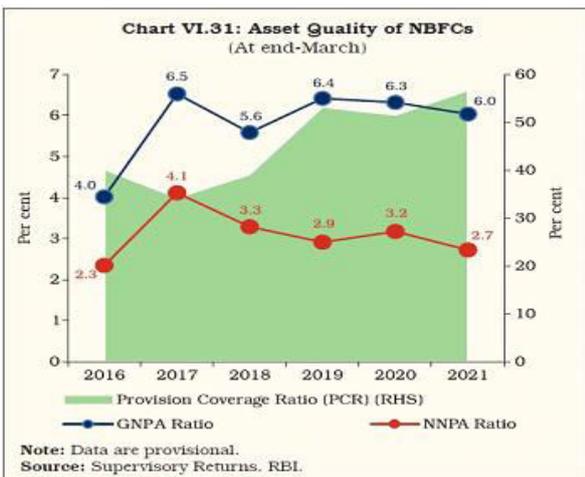
External Factors and Their Effects on Nbfcs to Hold the Going Concern Status:



Source: RBI Publication for NBFCs (28<sup>th</sup> Dec 2021)



Source: RBI Publication for NBFCs (28<sup>th</sup> Dec 2021)



Source: RBI Publication for NBFCs (28<sup>th</sup> Dec 2021)

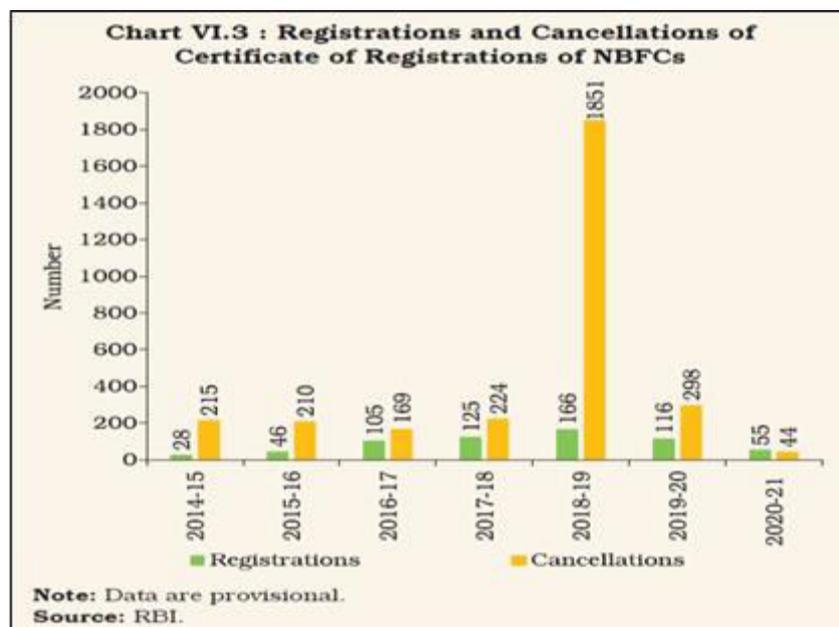
**KPMG Global-Insights to IFRS (Nov 2020 Updated March 2022)**

Outside Forces have may have adverse effects on the functioning of entities. Like Natural Calamities, Socio-Political matters, etc. These will create a situation of the doubt for the economic survival of the company. Eventually Going Concern Status would be in a doubtful condition. As discussed above, the disclosure for going concern is having immense importance in the world of reporting to the stakeholders to inform them very clearly, what’s the status of the company. This needs a strong analysis of the situation and measures to save going concern status depending upon the level of that entity (NBFC). Available alternatives have to be studied and implemented by taking into consideration future possibilities. They should be in sync with the earlier adopted principles and should follow the same in a non-contradictory manner. The companies need to revise the previously drawn financial plans according to their needs.

A few examples of issues that may hamper the going concern status are:

- Hard to get any debt funds for the low-rated entities.
- For risky companies, it becomes even more difficult as there will be fear in the minds of the investors and they will expect higher returns.
- Liquidity Crunch may result in further distress.
- When a home currency depreciates, it will be problematic to raise funds in the foreign currency as there will be a substantial increase in the repayment of that debt along with the interest.
- Loan covenants should be drawn carefully to avoid further complications.
- Companies should look into the safeguarding measures of survival and alternatives to save the situation from the solvency crisis e.g. availing factoring and other measures.

**Effect of IL & Fs Crisis On Nbfcs**



Source: RBI Publication for NBFCs (28<sup>th</sup> Dec 2021)

**Working Paper by Asian Development Bank: (Paper No. 83, Oct 2021)**

A study by ADB bank while writing a working paper summarised various factors which are after effects of the IL & FS crisis on NBFCs in India in the year 2018-19. Most importantly the issue was ultimately the solvency issue of NBFCs. The paper mentions a few after effects such as Severe difficulty in raising new Debt, Reckless increase in the borrowing cost, and ultimately credit spreads of Debt Instruments of NBFCs increased, Major Liquidity Problems, and eventually solvency issues.

As explained above the quality of Assets is the most important factor in the case of survival of NBFC, the main cause was the assets that failed to pay were earlier seemed to be the quality assets but eventually proved overrated and hence there were sudden repercussions of the same.

Surveillance by the authorities and agencies is vital as it will enhance the quality of NBFCs to survive the turmoil like IL & FS Crisis. Participants involved should gauge the risks accompanying the overall dynamics of NBFCs. The impact of linked leverage with respect to the Debt capital and that of Equity Capital should be assessed as per the related risks involved and due analysis has to be drawn to take the corrective measures to protect NBFCs from the sudden breakdown situations faced because of IL & FS Crisis.

The crisis created the shadow of fear in the debt market and it resulted in a strident increase in the bond's Credit Risk Premium. NBFCs had a huge setback in terms of commercial papers as mutual funds were suspicious for further extension of their term. The effect of this was the Commercial market held still. And the worst repercussion was that there was an acute liquidity crunch in the debt market. In a very small period of less than even three months, the fund stream was almost closed down for most of the NBFCs, especially the smaller ones. The NBFCs which were not backed by Government and which were small in quantum had a tough time getting additional funds through debt. Even for the larger NBFCs, who could manage to get little funds through debts, there was a huge difference in the yield between the bonds of similar maturities of other entities. This wasn't enough so eventually the cost to borrow funds through the debt market increased drastically. This situation was not showing any positives through the year 2020. And the situation worsens as it got hit the solvency issues.

### **Effects of Dhfl (Dewan Housing Finance Corporation) Disaster:**

#### **(Economic Times June 2022)**

In June 2019, a few months after the IL & FS disaster, it was discovered that DHFL's commercial papers failed to pay on the due date. Later it was informed that DHFL's promoters have committed Thirty-One Thousand Crore Rupees fraud. Recently CBI discovered that the actual fraud was for a huge Thirty-four thousand, six hundred and fifteen crore rupees. This is the biggest fraud discovered by CBI authorities in India. Apparently, the impact of this fraud was seen on NBFCs to worsen the aftereffects of IL & FS crisis that happened just a few months earlier. The amount could have been recovered only from the primary assets. This ultimately would result in a solvency problem. And that being the case it would be a massive shock to initiate add-on liquidity issues and increased distress in the stakeholder's minds. If this course of action would have been avoided to save the company, then there would be an adverse impact at a larger scale on the DHFL's lenders like various Banks, Pension funds, LIC & many more. In other words, it was a very unsafe, struggling, and stressful situation for the entire structure. It had a bad impact on Mutual funds also. This was a disastrous situation from a liquidity and solvency perspective for the entire economy.

**Andy Mukherjee of Bloomberg** proposed massive financial aid had to be provided to save the system.

### **Effects of Covid-19 Turmoil on Nbfcs**

COVID-19 pandemic strikes India around Jan-Feb 2020. The government announced a lockdown on 25<sup>th</sup> March 2020 and it was applicable throughout India. All activities got frozen till the end of June 2020. This pandemic situation of uncertainty actually checked the tolerance and sustainability of the NBFCs.

One disaster after the other, NBFCs were on the verge of collapse because of the worldwide pandemic and uncertainty.

#### **Economic Times (Jan 2022)**

COVID-19 pandemic created a dreadful situation for NBFCs as already they are at the lowest level of the consumption pyramid. As per the provisioning norms, NBFCs had to provide for losses not only based on the current bad situation but as per the Expected Credit Losses (ECL) requirements, they had to consider the future foreseeable losses and should provide for in the books causing the worst picture of solvency in front of the stakeholders. Auditors insisted to raise the provisions, especially in the III & IV quarter i.e. to increase the provisions from 5% to 15%. The concern for non-payment was always there throughout the year. As per the ICRA report, different COVID variants again create hesitancy and alertness in the minds of the investors, especially the retailers.

### **EY Report on Impact of COVID-19 on Nbfcs (April 2020):**

The pandemic caused the following impact which in turn created the chances that the situation may lead to solvency issues and then there would be doubt in the Going Concern Status.

#### **Expected Credit Losses (ECL):**

As explained above, Ernst & Young also explained that because of the ECL requirements there was a huge impact on the provisioning as well as on the reported Profits/(Losses).

**Changes According to Fair Valuation:**

As per IndAS-113 Fair, Value Measurement suggested changes in the carrying value of Assets/ Liabilities as per the “Exit-Price”. But under the COVID-19 situation, there were instability and unpredictability even in the prices as mentioned. Hence on the date of the Balance Sheet, it was very risky to evaluate the respective assets and liabilities according to the fair valuation concept. It involved considerable assumptions which might be blunders under the unstable and unpredictable scenario.

**Losses At Market Value Resulted in Capital Decrease:**

Assets/liabilities are charged as per the concept of marking to market losses and it involved charging losses to other comprehensive income (OCI). This resulted in consuming a significant capital portion. Alarmed the default on norms specified by RBI for Capital Adequacy. It required raising additional capital for the purpose of operations but under the COVID-19 ambiguity situation, it was not feasible to raise the add-on capital.

Impact on all these elements was so vital that it was capable of taking the NBFCs to the solvency issues to raise material doubt on the continuity of the businesses and finally the Going Concern.

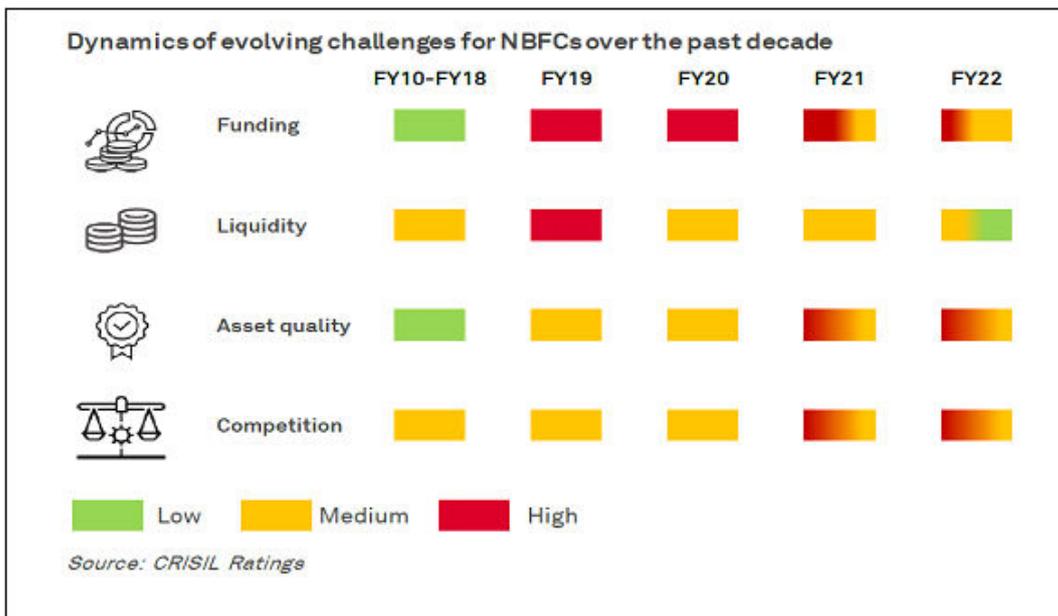
**Restructuring and Changes in the system:**

Companies had to gauge and analyze the requirements as there were material changes in the business circumstances. Accordingly, they had to design and restructure their products and allied system. The process involved checking quality assets and selling a few assets which were adversely affecting the company’s profits.

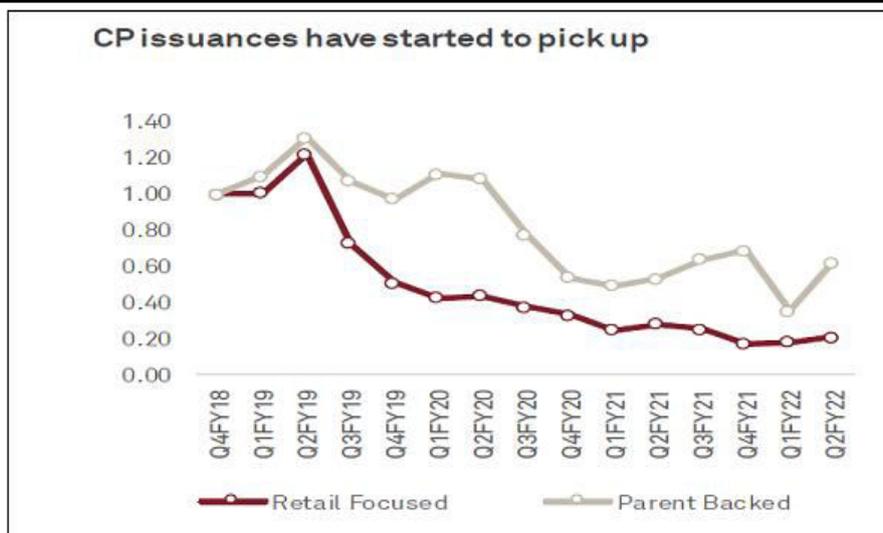
**Working Paper by Asian Development Bank: (Paper No. 83, Oct 2021)**

COVID-19 ambiguity & paused situation resulted in stopping operations of many NBFCs. The NBFCs which were mainly into lending money to small businesses had to close down their branches as those businesses were not in operation, hence for NBFCs, there was nothing to lend money to them. One of the products of NBFCs, providing Car Loans, was completely out of operations as no one actually bought the car in the month of April & May 2020. For MSMEs, there was a dearth of demand for their products and they had little reach to finance as a formal channel. NBFCs, which were focusing on these businesses and were lending money to them, were under distress for their assets’ burden as it was really a tough time for these businesses to keep their Going Concern Status. Overall, NBFCs were already on the verge of breaking down post IL & FS, and DHFL crisis because of the liquidity crunch, and their asset quality further deteriorated by RBI’s announcement of the moratorium for six months for the clients of NBFCs. NPAs grew out of proportion and there was a total lack of revenue for many months, stressed NBFCs to ultimately tackle the unwanted solvency issues and hard time to keep the Going Concern continuity for the foreseeable future. The difference in the yield for NBFCs and that of for standard securities was way increased in the COVID-19 era. It was even worse than the increased cost of borrowing issue after the IL & FS crisis. Mutual Funds considerably dropped their business to NBFCs.

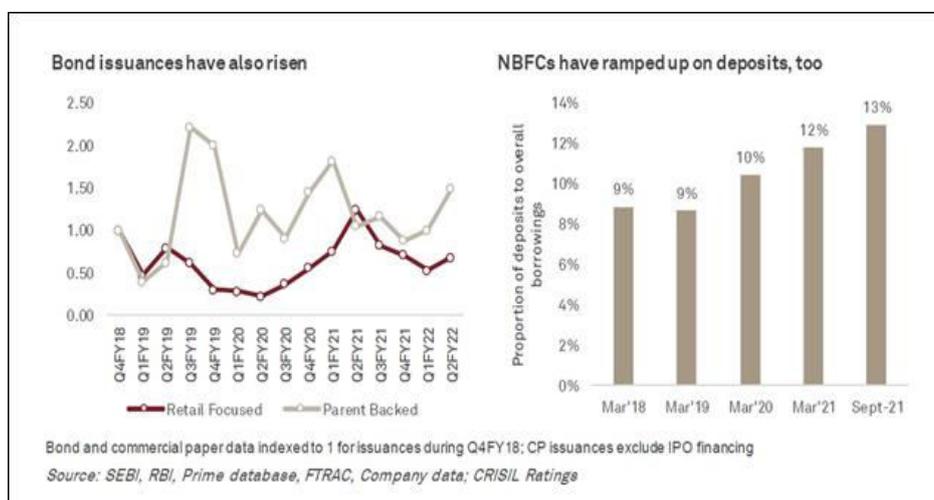
**Revival of Nbfcs Post-Crisis: Attempts by RBI and Government of India To Keep Nbfcs As Going Concern:**



Source: CRISIL Ratings, company data



Source: CRISIL Ratings, company data



Source: CRISIL Ratings, company data

RBI and the Government of India initiated various measures to revive NBFCs to take care of their liquidity problem. In Feb 2021, RBI offered, “Targeted Long-Term Repo Operations” to NBFCs to borrow from RBI at the repo rate of 4% to pump in some funds in the system to aid the liquidity issue of some stressed NBFCs.

- (1) “For the protection of all the NBFCs, Rs. One trillion first-loss default guarantee program announced”
- (2) “Rs. Two Hundred and Fifty Billion substitute investment fund with a contribution by the government of Rs. Hundred Billion to provide lift to housing projects. All this to help builders to tackle their liquidity crunch, which would ultimately benefit the NBFCs which have given loans to these projects”
- (3) “Decrease in bank’s risk weights for lending to NBFCs were made similar to those for other companies.”
- (4) “The limit of single person borrower exposure increased from 15% to 20%”
- (5) “Banks were allowed with conditions, to lend to registered NBFCs for lending mainly to the sector, micro & small entities and for housing sector in Millions of Rupees. All is considered as Lending for priority Sectors”
- (6) “Decreasing the requirement of the minimum holding period to boost NBFCs to securitize their loans and records.”

**IMPACT OF UNION BUDGET 2022-23 ON NBFCs**

**KEY BUDGET ANNOUNCEMENTS FOR NBFCs IN INDIA UNION BUDGET 2022-23 KPMG REPORT (BUDGET 2022)**

“Capex to Grow to Rs. Seven lakhs Fifty Thousand Crores in the year 2022-23 (35.4% increase over the previous year) will generate indirect demand for credit to NBFCs.”

“Focused on MSMEs Sector and the Hospitality Sector through Emergency Credit Line Guarantee Scheme-ECGLS & Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) will provide a lift to NBFCs with exposures to these sectors will help the flow of liquidity into these sectors.”

“Investment in affordable housing will provide a credit growth lift to NBFCs in reasonable housingFinance”

**NBFC LEADERS ON IMPACT OF UNION BUDGET 2022-23 ON NBFCs ECONOMIC TIMES 2<sup>nd</sup> FEB 2022:**

**Ravi Subramanian, MD & CEO, Shriram Housing Finance:**

“Budget 2022 is mainly focused on the overall Growth. The Government acknowledged what is required at this point of time and has done exactly the way with its infrastructure spending plan. The 35% increase in capital expenditure will lift systematic credit access and funding access to the sectors.”

**Ondrej Kubik (CEO, Home Credit India):**

“Union Budget is bang on laying what is needed, the foundation for growth oriented investments with the announcement of 35% rise in capital Expenditure for the year 2023 which will give the benefits in multiples to the overall economy.”

**Sarosh Amaria, (MD, Tata Capital Financial Services):**

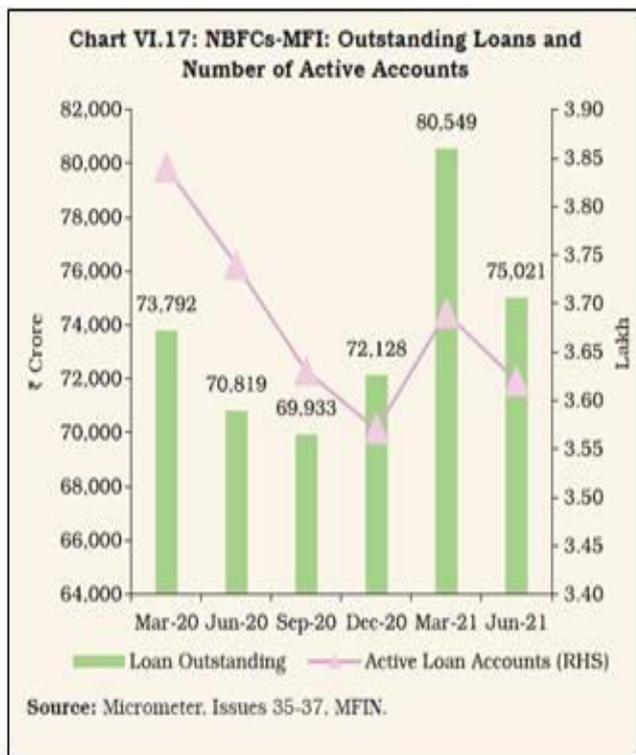
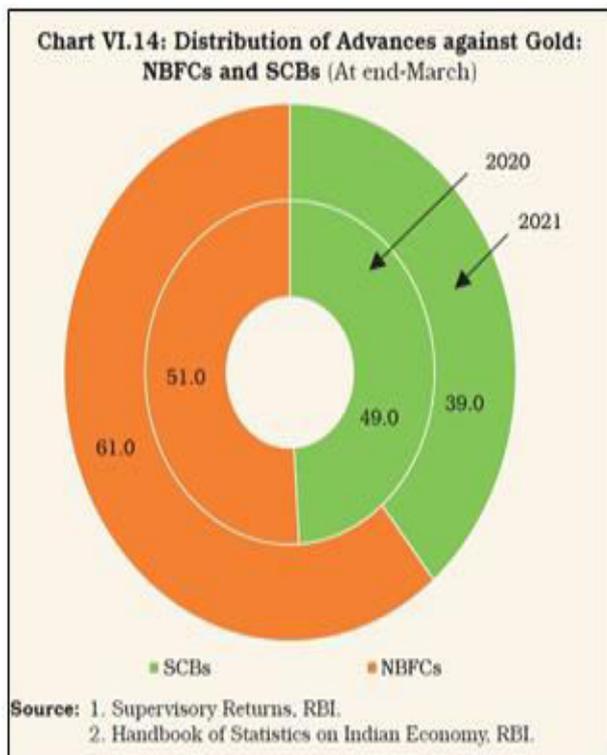
“The Govt. continuing its support to MSMEs like announcing schemes and extending the existing beneficial schemes for the sector. Incorporation of digital portals. Capital Expenditure allocation is high at Rs. 7.5 Lakh Cr. Will aid the industry in sustainable recovery after the pandemic.”

**Ajay Srinivasan, (Chief Executive– Aditya Birla Capital):**

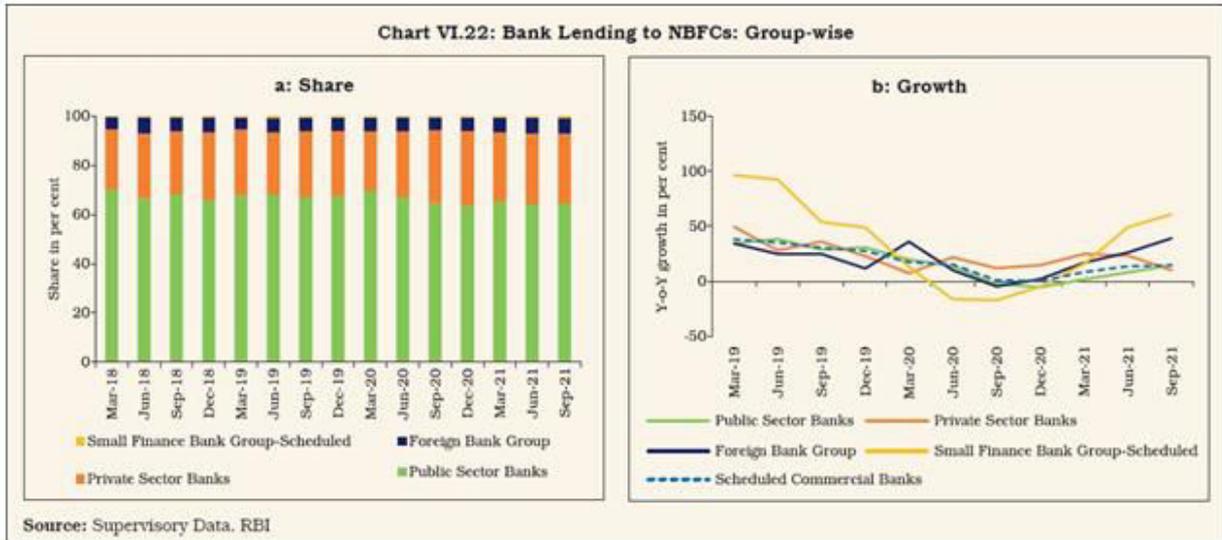
“Budget announced is by taking into consideration growth and moving-ahead approach. Also has the consideration for digital economy. Other areas benefitted are new ventures, and developments by taking technology at the centre. Other positive aspects of Budget are pathway for Energy and climateaction.”

**Y S Chakravarti, (MD and CEO, Shriram City Union Finance):**

“The Union Budget 2022-23 is mainly focusing on capital expenditure with a swing of measures in every sector, to do everything possible. Continuing its support to MSMEs like announcing schemes and extending the existing beneficial schemes for the sector”



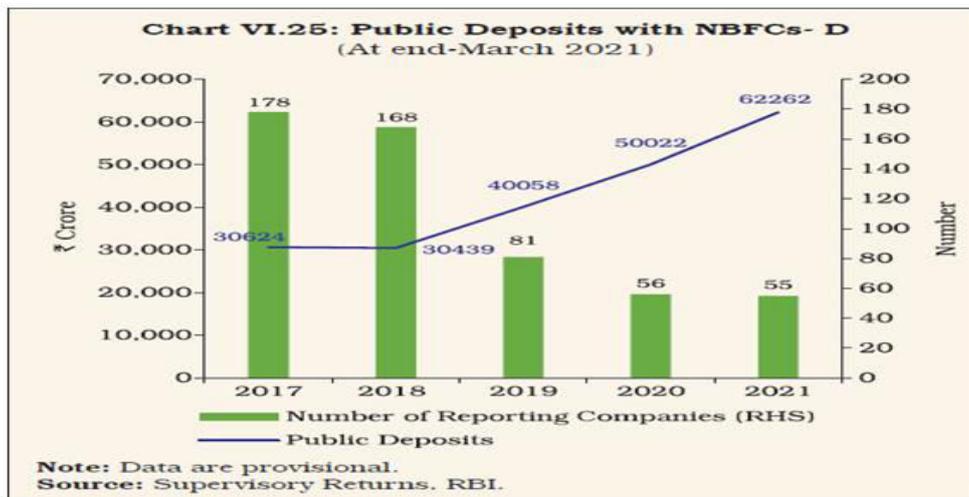
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**CONCLUSION & SUGGESTIONS**

**Road Ahead for Nbfcs Post Crisis**

After sustaining turmoils like IL & FS, DHFL, and COVID-19 pandemic NBFC Sector is trying to move on towards achieving sustainable growth.

As restructuring is one of the ways forward for NBFCs, analysts are predicting that there will become problem loan accounts with which NBFCs have to tackle and sustain but overall with the positive vibes of the Union Budget the coming year is expected to be positive for this sector.

Precaution has to be taken for careful restructuring of overall business models, detailing every product cautiously, especially the care should be taken in the light of recently discovered irregularities after COVID-19. Weaker accounts will be restructured. No serious worries if new products would be drawn carefully. New accounts would be of good quality with smooth collections with great profits.

There should be some mergers and acquisitions, higher rated, bigger NBFCs should acquire the lower rated and stressed NBFCs. RBI and the Government of India's positive moves would definitely boost the liquidity condition of NBFCs. At the offset, we should be hopeful about NBFCs that it will not only hold its Going Concern Status but also the journey of revival has begun.

"The share of NBFCs in the overall credit has grown from 12% (in 2008) to 17% (in 2021) also the assets under management of NBFCs are expected to grow 5%-7% in the FY2022 and 8%-10% in the FY2023. Stressed assets of NBFC-MFIs likely declined to 14% as of the end-March-CRISIL" as per Business Standards Report 2022.

To keep the Going Concern status intact governing body of NBFCs should exercise the judgment to evaluate and analyze the capabilities of the entity considering its foreseeable future and volatility factors by paying attention to the feasible important alternatives. Evaluate and analyze the subsequent events which may create substantial uncertainty about the entity's continuity. Reassure about its financial and operational plans for their practicality and attainability. Deliver strong disclosures, that should include the doubtful situations which would be recognized for the purpose of assurance of Going Concern Status by following the regulatory guidelines.

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**A COMPARATIVE STUDY OF PENSION AND RETIREMENT STRUCTURE OF INDIA AND UNITED STATES OF AMERICA****<sup>1</sup>Anushree Ganguly and <sup>2</sup>Dr. Piyush Prakash**<sup>1</sup>Research Scholar and Department of Commerce, DAV PG College, Chhatrapati Shahu Ji Maharaj University  
Kanpur, India**ABSTRACT**

*Retirement Planning is a matter of concern for all countries whether developed or developing. The schemes so available for retirement plans do vary in US and India. One is the biggest economy of the world with limited population and engaged mostly in organized sector. Whereas the Other Country India is far lagging in being strong held economy due to the ever growing population that too stuck in unorganized sector. A country where workers are struggling enough for getting a job, then getting an appropriate wage. How unimaginably difficult it might be for the huge population to be umbrella covered by a good Retirement Structure to get their future safe and sound? This Paper attempts to make a comparison between the Retirement structures of the two countries. The pension reforms that have brought in the structure of the two are also analyzed. Retirement Planning Structure should be improved in India and it should learn from the achievements and failures of USA.*

*Keywords: Retirement, Pension Structure, Social Security, Old Age Pension, Ageing Problem*

**JEL Classification:** D14, F65, G11

**INTRODUCTION**

Pension is an exchange system. An exchange for serving long years to an organization and getting security once one ceases to work in return of their dedicated services. After Retirement Life is a phase which is uncertain as the financial independency is lost. The working years of an individual takes care of one's present needs indeed but the future needs remain a contingency plan and the amount required to safeguard such interest is also not so exact. In country like India which is so badly stricken by poverty since ages, planning for Retirement becomes a questionable issue to be addressed. Therefore, the urgency is felt to research the matter of how one actually meets one's needs after he attains an age when he can't work or becomes mentally retarded to work anymore. In Poor Country like India, there is barely any support for the retired people apart from that given by family in the rural side. The bigger challenge is that India lacks a proper social security structure which forces the wide elderly population to depend mainly on their families. A proper formal pension system is lacked. A report of Agewell Research and Advocacy Centre says 77 Per Cent of the elderly men and 50 Per Cent of elderly women are using some form of social security schemes in 2019. But 79 Per Cent of that population finds out that money is barely enough to meet the basic need.

The whole Retirement structure or the Pension System are based on

- The Finance and the Demography of the state which directs towards the necessary reform.
- Sustainability of such System
- Adequacy

The Paper will discuss the prevailing Retirement plans of 2 different countries namely India and US. This paper will discuss how people invest differently in these 2 countries. How the structure of schemes varies from US to India?

**The Issue of Increasing Elderly**

A survey conducted by LIMRA LOMA Secure Retirement Institute covered a sample of 2000 respondents. It says that the growth of elderly population is way more than overall population growth with increased life expectancy and more advanced, medical science. Bank is still the most trusted financial institution to invest in. Although young workers have assumed to be self-dependent for their Retirement savings. It observed investing in Real estate is a prominent feature of Indians planning for their retirement. Due to lower retirement awareness, 60 Per Cent retirees regret for starting over saving later in their working life. The finds out that India will take 45 years to shift from aging to superaged whereas USA will take a longer period of 80 years. which means they have more time to prepare its steps. And 30 years for moving from young to ageing phase in India. It means it has lesser time to prepare adequately to manage the aging population. Therefore, need of the hour is to establish a good coverage retirement structure for the elderly.

### Factors Influencing Retirement

There are number of factors like health, wealth, family structure, employment features and so on Which influences retirement. If one is eligible for private or public pension schemes he chooses to retire sooner whereas those who haven't subscribed to any such scheme continue working longer to maintain his livelihood. Apart from this, health sufferings also force some to take retirement sooner. It has been noticed that morbidities are more frequent after requirement. It may include both physical and mental morbidity. Life expectancy of the generation and country also determines the age of retirement. In earlier times when there were no pension schemes at all then people used to have lower life expectancy and made them work until death. Another factor is Wealth. Wealth has a relation with early retirement. The wealthier one is the early he seeks retirement from as then he can devote more time of his after retirement life in leisure, recreational activities or hobbies due to abundance of wealth. Thereafter Spouse's employment status also influences one's own decision of retirement. If one's wife has retired; the husband retires soon too to spend more time together. Number of members in the family also influences retirement age. Number of family members determines the retirement age one chooses for himself. The more members there are greater is the financial need in the family which delays the retirement age. Also the research suggests women tend to retire earlier than men whether they are in USA or India. Inflation is another factor which influences the decision of retirement. Rising cost of living bothers, the retirees as the inflation won't be covered in their schemes. With Passage of time health care cost is also increasing and in old age this cost seems to increase more and more with increasing life expectancy over time. All these factors are more or less evident in all countries whether USA or India. (Justine S. Hastings 2020) found that people have difficulty with taking financial decision because of two problems, one being financially illiterate and another being prejudice towards present consumption. It notices that impatience towards saving is a huge problem among the retirees. It says Chile has a close to ideal system with mandatory national defined contribution system where they get a flexibility to choose their own pension fund manager alike 401(k) of USA.

### Why Comparing India and USA

India is a developing country with a very high population followed after china. Evidently today we have a very young population to support the elderly. But very soon this demographic dividend reaping will come to its end and then the population will have greater percentage of old age as it is the case of many urbanized, industrialized and developed country like USA, UK, Australia etc. (Charan Singh 2015) says that approximately 70 Per Cent of the Indian working population is not receiving any pension in social security. For the same they suggest burning need of Universal pension scheme to cover maximum population of India.

So this paper attempts to identify the features of social security of USA and make our social security system ready for tomorrow. The objective of the study is discussed below:

- To study the demographic difference in pension and retirement structure between India and USA.
- To study retirement structure with respect to pillar system .
- To study the schemes available in market for pensions in the two economies.
- To compare the role and interventions of government in the retirement structures.

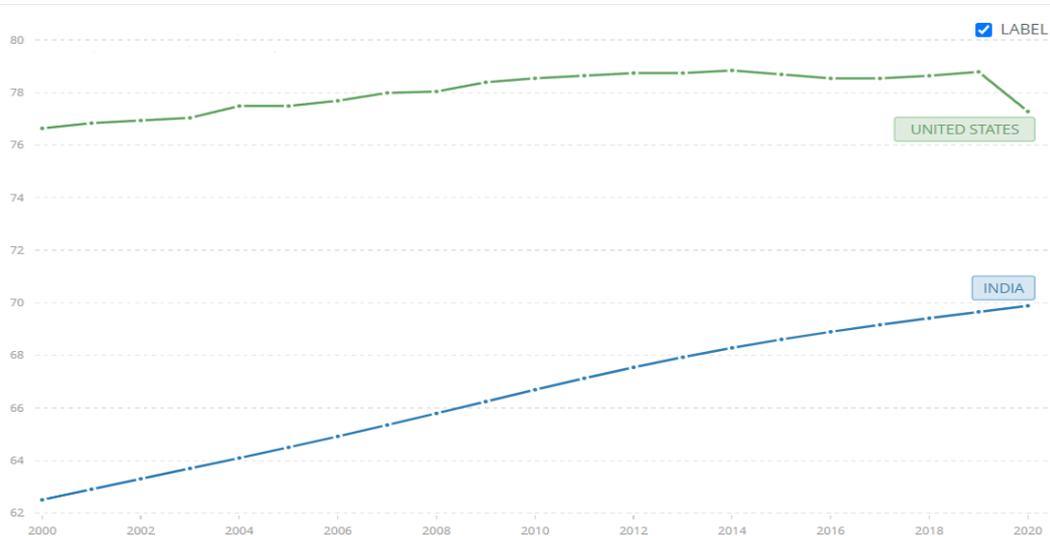
The paper will compare the pension and retirement structure of USA and India in context of demographics, Pillar System, Subscriber Base, Schemes available etc.



**Figure:** Age Dependency ratio (% of working population) India and United States,  
**Source:** World Bank

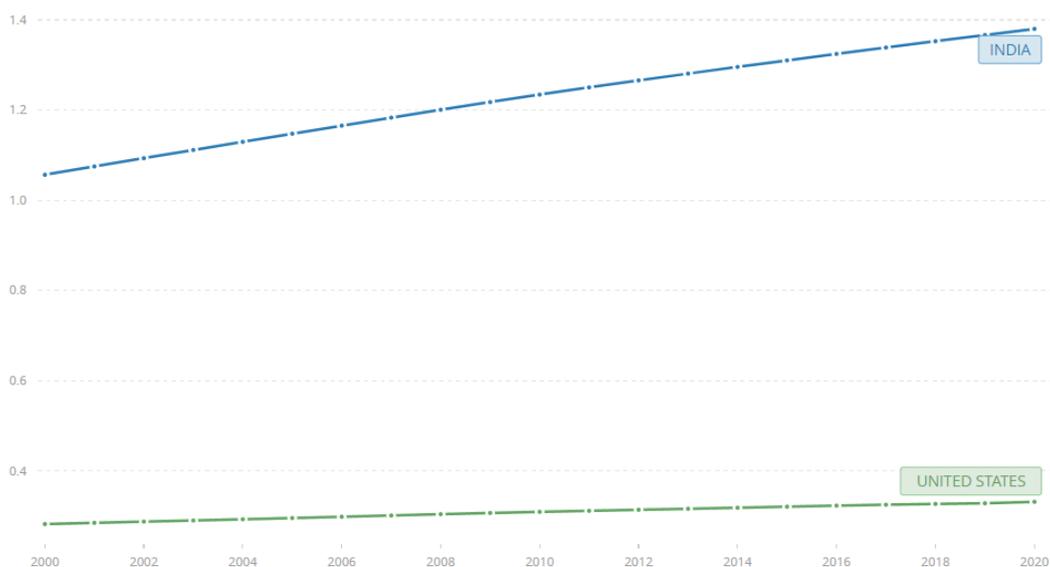
**Discussing Demographics**

- **Life Expectancy** Before 18<sup>th</sup> Century, on an average life expectancy was between 26 and 40 years which is very low than what is today. Nowadays both the countries are experiencing a higher life expectancy which will keep the economy healthier. Earlier in 1970s it was 49 years whereas now it has been 64 years worldwide. Life expectancy rate is 77 years in USA while it is 70 years in India according to World Bank 2020 Report.



**Figure:** Life expectancy at birth, total (years) - India, United States,Source : World Bank .

**Population** – According to the World Bank Report, as on 2018 India has a population of 1.38 billion whereas USA has 0.33 billion which is less than one fourth of India’s. It is one of the reason why USA has better pension coverage. Overall Population of India will grow by 27 Per Cent by 2050, Where the aged population (above 60 years’ people), the number will multiply by 171 Per Cent. The workforce will shrink with low mortality rate and low birth rate. And that would lead to pressure dependency on young workforce of huge aged population. An Industrial Opportunity is seen in India which can penetrate in social security system and improved the same. India is not only the fastest growing Economy rather it is one of the youngest major economies.

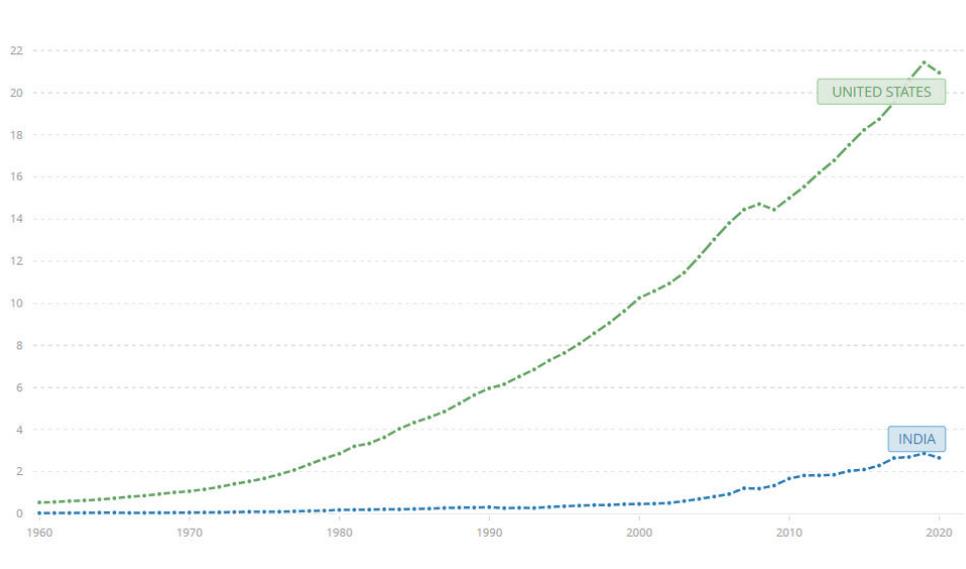


**Figure :** Population total , India and United States, Source : World Bank

- **Family Structure**-In US, children grow up and become financially independent sooner, therefore parent’s obligation is somehow reduced and they can retire at any age they want to. But in country like India where family members are webbed together harder. Generally, students don’t gets involved in some part time job for meeting their own expenses. Therefore, one needs to work longer till his kids get a full time job. So the retirement age is extended. Earlier the joint family culture was very famous where 3-4 generations lived

together and the aged were taken care efficiently by the younger generations will all due care. Joint Family structure is still common which spreads out the income risk among the family. But with the urbanization, industrialization, migration, increasing economic scenario the culture has shifted to more of nuclear families. With a shift to nuclear families as noticed in some recent years the size of the family is shrinking. And with the changing family dynamics from joint to nuclear such support system to elderly is also reducing. Therefore, a good pension system is a burning need. (Shreyan Kar 2019) suggest to act to the urging need towards pension of elderly. It says a rapid increase has been noticed in the number of elderly couples who are living by themselves. The new era of Urbanization, Nuclear family system, Modernization and westernization has led to decadency which says that old age persons seek for financial support when ignored by families which has been common nowadays. Discussing of changing family structure in USA, it is not about the change of Joint to nuclear. Joint families were never a prominent feature of families in America. But USA has experienced a lot of divorced or separated family in the last decade, children having single parent has now been common and that essentiate the need of more effective retirement planning due to the lost option of dependency on spouse.

- **Retirement Age** The normal retirement Age in USA is 62-67 years whereas 60-65 in India. This means people have a longer working life in USA than in India. (Teresa Ghilarducci 2019) studied the trends of inequality of wealth among the older employees. A very few but most wealthy people tend to hold half of the retired wealth over all nation. And the inequality grown much from 1992 to 2010. He also stresses the fact that it's the less earning group which is more vulnerable to economic mishaps. It says the Theil Index is inefficient to measure complete inequality.
- **GDP-** According to the world Bank data GDP per capita is 20.94 lakh Crores US\$ whereas it is 2.62 lakh Crores US\$ in India which justifies the fact that USA is the largest economy of the world whereas India is the fifth largest and still growing economy.



**Figure:** GDP ( Current US \$ )- India and United States, Source : World Data

- **Health Index** –According to the Report of Global Health Security Index, USA has better health Index than India being developed country. Therefore, the retirees will have a sustainable health after retirement. That means post retirement elderly will have lesser medical expenditure. The report says USA has 75.9 score with Ranked 1 whereas India has 42.9 score with 66<sup>th</sup> Rank.
- **After Retirement Goals-** (Ritu Gupta 2016) in her paper held that in India the retirement goals direct towards financial stability and self-related goals whereas in USA People invest for leisure and exploration after retirement.

### Multi Pillar System

1. **First pillar:** It is the mandatory, publicly managed and tax financed pension system. It is mainly for poor earned people for providing an assurance of old age benefits out of pocket of state by imposing some extra tax for pension. E.g., Us levies a social security tax on working force. This pillar is basically a safety net or a basic shield.

2. Second Pillar: It is mandatory, privately managed, fully funded pension system. It is mainly in organized sector and it is those employees linked schemes like NPS. It might be Defined Benefit or Defined contribution system.
3. Third Pillar: It is a voluntary system. It is mainly for the wealthy workforce who intend to have a more generous amount as their pension post retirement. It is a tool for tax inducements.

US lacks the second pillar of mandatory privately managed pension. It has old age and survivors Insurance which is a social security system which supports old age life or any other uncertainty that might occur in one's life. On the other hand, in third pillar it has voluntarily private pension plans like 401(K). Discussing of India, (Ramesh Gupta 2002) analyzed two perspectives one from educated and financially more earning ones and the other from the financially uneducated and low wage earners. It says India doesn't have the 1<sup>st</sup> pillar and works mainly on the 2<sup>nd</sup> one. Indians actually want a security in financial terms after retirement and are unwilling to take any risk on their own therefore plans, fund should be managed publicly by the state. (Ramesh Gupta 2003) His paper suggests a better system for lower income groups, to concentrate to work on the 2<sup>nd</sup> pillar and lastly to stop giving tax advantages to the already privileged ones. He says government should try to lower its fiscal costs and implementing a more viable pension system which is good for all. He says out of a 400 million populations of working class only 35 million had access to pension system.

Talking of structural reforms India has experienced a shift in past two decades whereas there wasn't any in USA. In India there has been a shift from Defined Benefit to Defined Contribution in early 2000 was an earmarking reform brought in India. But only that doesn't implement good coverage of pension schemes. There is still huge population left untouched i.e., Rural and Unorganized sector. This part remained unaddressed even today. India's retirement structure is weak due to the presence of a huge workforce in the unorganized sector who remain uncovered till today.

### **Allianz Pension Index**

According to the recent report of April 2020, the Life expectancy is increasing rapidly while fertility rates are falling overall in world. It is expected that the aged population of the world is going to increase from 9 Per Cent to 16 Per Cent by 2050. Comparing the index, USA is on 5<sup>th</sup> Rank whereas India is on 38<sup>th</sup> Rank. But if we talk about the Sustainability Index then USA ranks 14<sup>th</sup> while India ranks 31<sup>st</sup>. The Report also hints that this changing dynamic of life expectancy will be more impactful in India than in USA. It also finds out the Flaws with Pay as You Go scheme, it says this system is inefficient to cater the old age financial needs. And it supports the capital funded old age system instead.

### **Schemes Available**

In USA there is wide coverage of pension, there is no mandatory publicly manages schemes but mostly people are already involved in defined contribution plans. Number of plans popular in USA are 401(K), 403(b), IRA, IRA Roth etc. In US, hybrid and cash balance plans are also available where the account balances can be calculated retrospectively if one switches from traditional to hybrid plan. But that is still a controversial issue to mull over as hybrid plans rejects the provision of early Retirement. There is a cap on contribution that one can make in the plans to ensure that more earning participants don't get excessive tax advantages at the cost of less paid participants. In India there are various categories in retirement pension plans like Deferred Annuity, Annuity Certain, Immediate Annuity, with Cover and without Cover Pension Plans, Guaranteed Period Annuity, Life Annuity, National Pension Scheme, Pension Funds, ULIPs and so on. There are number of plans which are popular now like Atal Yojana, Post Office Monthly Scheme, Pradhan Mantra Vaya Vandana Yojana, LIC Jeevan Akshay Yojana, EPF pension, NPS, LIC Jeevan Nidhi and so on. Reform of Pension in India is evident with the shift from Defined Benefit to Defined Contribution.

### **Role of Government**

In India PFRDA is the regulatory body of pension system of the country. It promotes the pension schemes to ensure welfare for the old age needs of the retired people. It manages NPS and other agencies like fund managers, record keeps for the facilitation of smooth work. It also acts as facilitation of smooth work. It also acts as an intermediary for resolving any dispute. India has very little involvement of private players in Pension market. (Ramesh Gupta 2002) suggests the agency problem might arise if we shift to privatization. In USA which is a developed country there are systems to provide pension benefits in the old age after retirement and such benefits are funded by their employer or state. In USA Right to get Pension has been embedded in the constitution to ensure a better and secured life after retirement. Public servants aren't covered under social security system rather they are under some own pension schemes. In USA the regulatory Institution ERISA differentiates between qualified and unqualified plans. There are lot of strict Requirements to qualify for

qualified plans as those plans are there are systems to provide pension benefits in the old age after retirement and such benefits are funded by their employer or state. (Olivia S. Mitchell 2000) notices a problem of assets leakage. They found of that number of people often withdraws out of their pension fund before they approach retirement for other purposes which leads to reduction of their retirement corpus fund when they actually require. (Olivia S. Mitchell 2000) notices a problem of Assets leakage in USA. They found that number of people often withdraws out of their pension fund before they approach retirement for other purposes which leads to reduction of their retirement corpus fund when they actually require. Then pension funds are not maintained at market value. Another major concern for retirement in USA is investment in other assets by public pension system which are prone to risk lured after more returns. It says a separate body needs to be set up for managing the affairs more efficiently USA has not undergone any drastic social security Reform since 1983. (Axel Borsch Supan 2018) discussed the role of reforms of retirement and pension. It also specifies the role of incentives and its influences on behavior regarding retirement. The study was 12 countries including USA. It observes a negative relation between old age employment rates and taxes on working. Whereas a strong relation is noticed between working longer and employment rates. Unlike many other countries like India which has introduced a Defined Contribution system form Defined Benefit system. (Mukul G. Asher 2009) discussed about the importance of the whole new restructured social security concept in India. Since Social Security cost is borne by other age groups as the fund could be otherwise directed towards welfare of them. The paper identified the need of other private pension schemes to be participated so that it brings more of technological advances and professionalism into pension industry. The role of regulatory body was discussed which was missing in Indian market. It says that reform is not possible solely by pension industry unless accompanied by other sectors like Labor market, Financial and Capital market etc.

## CONCLUSION

In USA it has been noticed that the pension system has a handsome coverage but the third pillar voluntary schemes allows a lot of beneficiaries to evade taxes. Few don't actually want better post retirement support, rather they use tax advantage to get away with taxes. With the absence of second pillar we realize that there is no such employer sponsored pension scheme. Another problem with pension system in USA is asset leakage. As far as India is concerned it is in initial stage of implementing Retirement or pension reforms pension schemes very recently, the whole structure is quite new, the structure is still undergoing the building strong phase. Social security system is very different from that of USA. It always existed in India but in some informal structure of joint family dynamics. In the last decade, few schemes like swavalambhan scheme, Atal pension Yojana have focused on unorganized sector. A surge in the coverage of pension schemes has been noticed. Pension and Retirement structure of India should focus on lowering its cost of administration, efficient management of fund and more involvement from the rural and unorganized sector. India is world's one of the fastest growing economies and growth rate is surging each year. India runs with a budget deficit of Rs 7.03 lakh crore, or 3.3 Per Cent of the GDP in 2019. And for an efficient social security system Indian Government needs to allocate a separate fund for it similar to USA to address its increasing old age population. Therefore, a special fund should be allocated for social security of elders by imposing an extra tax on the higher earning assesses alike USA. Increasing Financial Literacy is another goal to be achieved by India. In India the greater part of population is of low wage earners who are neither educated nor rich. They need a certain pension system to depend on and they are lacking resources. Therefore, more penetrated pension structure can be made with more of financial inclusion and increased financial literacy. World Bank report says that India lacks the first pillar of mandated publicly managed fund pension system. For better and pervasive coverage, the first pillar should be built in future. India has a very fragmented pension system, mainly it is restricted to the government owned structure. There are few private providers in India like HDFC, ICICI and few others but their market penetration and coverage is little. A need has been noticed to involve other agencies than government to work for pension system. But few advocates that privatization is no better if the publicly managed funds also perform in the same investment fashion. The returns of both will be more or less the same with volatile returns. And lastly, a more penetrating approach should be adopted to cover pension for the unorganized sector which is of utmost importance for India having three fourth of its working population in informal sector.

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**TRANSDERMAL PATCHES: AN ADVANCED ROUTE OF DRUG DELIVERY-A REVIEW**

Varsharani A. Jadhav, Dr. Nagoba Shivappa N\*, Mr. Hindole S. S\*, Rupesh Choure and Rohit Kombade  
Department of Pharmaceutics, Channabasweshwar Pharmacy College (Degree), Latur, Maharashtra, India

**ABSTRACT**

Transdermal drug delivery system was presented to overcome the difficulties of drug delivery especially oral route. A transdermal patch is a medicated adhesive patch that is placed on the skin to deliver a specific dose of medication through the skin and into the bloodstream. It promotes healing to an injured area of the body. An advantage of a transdermal drug delivery route over other types of delivery system such as oral, topical, i.v., i.m., etc. is that the patch provides a controlled release of the medication into the patient, usually through either a porous membrane covering a reservoir of medication or through body heat melting thin layers of medication embedded in the adhesive. The administration of drugs by transdermal route offers the advantage of being relatively painless. The appeal of using the skin as a portal of drug entry lies in ease of access, its huge surface area, and systemic access through underlying circulatory and lymphatic networks and the noninvasive nature of drug delivery. The main objective of transdermal drug delivery system is to deliver drugs into systemic circulation through skin at predetermined rate with minimal inter and inpatient variation.

Keywords: Transdermal drug delivery, patch

**INTRODUCTION**

Oral route is the most popular route of drug delivery system drug degradation etc in gastrointestinal tract due to enzymes, pH etc. To overcome these problems, a novel drug delivery system was developed by Chien in 1992, Banker in 1990, Guy in 1996. It was Transdermal patches or Transdermal delivery system. In this system medicated adhesive patches are prepared which deliver therapeutically effective amount of drug across the skin when it placed on skin. They are available in different sizes & having more than one ingredient. Once they apply on unbroken skin they deliver active ingredients into systemic circulation passing via skin barriers. A transdermal patch containing high dose of drug inside which is retained on the skin for prolonged period

**Drug Can Penetrate through Skin via Three Pathways-**

- a) Through hair follicles.
- b) Through sebaceous glands.
- c) Through sweat duct.

Transdermal drug delivery systems are used in various skin disorders, also in the management of angina pectoris, pains, neurological disorders, etc.

**Types of Transdermal Drug Delivery**

1. Single-layer Drug-in-Adhesive System
2. Reservoir System
3. Matrix System
4. Micro-Reservoir System

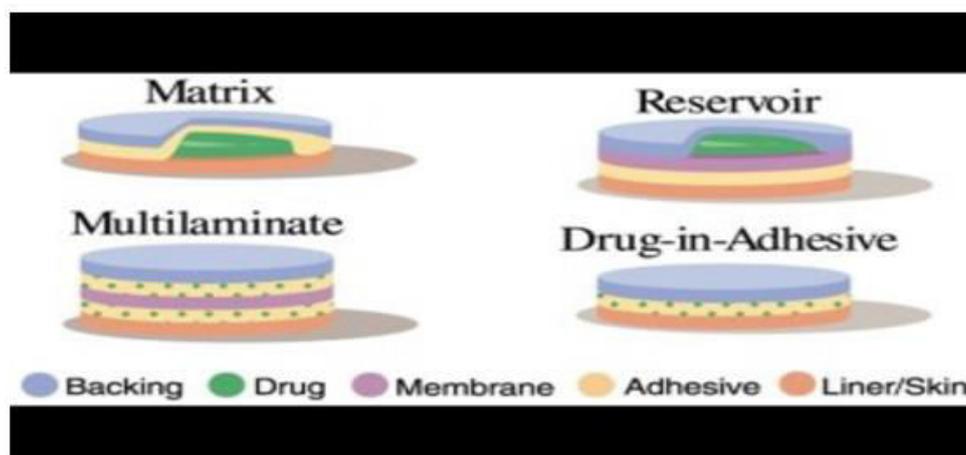
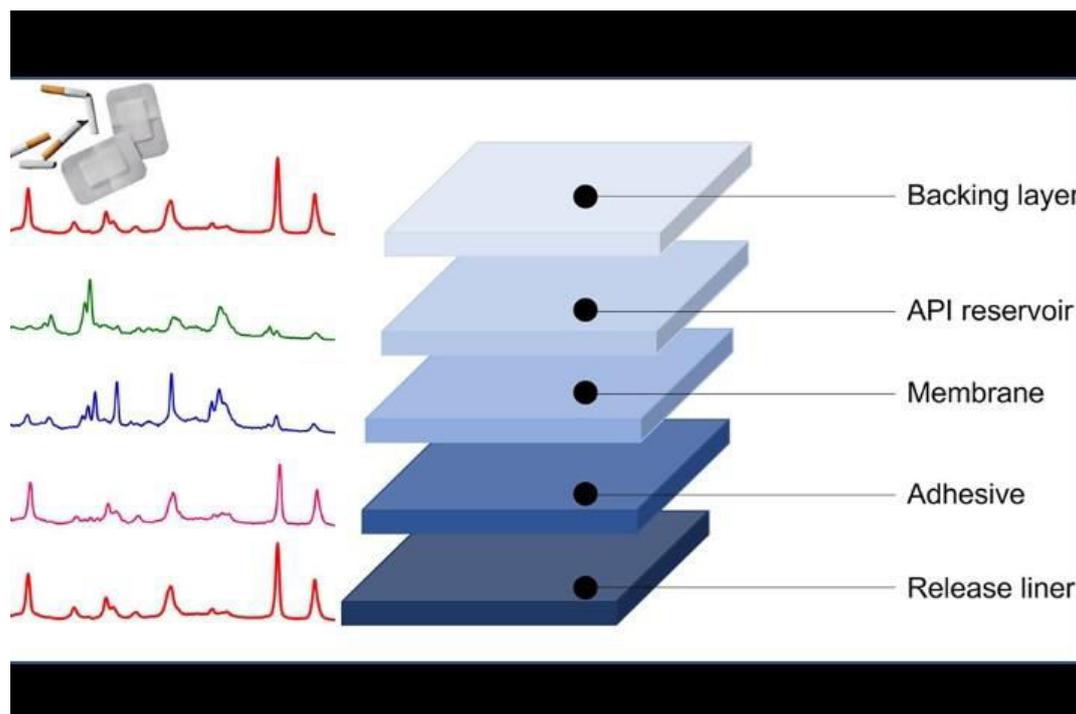


Fig: Types of Transdermal Drug Delivery

❖ **Components of Transdermal Drug Delivery System:-**

- ✓ Polymer matrix/ Drug reservoir
- ✓ Drug
- ✓ Permeation enhancers.
- ✓ Adhesive.
- ✓ Backing laminate.
- ✓ Release liner.
- ✓ Other excipients like plasticizers and solvents



**Fig:** Components of Transdermal Drug Delivery System

**Polymer Matrix**

Polymer is an integral and foremost important component of transdermal drug delivery systems. The mechanism of drug release depends upon the physicochemical properties of the drug and polymer used in the manufacture of the device. The following criteria should be satisfied for a polymer to be used in a transdermal system.

- Molecular weight, glass transition temperature, chemical functionality or polymer must allow diffusion and release of the specific drug.
- The polymer should permit the incorporation of a large amount of drug.
- The polymer should not react, physically or chemically with the drug
- Polymers and its degradation products must be non toxic.

**Classification of Polymers is given in Below Table:**

Natural Polymers	Synthetic Elastomers	Synthetic Polymers
cellulose derivatives	polybutadiene	Polyvinylalcohol
zein	hydrin rubber	Polyvinylchloride
gelatin	silicon rubber	Polyethylene
shellac	polyisobutylene	polypropylene
waxes	acrylonitrile	
gums	neoprene	
natural rubber	butyl rubber	
chitosan		

**Drug:-**

Some of ideal properties of drug & some factors to be consider during preparation of Transdermal patches

Parameter	Properties
Dose	Should be Low in weight (less than 20mg/day).
Half- life	10/less (hrs).
Molecular weight	<400da.
Skin permeability coefficient	>0.5*10 <sup>-3</sup> cm/h.
Skin Reaction	Non irritating, Non sensitizing
Oral bioavailability	Low.

**Permeation Enhancer:-**

The chemical compounds that enhance the permeability of stratum corneum so as to attain therapeutic levels of the drug candidate. They improve the permeability by interacting with Stratum corneum.

**Adhesive:-**

It helps to increase the adherence of transdermal patch to the skin surface. It can easily remove from the smooth surface without leaving a residue on it. The fasting of all transdermal devices to the skin using a pressure sensitive adhesive that can be positioned on the face or in the back of device is necessary.

**Backing Laminate:-**

The primary function of the backing laminate is to provide support. They should be able to prevent drug from leaving the dosage form through top. They must have optimal elasticity, flexibility, and tensile strength.

**Release Liner:-**

This is the primary packaging material that can protect the patch during application. It also helps to prevent contamination. It is composed of a base layer, which may be nonocclusive or occlusive, and a release coating layer made of silicon or Teflon.

**❖ Preparation Methods of Patch:-**

**Solvent Casting:** In solvent casting method polymers in required quantity is treated with solvent and polymer swell after vortexing. The measured quantity of plasticizer added in polymer mixture and again vortexed. The quantity of drug that needed liquefied in small volume of solvent system and added to the polymer solution and mixed well. Then entrapped air is removed and blend is transferred into a cleaned petri plate. The patches developed are stored in a desiccator till the evaluation tests are performed.

**Direct Milling:** In this process, patches are fabricated deprived of the usage of solvents. Direct milling or kneading methods are used for motorized mixing drug and excipients without the existence of any liquefied solution. The desired thickness is accomplished by rolling the consequential material. The backing material is then laminated. The solvent-free process is chosen because there is no probability of residual solvents and health issues produced by solvents.

**Hot Melt Extrusion:** In hot melt extrusion method blend of pharmaceutical ingredients is molten and different shapes yielded by forcing mixture through an orifice. Hot melt extrusion has been used for the fabrication of controlled release matrix tablets, pellets, granules, oral disintegrating films dosage forms. Solid dispersion extrusion immiscible components are extruding with drug and then solid dispersions are formulated. Finally, the solid dispersions are shaped into films by means of dies.

**Semisolid Casting:** In the semisolid casting process initially a solution of water soluble film forming polymer is organized. The resulting solution is added to a solution of acid insoluble polymer which was prepared in ammonium or sodium hydroxide. Then appropriate aggregate of plasticizer is added so that a gel mass is acquired. Finally, the gel mass is casted into films or ribbons using heat controlled drums.

**Rolling Method:** In this method solution or suspension containing drug is rolled on a carrier. The solvent is mainly water and mixture of water and alcohol. The film is dried on rollers and cut into desired shapes and sizes.

**❖ Factors Affecting on Transdermal Patches:-**

Physicochemical Properties	Physiological & Pathological Conditions of Skin
✓ Partition coefficient	✓ Reservoir effect of horny layer
✓ Molecular size	✓ Lipid film
✓ Solubility/melting point	✓ Skin hydration

✓ Ionization	<ul style="list-style-type: none"> <li>✓ Skin temperature</li> <li>✓ Regional variation</li> <li>✓ Pathological injuries to the skin</li> <li>✓ Cutaneous self-metabolism</li> <li>✓ Skin barrier properties in the neonate and young infant</li> <li>✓ Skin barrier properties in aged skin</li> <li>✓ Race</li> <li>✓ Body site</li> <li>✓ Penetration enhancers used</li> </ul>
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#### ❖ Advantages of Transdermal Drug Delivery:-

- a) First pass metabolisms of drug get avoided.
- b) Gastrointestinal incompatibilities get avoided.
- c) Self-medication is possible.
- d) Duration of action gets extended & predictable.
- e) Unwanted side effects get minimized.
- f) Drug plasma concentration gets maintained.
- g) Number of doses get reduces which improve patient compliance.
- h) Therapeutic value of many drugs get increased by avoiding problems associated with drug like-lower absorption, GI irritation, decomposition due to hepatic first pass metabolism.

#### ❖ Disadvantages of Transdermal Drug Delivery:-

- a) Chances of allergic reactions at the site of application like- itching, rashes, local edema etc.
- b) Larger molecular size of drug (above 1000) creates difficulty in absorption.
- c) Barrier function of skin varies from site to site on the same or different person.

#### ❖ Evaluation Parameters for Transdermal Patch:-

- 1) Evaluation of adhesive
- 2) In-vitro drug release
- 3) Effect of skin uptake & Metabolism
- 4) In-vivo evaluation
- 5) Cutaneous toxicological evaluation

### CONCLUSION

It was concluded that the transdermal patches have numerous advantages above the conventional drug delivery system. The usage of transdermal drug delivery is safe in patients because drug usage stopped if adverse effects appear. So in the forthcoming years, it is predictable that transdermal patches are one of the vital dosage forms in pharmaceutical and healthcare sector.

#### Future of Transdermal Drug Delivery System:-

Future aspects in Drug delivery system include liposomes, Niosomes and micro emulsion. Aim of this development is to improve delivery of drug that has low inherent solubility in most of classical formulation excipients. A wide range of potential drugs for delivery like steroids, antifungal, antibacterial, interferon, methotrexate, local anesthetics are formulated. Transdermal delivery of analgesics is likely to continue to increase in popularity as there are further improvements in design. Research is being performed to increase safety and efficacy. To improve practical matters such as the experience for the wearer of the patch, and also to provide more precise drug delivery associated with increased duration of action. After the successful design of patches using iontophoresis, various modes of 'active' transdermal technologies are being investigated for different drugs. The transdermal drug delivery systems (TDDS) have been designed as an alternative, safest and easy route for systemic drug delivery. The systemic drug administration through skin holds several advantages such as maintenance constant drug level in blood plasma, less number of side effects, and improvement of bio availability by circumvention of hepatic first pass metabolism and increase patient compliance with respect to drug regime used for treatment.

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## ROLE OF CAPITAL STRUCTURE ON FINANCIAL PERFORMANCE OF SELECTED INDIAN BANK

<sup>1</sup>Chetan Agrawal, <sup>2</sup>Akshita Hablani, <sup>3</sup>Paridhi Nareliya and <sup>4</sup>Dr. Prashant Sharma

<sup>1,2,3</sup>Student of MBA, ITM, Gwalior

<sup>4</sup>Assistant Professor, Department of Management, ITM, Gwalior

### ABSTRACT

*This study examines the capital structure of banking companies in India between the periods 2017 to 2021. Researcher has been laid to show the role of capital structure on the financial performance of Indian Banking companies listed in the Indian Stock Exchange. For the purport of the study the data has been amassed from the secondary sources i.e. from the annual reports of the selected Banks Multiple Regression and correlation is utilized to analyze the data. The variables utilized for the study are Debt Equity Ratio, Long term debt and Debt Asset Ratio as the independent variable and Gross Profit Margin (GPM), Net Profit Margin (NPM), Return on Capital Employed (ROCE), Return on Assets (ROA) and Return on Equity (ROE) as the dependent variables. The result revealed that there is a positive relationship between then capital structure and financial performance of the selected Banks.*

*Keywords: Capital structure, financial performance, correlation, multiple regressions.*

### INTRODUCTION

Financial performance of any bank can measure by cash inflow and cash outflow in the bank during a year. if the cash inflow more than cash outflow it is good sign for the bank. There are various ways to finance assets of bank. Shares, debentures, long term loans and retained earnings are the tool by an any bank finance the assets. In Finance, Capital structure is defined as an amalgamation of company's long term debt, categorical short term debt, mundane equity and preferred equity. The capital structure is how a firm finances its overall operations and the magnification by utilizing different sources of fund Debt comes in the form of bond issues or long term notes payable, while equity is relegated as prevalent stock, preferred stock or retained earnings. Financing of working capital is additionally considered as a component of capital structure.

### REVIEW OF LITERATURE

Modigliani Miller (1960) was the first economist who think about the capital structure and its impact on financial performance. they provide relevance theory of capital structure and financial performance and provide some assumption that there are no tax implementation and market are also a perfect market. Ferri and Jones (1979) considered the capital structure factors considering, industry type, firm size, business risk, and operating leverage. They found independent variables, except to business risk, seemed to be related significantly, although the Industry type, have a weak relationship. Agarwal (1981) expresses that, growth rate, profitability, and international risk are not adequate factors to determine the capital structure choice, and some important variables such as industry type have been ignored. He adds "country-effect" as another important variable in determining firm's capital structure. Park (1998) also uses the national culture as an independent variable in such researches.

### RESEARCH METHODOLOGY

#### Sample

Out of 35 scheduled bank researchers select only 10 banks five public sector and five private sectors on the basis of their financial performance on stock exchange. The duration decided on for this look at includes five years ranging from 2017-18 until 2021-22. The study depended on the following sources for collecting the needed data: Profit and Loss account and Balance sheet of the selected companies.

### LIST OF SELECTED BANK

S.No	Company's Name
1	Bandhan Bank
2	State Bank Of India
3	Bank Of Baroda
4	IDBI
5	Union Bank
6	HDFC Bank
7	ICICI Bank

8	Kotak Mahindra
9	IndusInd Bank
10	Axis Bank

Table-1

Data-Researches use secondary data which has been collected from many sources like Prowess Data, Money control com and websites of selected bank

**METHODOLOGY**

To estimate regression model, the Ordinary Least Squares (OLS) was used to examine the determinants of the capital structure (leverage) and financial performance of the Indian Banks from the period ranging from 2017 to 2021.

**Tool use for Data Analysis**

Researches use SPSS 26 for data analysis which has been collected with different sources regression, correlation descriptive analysis has been used for identify the role of capital structure on financial performance .with the help of regression line model we find out role of capital structure on financial performance of bank.

$$Y_{it} = \alpha_i + \beta_1 X_{it} + U_{it}$$

Where X represent dependent and Y represent independent variables.

Dependent Variable- (debt/equity ratio, long term debt ratio and debt to total asset ratio)

Independent Variable- NPM= Net Profit Margin, ROCE = Return on Capital Employed ROE = Return on Equity ROA = Return on Assets.  $\beta_1$  is slope, and  $\alpha$  is constant.

**Conceptual Model**

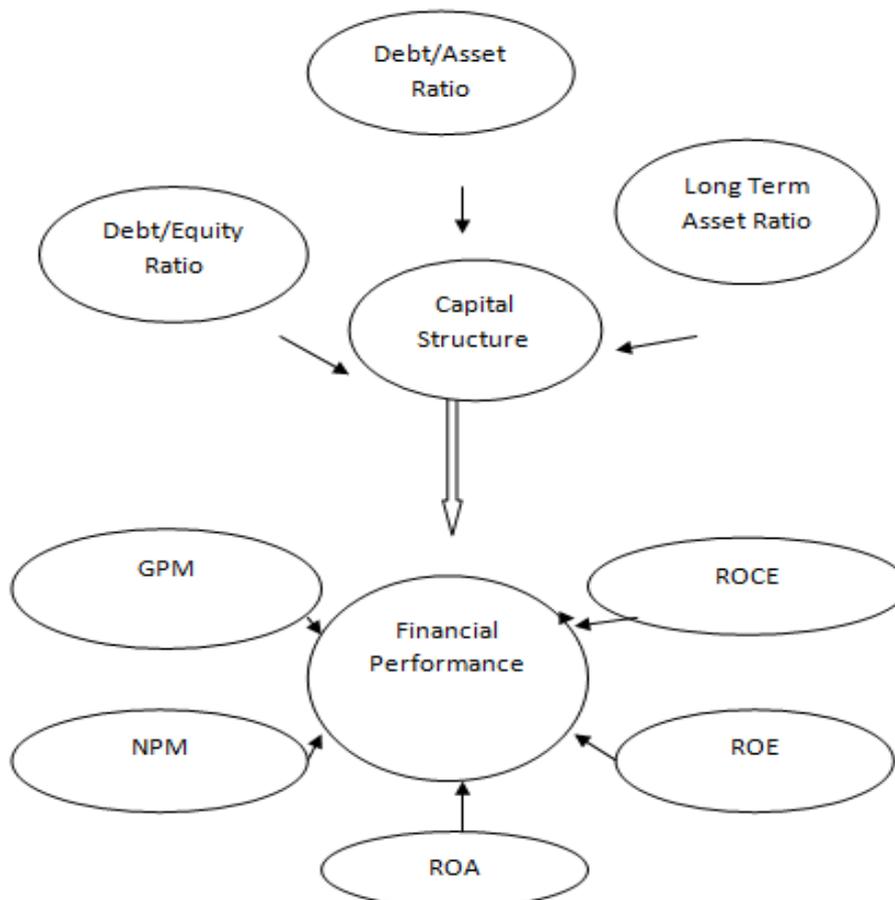


Figure-1

**OBJECTIVE OF STUDY**

The objective of study is to investigate the role of capital structure on financial performance of selected banks which are listed in various stock exchanges of India with the help of various dependent and independent variables.

**The Present Study Examines the Following Hypotheses:**

**H1:-**There is a positive & negative relationship between debt equity ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

**H2:-** There is a positive & negative relationship between debt asset ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

**H3:-** There is a positive & negative relationship between long term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

**H4:** capital structure is significantly impact on the financial performance of the Banking companies in India.

**DATA ANALYSIS AND INTERPRETATION****Descriptive Statistics**

The following table shows the maximum, minimum, mean & standard deviation and also consist of number of samples and variance of each capital structure and financial performance variables.

	N	Maximum	Minimum	Mean	Standard Deviation
<b>GPM</b>	10	4.08	3.65	3.8660	.12030
<b>NPM</b>	10	26.24	-29.20	7.9508	16.75397
<b>ROCE</b>	10	6.18	1.44	2.7836	1.37628
<b>ROE</b>	10	17.86	-34.00	3.1654	15.05623
<b>ROA</b>	10	3.07	-1.99	.6874	1.37593
<b>DEBT-EQUITY RATIO</b>	10	81.68	5.84	25.9874	26.55696
<b>DEBT ASSET RATIO</b>	10	.94	.87	.9048	.02662
<b>LONG TERM DEBT RATIO</b>	10	18.02	5.84	11.1258	4.39539

**Table-2****Correlation Analysis**

H1, H2, H3 Correlation between capital structure variables (debt equity ratio, debt asset ratio and long term debt ratio) and financial performance variables (GPM, NPM, ROCE, ROA, ROE) of banking companies.

**Correlation Matrix**

Variables	GPM	NPM	ROCE	ROE	ROA	Debt Equity Ratio	Debt Asset Ratio	Long Term Debt Ratio
<b>GPM</b>	1							
<b>NPM</b>	-0.615	1						
<b>ROCE</b>	-0.191	0.675*	1					
<b>ROE</b>	-0.575	0.978**	0.592	1				
<b>ROA</b>	-0.513	0.961**	0.829**	0.932**	1			
<b>Debt Equity Ratio</b>	0.014	-0.558	-0.475	-0.457	-0.515	1		
<b>Debt Asset Ratio</b>	0.458	-0.477	-0.720*	-0.308	-0.551	0.367	1	
<b>Long Term Debt Ratio</b>	0.495	-0.618	-0.760*	-0.474	-0.651*	0.446	0.944**	1

**Table-3**

\*\*Correlation is significant at the 0.01 level (2-tailed)

\*. Correlation is significant at the 0.05 level (2-tailed)

**Table: Correlation Matrix**

The above correlation table indicates the relationship between debt equity ratios, debt asset ratio and long term debt ratio are as follows:

1. Correlation between debt equity ratio and GPM, NPM, ROCE, ROA, ROE is positive as well as negative because R values of debt equity ratio & GPM is 0.014, debt equity ratio and NPM is -0.558, debt equity ratio and ROA is -0.515, debt equity ratio and ROCE is -0.475, debt equity & ROE is -0.457.
2. Correlation between debt asset ratio and GPM, NPM, ROCE, ROA, ROE is positive because R values of debt asset & GPM is 0.458, debt asset ratio and NPM is -0.477, debt asset ratio and ROA is -0.551, ROCE is -0.720, debt equity & ROE is -0.308.
3. Correlation between long term debt ratio and GPM, NPM, ROCE, ROA, ROE is both negative and positive because R values of long term debt ratio & GPM is 0.495, long term debt ratio and NPM is -0.618, long term debt ratio and ROA is -0.651, long term debt ratio and ROCE is -0.760, long term debt & ROE is -0.474.

According to the above result we can accept the hypothesis H1, H2 and H3 because the results indicate the positive & negative relationship between debt equity ratio and financial performance variables & positive & negative relationship between debt asset ratio but it shows positive & negative relationship between long-term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE and ROA)

### Regression Analysis

Regression analysis is a mathematical method to measure the impact of one (independent) variable on other (dependent) variable. In this part, the researcher has used this to test the hypothesis H4 to measure the impact of capital structure on financial performance.

**H4:** capital structure is significantly impact on the financial performance of the Selected Banks listed in various Indian stock exchanges.

### Regression Analysis between Independent Variable Debt Equity Ratio and Financial Performance Variables

Dependent Variable	R <sup>2</sup>	Significance level
GPM	0.000	0.969
NPM	0.300	0.101
ROCE	0.209	0.184
ROE	0.225	0.166
ROA	0.265	0.128

**Table 4:** Regression analysis of debt equity ratio

#### I) Regression Analysis between Debt Equity Ratio and GPM

Based on the above table  $R^2 = 0.000$  That means 0.0% of the variation in the GPM is determined by in the variation of debt equity ratio other remaining 100% is undetermined with a significant level of 0.969. This means 100% of variation of GPM may be caused by other variables.

#### II) Regression Analysis between Debt Asset Ratio and NPM

Based on the above table  $R^2 = 0.300$  That means 30% of the variation in the NPM is determined by in the variation of debt asset ratio other remaining 70% is undetermined with a significant level of 0.101. This means 70% of variation of NPM may be caused by other variables.

#### III) Regression Analysis between Debt Equity Ratio and ROCE

Based on the above table  $R^2 = 0.209$ . That means 20.9 % of the variation in the ROCE is determined by in the variation of debt equity ratio other remaining 79.1% is undetermined with a significant level of 0.184. This means 79.1 % of variation of ROCE may be caused by other variables

#### IV) Regression Analysis between Debt Equity Ratio and ROA

Based on the above table  $R^2 = 0.265$ . That means 26.5 % of the variation in the ROA is determined by in the variation of debt equity ratio other remaining 73.5% is undetermined with a significant level of 0.128. This means 73.5% of variation of ROA may be caused by other variables.

#### V) Regression Analysis between Debt Equity Ratio and ROE

Based on the above table  $R^2 = 0.225$ . That means 22.5 % of the variation in the ROE is determined by in the variation of debt equity ratio other remaining 72.5% is undetermined with a significant level of 0.166. This means 72.5% of variation of ROE may be caused by other variables.

**Regression Analysis between Independent Variable Debt Asset Ratio and Financial Performance Variables**

Dependent Variables	R <sup>2</sup>	Significance level
GPM	0.210	0.183
NPM	0.228	0.163
ROCE	0.518	0.019
ROE	0.095	0.387
ROA	0.303	0.099

**Table 5:** Regression analysis of debt asset ratio**I) Regression Analysis between Debt Asset Ratio and GPM**

Based on the above table  $R^2 = 0.210$ . That means 21% of the variation in the GPM is determined by in the variation of debt asset ratio other remaining 79% is undetermined with a significant level of 0.183. This means 79% of variation of GPM may be caused by other variables.

**II) Regression Analysis between Debt Asset Ratio and NPM**

Based on the above table  $R^2 = 0.228$ . That means 22.8 % of the variation in the NPM is determined by in the variation of debt asset ratio other remaining 77.2% is undetermined with a significant level of 0.163. This means 77.2% of variation of NPM may be caused by other variables.

**III) Regression Analysis between Debt Asset Ratio and ROCE**

Based on the above table  $R^2 = 0.518$ . That means 51.8 % of the variation in the ROCE is determined by in the variation of debt asset ratio other remaining 48.2% is undetermined with a significant level of 0.019. This means 48.2 % of variation of ROCE may be caused by other variables

**IV) Regression Analysis between Debt Asset Ratio and ROA**

Based on the above table  $R^2 = 0.303$ . That means 30.3 % of the variation in the ROA is determined by in the variation of debt asset ratio other remaining 69.7% is undetermined with a significant level of 0.099. This means 69.7% of variation of ROA may be caused by other variables.

**V) Regression Analysis between Debt Asset Ratio and ROE**

Based on the above table  $R^2 = 0.095$ . That means 9.5 % of the variation in the ROE is determined by in the variation of debt asset ratio other remaining 90.5% is undetermined with a significant level of 0.387. This means 90.5% of variation of ROE may be caused by other variables.

**Regression Analysis between Independent Variable Long-Term Debt Ratio and Financial Performance Variables.**

Dependent Variables	R <sup>2</sup>	Significance level
GPM	0.245	0.146
NPM	0.382	0.057
ROCE	0.578	0.011
ROE	0.225	0.166
ROA	0.423	0.042

**Table 6 :** Regression analysis of long term debt ratio**I) Regression Analysis between Long-Term Debt Ratio and GPM**

Based on the above table  $R^2 = 0.245$ . That means 24.5% of the variation in the GPM is determined by in the variation of long-term debt ratio other remaining 75.5% is undetermined with a significant level of 0.146. This means 75.5% of variation of GPM may be caused by other variables.

**II) Regression Analysis between Long-Term Debt Ratio and NPM**

Based on the above table  $R^2 = 0.382$ . That means 38.2 % of the variation in the NPM is determined by in the variation of long-term debt ratio other remaining 61.8% is undetermined with a significant level of 0.057. This means 61.8% of variation of NPM may be caused by other variables.

**III) Regression Analysis between Long-Term Debt Ratio and ROCE**

Based on the above table  $R^2 = 0.578$ . That means 57.8 % of the variation in the ROCE is determined by in the variation of long-term debt ratio other remaining 42.2% is undetermined with a significant level of 0.011. This means 42.2 % of variation of ROCE may be caused by other variables

**IV) Regression Analysis between Long-Term Debt Ratio and ROA**

Based on the above table  $R^2 = 0.423$ . That means 42.3 % of the variation in the ROA is determined by in the variation of long-term debt ratio other remaining 57.7% is undetermined with a significant level of 0.042. This means 57.7% of variation of ROA may be caused by other variables.

**V) Regression Analysis between Long-Term Debt Ratio and ROE**

Based on the above table  $R^2 = 0.225$ . That means 22.5 % of the variation in the ROE is determined by in the variation of long-term debt ratio other remaining 77.5% is undetermined with a significant level of 0.166. This means 77.5% of variation of ROE may be caused by other variables.

Therefore the above results point out the capital structure variables are significantly impact on financial performance of companies, and hypothesis H4 is accepted by the researcher.

Here the GPM, NPM, ROCE, ROA, ROA are considered as dependent variables to test the hypothesis & Debt equity ratio, debt asset ratio & long term debt ratio are considered as independent variables. Based on the regression analysis the following findings are discovered.

**They are,**

- 0.0% of variation in gross profit is explained by debt equity ratio and remaining 100% may be caused by other variables.
- 30% of variation in net profit is explained by debt equity ratio and remaining 70% may be caused by other variables.
- 20.9% of variation in ROCE is explained by debt equity ratio and remaining 79.1% may be caused by other variables.
- 22.5% of variation in ROA is explained by debt equity ratio and remaining 77.5% may be caused by other variables.
- 26.5% of variation in ROE is explained by debt equity ratio and remaining 73.5% may be caused by other variables.
- 21% of variation in gross profit is explained by debt asset ratio and remaining 79% may be caused by other variables.
- 22.8% of variation in net profit is explained by debt asset ratio and remaining 77.2% may be caused by other variables.
- 51.8% of variation in ROCE is explained by debt asset ratio and remaining 48.2% may be caused by other variables.
- 9.5% of variation in ROA is explained by debt asset ratio and remaining 90.5% may be caused by other variables.
- 30.3% of variation in ROE is explained by debt asset ratio and remaining 69.7% may be caused by other variables.
- 24.5% of variation in gross profit is explained by long term debt ratio and remaining 75.5% may be caused by other variables.
- 38.2% of variation in net profit is explained by long term debt ratio and remaining 61.8% may be caused by other variables.
- 57.8% of variation in ROCE is explained by long term debt ratio and remaining 42.2% may be caused by other variables.
- 22.5% of variation in ROA is explained by long term debt ratio and remaining 77.5% may be caused by other variables.
- 42.3% of variation in ROE is explained by long term debt ratio and remaining 57.7% may be caused by other variables.

**In Addition to the Above Findings the Ratio Analysis Interprets the Followings.**

When we focus on debt and equity position of banking industry, we found that firms are more attracted towards the equity only, very few amounts of financing are done by issuing debentures. So, we can say that the banking firms. However, we have considered the measures on the basis of total average of each, so we can agree with hypothesis.

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**CONCLUSION**

This paper been finished with the important goals of to what extend capital shape impact on financial performance of corporations and whether the capital shape effect in financial performance of listed banking organizations in India, that Correlation analysis confirmed that debt asset ratio, debt equity ratio and lengthy-time period debt correlated with gross profit margin, net profit margin, ROCE, ROA & ROE at various substantial degrees.

Subsequently conclude there is both advantageous & negative courting between capital shape and monetary overall performance. And also, capital structure has very high giant effect on financial performance of the firms in case of return on Capital hired (ROCE) and return on assets (ROA) and capital structure has much less great impact on the economic performance of the corporations in case of Gross profit (GPM), net profit (NPM) and go back on fairness (ROE). So, we finish that something be the sample of capital shape the economic overall performance of the banks is changing due to different factors inside the firms or in the economy. So, the banks need to concentrate on the sample of capital shape.

**SUGGESTIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH**

The researcher has experienced the ability to provide inspiration and recommendation for in addition researcher to advantage greater worth if any studies can be conducted with the aid of them on this subject.

- There are such a lot of sectors in India however for the studies simplest one region i.e. banking sector is considered, so other sectors also can be studies and the size of the businesses can also be multiplied.
- Just a few strategies are used to test speculation which includes correlation & regression. Further the researcher can add a great deal form of strategies to generalize their findings inclusive of ANOVA, descriptive information and so forth.
- Most effective secondary facts are accumulated to evaluation to do this research. Similarly, researchers may additionally use secondary information by travelling to every enterprise.

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**ADSORPTION OF CRYSTAL VIOLET FROM AQUEOUS SOLUTION ONTO CHEMICALLY TREATED ACTIVATED CARBON****Rumi Goswami<sup>1</sup> and Amit Kumar Dey<sup>2</sup>**<sup>1</sup>Ph.D Scholar and <sup>2</sup>Assistant Professor, Department of Civil Engineering, Central Institute of Technology, Kokrajhar- 783370, India**ABSTRACT**

Adsorption of Crystal violet onto chemically treated activated carbon (AC) was studied for different concentrations of dye solutions (50, 100, 150 and 200 mg/L). Experiments were carried out as function of contact time, initial solution pH (2–7), adsorbent dose (10 gm/L – 20 gm/L) and temperature (298, 308 and 318 K). The adsorption was favored at higher pH and lower temperatures. Adsorption data were well described by the Langmuir isotherm, although they could be modeled by the other models as well. The adsorption process followed the pseudo-second order kinetic model. The maximum sorption capacity ( $q_{max}$ ) was found to be 230.24 mg/g. Thermodynamic parameters suggest that the adsorption is a typical chemical process, spontaneous, and exothermic in nature. The maximum adsorption occurred at pH 7.0. The effect of adsorption dose was studied and optimum adsorption was obtained at a AC dose of 16 gm/L.

Keywords: Adsorption; Crystal Violet; Isotherm; Equilibrium studies.

**1. INTRODUCTION**

Color is an important aspect of human world. We like to wear clothes of all kinds of colors and hues, eat food decorated with colors, even our medicines are colorful. No wonder then, that a lot of research has gone into the production of color. Today there are more than ten thousand dyes available commercially and seven lakh tons of dyes are produced annually [1]. Dyes can be of many different structural varieties like acidic, basic, disperse, azo, anthraquinone based and metal complex dyes among others. The textile industry is the largest consumer of dye stuffs. During the coloration process a large percentage of the synthetic dye does not bind and is lost to the waste stream [2]. Approximately 10–15% dye are released into the environment during dyeing process making the effluent highly colored and aesthetically unpleasant. The effluent from textile industries thus carries a large number of dyes and other additives which are added during the coloring process [3]. These are difficult to remove by conventional water treatment procedures and can be transported easily through sewers and rivers especially because they are designed to have high water solubility. They may also undergo degradation to form products that are highly toxic and carcinogenic [4]. Thus dyes are a potential hazard to living organisms. It is hence important to safeguard the environment from such contaminants. To prevent contamination of natural waters by dyes, it is essential to first detect and quantify these chemicals in the waste waters. It is well known that use of activated carbon for the treatment of wastewater (removal of dyes from waste water) is a very well established technique, but due to the high cost involved in the process, researchers are constantly working on finding other low cost bio-sorbents which are effective in removal of dyes from waste water. In this work we have attempted to use anionic surfactant treated activated carbon for the removal of Crystal Violet (CV) from aqueous solution. Reactive dyes encompass azo dyes, which form covalent bonds with the fibres they colour, e.g. cotton, rayon, wool silk and nylon. Crystal violet is a commercial azo dye with Colour Index Generic Name Crystal violet. The dye molecule contains specific functional groups, which can undergo addition or substitution reactions with the -OH, -SH and -NH<sub>2</sub> groups present in the fibres. Due to very good fastness of the substrate, the reactive dyes are one of the most important group of dyes for colouring of textiles. Thus it is important to remove CV before its transformation. In order to design adsorption treatment systems, knowledge of kinetic and mass transfer process is essential. In this paper, we report the applicability of kinetic and mass-transfer models for the adsorption of CV onto surfactant treated activated carbon.

**2. MATERIALS**

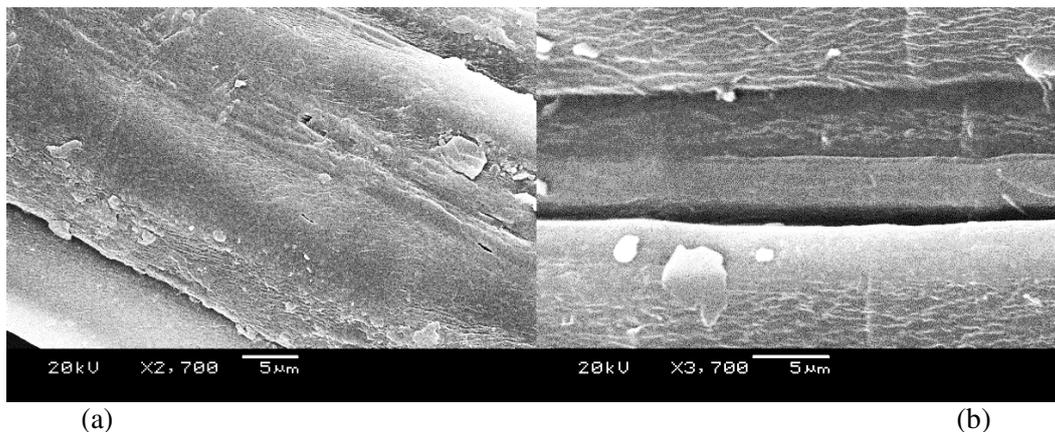
Crystal violet dye (CI = 42555, dye content  $\geq 90\%$ , molecular formula C<sub>25</sub>H<sub>30</sub>ClN<sub>3</sub>, MW 407.99 and  $\lambda_{max} = 590$  nm) was obtained from Merck (India).

**Production of AC from Rice Husk**

Activation through physical activation and chemical activation techniques might be used to activate carbon derived from waste biomaterials [22]. To improve the capacity of adsorption of the organic dye, chemical agents such as H<sub>2</sub>SO<sub>4</sub>, ZnCl<sub>2</sub>, H<sub>3</sub>PO<sub>4</sub>, K<sub>2</sub>S, HNO<sub>3</sub>, KCNS, H<sub>2</sub>O<sub>2</sub>, NaOH, KMnO<sub>4</sub>, KOH, (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, and K<sub>2</sub>CO<sub>3</sub> are generally employed to activate the carbon [23]. The most difficult aspect of the AC preparation procedure is its activation. NaOH activation is cheaper than

other chemicals and less harmful to the environment than KOH-AC activation. Through surface reactions, NaOH is an effective activator for disordered carbon compounds [25].

To generate rice husk activated carbon (AC), following methods were utilised: first, washing of the rice husk with water to eliminate dirt and other impurities, then it was kept for drying in an oven for 12 hours at 110 °C, crushed, and sieved into fractions with an average particle size of 1.0 mm. Second, the husks were carbonised at 400°C for 90 minutes with a nitrogen flow of 300 mL/min. After that, NaOH (weight ratio 1/3) impregnation was done with the samples and dried at 120 °C for 12 hours. For the activation the material obtained, the temperature was increased to 800 °C at a rate of heating of 10 °C and maintained at the final temperature for 60 minutes, after which the preparative process was then carried out by heating at 400°C for 20 minutes in presence of nitrogen at a rate of flow of 300 mL/min. At last, the active ingredient was grinded, neutralised with 0.1 M HCl, and washed many times with high temperature distilled water to keep the pH constant (6.6–7.0). The samples activated carbon after washing were kept for drying for 24 hours under vacuum at 120 °C in a desiccator. As a result, activated carbon was produced.



**Fig.1:** SEM micrographs : (a) Distilled washed AC; (b) AC washed by NaOH.

### 3. Experiments and Equilibrium Studies

Batch adsorption studies were carried out and at first the effect of pH variation onto the removal of CV by AC was studied and found that the maximum adsorption occurred at pH 7.0. From the stock solution of 1000 mg/L, different combinations of dye solutions were prepared for solutions of different initial concentrations viz. 50, 100, 150 and 200 mg/L at pH 7.0. Initial AC dose was taken as 10g/L and the same rate of dose was mixed with each of the prepared solutions, agitated mechanically with the help of rotary shaker at 303K at 150 rpm until the equilibrium was reached. For time  $t = 0$  minute, 5 minute, 10 minute and soon, until equilibrium, the dye concentrations were measured by UV/VIS spectroscopy (PerkinElmer, Lambda 45). The data's were used to calculate the amount of dye adsorbed,  $q$  (mg/g). Effect of AC dose was studied upon the absorption of CV dye by varying AC dose at 10, 15 and 20 g/L. Experiments were carried out at different pH values ranging from 3 to 9. A fixed amount of AC (1 gm) was added to the 100 ml of 50 mg/L of CV solution at different pH values (3 - 9) and agitated for 3 h at 303 K to assess the influence of initial pH on CV concentration, by taking and measuring the samples after each five minute of agitation.

Variation of temperature affect was evaluated for 298, 308 and 318 K. Experiments were carried out in duplicate and mean values were taken. The amount of dye adsorbed per unit adsorbent (mg dye per gm adsorbent) was calculated according to a mass balance on the dye concentration using the given equation:

$$q_e = \frac{(C_i - C_e)V}{m}$$

### 4. THEORY

#### Adsorption Isotherm

The equilibrium sorption isotherm is fundamental in describing the interactive behaviour between sorbates and sorbent and is important in the design and analysis of sorption systems. Adsorption equilibrium data are widely evaluated by different isotherm models. In the present investigation the isotherm study of CV was conducted at different temperatures by keeping the initial CV concentration fixed at 50 mg/L. And the overall study was done including the Freundlich [5,6], Langmuir [5,7], Temkin [5] and Dubinin–Radushkevich [5,8] isotherm models, which were used to describe the equilibrium bio-sorption data for this report and for further reports for future. Similarly the case with kinetic modeling studies.

Langmuir:  $q_e = \frac{Q_o b C_e}{1 + b C_e}$

Where,  $q_e$  = No of moles of solute adsorbed per unit wt. of adsorbent at concentration  $C_e$ .

$Q_o$  = No of moles of solute adsorbed per unit wt. of adsorbent in forming monolayer coverage, it is independent of temperature.

$b$  = Constant related to energy, it is temperature dependant

$C_e$  = Measured concentration of solute in solution at equilibrium.

Freundlich:  $q_e = K_f C_e^{1/n}$

Where,  $K_f$  and  $1/n$  are constant.

$C_e$  = Concentration at equilibrium

$q_e$  = equilibrium sorption capacity

Temkin:  $q_e = B_T \ln K_T + B_T \ln C_e$

Where,  $B_T$  is Temkin adsorption potential and  $B_T$  is Temkin constant.

D-R Isotherm-  $\ln q_e = \ln q_s - \beta \varepsilon^2$

Where  $q_s$  = theoretical isotherm saturation capacity (mg/g);

$\beta$  = Dubinin–Radushkevich isotherm constant

$\varepsilon = RT \ln(1 + 1/C_e)$

**Kinetic Modelling**

The data obtained from the contact time-dependent experiments were further used to evaluate the kinetics of the adsorption process. The pseudo-first-order[9] and pseudo-second-order[10] kinetic models were tested to obtain the rate constants and equilibrium adsorption capacity at different temperatures.

Pseudo-firstorder:  $\log(q_e - q_t) = \log q_e - \frac{k_1}{2.303} t$

Pseudo-secondorder:  $\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{1}{q_e} t$

Since the models mentioned above cannot identify a diffusion mechanism, the intra-particle diffusion model (Weber & Morris, 1963) was also analysed to find the rate controlling steps.

Intra-particle diffusion:  $t = k t^{0.5}$

**Activation Energy and Thermodynamic Parameters**

The activation energy  $E_a$  for CV adsorption onto AC was calculated by the Arrhenius equation[11]:

$$\ln K = \ln A - \frac{E_a}{RT}$$

Where, activation energy  $E_a$  can be obtained from the slope of a plot of  $\ln k$  versus  $1/T$ .

Thermodynamic behaviour of CV adsorption on AC was analysed with the use of thermodynamic parameters—Gibbs free energy change ( $\Delta G^\circ$ ), enthalpy ( $\Delta H^\circ$ ) and entropy ( $\Delta S^\circ$ ). These parameters were then calculated using the following equation:

$\Delta G^\circ = -RT \ln K_c$

$K_c = C_a / C_e$

$\Delta G^\circ = \Delta H^\circ - T \Delta S^\circ$

A plot of  $\Delta G^\circ$  versus temperature,  $T$  will generally be linear with the slope and intercept giving the values of  $\Delta H^\circ$  and  $\Delta S^\circ$

**5. RESULT AND DISCUSSION**

**Effect of Contact Time and Initial Dye Concentration**

The experimental results of adsorption of CV on AC surface at various concentrations (50, 100, 150 and 200 mg/L) with contact time shows that percent adsorption decreased with increase in initial CV concentration,

but the rate of CV adsorbed per unit mass of AC increased with increase in CV concentration. The unit adsorption of CV was increased from 40.27 to 84.63 mg/g as the CV concentration varied from 50 to 200 mg/L. Equilibrium was established at 90 minutes for all the concentrations studied. During the adsorption of dyes, initially the dye molecules reach the boundary layer; then they have to diffuse into the adsorbent surface to get adsorbed.

So, this phenomenon will not take place too early but will also not consume too much time to complete. The study shows that there is a possible monolayer coverage of CV on the AC surface.

### Effect of pH

It is well known that the pH of a system exhibits significant influence on the adsorptive capacity of adsorbate due to the effect of pH on the surface properties of the adsorbent and ionization/dissociation of the adsorbate molecules (Saeed et al., 2010). Therefore the adsorption characteristics of CV onto AC was studied for a pH range of 3-9 for a volume of 100 ml taken from the solution having concentration of 50mg/L agitated for 3 hours at 303K, with jute dose 10 g/L, rotated at 150 rpm. The analysis shows that percentage removal of CV increases with increase in pH of the dye solution significantly upto 6, after this value of pH further increment of the same doesn't show same rate of increment of CV adsorption onto AC. But since maximum adsorption occurred at pH 7.0, all the further studies were carried out at pH 7.0. The results are shown in Fig. 2. Similar trend of pH effect was observed for the adsorption of CV on modified rice husk (Chakraborty and Chowdhury, 2011). This variation of adsorption due to change in pH is due to the fact that at low pH values the surface of the adsorbent becomes positively charged, and this decreases the adsorption of the positively charged dye ions through electrostatic repulsion. As the pH value of the dye solution increases, increase in adsorption takes place due to deprotonation of positively charged adsorbent surface converting the sites into negatively charged, thereby increasing the electrostatic attraction between the adsorbent surface and the positively charged adsorbate.

### Effect of AC Dose

The adsorption process of dye also depends upon the adsorbent dose which is an important parameter that strongly affects the process adsorption capacity. The adsorption of CV onto AC was studied by varying the dose concentration from 10 gm/L to 20 gm/L for different CV dye concentrations (50, 100, 150 and 200 mg/L) at pH 7.0. The percent adsorption increased with shorter equilibrium time when the jute dose concentration increased from 48 %, 43 %, 36 % and 30 % to 98.2 % for all the corresponding dye concentrations, i.e. for 50, 100, 150 and 200mg/L respectively. This occurrence is due to the increased jute surface area and thereby increase in availability of more active sites for adsorption. Fig. 3 depicts the result for the same.

### Effect of Temperature and Contact Time

Investigation depicts that the percentage removal of dye decreased with increasing temperature. Fig. 4 represents the adsorption of CV at different temperatures as a function of contact time. This is due to the weakening of the bonds between the dye molecules and the binding sites of the adsorbents [5]. The investigation pattern shows that there is decrease in dye removal capacity with increasing temperature which concludes that adsorption of CV by AC is kinetically controlled by an exothermic process. Moreover, there is high rate of CV adsorption onto AC during the first 60 min of the dye sorbent contact. This quick rate of adsorption is due to the availability of large amount of active sites/surface area for adsorption of the dye molecules. As the contact time gradually keep on increasing, the rate of adsorption also decreases, and gradually leading to adsorption equilibrium. This reduction in adsorption of CV onto AC is due to decrease in total active sites available for adsorption and hence less available binding sites [5]. The equilibrium time for maximum dye uptake is found to be 120 min. After this equilibrium period, the amount of dye adsorbed does not show time-dependent change. Similar results have been reported in the study of CV removal on modified rice husk [12] and also in literature for adsorption of CV onto coniferous pinus bark powder [13].

### Adsorption Isotherm

From the values obtained from experimental studies, a typical example of adsorption isotherm data (at  $T = 298$  K) fitted using the two isotherm models as shown in Fig. 5. It was found that the maximum adsorption capacity of AC for CV is determined from the Langmuir isotherm at 230.24 mg/g at 298 K.

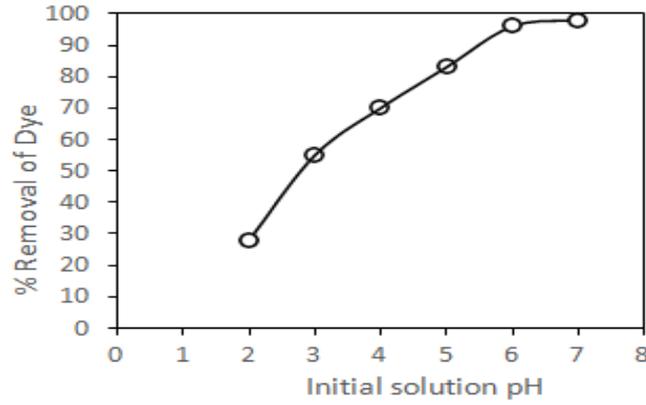


Fig. 2: Effect of pH on adsorption of CV onto AC

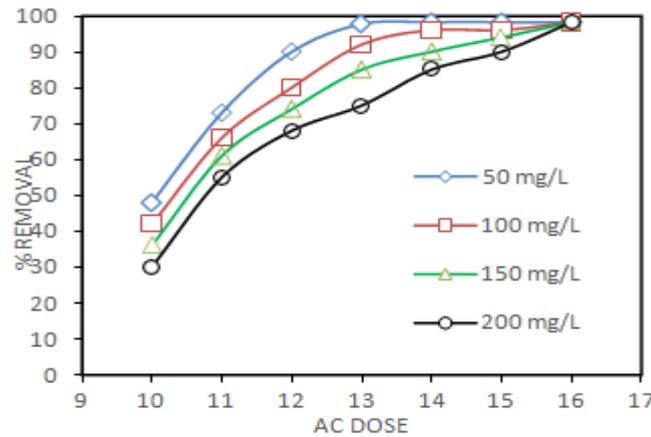


Fig. 3: Effect of AC dose on CV removal

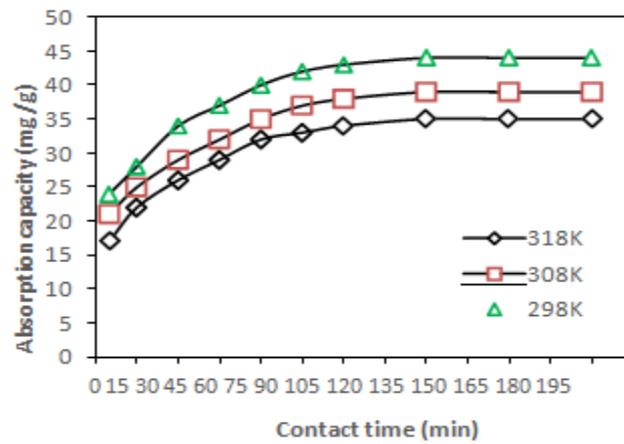


Fig. 4: Adsorption of CV at different temperatures Vs contact time at different temperatures

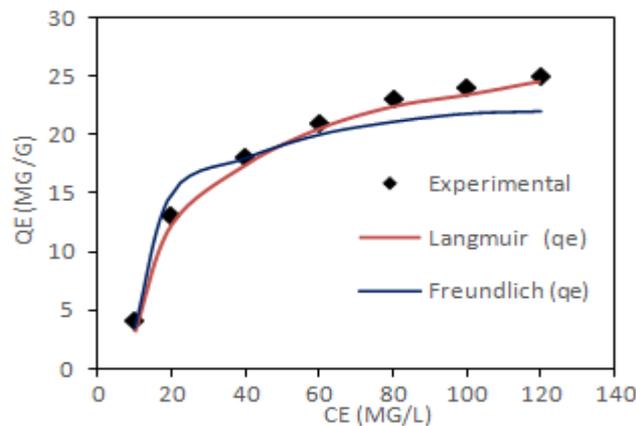


Fig. 5: Comparison between the measured and modelled isotherm profiles for the adsorption of CV onto AC

## 6. CONCLUSION

AC was used as an adsorbent for the quantitative removal of CV from aqueous solution. It was found in the study that equilibrium data fits well with the Langmuir's isotherm model. The adsorption capacity was found to be 230.24mg/g. The optimum pH for the adsorption was favoured at 7.0. The inter-particle diffusion played the significant role in the adsorption process. Optimum jute dose was calculated at 16gm/L.

It can be commented that the kinetic studies obtained from the analysis will be helpful for the understanding to use AC for the removal of other type of dyes.

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**EFFECT OF GEOPOLYMER ACTIVATOR IN PRESENCE OF ALCCOFINE IN GEOPOLYMER CONCRETE****Sai Baba Kothoju<sup>1</sup>, Soumith Kumar<sup>2</sup>, B. Kondraivendhan<sup>3</sup> and Venkata Kamal Lal Meenuga<sup>4</sup>**<sup>1</sup>Research Scholar and <sup>3</sup>Assistant Professor, Department of Civil Engineering, SVNIT Surat<sup>2</sup>PG Student and <sup>4</sup>Assistant Professor, Department of Civil Engineering, Anurag University**ABSTRACT**

Many researchers have carried out several studies to investigate the possible utilization of an extensive range of supplementary cementitious materials (SCM) as a partial replacement of Portland cement. The present work deals with the mechanical and durability properties of flyash based geopolymer concrete with combination of and partial replacement of GGBFS and Alccofine 1203, and complete replacement of water with geopolymer activator. In the view of effect of Alccofine in geopolymer concrete (GPC), combined fly ash and GGBFS was replaced with Alccofine with an interval of 10%, 20%, and 30% by weight of fly ash. The specimens were cured upto the ages of 28 days and 91 days. The parameters like workability, compressive strength, and flexural strength, as well as the durability properties were studied by 5% diluted HCl and H<sub>2</sub>SO<sub>4</sub> are used in this project by weight loss and then by compression tests conducted to the specimens. The obtained results indicated that the Alccofine and activator concentration has a larger influence on the mechanical strength and liquid/binder ratio of geopolymer concrete (GPC). The weight loss is higher in the hydrogen chloride (HCl), then the sulphuric acid (H<sub>2</sub>SO<sub>4</sub>). The M3 mix showed higher compressive strength for both liquid to binder ratios 0.7 and 0.8. It was found to be the same with flexural strength also.

*Keywords: Alccofine, GGBS, steel fibers, compressive strength, flexural strength, Geopolymer activator.*

**14. INTRODUCTION**

One of the important construction materials is concrete which is manufactured by using Portland cement as the main component along with coarse aggregates, fine aggregates and water. Day – day the demand for concrete was increasing due to fast growing cities and towns along the world-wide. In 1995 the estimated consumption of cement was 1.5 billion tons but by 2010 the consumption was increased to 2.2 billion tons [1].

During the last decade, global warming became a major environmental issue is a result of climate changes caused by many factors. Methane, carbon dioxide, nitrous oxide etc. which are also known as greenhouse gases emitted in to atmosphere by human activities are the factors responsible for global warming. 65 per cent of global warming is contributed by the Carbon dioxide which is one of the gases of greenhouse gases [2]. The manufacturing of cement is one reason for the emission of carbon dioxide into the atmosphere and 6 % of total emissions of carbon dioxide was only because of production of cement. Manufacturing of 1 ton of Portland cement releases approximately one ton of carbon dioxide in to the atmosphere [3, 4].

Many investigations are carried to reduce the use of cement content in production of concrete so that emission of carbon dioxide gas can be reduced to some extent. These investigations include the use of supplementary materials like silica fume, Alccofine, fly ash, GGBS, rice husk ash etc. which are having cementitious properties as the alternative of cement up to some percentage [5]. In this context, the geopolymer concrete technology uses cementitious materials are having same binding properties as Portland cement for production of concrete. Hence geopolymer concrete do not use the Portland cement, carbon dioxide emission is also reduced resulting in reducing global warming [6].

When the research on geopolymer concrete was started in the year 2001, there are several articles were available describing geopolymer pastes and geopolymer coating materials [7]. However, regarding the use of geopolymer for the production of low calcium fly-ash based geopolymer was available only in few published articles. [8] The author proved that by Alccofine as an additive to geo polymer concrete, it increases the mechanical strength of geo polymer concrete at early ages. Geopolymer concrete achieves high strength on over curing by the addition of Alccofine to the geo-polymer mixture. [9] By the addition of Alccofine to the geo polymer mixture results in compressive strength of GPC and improves the workability of the fresh GPC.

This research was therefore dedicated to the development, the mechanical and the durability properties of the fresh and hardened low-calcium (ASTM Class F) fly ash-based geopolymer concrete.

**15. EXPERIMENTAL PROGRAM**

The experimental program has been designed to evaluate the mechanical properties of making geopolymer concrete specimens are industrial by-product like fly ash, ground granulated blast- furnace slag (GGBFS),

Alcofine 1203, alkaline liquids and water. The details of the Geopolymer concrete mixtures used in this investigation are shown in Table 2.

○ **MATERIALS**

The mix design of geopolymer concrete (GPC) is done by the Trial and error method. The following factors are examined in the mix design of geo-polymer concrete (GPC) liquid to binder ratio of 0.7 and 0.8, with the replacement of fly ash by Alcofine in the proportions of 10%, 20%, and 30%. Slag is confined to IS:455- 1989 [15] and ASTM C989 [16] The chemical composition and specific gravity of the materials used in the study are presented in Table3. Coarse and Fine aggregate used in the project were available locally. Coarse aggregate of size 20 mm and 10 mm with specific gravity of 2.65 and 2.57 respectively were used in proportion of 67% and 33% respectively of the total mass of coarse aggregate according to ASTM C33 / C33M - 18 [19] and IS:383-1970 [18] . Fine aggregate with specific gravity of 2.6 respectively and is conforming to zone-II as per IS: 383-1970 [18] and ASTM C128 - 15 [17]. The details of the geopolymer concrete mix are presented in Table 2 for both liquid to binder (l/b) ratios of 0.7 and 0.8. Hydrochloric acid (HCl) and Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) was purchased from a local supplier. The acids used to investigate the durability for geopolymer concrete against acid attack 5% of hydrochloric acid and sulphuric acid used. Table 5 and Table 6 shows the specifications of HCL and H<sub>2</sub>SO<sub>4</sub>. As per IS: 265-1993 [19] and IS: 266-1993 [20].

**Table 1:** Mix proportion for conventional concrete

Alkaline Activator Solution to fly ash ratio	0.7	0.8
Fly Ash	353 kg/m <sup>3</sup>	333.33 kg/m <sup>3</sup>
Geopolymer Activator Solution	247 kg/m <sup>3</sup>	266.67 kg/m <sup>3</sup>
Fine aggregate	540 kg/m <sup>3</sup>	540 kg/m <sup>3</sup>
Coarse Aggregate	1260 kg/m <sup>3</sup>	1260 kg/m <sup>3</sup>
For Binder to liquid Ratio	1:1.53:3.57	1:1.62:3.78

**Table 2:** Details of different concrete mixtures

Mixes	% of materials in mix for both 0.7 and 0.8
M1	F60G30A10
M2	F50G30A20
M3	F40G30A30

Constituent (wt %)	FLY ASH	GGBFS	ALCCOFINE
Calcium oxide (CaO)	8.9	40	35.85
Silicon dioxide(SiO <sub>2</sub> )	59.5	38	32.40
Aluminium oxide(Al <sub>2</sub> O <sub>3</sub> )	21.9	14.5	21.40
Ferric oxide (Fe <sub>2</sub> O <sub>3</sub> )	5.7	0.684	1.21
Magnesium oxide (MgO)	1.6	6.9	8.72

**Table 3:** Chemical composition of materials used.

Sulphur trioxide (SO <sub>3</sub> )	2.4	-	0.44
Specific gravity	2.69	2.87	2.9

**Geopolymer Activator**

The geopolymer activator is used in present work as a replacement of water. The product composition is given by:

**Table. 4:** Composition of Geopolymer Activator

Components	Formula/CAS	Percentage	OSHA PEL (mg/m <sup>3</sup> )	ACGIH TVL (mg/m <sup>3</sup> )
Silica, Amorphous	SiO <sub>2</sub> /7631-86-9	40- 52	6	10
Silica, Crystalline	SiO <sub>2</sub> / 14808-60-7	1.5 - 4.0	0.1	0.1
Aluminium Oxide	Al <sub>2</sub> O <sub>3</sub> /1344-28-1	15.5 - 25.6	15	10
Iron Oxide	Fe <sub>2</sub> O <sub>3</sub> /1309-37-1	3.9 - 26.5	10	5
Calcium Oxide	CaO/1305-78-8	15.8 – 25.0	5	2
Magnesium Oxide	MgO/1309-48-4	2.5 – 10.4	10	10
Titanium Oxide	TiO <sub>2</sub> /13463-67-7	1.0 - 1.9	10	10

**Table 5:** Specification of HCl

<b>Molecular weight (M.W)</b>	<b>98.08</b>
Minimum assay (acidimetric)	98%
Wt. Per ml at 20° C about	1.84g
Maximum limit of impurities	
Hydrochloric acid (HCl)	0.0005%
Nitric acid (HNO <sub>3</sub> )	0.001%
Lead (Pb)	0.002%
Arsenic (As)	0.0002%
Iron (Fe)	0.002%
Substances reducing KMNO <sub>4</sub>	0.02 ml N/1 %
Non- volatile matter	0.01%

**Table 6:** Specification of H<sub>2</sub>SO<sub>4</sub>

<b>Assay (Acidimetric)</b>	<b>35-37%</b>
Wt.per ml at 20° C	1.180-1.182 g/ml
Maximum limits of impurities	
Non- volatile matter	0.01%
Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> )	0.02%
Arsenic (As)	0.0001%
Iron (Fe)	0.0005%
Lead (Pb)	0.0005%
Free chlorine (Cl)	0.0005%

#### ○ Preparation of Concrete Specimens

Cube specimen of size (150 × 150 × 150) mm were prepared using different Geopolymer concrete mixes i.e. from mix with percentages of Fly ash, Alccofine, and constant percentage of GGBS. Prismatic specimen of size (500 × 100 × 100) mm were prepared from different concrete mixes using Fly ash i.e. from control mix and mixes with percentages of Alccofine and Fly ash. After 24 hours of casting, the specimens were demoulded and subjected to ambient curing till the age of 28 days and 91 days from the day of preparation. After ambient curing, the specimens were tested for different mechanical properties and durability properties.

#### ○ TEST METHODS

##### ▪ Workability

##### • Slump Cone Test

Slump cone test is the most common method for determination of workability of concrete. This test was carried out before casting the specimens using fresh concrete mix. The slump cone consists of a diameter of 150 mm and height of 300 mm and this test was carried out in laboratory as per IS: 1199: 1959 [15]. The slump height was measured in millimeters.

##### ▪ Mechanical Properties

##### • Compressive Strength Test

The compressive strength test was conducted on cube specimens at the age of 28 days and 91 days during a hydraulically operated compression testing machine as per IS: 516:1959 [21]. For every Geopolymer concrete mix admixed with varying concentrations of Fly ash, Alccofine, GGBS and, three cubes were tested and therefore the average value of compressive strength was obtained.

Compressive Strength = Load / Cross-sectional Area.

##### • Flexural Strength Test

Flexural strength test was conducted on the beam specimen as per IS: 9399:1979 [22] made of different concrete mixes containing Fly ash, Alccofine and GGBS of 28 days and 91 days of water curing. Three replicates of every concrete mix were tested and also the average value of flexural strength was obtained.

Flexural strength is calculated using the equation:

$$F = PL / (bd^2), \text{ For } a > 133\text{mm } F = 3Pa / (bd^2), \text{ For } 133\text{mm} > a > 110\text{mm}$$

Where, F= Flexural strength of concrete (in MPa). P= Maximum load (in N).

$L$ = Effective span of the beam (in cm).  $b$ = Breadth of the beam (in cm).

$a$ = the distance between the line of failure and the nearer support measured in cm

**16. RESULTS AND DISCUSSIONS**

o **Workability of Concrete**

Slump test was carried out to determine the workability of concrete of different concrete mixes. The result obtained for the binary and ternary concrete mixes specified in Table 2 have been presented respectively. While performing the workability test, true slump was observed for all types of concrete mixes. From the results, test performed observed that the slump varies as per SP-23: 1982 [18]. The workability of fresh concrete depends primarily on the materials and mix proportions and also on the environmental conditions.

The slump values of GPC with different Activator solution/binder ratios are represented in Fig.1. it was noticed that at both  $l/d$  ratios the slump is equal and more for M1 (i.e., the mix with 60% fly ash and 10% Alccofine) compared to other remaining mixes. The  $l/b$  ratio did not show any significant effect on slump values of all the mixes.

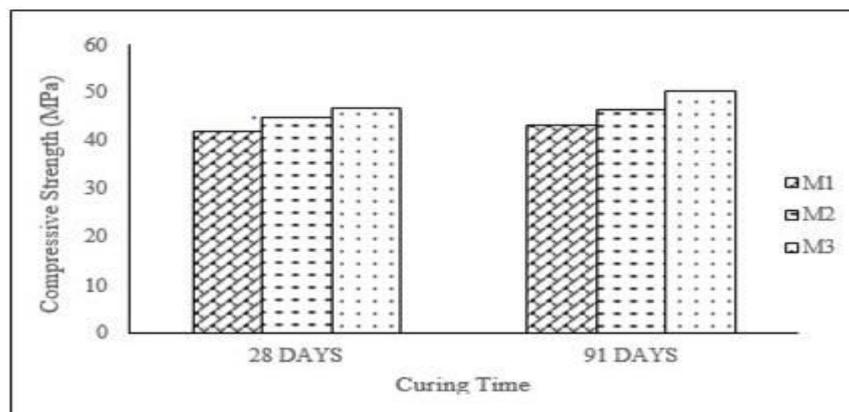


**Fig: 1** Slump test results with different liquid binder ratios

At 0.7 the slump is shear for all the mixes M1, M2, M3 due to the lower water content which makes the mix non-cohesive and segregates the aggregates and paste which results in a shear slump. At 0.8  $l/b$  ratio, the slump is true for all the mixes M1, M2, M3 which represents there is no segregation in the mixes.

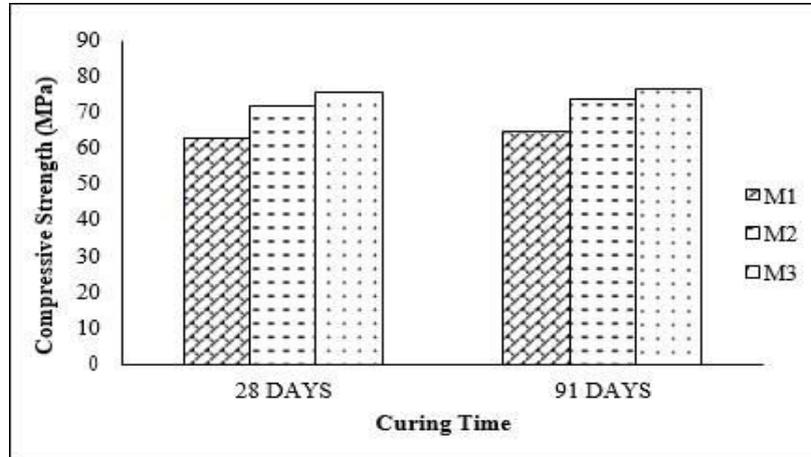
o **Compressive Strength**

The quality of concrete is based on compressive strength. Compressive strength is determined according to the IS code 516. Compressive strength results are shown in Fig. 2 and Fig 3 for the different liquid to binder ( $l/b$ ) ratio. The testing is done on a set of three identical samples for each mix at the age of 28 and 91 days. The compressive strength is the average strength of three cubes. Fig 2 shows the compressive strength of  $l/b$  ratio 0.7. The compressive strength of 0.7  $l/b$  ratio shows the slight variations between mixes M1, M2, and M3 at different curing days. Mix M3 has obtained higher compressive strength of 46.82MPa and 50.43MPa at different curing days (respective curing days) of 28 and 91 days with 50% fly-ash, 30% GGBFS, and 20% Alccofine. The mix M1 has obtained lower compressive strength of 41.89MPa and 65.77 MPa with 60% fly-ash, 30% GGBFS, and 10% Alccofine. As Alccofine is finer material it requires more water content due to the leaching of Si and Al is low in alkaline solution and low  $l/b$  ratio compressive strength of the M1 and M3 mix has decreased



**Fig:2:** Compressive strength of concrete  $l/b$  ratio 0.7.

From fig 3 it can see that at 28 and 91 days the higher compressive strength is obtained by M3 mix with 40% fly-ash, 30% GGBFS, and 30% Alccofine at l/b ratio 0.8 compared to M1 and M2. M1 has low compressive strength due to the low percentage of Alccofine in mix M1 compared to M2. M1 and M2 have less compressive strength because of low Alccofine content than the M3 mix. Alccofine improves compressive strength because it has a high calcium content and high particle packing on comparing with other geopolymer concrete mixes results in high compressive strength.

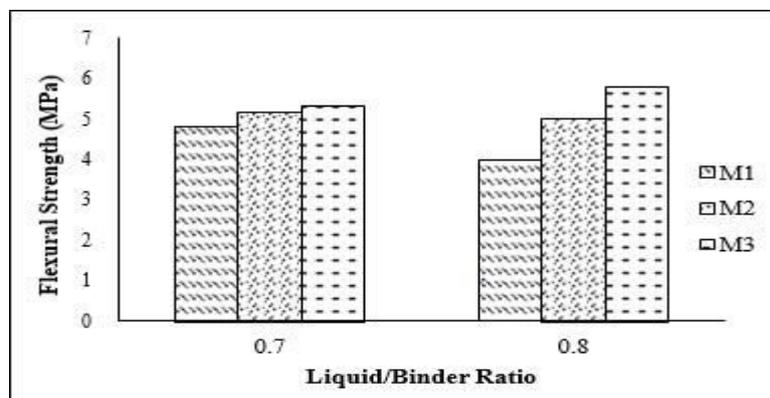


**Fig.3:** Compressive strength at 0.8 l/b ratio

By comparing both l/b ratios, 0.8 shows the better compressive strength because of the high l/b ratio.

#### ▪ Flexural Test

From Figure 4 and Fig 5 flexural strength increased in all the mixes at both the ages i.e. 14 and 28 days. The increase in the flexural strength is due to the secondary formation of calcium aluminosilicate hydrate gel, high density, and high packing value of GGBS and Alccofine. It is due to its voids filling capacity due to its physical property of high fineness of the materials. The increase in flexural strength due to an increase in the formation of C-S-H gel which is due to the large quantity of reactive Si and Al in materials.



**Fig 4:** Flexural Strength of geopolymer concrete at 28 days

Further, it is observed that the flexural strength increases with the age of curing. The increase in the flexural strength may be due to high pozzolanic activity and also due to an increase in Alccofine in geopolymer concrete which resists the initial cracking in the tensile zone and that leads to an increase in the flexural strength at both 14 and 28 days.

#### ○ DURABILITY TESTS

##### ▪ Weight Loss

The weight loss of a specimen as a percentage of the initial weight is a widely used indicator for the assessment of the deterioration of concrete subjected to acid attack. In this study, at the age of 28 days, the initial weight of specimens is determined under saturated surface dry (SSD) condition. Then, these samples are immersed in a sulphuric acid solution. The measurements of the weight loss of specimens at the SSD condition are taken at 91 days. During measurement, the samples are washed with tap water, brushed smoothly with a plastic brush to remove loose particles, and then measured for their SSD weights. The weight loss of the specimens is determined as

$$\% \text{ Weight change} = \left( \frac{W_1 - W_2}{W_1} \right) \times 100$$

Where, W1 is the weight of the specimen before immersion and W2 is the weight of the specimen after immersion.

Fig 4 and Fig 5, shows the weight loss of geopolymer concrete specimens immersed in the 5% of dilute HCl and H<sub>2</sub>SO<sub>4</sub> solution with l/b ratios of 0.7 and 0.8. The mass of each cube is measured before and after the acid attack and the percentage change in weight is represented in Fig. 5 and 6 for each acid individually and each value represented is an average of 3 cube specimens. The percentage change in weight was calculated using the above Equation. Fig 5 and Fig 6 show the weight loss is higher for a cube immersed in the Hydrogen chloride (HCl), by comparing with Sulphuric Acid (H<sub>2</sub>SO<sub>4</sub>). The percentage of weight loss may vary depending on the type of acid in which the specimens are immersed. The weight loss tends to decrease with an increase in l/b ratio and binder content because the presence of more past reduces the void and offers more resistance to ingress of acid. The weight loss may due to the higher reaction of concrete with an acid solution.

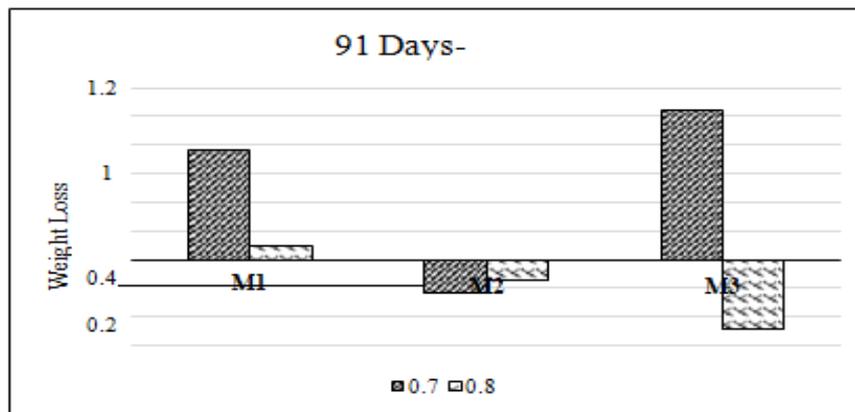


Fig 5: Weight loss of GPC specimens immersed in 5% HCl

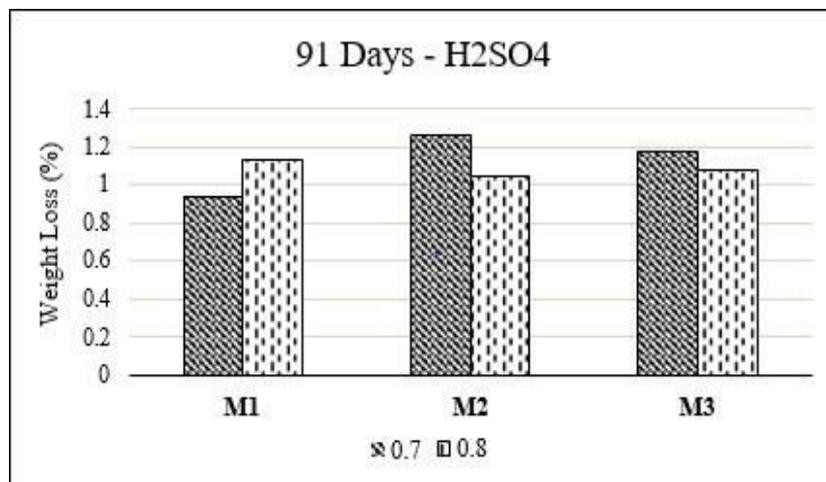


Fig 6: Weight loss of GPC specimens immersed in 5% H<sub>2</sub>SO<sub>4</sub>

Fig 5, shows the gaining in weight by increasing the percentage of Alccofine and increase of l/b ratio the gain in weight due to the reaction between the acid and concrete constituents resulting in the formation of new compounds like gypsum which are expansive in nature causing the increase in volume. Since mass depends on both density and volume, the mass gain initially may be due to a relative increase in a volume greater than the relative decrease in density.

▪ **Change in Compression Strength**

The change in compressive strength is calculated on the basis of the 28-day compressive strength of unexposed geopolymer specimens. Change in compressive strength of specimens is determined as

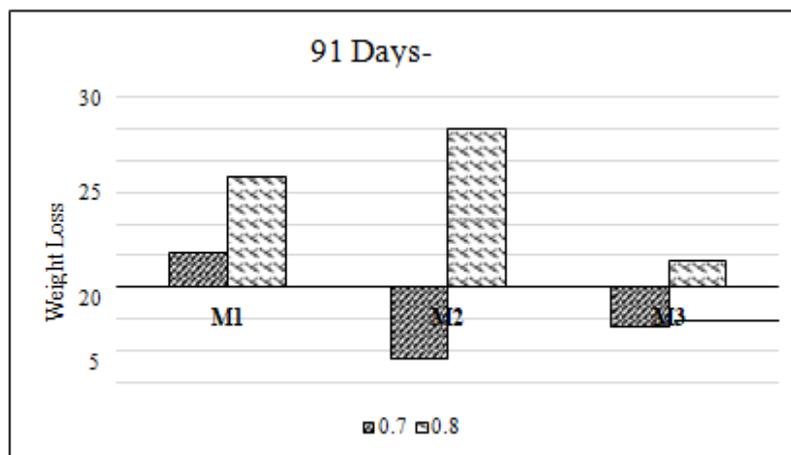
$$\% \text{ Change in compressive strength} = \left( \frac{C_2 - C_1}{C_1} \right) \times 100$$

Where, C1 is the compressive strength of cubes after curing for 28 days and C2 is the after acid attack test.

**3.3.2.1 Hydrochloric Acid (HCL)**

Fig 7 shows the percentage change in compressive strength of geopolymer concrete specimens calculated using the above formula at the age of 91 days. The values are the average of 3 geopolymer cube specimens. Fig 7 with l/b of 0.7 shows Mix M1 has gained a higher percentage of compressive strength compared with M2 and M3. Mix M2 has lost a higher percentage of compressive strength compared with M3. By the increase in Alccofine content, the percentage of change in compressive strength decreases. The l/b of 0.8 shows the strength gained as the percentage of Alccofine percentage increases. Mix M3 has gained a higher percentage of compressive strength compared to M1 and M2.

By comparing 0.7 and 0.8 l/d ratio 0.7 lost the compressive strength compared to 0.8. The loss in compressive strength is due to a low l/b ratio and binder content. The reaction of hydrochloric acid with calcium-based compounds of geopolymer concrete leads to the formation of calcium chloride (CaCl<sub>2</sub>) which is a harmful salt and is highly soluble that will leach out of concrete through pores or by creating voids and results in deterioration of concrete. So, when the calcium aluminosilicate gel reacts with chloride ion present in the acid solution, calcium chloride is formed and hence the volume of gel responsible for strength decreases thus causing a decrease in strength. 0.8 has gained strength due to the presence of Alccofine with high particle packing, high l/b ratio, and binder content because the presence of more past reduces voids and offers more resistance to ingress of acid.

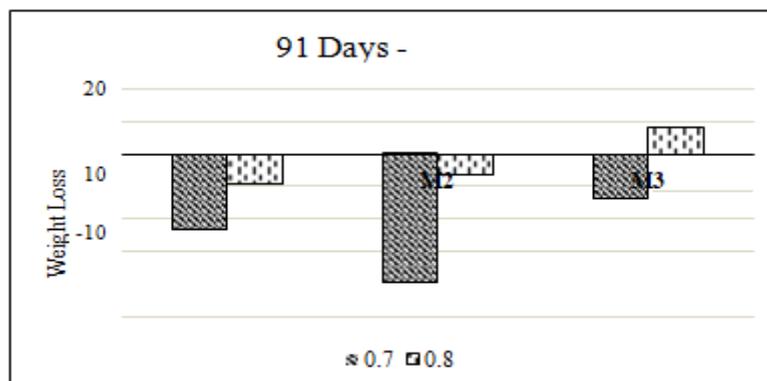


**Fig 7:** Change in compressive strength of GPC specimens immersed in 5% HCl.

**3.3.2.2 Sulphuric Acid Test (H<sub>2</sub>SO<sub>4</sub>)**

In this investigation, the three identical specimens of all the mixes with different l/b ratios are immersed in H<sub>2</sub>SO<sub>4</sub> acid for 91 days. After 91 days, the specimens are dried and tested for compressive strength. The compressive values of this test are presented in fig 8.

From fig 8 it can be seen that at a 0.8 l/b ratio M3 has maximum compressive strength gained compared to other mixes. This is because of a 30% percentage of Alccofine in the mix. At 0.7 l/b ratio, all the mixes have lost the compressive strengths compared to the l/b ratio of 0.8. The Maximum percentage strength loss was observed for mix M2 of about 39.28% for an immersion time of 91 days. From fig 8, it can be concluded that the l/b ratio has a significant effect on the durability of GPC. The results showed that by increasing the l/b ratio and Alccofine content the percentage of compressive strength of geopolymer concrete (GPC) increases.



**Fig 8:** Change in compressive strength of GPC specimens immersed in 5% H<sub>2</sub>SO<sub>4</sub>

The diffusion of acids through this layer further degrades the concrete by leaching calcium. The combined effect of decalcification of binding gel phase (C-S-H) and the instability in volume due to expansion caused by the formation of gypsum leads to a reduction in compressive strength.

## 17. CONCLUSIONS

From the obtained results of the present investigation the following conclusions were drawn:

1. Workability of GPC shows better results by an increase in liquid to binder ratio and increase in Alccofine.
2. By comparing the 0.7 and 0.8 l/b ratios, the 0.8 M3 mix shows the better compressive strength because of the high l/b ratio and due to effective dissolution of Si and Al in alkaline solution.
3. The flexural strength of GPC concrete mixes increase in Alccofine content due to high particle packing and void filling.
4. The weight loss is higher for a cube immersed in the Hydrogen chloride (HCl), by comparing with Sulphuric Acid (H<sub>2</sub>SO<sub>4</sub>).
5. The optimum mix is obtained for the M2 mix at 0.8 l/b ratio when all the specimens are immersed under HCl solution.
6. The maximum compressive strength is shown for the M3 mix at 0.8 l/b ratio when all the mixes are immersed under H<sub>2</sub>SO<sub>4</sub> solution.

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**INDUSTRY 4.0: IMPACT ON PRODUCT DEVELOPMENT AND PRODUCT LIFE CYCLE****Samar Sawant, Dr. Ajay Gangrade and Dr. Shivangi Thakker**

Mechanical Engineering Department, K.J. Somaiya College of Engineering, Vidyavihar, Mumbai- 400077, India

**ABSTRACT**

*Industry 4.0 refers to the intelligent networking of equipment and processes for industry using information and communication technology. Industry 4.0 is a term that reflects industrial businesses embrace of techniques and processes enabled by digitalization, cloud computing, the internet of things, and big data in order to obtain competitive advantages in domestic and worldwide markets. There is a need for more research into the applications of I-4.0 enabling technologies in product development and lifecycle management. The link between I-4.0 and product development is the main focus of this research. Manufacturers are trying to shift to new and developing technologies while maintaining optimum design, operational effectiveness, and ease of maintenance, therefore the path to I-4.0 is complicated and diverse. This research examined the influence of Industry 4.0 tools and techniques on product development and lifecycle management by providing a critical assessment of the next generation of Design and Manufacturing problems as well as numerous implementation hurdles. This research includes several models, examples including case studies, as well as the benefits of these Industry 4.0 tools to solve these problems and optimize the Product Development Process.*

*Keywords: Industry 4.0, Product Development, Product Lifecycle, Internet of Things.*

**1. INTRODUCTION**

In 2010, Germany developed and expanded the concept of Industry 4.0 (I-4.0) as a plan to increase company production competitiveness, which had been harmed by emerging economies with low labor costs. The goal was to provide a cutting-edge industry that was close to the consumers, with customized and turnkey goods and solutions, as well as shorter manufacturing and service periods. This was made possible by the use of Information and Communication Technologies (ICTs) in manufacturing, business, and industrial operations. Among the most important technologies are big data, cybersecurity, robotics, artificial intelligence, additive manufacturing, augmented and virtual reality, and others. Industry 4.0 is defined as "a term for the current trend of automation and data exchange in manufacturing technologies, which includes cyber-physical systems, the Internet of Things, cloud computing and cognitive computing, and the construction of the smart factory." It is characterized by increased automation over the third industrial revolution, the bridging of the physical and digital worlds through cyber-physical systems, enabled by Industrial IoT, a shift from a central industrial control system to one where smart product define the production steps, closed-loop data models and control systems, and product personalization/customization.

In essence, Industry 4.0 technologies make use of existing data as well as a multitude of new data sources, such as data from connected assets, to improve efficiency on numerous levels, modify existing industrial processes, build end-to-end data streams across the value chain, and realise new services and business models.

**1.2 Motivation**

The global manufacturing market is predicted to grow 4-5 times faster than it is now. After the concept was introduced, several sectors examined the fourth industrial revolution and the influence of the drivers and technologies driving Industry 4.0. The entire process of delivering a new product or refining an old one for clients is known as product development. In today's commercial world, implementing I 4.0 into product development is critical for combating with industrial competitiveness. As a result, the purpose for this topic has been to explore the link and experiment with different approaches to utilize these methods and technologies.

**1.3 Scope**

The majority of Industry 4.0 projects are in their early stages and have a limited reach. In actuality, the majority of digitization and digitalization initiatives are focused on third and even second industrial revolution technology and their targets. In essence, the technologies that enable Industry 4.0 make use of existing data as well as a plethora of new data sources, such as data from connected assets, to gain efficiencies on multiple levels, transform existing manufacturing processes, create end-to-end data streams across the value chain, and realize new services and business models.

**1.4 Organization of Paper**

This paper is divided into various sections. Section 1 has covered introduction of the entire topic. Section 2 covers literature survey part in which Research findings and Research gaps are assigned with the sub-sections.

Section 3 covers case studies of the Impact of Industry 4.0 on Product Development and Product Lifecycle. Section 4 is conclusions drawn on the basis of study and future scope of current study. At the end, references of the articles selected are provided.

## 2. LITERATURE SURVEY

Literature survey for this report using Scopus database peer reviewed research articles only. Conference proceedings and thesis work are not included in this study. Research papers are selected from 2017 onwards. Articles are selected from reputed Journals by reputed publishers by like Taylor and Francis, Springer, Elsevier etc. 30 articles were selected on the basis of TAK (Title, Abstract and Keywords) principle after the scanning process. Upon further reading, 15 papers were shortlisted and summary of the contributions of the shortlisted articles are summarized in the below table, which highlights the key factors investigated, findings of the article and research gaps. Table 2.1 describes title of the papers selected, year in which they are published, country and applications for Industry 4.0. Further in the literature survey the objectives and achievements of the various Industry 4.0 tools impact on product development and product life cycles are discussed in detail.

**Table 2.1:** Objectives/Title of the papers selected

No.	Author	Title of the paper	Year	Country
1	Kássio Santos	Opportunities Assessment of Product Development Process in Industry 4.0	2017	Italy
2	Iara Franchi Arromba	Industry 4.0 in the product development process: benefits, difficulties and its impact in marketing strategies and operations	2020	United Kingdom
3	Velo 3D	Driving the Future of Innovation with Advanced Metal AM	2021	US
4	Wieslaw Urban	Application of Industry 4.0 to the Product Development Process in Project-Type Production	2020	Poland
5	Shashi Bahl	Automation and manufacturing of smart materials in additive manufacturing technologies using Internet of Things towards the adoption of industry 4.0	2020	India
6	M. Lopes Nunes	Smart products development approaches for Industry 4.0,	2017	Spain
7	David Inkermann	A framework to classify Industry 4.0 technologies across production and product development	2019	Germany
8	Guo, Ziyue	Applications of virtual reality in maintenance during the industrial product lifecycle: systematic review	2020	China
9	Rachel Lacroix	Benefiting from additive manufacturing for mass customization across the product life cycle	2021	Switzerland
10	Saurabh Vaidya	Industry 4.0 – A Glimpse- 2nd International Conference on Materials Manufacturing and Design Engineering	2018	India
11	Iara Franchi Arromba	Industry 4.0 in the product development process: benefits, difficulties and its impact in marketing strategies and operations	2021	Brazil
12	Sepasgozar	Additive manufacturing applications for industry 4.0: a systematic critical review	2020	Australia
13	Ashima	Automation and manufacturing of smart materials in Additive Manufacturing technologies using Internet of Things towards the adoption of Industry 4.0	2021	India
14	Radu Godina	Impact assessment of additive manufacturing on sustainable business models in industry 4.0	2020	Portugal
15	Fatih Ozturk	Product Lifecycle Management in Smart Factories: Industry 4.0 Applications	2019	Istanbul

### 2.1 Research Findings

A state-of-the-art evaluation of Industry 4.0 based on current advancements and experience within the PDP area is described in the work [1] by Kássio Santos\*, Eduardo Loures, Flávio Piechnicki, and Osris Cancigliieri. Support for the integration and virtualization of manufacturing design and production processes utilizing information and the internet to produce smart products is one of Industry 4.0's primary characteristics. It demonstrates the integration of IoT and Product Development, which allows for more customization of production and product, lowering product development time and time to market the finished product. A subsection of paper [1] gives a literature review analysis based on the Promethee multi-criteria decision analysis method to find the key concepts from the relational analysis between the two domains – Industry 4.0 and PDP. An examination of the Product Development Process Phases and Industry 4.0 concepts will be realized utilizing

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a multi-criteria decision-making technique employing the Promethee, taking into account relationship, attributing values, and some other features between them. The paper [1] concludes with a summary of the findings of the analysis. The conclusion and future work are discussed in the end.

Iara Franchi Arromba, Philip Stafford Martin, Robert Cooper Ordoez, and Rosley Anholon published paper [2] in which they investigated the benefits and challenges of Industry 4.0 in relation to the Product Development Process, as well as its impact on marketing strategies and operations. In the context of Industry 4.0, the product development process (PDP) may have numerous marketing implications. The research methodology adopted in this study was a comprehensive literature review. This chapter provides an overview of the field's research as well as findings from other researchers on our topic. It briefly summarizes the scope, objectives, and work that has involved into integrating Industry 4.0 with Product Development and Lifecycle Management. This section will explain the relationship between these fields and how I-4.0 will impact product development and lifecycle management. They will also provide a general overview of the tools and techniques that can be employed, as well as their effects on the product development process, product lifetime, and benefits. The research question development, study site, study selection and evaluation, analysis and synthesis, and reporting and utilization of research results were all followed. A thorough literature study of PDP in the context of Industry 4.0 found 28 benefits and 14 challenges in a total of 53 papers. Several marketing implications emerged from the analysis of these benefits and challenges, including a better understanding of customer preferences, increased agility in marketing decision-making, better alignment of marketing, product development, and operations processes issues, a better understanding of product/service lifecycle, analysis of new distribution and communication channels, and a better definition of product and service value and location requirements. The information offered here can be used by market professionals who are interested in the topic as well as researchers for future research. A greater knowledge of PDP in the context of Industry 4.0 will help market professionals improve their marketing tactics and researchers get new insights.

Paper [3] is a white paper publishes by Velo 3D which is working in the field of Additive Manufacturing (AM). Metal AM has matured into a viable, and in many cases preferred, alternative to legacy production processes, especially when it comes to complex parts geometries. Advanced metal AM solutions, like Velo3D, provide innovation without compromise, producing parts with unprecedented complexity and repeatability. In this whitepaper they have discussed the challenges industries are facing in their production, why now is the time for broad adoption of advanced metal AM, and the freedom of design and manufacturing that can be unearthed when this adoption and acceptance occurs is being discussed. They have done a comparative analysis between the traditional methods and the advance Metal AM showing the advantages and impacts of it on the entire manufacturing process affecting the product development process, lifecycle and cost of the product.

The focus of this research in paper [4] was to see if I-4.0 principles and tools could be applied to the product development process in a small- to medium-sized firm (SME)—a food processing technology provider that provides personally customized solutions. The case study methodology is combined with conceptual research in this work. The goal of this research was to look into one PDP at a company that specializes in custom project manufacturing and to see how I4.0 can be used in this process. The researched object is a company that creates, manufactures, and installs custom-made technologies for the food processing industry. It should be mentioned that the investigated company engages in unit production, with each technology developed according to the customer's specifications. As a result, each product is unique, and the development process necessitates a tailored approach. The research topic is an attempt to uncover methods that can be utilized by the company to reduce the time it takes to deliver a new product to the market and to reduce the amount of energy used in an analyzed process. Several I4.0 tools that would be beneficial to the process are examined in terms of their applicability as well as their energy benefits. The parts of the process that could be enhanced were identified using the available I4.0 concepts/technologies. The study closes by suggesting many process changes in the context of I-4.0. Implementing I-4.0 tools and potential advantages can help to shorten some of the process stages with potential energy savings.

Paper [5] explains digital manufacturing which is gaining popularity as the industrial sector is progressing along with the ongoing wave of Industry 4.0 because of increased production and mass customization. Automation in Additive Manufacturing [AM] procedures will improve efficiency, productivity, and reproducibility in traditional AM methods. The main goal of this research is to investigate the use of Industry 4.0 technologies in traditional 3D printing methods. Identifying the need for IoT implementation in additive manufacturing technology, exploring how additive manufacturing processes can be automated for optimal manufacturing using IoT, identifying benefits to the industry by adopting 14 automated AM processes, and major applications of automated AM processes towards the adoption of Industry 4.0 are the major research objectives of this paper.

A literature study is conducted in paper [6] to provide information on smart product development (SPD) methods. With the arrival of enhanced digital tools for product development and prototyping that include advanced computing platforms, such as virtual and augmented reality, Industry 4.0's disruptive developments had an impact across the whole product lifecycle. These technologies are altering the norms of product development processes by allowing the merging of digital and physical prototyping, presenting new potential and difficulties for SPD. This study has examined these potential and challenges. Bringing design and visualization together increases product perception and promotes communication between all stakeholders, creating more collaborative environments, which represents a great potential for increasing an organization's competitiveness, placing companies that adopt these SPD approaches at the cutting edge of technology.

They presented a framework to characterize and identify Industry 4.0 technologies, which affect both manufacturing and product development, in their study [7]. The proposed framework is intended to serve as the foundation for an organized and uniform description of existing technologies, as well as to identify the impacted activities in the product development process. The primary aim is to provide a framework explaining Industry 4.0 technologies inside production and product development by combining existing models of cyber-physical production systems with established descriptions of central product development process activities. The components of the framework, as well as their integration for the goal, are explored extensively in the paper. In the context of Industry 4.0, this article concludes that knowledge will help uncover potentials in product design and production system design, as well as insights for new Design for Manufacturing and Design for Assembly approaches.

The goal of Paper [8] is to thoroughly explore the applications of virtual reality in industrial maintenance in exploring evidence of its benefits, limitations, and future directions so that VR can be steered to better serve manufacturing firms in the coming Industry 4.0. To review primary papers on this topic, a systematic literature review (SLR) methodology is used, and 86 studies are eventually included. The findings reveal that virtual reality has shown to be beneficial in addressing maintenance concerns throughout the product lifecycle. However, VR is not yet an essential component of product lifecycle management when it comes to maintenance difficulties. Based on the analysis of the 86 research, several major conclusions are reached. Researchers interested in the use of virtual reality technology in maintainability design, maintenance training, task assistance will find this review useful.

In paper [9] they created an exploratory quantitative model to better understand how Additive Manufacturing may complement existing manufacturing systems. First, they combined the Bass and Hotelling–Lancaster models to create a novel time-varying locational choice model of heterogeneous clients that leveraged customer centrality. The researchers then looked into customer-centric marketing and operations decisions, examining technology switching scenarios that swap AM for MC across the product life cycle (PLC). They have defined and solved an optimization problem by deciding on technology-switching times, pricing, and product diversity strategies together in order to optimize a manufacturer's profit while meeting the diverse and developing needs of individual customers. For the numerical solution of non-convex optimization problem, they applied a verified Sample Average Approximation technique. After experimenting with various price techniques, it was shown that declining and flexible trajectories are the ideal. They also developed analytical properties for the best pricing policy and showed how an AM-MC-AM scenario can benefit a company by allowing AM and MC to be exchanged throughout the PLC.

Industry 4.0, which covers Internet of Things, Industrial Internet, Smart Manufacturing, and Cloud-based Manufacturing, is still a futuristic but plausible notion. Industry 4.0 refers to the strict integration of humans into the manufacturing process in order to achieve continuous improvement, a focus on value-added activities, and the avoidance of waste. The goal of paper [10] is to provide an overview of Industry 4.0, as well as an understanding of the nine pillars of Industry 4.0 and their applications, as well as to identify the challenges and issues that may arise during the implementation of Industry 4.0, as well as to research new trends and streams related to Industry 4.0. The focus of the paper [10] was on the notion of Industry 4.0, which enables for smart, efficient, effective, individualized, and customized production at a reasonable cost. Faster computers, smarter machines, smaller sensors, and less expensive data storage and transmission could let machines and products connect and learn from one another. The nine pillars of Industry 4.0 are discussed with examples to help you understand how to apply Industry 4.0 and to identify the obstacles and concerns that come with its adoption.

### **3. CASE STUDY**

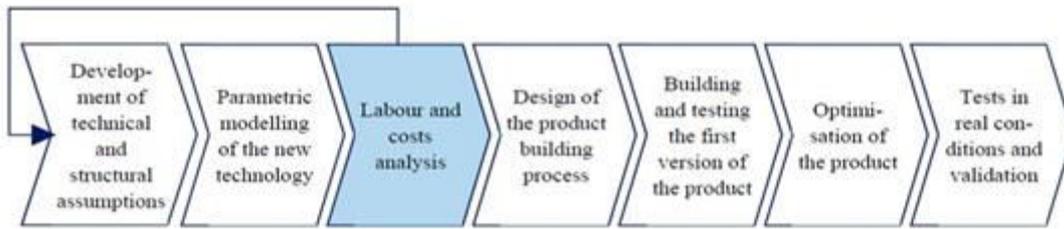
The different case studies related to the application of manufacturing sector in Industry 4.0 paradigm have been discussed. These case studies are based on food sector, automotive sector and health sector.

3.1 Case Study 1

[Application of Industry 4.0 to the Product Development Process in Project-Type Production]

Wieslaw Urban proposed this study wherein the purpose was to see if I4.0 principles and tools could be used to the product development process in a small to medium-sized firm (SME) that provides individually customized food processing technology solutions. The case study methodology is combined with conceptual investigations in this work. The parts of the process that could be enhanced were identified using the available I-4.0 concepts/technologies.

The researched object is a food processing industry designer, producer, and installation of custom-made technologies. It is highlighted that the investigated company engages in unit production, with each technology developed according to the customer's specifications. As a result, each product is unique, and the development process necessitates a tailored strategy. The research topic is an attempt to discover methods that can be utilized by the company to reduce the time it takes to deliver a new product to the market and to reduce the amount of energy used in the analyzed process.



**Table 1.** Industry 4.0 (I4.0) solutions that may provide benefits at particular steps of the PDP:

Steps	I4.0 Solutions					
	ID	S	VT/AR	VT/VR	PI	VM
1. Development of technical and structural assumptions	+			+	+	
2. Parametric modelling of the new technology	+	+		+	+	+
3. Labour and costs analysis				+	+	
4. Design of the product building process	+	+	+		+	+
5. Building and testing the first version of the product	+		+		+	+
6. Optimisation of the product	+		+		+	+
7. Tests in real conditions and validation			+		+	

**Source:** Application of Industry 4.0 to the Product Development Process in Project-Type Production; [4] ID and PI are recommended for most of the stages of the product development process

The study adds significant value by proving I4.0 deployment in a project production SME's core processes. The I4.0 implementation concept given here is considered critical at a time when I4.0 can grow to smaller businesses, providing them with competitive tools and enhancing their productivity and effectiveness. It was discovered that the process time can be reduced from 36 to 26 months, and that energy savings could be obtained as well.

3.2 Case Study 2

[Applications of Virtual Reality in Maintenance During the Industrial Product Lifecycle]

Guo, Ziyue proposed the following study.

The goals of this paper were to investigate the current applications of VR for Maintenance aspect in Product Lifecycle and reveal its future challenges and potential.

• **Challenges Leading to Requirement of VR:**

- (1) Intangible actual environment
- (2) Narrow space to introduce new components and conduct assembly and maintenance operations

- (3) Poor fault tolerance
- (4) Ergonomics
- (5) Cost constraints in the production of physical prototypes.

Because of its potential to enable visualizing a lifelike environment and further propose solutions to engineers, VR has been used to tackle these issues. The advantages of VR to the industry are realized throughout the lifecycle, from design to operation, as a major cost-cutting measure.

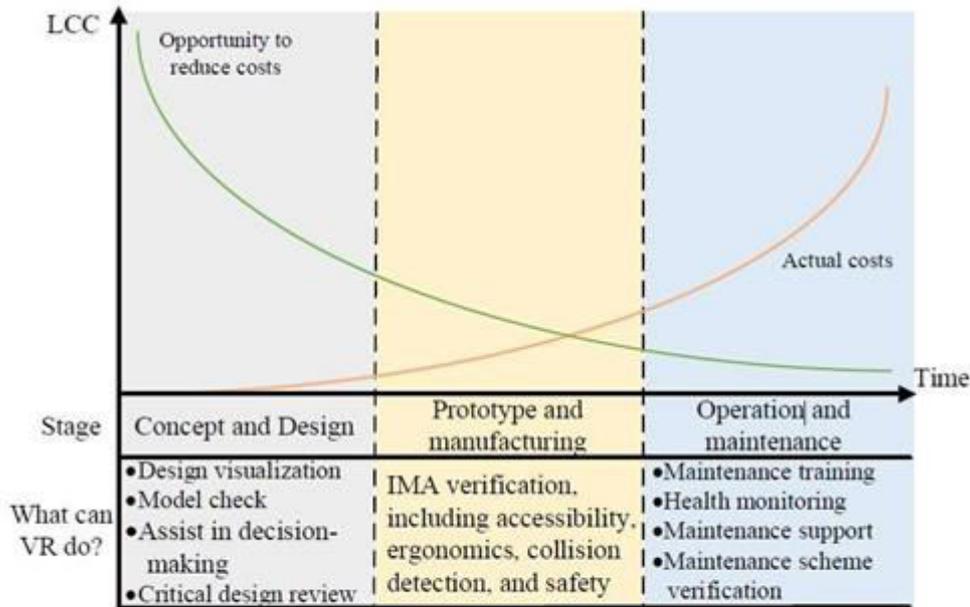


Fig. 2. Lifecycle cost of industrial products and the effects of VR from the perspective of maintenance.

**Source:** Applications of virtual reality in maintenance during the industrial product lifecycle [8]

Virtual reality has been a big hot topic in academics and industry in recent years. A Systematic Literature Review [SLR] is shown to be a useful approach for systematically assessing primary papers to synthesize the evidence on the benefits and limitations of virtual reality in industrial maintenance in this paper. VR has proven to be a valuable tool for optimizing development processes, enhancing maintenance efficiency and safety, and, perhaps most importantly, lowering lifecycle costs.

Virtual Reality, as a new technology, still faces a number of obstacles. To find things simpler for designers or engineers to use or generate material that suits their needs, friendliness towards VR must be increased. To better adapt to complicated industrial situations, portability and robustness must be improved. More importantly, an application architecture that seamlessly integrates VR into product lifecycle activities must be established. The Cohen Kappa statistic is used to gauge the discrepancy amongst authors during the quality assessment of the included research. To resolve these differences amongst authors, the Delphi approach is used. The greatest benefit of virtual reality is its capacity to reduce the amount of time and money spent by stakeholders on maintenance problems at all stages of the manufacturing process. Future review studies will look into successful VR application scenarios throughout the product lifecycle in order to summarize the VR implementation process in Industry 4.0 world at large. In addition, explanatory interviews with industrial companies will be done to see how virtual reality affects actual product development processes in businesses rather than laboratories.

Engineers may verify the assembly and maintenance process of products in the VE in the early stage of design, foresee design faults, and avoid rework caused by these defects in the assembly and maintenance stage, using to the VR system's visualization and physical simulation capabilities. Designers can conduct several ergonomic design activities utilizing digital virtual humans with varying percentiles in an immersive environment with the help of VR to optimize the passenger space design. Without having to start from scratch, a knowledgeable person can author maintenance instructions from a standard manual. Moreover, the application can vary between several context presentation modes, such as AR, VR & 2D.

Some of pictorial examples that can increase ergonomics and ease to use different products using I4.0 Virtual Reality Tools and Techniques are showcased as follows:

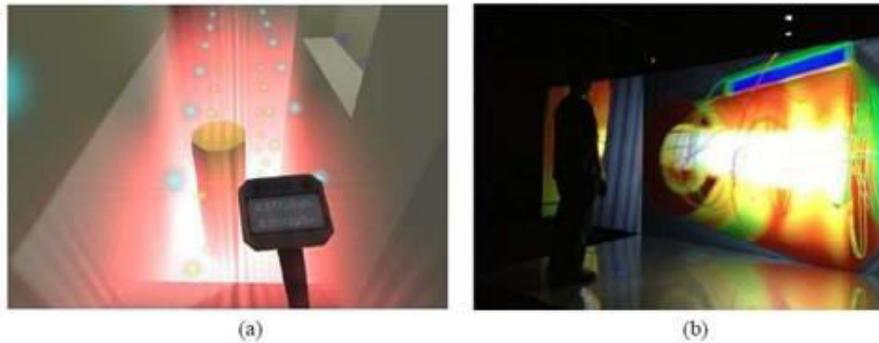


Fig. 3. Data visualization of the radiation dose in WEST [44] (a), and the temperature and velocity in the combination zone of a boiler



Fig. 4: Designers performing ergonomic design



Fig. 5: Haptic Feedback with physical human templates.

*Source:* Applications of virtual reality in maintenance during the industrial product lifecycle [8].

#### 4. CONCLUSION

The relationship between Industry 4.0 and Product Development and Product Lifecycle was investigated in this review paper. Industry 4.0 and its implications were explored in this study, which looked at how future technologies of I4.0 can improve the overall system efficiency by reducing errors and voids in the product development process. I-4.0 implementation Tools and Techniques were examined in various scenarios, with the resulting benefits and drawbacks being considered and analyzed. VR has proven to be a valuable tool for optimizing development processes, enhancing maintenance efficiency and safety, and, perhaps most importantly, lowering lifecycle costs. These advantages of these technologies were highlighted in this paper. The research will contribute to a better understanding of the current state, challenges, and plans for Industry 4.0 implementation in SMEs, which will aid in the development of future SME-friendly manufacturing tools and systems, as well as craft managers' and policymakers' understanding of I 4.0 technology implementation. Real-time data will be used in simulations and prototyping to reflect the physical world in a virtual model, which can include machines, products, and humans. Modern robots are defined as self-contained, flexible, and cooperative systems. It is expected that robots will begin communicating with one another and working securely alongside humans, even learning from them, in the near future. In the future, Industry 4.0 will make a significant contribution to more sustainable industrial value production. This study emphasizes on the various I4.0 techniques that is and can be used in the current industry to enhance their performance and improve their overall efficiency which is discussed with examples and case studies of various reviewed papers in this study.

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**A REVIEW ON A NOVEL APPROACH FOR MITIGATING LOCAL SCOUR AROUND BRIDGE PIERS**

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**S. T. Vijaya Sarada<sup>1</sup>, Venkata Rao Gummadi<sup>2</sup> and Venkata Kamal Lal Meenuga<sup>3</sup>**<sup>1</sup>Research Scholar, <sup>2</sup>Professor and <sup>3</sup>Assistant Professor, Department of Civil Engineering, Anurag University**ABSTRACT**

*Scour around the bridge piers needs to be controlled for safe and cost-effective design. Any scour protection or control device's effectiveness around bridge piers depends on how it combats the scouring process. By adopting various pier forms and enclosing the pier in a collar, efforts have been made to lessen the depth of scour. In the current study, a thorough assessment of recent research on scour reduction near bridge piers is offered, covering all conceivable elements such flow field, scouring process, parameters affecting scour depth, and time-variation of scour.*

*Keywords: Bridge Piers, flow field, scour process, scour reduction, time variation.*

**1. INTRODUCTION**

Bridges over waterways are constructed in many nations as traffic volume rises as a result of economic expansion. In addition to structural issues, pier and abutment scouring also contributes to the failure of a number of bridges each year. 60% of all US highway bridge collapses are caused by hydraulic causes, according to Huber (1991), including stream instability, local and broad scour, long-term streambed aggradation/degradation, and lateral migration. A localised decrease in the bed elevation surrounding the bridge pier is known as scouring at the pier (Chiew 1992). A complicated vortex system and three-dimensional boundary layer separation are linked to this lowering, which is brought on by modifications in the local flow pattern near the pier. The local scour may endanger the stability of bridge piers, ultimately leading to failure when the pier's base is compromised. In addition to the human toll, bridge failures cost crores of rupees in direct replacement and repair costs, as well as indirect costs associated to the interruption of transportation infrastructure. The maximum scour depth must be considered during design in order to make the bridge stable. It costs a lot of money to sink the bridge pier far enough into the bed. Researchers have been working to protect the bridge from regional scouring at the piers and abutments. The issue of scour near an isolated pier has been thoroughly researched and also documented by several researchers, including Chabert and Engeldinger (1956), Laursen and Toch (1956), Liu et al. (1961), Shen et al. (1969), Melville (1975), Hjorth (1975), Melville and Raudkivi (1977), Ettema (1980), Baker (1981), Jain (1981), Raudkivi and Ettema (1983), Melville and Su (2004). Recent pier scour-related bridge failures, as reported by Tafarjoruz, Ali et al. (2010), Barbhuiya (2004), Wardhana and Hadipriono (2003), Hoffmans and Verheij (1997), and others, have reignited interest in finding better ways to gauge the maximum depth of scour and safeguard bridges from its ravages. Numerous factors have an impact on the scouring process. The scour pattern around the pier is greatly influenced by the shape of the pier nose and the angle of attack of the incoming flow. The type of pier scour differs depending on whether or not the flow approaching the pier is conveying material: (i) clear-water scour, which occurs when the flow doesn't carry any sediment; (ii) live-bed scour, which occurs when the flow does.

Engineering solutions for bridge pier scour mitigation typically fall into one of two categories: bed armoring or flow-altering countermeasures. In order to resist the shear stress that develops around bridge piers, bed armoring countermeasures serve as a physical barrier. The most popular armoring method is to place riprap stones in the riverbed near bridge piers (Breusers et al. 1977; Parola 1993; Bhalariao et al. 2010). Other bed armoring tools include gabions, articulating concrete blocks, concrete armour units, etc. surrounding the piers (Escameia 1998; Parker et al. 1998; Yoon and Kim 1999). On the other hand, flow-altering countermeasures aid in lowering the intensity of the horseshoe vortex and downflow, which are the main contributors to local scour. Flow-altering devices are often divided into two types based on how they are attached and how they are designed: pier attachment and its modification, and bed attachment. Slot in a pier (Chiew 1992; Setia 1997; Kumar et al. 1999; Grimaldi et al. 2009); collar plate attached to a pier (Dargahi 1990; Chiew 1992; Vittal et al. 1994; Setia 1997; Parker et al. 1998; Kumar et al. 1999; Kim et al. 2005); The threaded pier (Dey et al. 2006; Khaple et al. 2017); splitter plate (Dey et al. 2006; Ghorab; 2013); internal connecting tubes (Razek et al. 2003; Ghorab; 2013); pier group (Vittal et al. 1994); and caisson (Chabert and Engeldinger 1956; Shen et al. 1969; Jones et al. 1992) are pertinent. The bed attachment flow-altering devices include sacrificial pile arrangements (Setia 1997; Melville and Hadfield 1999; Chiew and Lim 2002; Wang 2016), flow deflection by upstream vanes or vertical plates (Odgaard and Wang 1991; Lauchlan 1999), surface guide panels (Huang et al. 2005), sleeve and collared sleeve (Singh et al. 2001; Garg et al. 2008), (Gupta and Gangadharaiah 1992; Setia 1997). Setia has conducted extensive experimental effort to look into the features of the primary horseshoe vortex (1997).

The goal of this work is to provide a thorough analysis of various pier designs as scour-protecting countermeasures. Additionally, collar countermeasure strategies are presented, and future research is recommended.

## 2. FLOW PATTERN AND MECHANISM OF LOCAL SCOUR AROUND BRIDGE PIER

Several experts have looked into the intricate mechanism of scouring around a bridge pier (Chabert and Engeldinger, 1956; Hjorth, 1975; Melville, 1975; Melville and Raudkivi, 1977; Dargahi, 1990; Ahmed and Rajaratnam, 1998 and Graf and Istiarto, 2002).. It was demonstrated that (Fig. 1) a downhill flow forms in front of the pier, impinging on the stream bed and leading to the development of scour holes in the front side of the pier, while a complex wake vortex system develops behind the pier. The vortex later extends downstream along the pier's edges. Due to its resemblance to a horseshoe, this vortex is frequently called a horseshoe vortex. The separation of flow at the upstream face of the scour hole created by the downflow is what causes the horseshoe vortex to emerge. The horse-shoe vortex is responsible for quickly removing the displaced particles from the pier. Horseshoe vortex strength decreases with increasing scour depth, which naturally results in a decrease in the pace at which silt is transported from the pier's base.

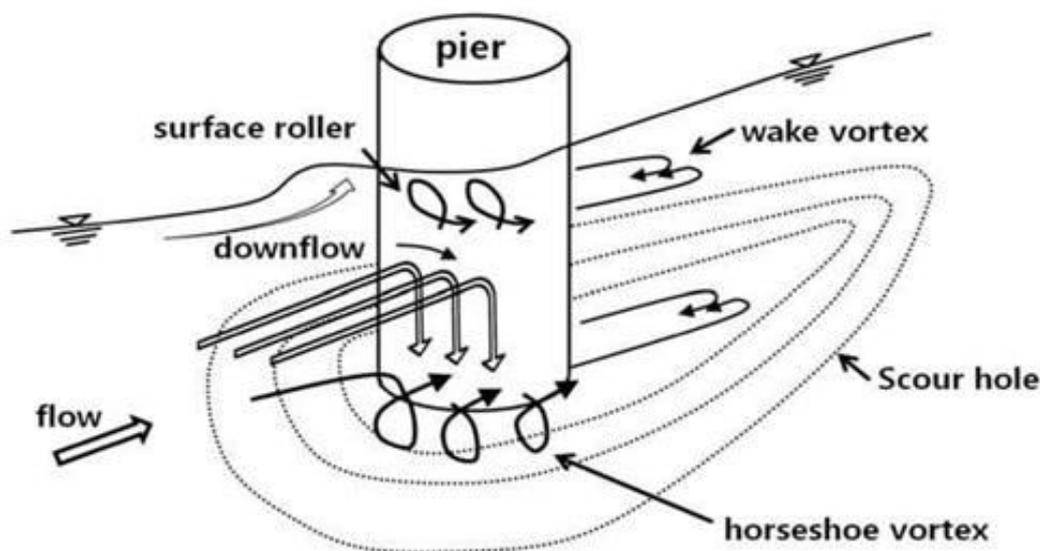


Fig. 1: Diagrammatic flow pattern at a cylindrical pier (Raudkivi, 1986)

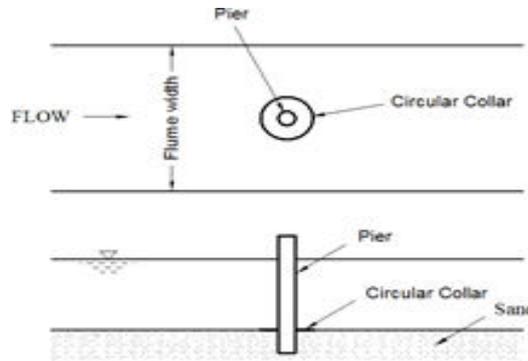
## 3. SCOUR REDUCTION USING DIFFERENT PIER SHAPES

In previous studies, the local scour at the circular pier has already been proven ( Melville 1975, Melville and Raudkivi 1977, Kothiyari et al. 1992, Ahmed and Rajaratnam 1998, Ettema et al. 1998, Melville and Coleman 2000, Graf and Istiarto 2002, Muzzammil and Gangadhariah 2003, Chang et al. 2004, Oliveto and Hager 2005, Dey and Raikar 2007, Chreties et al. 2008, Link et al. 2008, Elsebaie 2013, Izadinia et al. 2013, Mohammadpour et al. 2013 and others), Only a relatively small number of studies have been conducted to comprehend the physical properties of scour geometries and the turbulence characteristics surrounding bridge piers of various non-circular forms. Tison (1961) was the first to start researching local river scour through laboratory tests utilising several pier models, including rectangular, triangular, aerodynamic, and lens-shaped. ones Using a variety of characteristics, including pier diameter, pier shape, grain size, and water depth, Chabert and Engeldinger (1956) made comprehensive measurements to explore the local scour near piers. They found that the scour depth asymptotically reaches a steady state for fluid velocities below the critical velocity of particle movement and exhibits maximum depth, whereas for higher velocities, the scour depth fluctuates due to the periodic dumping of materials into the scour hole. Dietz (1972) tested various bed materials and found that the scour depth around circular piers increased with aspect ratio up to three, where aspect ratio is defined as flow depth and pier diameter. Additionally, he looked at the scour depth for various pier forms, using the cylindrical pier as a baseline. Based on field and experimental data, Breusers et al. (1977) produced a "state-of-the-art" study to outline the characteristics of local scour around piers of various shapes. Fael et al. (2014) recently investigated the effects of pier design and alignment on the equilibrium scour depth near a single pier in clear water flow conditions close to the threshold for beginning of sediment motion. They compared five different pier shapes with various shape dimensions, including circular, rectangular, square and round nosed, oblong, and zero-spacing pile groups.

**4. SCOUR REDUCTION USING COLLAR**

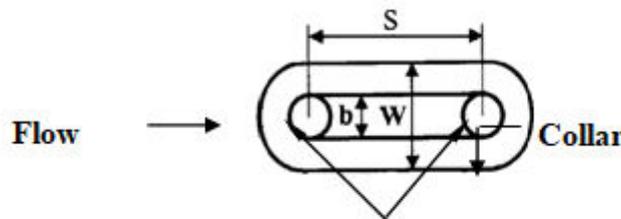
The maximum scour depth and rate of scouring are both significantly decreased when a collar is constructed around the pier to prevent the direct impact of the down flow on the streambed. When the flood duration is brief, a decrease in scouring rate lowers the danger of pier failure.

Previous studies have already demonstrated the effectiveness of collars in reducing scour (Zarrati et. al., 2006; Zarrati et. al., 2004; Kumar et. al., 1999; Chiew, 1992; Ettema, 1980; Tanaka and Yano, 1967; Thomas 1967; Schneible, 1951). In addition, a collar installed at  $0.2 b$  above the sediment bed with an effective width of three times the pier diameter and a slot measuring  $0.25 D$  wide with a length of  $2 b$  close to the bed were examined by Chiew (1992), who found no scour depth at the pier. In order to control scouring around circular bridge piers, Kumar et al. (1999) conducted a number of studies. They came to the conclusion that when there is a collar at the bed and  $W$  is four times the width of the pier, there is no scour in the front or sides of the pier, but a large scour hole occurs in the back of the pier. In a series of tests, Zarrati et al. (2004) used a collar to manage scouring around a rectangular pier that had a collar that was the same width all the way around the pier. They used collars in two different sizes ( $W = 2b$  and  $W = 2b$ ). As rectangular piers are sensitive to the flow's angle of attack and the scour depth around them rises sharply as the angle of attack rises (Laursen and Toch, 1956; Ettema et. al., 1998), Zarrati et. al. (2004) also carried out several experiments with various angles of attack. Figure 2 depicts a pier with a collar attached to it.

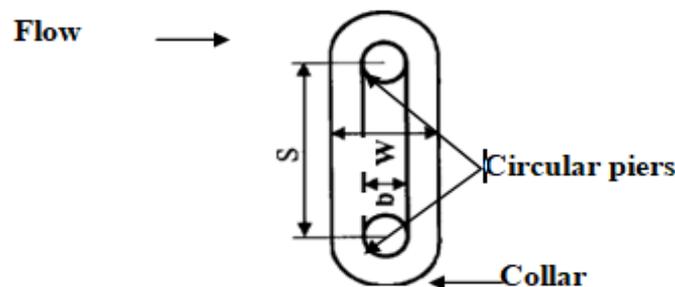


**Fig 2:** A pier fitted with a collar (Setia 1997)

Zarrati et al. (2006) conducted an experimental investigation into the effectiveness of a collar encircling a pair of circular piers that were transverse to the flow (Fig. 3) and aligned with the flow (Fig.4).



**Fig. 3:** Group of two piers with collar aligned with the flow (Zarrati et. al.2006)

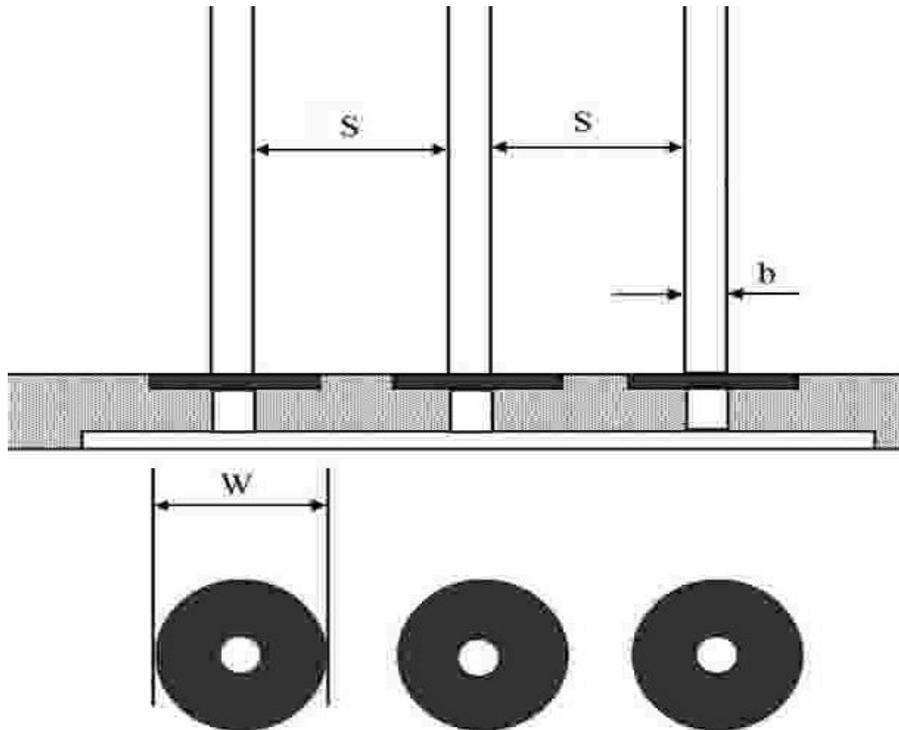


**Fig.4:** Group of two piers with collar aligned transverse to the flow (Zarrati et. al.2006)

Rip-rap was placed over the area between two piers. According to the statistics, continuous collars combined with riprap result in the greatest scour reduction when two piers are placed in a straight line. However, experiments showed that collars were ineffective at reducing scouring around two transverse piers.

Heidarpour et al. (2010) conducted an experimental study using two different collar sizes ( $W=2b$  and  $W=3b$ ) and two different pier spacings ( $S=3b$  and  $S=4b$ ) to determine the effectiveness of circular collars in reducing

scour around groups of two and three piers (Fig. 5). The results of the study indicate that the collar has a greater impact on the lowering of scour depth in rear piers than the first pier. Additionally, as pier spacing grows, the exposed space between them is washed away, leading to bigger scour holes at the back piers.



**Fig. 5:** Three piers in line with collar (Heidarpour-2010)

In a series of studies, Shunyi Wang et al. (2019) compared the local scour at a cylindrical bridge pier model with and without a collar to examine the protective effect of an anti-scour collar. The parametric investigation of the effects of collar installation height and collar external diameter on scour depth and scour development. According to the study, using an anti-scour collar efficiently lowers local scour at the pier. The protection efficacy increases with increasing collar external diameter but decreases with increasing collar installation height.

A study on the application of collars to a set of two circular cylindrical piers oriented at  $0^\circ$ ,  $15^\circ$ ,  $30^\circ$ , and  $45^\circ$  angles of attack was conducted by Mubeen Beg et al. in 2008. This study demonstrates that as the angle of attack increases, the collar's ability to reduce the scour depth around a group of two piers becomes less effective.

Zarrati et al. (2011) conducted an experimental study to determine how scouring changes over time and extends beyond a collar-protected circular pier. In the studies, both a pier that was unprotected and a pier that had collars placed at various heights of the pier were surveyed. The width of the collars was three times that of the pier. The greatest significant scour reduction, according to experiments, is achieved by placing one collar at the bed level and another one one pier diameter below the bed level.

## 5. OTHER METHODS OF SCOUR PROTECTION SLOTS

Local scour is caused by the flow that is forced down the pier's upstream face and the forced vortex that occurs from three-dimensional flow separation. We should either lessen the downflow impinging on the bed or direct the downflow away from the bed in order to pre-vent the scour hole creation. You can accomplish this by building a slot close to the water's surface or close to the bed. Additionally, the presence of a slot allows water to flow through, preventing an unfavorable pressure gradient from developing and thereby weakening the horseshoe vortex. A bridge pier with a slit is shown in (Figure 6) next to sediment from the river bottom. Many researchers have examined slots in cylindrical piers, including Chiew (1992), Setia (1997), Kumar et al. (1999), and others. The flow pattern varies depending on the slot's location. When the slot is situated close to the bed, the bottom boundary layer flow that is approaching accelerates and ejects as a horizontal jet when it passes through the slot. The horizontal jet, which deflects the downflow away from impinging the bed and lessens its potential for scouring, is perpendicular to the direction of the downflow at the pier. When the slot is positioned close to the water's surface, it effectively lessens the downflow and horseshoe vortex, which prevents the creation of scour holes.

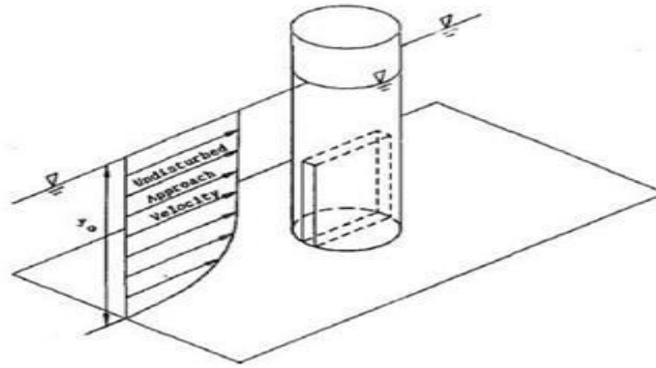


Figure 6: Bridge pier with parallel slot near sediment bed (Chiew 1992)

**Sacrificial Piles**

Sacrificial piles are inert piles positioned upstream of the bridge pier with the aim of shielding the bridge pier from regional scour. The sacrificial piles can redirect the flow and leave behind a low-velocity wake zone. Local scour near the pier is produced less frequently due to the decreased erosive energy. In earlier research, sacrificial piles for pier scour protection were studied in the lab and published by Chabert and Engeldinger (1956), Chang and Karim (1972), Wang (1994), Melville and Hadfield (1999), Chiew and Lim (2002), and Haque et al (2007). According to Melville and Hadfield (1999), the effectiveness of this strategy as a scour countermeasure depends on the quantity of piles, their geometrical arrangement, the flow angle at which they are approached, and their flow intensity  $V/V_c$ .

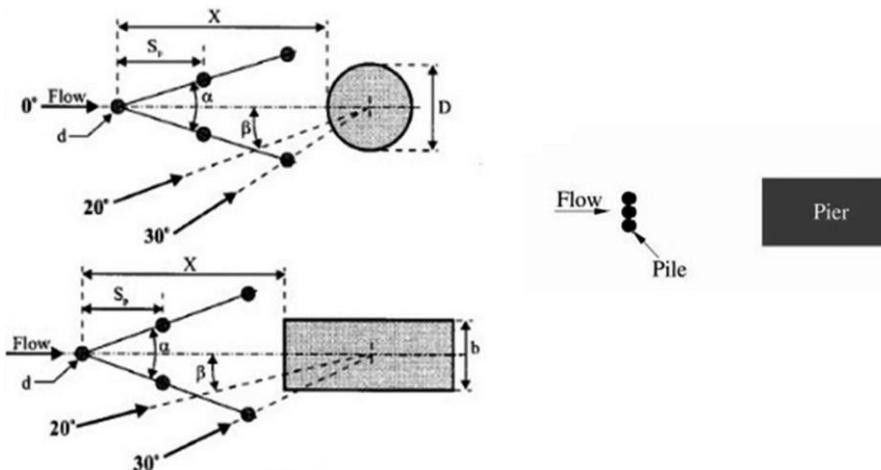


Figure 7: Sacrificial piles in (a) triangular and traverse arrangement (Melville and Hadfield 1999)

**Delta-Wings Like Passive Device**

The passive device that resembles a delta wing in terms of geometry. The passive device was created by passing a plate with a delta-wing-like shape and a downward angle of attack. The trailing vortices' sensation of rotation is reversed when the delta-wing is in this position.

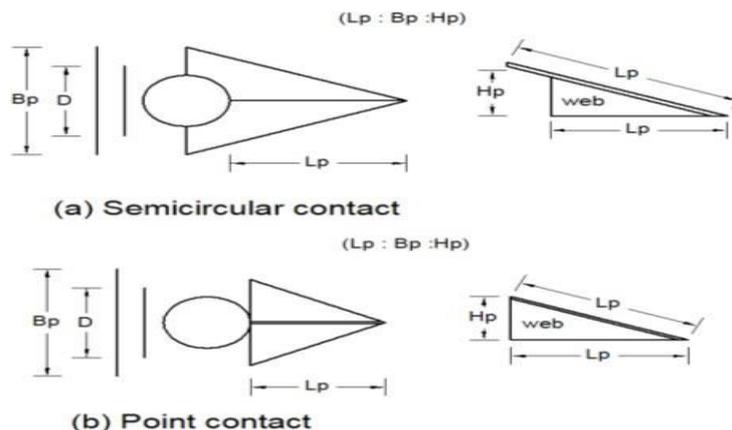
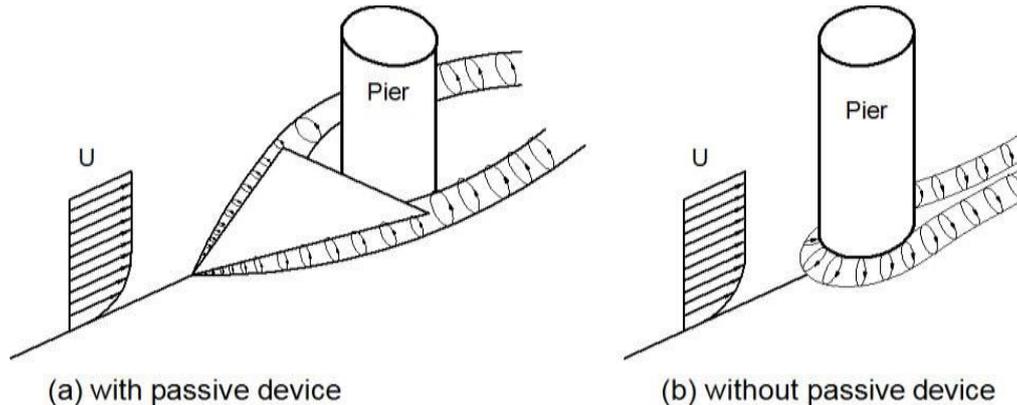


Fig.8: Definition of a delta wing-like passive device (after Gangadhariah and Gupta, 1992)

This device alters the rotating direction of the horseshoe vortex as seen in Fig. 8 when it is fastened to the leading edge of the pier junction. The horseshoe vortex's rotational orientation is reversed, scouring the area distant from the pier and depositing sediment close by. The stability is strengthened by this action. In order to reduce scour, Gangadhariah and Gupta (1992) suggested placing a structure resembling a delta wing in front of the pier.

**Submerged Vanes**

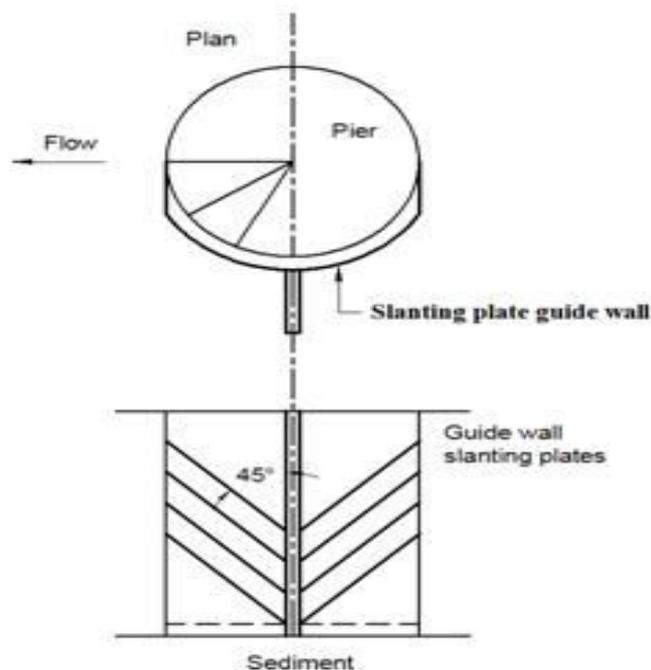
The rectangular plates of the various vanes were held at an angle to the flow's horizontal direction. They caused the flow to be deflected to one side and generated tip vortices at their back edge. These tip vortices were able to sever the horseshoe vortex, potentially reducing the depth of the scour. The pier's arrangement of vanes channelled the eroded sediment into the scour pit, which slowed the scouring process. Figure 9 depicts a sketch with the plan's dimensions and layout in front of the bridge piers.



**Fig.9:** Flow Modification by Passive Device (after Gangadhariah and Gupta, 1992)

**Slanting Vanes on Front Face of Piers**

On either side of the splitter plate, which was positioned on the symmetry axis of the pier front face, downward-slanting vanes were attached. Fig.10 depicts the vane's details in depth. The goal of this design is to reduce the horse-shoe vortex's down swelling zone. For use, this device has to undergo more testing.



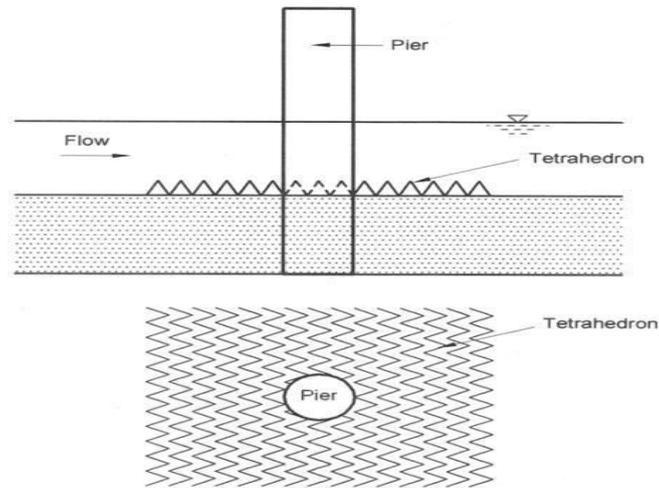
**Fig.10:** Slanting vanes attached to pier (after Parker *et. al.*, 1998)

**Stone Gabion with Geo-Textile Filter**

Each stone box in a stone gabion is connected to the stone box next to it by a wired net box in which bundles of stones have been put. Below the stone gabion, a geotextile filter is utilised. Due to the scouring mechanisms' subsequent reactions, this is necessary to stop the suction of silt from the bed through the gabion. A non-woven geotextile filter is used.

### Use of Tetrapods as Artificial Rip-Rap

Around a bridge pier, artificial materials like tetrapods (Fig. 11) might be stacked. They connect with one another well, interlocking. They do a superb job protecting against scour. (2000) (Parker et al.).



**Fig. 11:** sketch of placement of tetrahedron frames (after Parker *et. Al.*, 1998)

### CONCLUSIONS

Certain observations have been drawn after a thorough assessment of the literature. A viable scour reduction device is discovered to be both single-collar plates and multiple-collar plates. The angle of attack has no effect on circular collar plates because they are axis-symmetric.

Limitations related to the lowering of the bed level during a flood caused by single-collar plates are removed by the installation of multiple-collar plates. A set of numerous collar plates also produces less pulsing force than a single large collar plate. A sliding collar plate system that maintains its location at bed level needs to be created using enhanced technology. According to information on various pier shapes contained in the literature, a pier's shape plays a crucial role in the process of stopping scouring. The scour surrounding each pier primarily depends on the pier's upstream shape and breadth. The geometry of the pier shape also affects the position of the maximum scour depth. The design of the pier influences the initial scour rate and equilibrium depth of scour.

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**MECHANICAL CHARACTERISTICS OF CONCRETE COMPARED WITH PARTIAL REPLACEMENT OF CEMENT WITH MARBLE DUST AND LIME POWDER**

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**Sruthilaya Dara and T. Nagapurna Chandan**

Assistant Professor, Department of Civil Engineering Anurag University, Hyderabad, India

**ABSTRACT**

Concrete is the composition of three main ingredients namely cement, fine aggregates and coarse aggregates added together with water for proper consistency and workability. The usage of concrete has been dated since 1824 to till date which has created the scarcity of raw materials and led to the rise of a new scope of research in the replacement of raw materials utilized in the manufacture of concrete. The main objective of this research is to investigate and compare the performance of concrete with partial replacement of cement with marble dust and lime powder. Mix was prepared with cement and sand blended with marble dust and lime powder at different percentages like 0%, 5%, 10%, 15%, 20%, and the basic mechanical properties such as compressive strength, flexural strength, and tensile strength tests were carried out for 7 and 28 days. The investigation indicates that the replacement of cement with marble waste and lime powder at different ranges, in concrete production, results in higher compressive strength, split tensile strength, and flexural strength than concrete specimens without marble dust.

*Keywords: Marble dust, lime powder, compressive strength, flexural strength, split tensile strength*

**1. INTRODUCTION**

Concrete is a key component that is widely used in the construction industry. The vast amount of cement produced in factories directly affects greenhouse gas emissions. High-quality cement production is directly impacted by the lack of high-quality limestone. In addition, the cost of construction is increasing, and releasing garbage into the environment may cause environmental issues. Therefore the usage of recycling material has become more important. To build innovative mortar and concrete, this study aims to show the possibilities for recycling waste materials from diverse production processes. The marble stone industry generates both solid waste and stone slurry while lime is a bi-product of limestone or chalk which is an inorganic material consisting of carbonates, oxides, and hydroxides. Direct disposal of waste materials into the environment could have negative effects on the environment. Modern concrete technology can reduce the number of pollutants emitted into the environment by utilizing less energy and natural resources. We talk about the possibility of using marble dust and lime powder as a partial replacement for the cement used in the production of concrete. These compounds participate in the hydraulic reactions and significantly affect the hydrated product's microstructure and composition. This study helps to decrease the production of cement and use alternative materials for binding in the construction for effective results and decrease the environmental impact.

**2. LITERATURE REVIEW**

Marble and lime resources are widely available in India and are available in many different varieties. The two most common recrystallized carbonate minerals that make up metamorphic rock are marble and limestone. A lot of marble dust is obtained because marble is one of the minerals mined in India and used in the construction sector. Marble can be utilized in concrete mixtures in place of fine aggregates [1]. [2] looks at how marble powder and silica fume in various concentrations affect mortar when used as a partial cement alternative. [3] [4] [5][6] demonstrated the benefits of marble dust, fly ash, and waste sand. According to [6] the replacement of cement or sand with marble powder to improves the concrete properties. It shows that marble dust used as a sand replacement gives better results as compared to cement replacement. According to the investigation's findings, adding marble dust to concrete significantly improves its compressive, flexural, and split tensile strengths. However, due to the implementation of environmental protection legislation, many raw materials quarries have been shut down recently [7]. [4] Have explored the usability of marble dust rather than very fine sand passing through a 0.25 mm screen at proportions of 0, 25, and 100% by weight on the concrete while also avoiding environmental damage. By using the marble dust produced as a byproduct of the marble sawing and shaping operations in the manufacturers operating in our area, we will contribute to environmental protection in this way. The marble powder can be utilized as a filler material in the concrete mix and can have good strength, according to the literature. It can be used in place of sand, cement, and aggregate chips to the extent of 10% replacement since its compressive strength is higher than that of cement[6]. The development of concrete technology can minimize the demand for energy and natural resources as well as a load of pollutants on the environment. Natural stone processing facilities currently produce significant volumes of marble dust, which harms both the environment and people.

Since ancient times, marble has been extensively employed as a building material. The disposal of marble powder material, which is made up of a very fine powder, by the industry today contributes to global environmental issues. The environment would be protected if marble dust were used in a variety of industrial sectors, particularly those related to construction, agriculture, glass, and paper. The addition of lime to concrete increases the workability, and abrasion, and decreases the percentage of air content in the concrete which leads to an increase in the mechanical properties of concrete. Evaluation of the mechanical properties of concrete mixtures using class F lime in place of specific fine aggregates (sand) by experimental testing [8]. Up to 5% by weight of Class F lime was used in place of fine aggregate (10%, 20%, 30%, 40%, and 50%)[9]. According to [5] in his studies, the test results, lime concrete mixes with lime substitution ranging from 10% to 50% had compressive strengths that were higher than control mixes at all ages. Along with the increase in lime content in such mixtures, the compressive strength of concrete mixes also increased. The pozzolanic activity of lime was thought to be responsible for the improvement in strength brought on by the replacement of fine aggregate with lime. The splitting tensile strength also increased as the amount of lime used as a replacement for fine aggregate increased. The early beginnings of a project to research the usage of significant amounts of high lime in concrete were described in detail by [9]. Lime was employed by the authors to partially replace cement and tiny particles. Replacement Percentage with a base rate of 0% (UAE) half of the participants in their study underwent testing. According to their studies, concrete with 25–35% lime content had the best compressive strength. [10] State that the addition of lime as a partial replacement of fine aggregates helps to reduce the pores in the concrete leading to an increase in the mechanical properties of concrete. Therefore, it is necessary to look into using these waste materials as filler in construction materials. The usage of marble and limestone dust as a partial replacement for cement in concrete mixtures is examined in the study. The results show that the marble dust concrete would likely have lower water permeability than the limestone dust and control concrete because it had higher compressive strength than the matching lime dust and control concrete with the same water-cement ratio and mix proportion. In this study, the viability of employing marble and limestone dust in place of cement is discussed. The present study aims to compare the mechanical properties of hardened concrete when cement is replaced with marble dust and lime powder. The study represents the replacement of cement with marble dust and lime powder at different ranges, to determine the compressive strength, split tensile strength, and flexural strength of concrete specimens.

**3. EXPERIMENTAL METHODOLOGY**

**3.1 Materials:** Ordinary Portland cement of grade 53 grade is utilized in the project for the experimental study. The physical properties of cement along with the test results are presented in the table1 satisfying the codal provisions as per IS 455:1989 [11] Marble dust and lime powder are obtained from the quarries located on the outskirts of Hyderabad city and their physical properties are represented in table 2. River sand confining to Zone III as per BIS (383:1970) [12] and coarse aggregates of sizes 10mm and 20mm are utilized in this experiment and represented in Tables 3 and 4. The physical properties of aggregates are shown in table 5.

**Table 1:** Physical properties of 53-grade cement

Physical properties	Test Method	Results	IS 455:1989 Standard Limits
Fineness	Sieve test on 90-micron sieve- (IS 4031 Part - 1)	8% retained on 90 micron sieve	< 10%
Normal Consistency	Vicat apparatus (IS 4031 Part 4)	32%	-
Soundness	Le-Chatlier apparatus (IS 4031- Part 3)	3.5mm expansion	<10 mm
Initial Setting Time	Vicat apparatus (IS 4031 part-4)	28 minutes	<30 minutes
Final Setting Time		237 minutes	<600 minutes
Specific gravity	Specific Gravity Bottle (IS 4031 Part-2)	3.15	
Compressive strength of mortar 7,14,28 days	IS 4031 Part-6	20 N/mm <sup>2</sup>	>16 N/mm <sup>2</sup>
		56 N/mm <sup>2</sup>	>22 N/mm <sup>2</sup>
		64 N/mm <sup>2</sup>	>33 N/mm <sup>2</sup>

**Marble Dust and Limestone are used as the Replacement for Cement:** Marble dust and limestone are considered the main wastes generated during the cutting, shape, and polishing of marbles in the stone industry. About 20–25 percent of the marble and lime are used in this method which is converted to powder.

**Table 2:** Physical properties of Marble dust and limestone powder

Physical properties	Results	
	Marble dust	Lime stone Powder
Fineness	8%	8.5%

Normal Consistency	25%	29%
Soundness	3.5mm expansion	
Initial Setting Time	135 minutes	25 Minutes
Final Setting Time	208 minutes	
Specific gravity	2.62	2.78

**Table 3:** Sieve analysis for Coarse aggregates

IS sieve size (mm)	Analysis of C.A (% passing)		Percentage of different factors		
	I	II	I (60%)	II (40%)	Combined (100%)
20	100	100	-	-	-
10	0	71.20	0	28.5	28.5
4.76	-	9.40	-	3.7	3.7
2.36	-	0	-	-	-

**Table 4:** Sieve analysis for fine aggregates

IS sieve size	Fine aggregate (% passing)
4.75mm	-
2.36mm	100
1.18mm	93
600µ	60
300 µ	12
150µ	2

**Table 5:** Physical properties of fine and coarse aggregates

Physical Properties	Fine Aggregates	Coarse aggregates
Specific Gravity	2.65	2.72
Bulk Density	1.68	1.92
Water absorption (%)	0.94	0.51

### 3.2 Mix Proportions

Following the Indian Standard (IS: 10262-2009) [13], the design mix for M20 grade concrete: Replacing the cement with marble dust and lime powder at different proportions (5%, 10%, 15%, and 20%), along with cement, aggregates and water are mixed in the assumed proportions as stated in table 6 and table 7.

**Table 6:** Details of Mix proportions with replacement as lime powder

% Lime powder	Cement (kg)	Lime powder (kg)	Fine aggregate(kg)	Coarse aggregate (kg)		w/c ratio
				10mm	20mm	
0	422.21	-	647.24	432.54	701.25	0.43
5	399.93	22.28	647.24	432.54	701.25	0.43
10	380.00	42.21	647.24	432.54	701.25	0.43
15	358.88	63.33	647.24	432.54	701.25	0.43
20	337.77	84.44	647.24	432.54	701.25	0.43

**Table 7:** Details of Mix proportions with replacement as Marble powder

% Marble dust powder	Cement (kg)	Marble powder (kg)	Fine aggregate (kg)	Coarse aggregate (kg)		w/c ratio
				10mm	20mm	
0	422.21	-	647.24	432.54	701.25	0.43
5	399.93	22.28	647.24	432.54	701.25	0.43
10	380.00	42.21	647.24	432.54	701.25	0.43
15	358.88	63.33	647.24	432.54	701.25	0.43
20	337.77	84.44	647.24	432.54	701.25	0.43

**3.3 Workability Tests:** The slump test, compaction factor, and Vee-Bee consistometer tests were carried out for all the percentages (0%, 5%, 10%, 15%, and 20%) that are replaced with marble dust and lime powder and the results are tabulated in the following tables 8,9,10 and 11. The experimental tests performed in the laboratory are represented in figures 1, 2, and 3.

**Table 8:** Test results for Slump Test for lime powder and marble dust

S.no:	Proportions of replacement	Lime Powder	Marble Dust
1	0	76	73

2	5	63	68
3	10	72	53
4	15	78	44
5	20	80	35

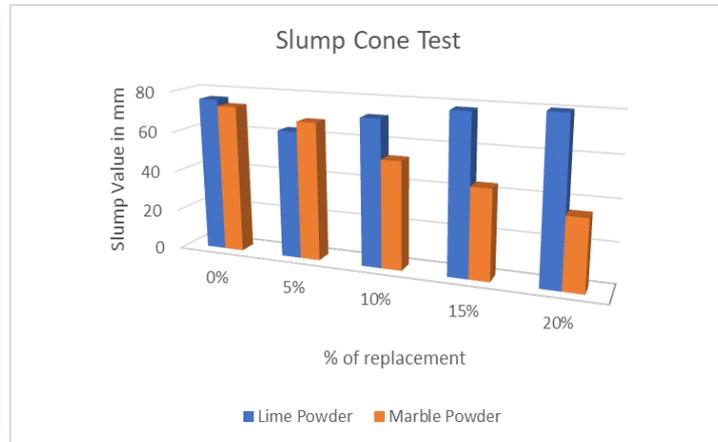


Figure 1: Slump Cone Test

Table 9: Test results for Compaction Factor test with replacement of cement by marble dust

S.no:	Proportions of Marble dust	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	Compaction factor
1	5%	8.230	19.870	20.38	0.958
2	10%	8.230	19.915	20.92	0.92
3	15%	8.230	20.08	20.72	0.943
4	20%	8.230	20.455	20.855	0.968

Table 10: Test results for Compaction Factor test with replacement of cement with lime powder

S.no:	Proportions of Lime Powder	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	Compaction factor
1	5%	8.230	20.095	20.885	0.937
2	10%	8.230	20.08	21.21	0.912
3	15%	8.230	19.64	20.965	0.895
4	20%	8.230	19.68	21.01	0.9

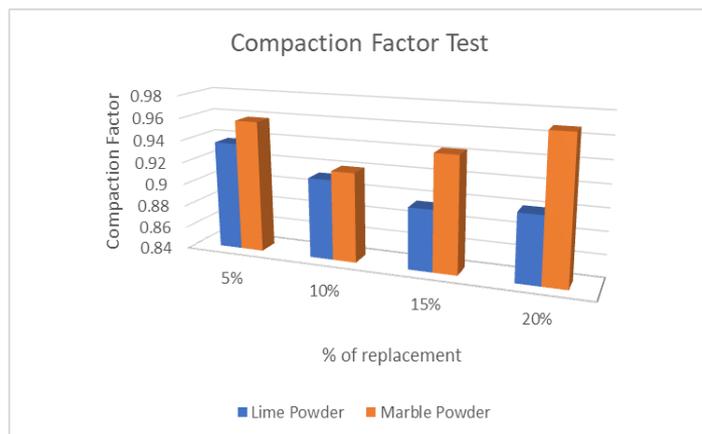


Figure 2: Compaction factor Test

Table 11: Test results for Vee – Bee consistometer test for marble dust and lime powder

S.no:	Different proportions	Settling time of concrete with marble (in sec)	Settling time of concrete with lime (in sec)
1	0%	11.26	11.19
2	5%	15.15	11.57
3	10%	13.09	14.01
4	15%	15.32	16.35
5	20%	8.16	17.27

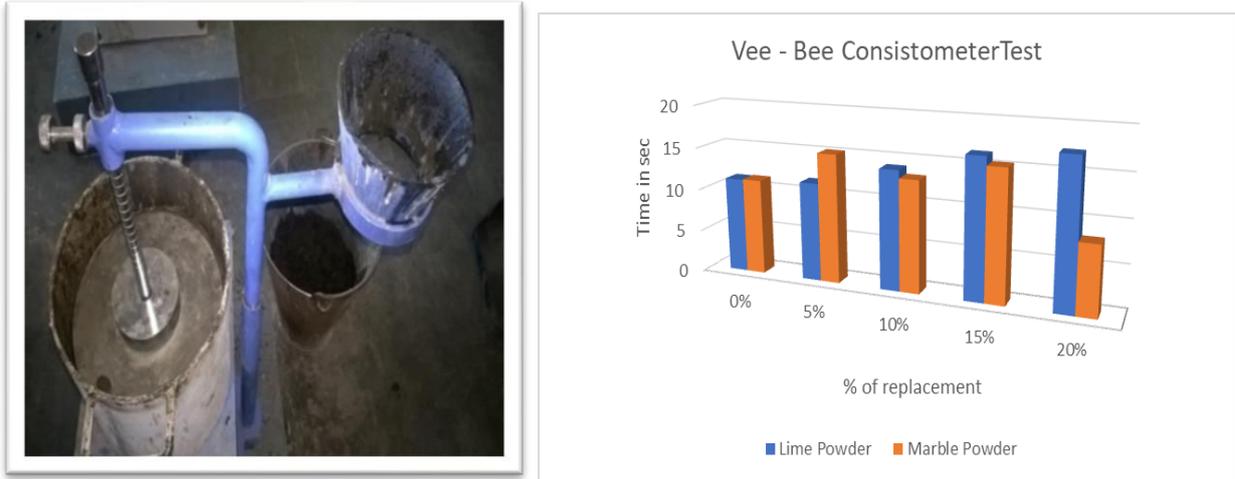


Figure 3: Vee – Bee Consistometer Test

**3.4 Tests on Hardened Concrete**

The compressive strength of concrete is the most important property to determine the quality of the hardened concrete. The compressive, split tensile, and flexural tests on hardened concrete were performed. The cementitious material present in the mix determines the mechanical properties of cured concrete. The replacement of cement with lime and marble powder with percentages of (0%, 5%, 10%, 15%, and 20%) is used to determine the tests on hardened concrete. The experimental analysis of compressive strength, flexural, and split tensile strength with the replacement of lime powder and marble dust are represented in tables 12 and 13. 150mm size cubes were used to test the compressive, 150x300 mm size cylinders are used to determine the split tensile strength, and flexural strength beams of 500x100x100 mm size are used. The tests are performed at the age of 7 and 28 days following the Indian standard specifications of BIS: 516-1959.

**4. RESULTS AND DISCUSSIONS**

Concrete's compressive strength values tend to rise with each curing age as a result of adding more marble dust. This pattern can be due to the cementing abilities of marble dust. Because the marble powder has a lower fineness modulus, it is equally effective at improving cohesion. Additionally, marble dust concrete mixtures had a mean strength that was 5–10% higher than that of conventional concrete. However, using 10 percent marble dust instead of 15 percent marble dust results in a minor reduction in the compressive strength value of the concrete mix.

Split tensile strength is evaluated on cylinders with marble dust from 0% to 20%. The test results determine the tensile strength increased to 10% replacement for 7 days and then 5% for 28 days and reduced gradually. The flexural strength for the replacement of 15% has been increased for 7 days and 15% for 28 days and decreased gradually at the age of curing for 7 and 28 days.

**Table 12:** Tests on Hardened concrete with replacement of Marble powder

Sample Number	% Marble powder added	Compressive Strength		Split tensile strength		Flexural Strength	
		7 days	28 Days	7 days	28 Days	7 days	28 Days
L0	0	21.18	29.96	3.12	3.15	3.02	5.29
L1	5	25.40	30.72	3.18	4.12	3.18	5.48
L2	10	27.40	34.22	3.26	4.02	3.24	5.72
L3	15	21.26	26.96	2.98	4.18	3.32	5.79
L4	20	20.30	21.18	2.72	3.24	2.94	4.74

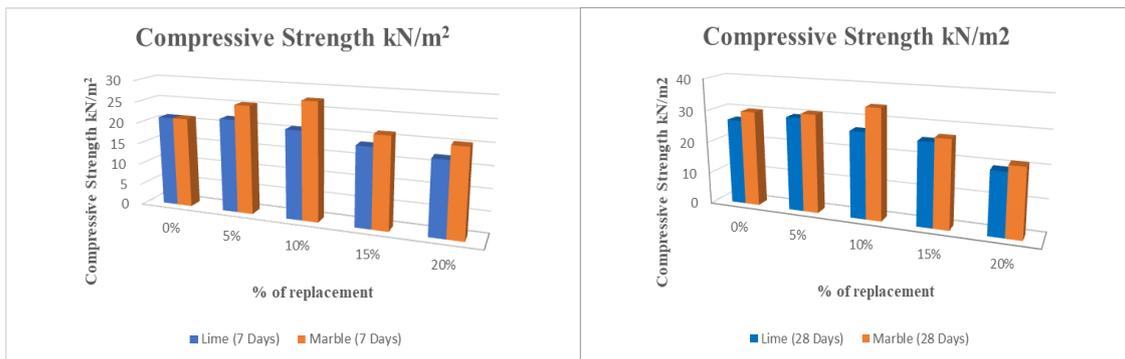
Concrete's compressive strength values tend to rise with each curing age as a result of adding more marble dust. This pattern can be due to the cementing abilities of lime powder as it has a lower fineness modulus. However, using 5 percent lime powder results in an increase in the compressive strength value of the concrete mix, and an increase in the percentage of lime powder decreases the compressive strength accordingly.

Split tensile strength is evaluated on cylinders with marble dust from 0% to 20%. The test results determine the tensile strength increased to 5% replacement for 7 days and then 10% for 28 days and reduced gradually. The flexural strength for the replacement of 5% has been increased and decreased gradually at the age of curing for 7 and 28 days.

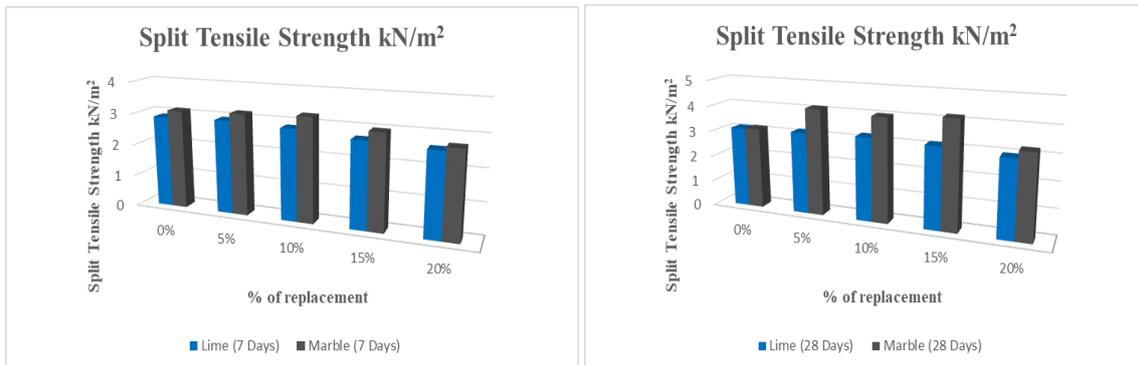
**Table 13:** Tests on Hardened concrete with replacement of Lime powder

Sample Number	% Lime powder added	Compressive Strength		Flexural strength		Split tensile strength	
		7 days	28 Days	7 days	28 Days	7 days	28 Days
L0	0	21.18	26.96	3.22	3.63	2.89	3.12
L1	5	21.92	29.33	3.27	3.79	2.94	3.16
L2	10	20.74	26.81	3.18	3.62	2.86	3.22
L3	15	18.52	25.63	3.01	3.54	2.70	3.14
L4	20	17.18	19.26	2.90	3.07	2.61	2.97

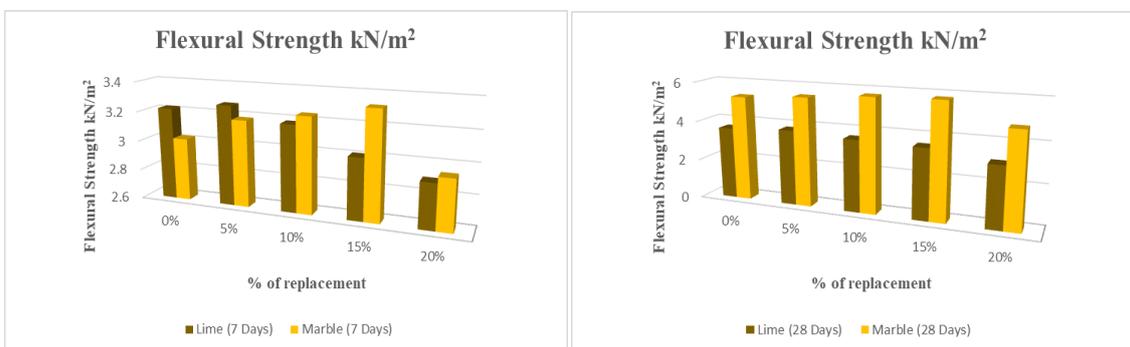
The comparison of hardened concrete with the replacement of marble dust and lime powder is represented graphically from the obtained analysis of 7 days and 28 days strength. The graphs are represented for a percentage of replacement on the X-axis and respective strength on the Y-axis.



**Figure 4:** Compressive strength for lime and marble dust for 7 days and 28 days



**Figure 5:** Split tensile strength for lime and marble dust for 7 days and 28 days



**Figure 6:** Flexural strength for lime and marble dust for 7 days and 28 days

### 5. CONCLUSIONS

Concrete's strength was increased by the addition of marble dust and lime powder to the mix. Based on the analysis of the test results, the following conclusions were drawn. The compressive strength of concrete increases by up to 10% when cement is replaced with marble dust and 5% with the replacement lime powder; however, when the amount of marble dust and lime powder is increased, the compressive strength of concrete decreases. When cement is replaced with marble dust, the Split Tensile Strength of Concrete increases by up to 15%; and by 10% with the replacement of lime powder however, when the amount of replacements for marble powder and lime powder is increased, the Split Tensile Strength of Concrete decreases. The substitution of

cement with marble dust increases flexural strength by up to 15%; and up to 10% for the addition of lime powder however, when the amount of marble powder and lime powder is increased, flexural strength decreases. Therefore from the results, it is observed that the replacement of cement with marble powder by 15% gives good strength when compared to conventional concrete. And replacement of lime powder up to 10% produces outstanding results in terms of strength when compared to conventional concrete. The use of both waste materials promotes sustainable growth in the construction sector. The use of marble dust and lime powder may be employed as a superior partial alternative for cement in concrete to protect the environment. The future scope can be done by altering the percentages of marble dust and lime powder and finding out the SEM analysis of the altering percentages can be identified. Infusing various fibers to increase the mechanical properties of concrete can also be measured.

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**UNDER WATER WIRELESS SENSOR NETWORKS****Madireddy Veera Lakshmi and Dr. B Leela kumari**

Department of Electronics and Communication, University College of Engineering, Jawaharlal Nehru technological University, Kakinada Andhra Pradesh, India

**ABSTRACT**

*Underwater acoustic localization may aid both the military and the general population. Simply said, the ToA method is the most often utilized method for locating underwater objects because of its simplicity. In comparison, marine conditions are less of a concern, and it is also considerably simpler to put in place. Time Delay of Arrival (TDoA) is a method that may be used to pinpoint the exact location of an audible event, such as a gunshot or explosion. An underwater sound sensor network's position may be pinpointed using TDoA in this article. For example, when the presence of aquatic sound is present, the TDoA approach beats current state-of-the-art algorithms in terms of accuracy and computing cost.*

*Keywords: time difference of arrival; under water acoustic localization; under water acoustic sensor networks*

**I. INTRODUCTION**

Rivers, canals, lakes, and the oceans make up a quarter of the planet's water supply. Many important metals have yet to be discovered at the depths of the ocean. Exploration would be impossible without technological breakthroughs. People may now explore deep underwater and utilize sensors at every level thanks to recent technological advancements. Because of this, the use of UWSNs in research is becoming more and more prevalent. The UWSN includes sensors that are small enough to fit in your palm, wireless technology, and micromechanical sensors. Systems that integrate sensors, computers, and communications As the name suggests, this is a network of sensor nodes that may operate independently of one another. This graph displays information on many parameters related to the quality of the water. The obtained data may be put to a variety of beneficial purposes for the benefit of all parties involved.

Unmanned underwater systems (UWS) may be used for research and commercial reasons to monitor coastal and marine environments and pollutants in the ocean. To meet the needs of more demanding applications, UWSN is an option. Developing UWSN applications, on the other hand, may be both exciting and challenging. Unstable water levels are by far the most worrisome part of the situation. There are ways to build underwater acoustic sensor networks (UASNs). Sensor nodes in a specified observation area communicate with each other through audio. In the past several years, interest in underwater sensor networks has skyrocketed. This means that UASN may be used in many different ways. Monitoring and pollution control, as well as climate recorders for predicting natural interferences, are included in this set of equipment. In order to locate an underwater target, emergency planning and navigation are required, as the sensor network's duty does not end there.

When earthquakes or tsunamis strike coastal areas, UASNs can swiftly identify seismic activity using acoustic source localization to help with disaster relief efforts. However, given the complexity of the marine environment, it is impossible to predict what the final outcome will be. Water positioning is a lot more difficult than terrestrial wireless positioning. The attenuation of acoustic signals is a problem when sending data across water. This delayed propagation is due to the fact that underwater sound may travel a long distance. The acoustic channel may also be harmed by problems such as low bit rates, which can cause channel failures or even a loss of communication, as well as problems such as multipathing and channel fading. Because of this, recent years have seen a lot of effort put towards finding the source of underwater sound.

**II. LITERATURE SURVEY**

For TDOA-enabled underwater wireless sensor networks, this section provides an overview of the potential localisation algorithms. There are new underwater acoustic source detection and localization algorithms. ' To locate the source of a sound, compare the elapsed time between the signals from two different sensors. Because the distance between the sound source and the receiver sensor is still too considerable, we must calibrate it.

In [1]'s underwater wireless sensor network, time synchronization relies on the sensors' mobility (UWSN). [1] proposes two moveable reference nodes as a countermeasure to node mobility's harmful effects. Thus, new reference node trajectory calculations were required. For underwater localization, 2 offers two acoustic methods based on the frequency difference of arrival (FDOA) and the temporal difference of arrival (TDA) (TDOA). Uncertainty in the sound propagation speed in water has to be taken into consideration. Because the battery-powered sensor nodes I'm employing can't be recharged underwater, any system that depends on auditory signals is out of the question. [3-5].

### III. PROPOSED SYSTEM

The use of UWSNs, or underwater wireless sensor networks, is growing in importance in oceanographic research. UWSN might be used for a multitude of purposes, both military and civilian, in the future. The UWSN is being built with the help of several WSN apps and wireless technologies. Recently, there has been a lot of buzz around UWSNs (underwater wireless sensor networks). For a number of reasons, the United States Navy (USN) may be built. In addition to their intrinsic significance, certain implementations may have a favorable influence on ocean health. Oceanographic data collection, tsunami and seismic tracking, and assisted navigation are only a few of the applications of this technology. Industrial uses include data collection, subsea surveillance, and environmental monitoring (e.g., quality of biological water, monitoring of toxins).

### IV. UNDER WATER WIRELESS SENSOR NETWORKS

Sensor networks (UWSNs) are becoming important in ocean research, environmental monitoring, underwater navigation target tracking and terrain-assisted navigation in particular. An under water sensor network is one whose center element has been submerged in liquid. Autonomous underwater vehicles (AUVs) are deployed to conduct research at a specific location and are part of the overall system. Due of water's tremendous energy absorption, electromagnetic waves cannot efficiently multiply underwater. The propagation delays of acoustic networks are well-defined in underwater communications.

Using smart sensors and cars that can communicate wirelessly, the UWSN network keeps tabs on what's going on in a certain area. Surface sinks accept information from sensor nodes. Using a transceiver, the Sink node may regulate acoustic signals from other underwater nodes. An additional feature of the transceiver is that it can send and receive radio frequency signals across long distances to the terrestrial station. Locally or in partnership with other organizations, the obtained data is put to good use. The UWSN ecosystem is shown in broad strokes in Figure 4. Standard wireless underwater sensors and the Internet of Underwater Things (IoUT) architecture are used in the network design.

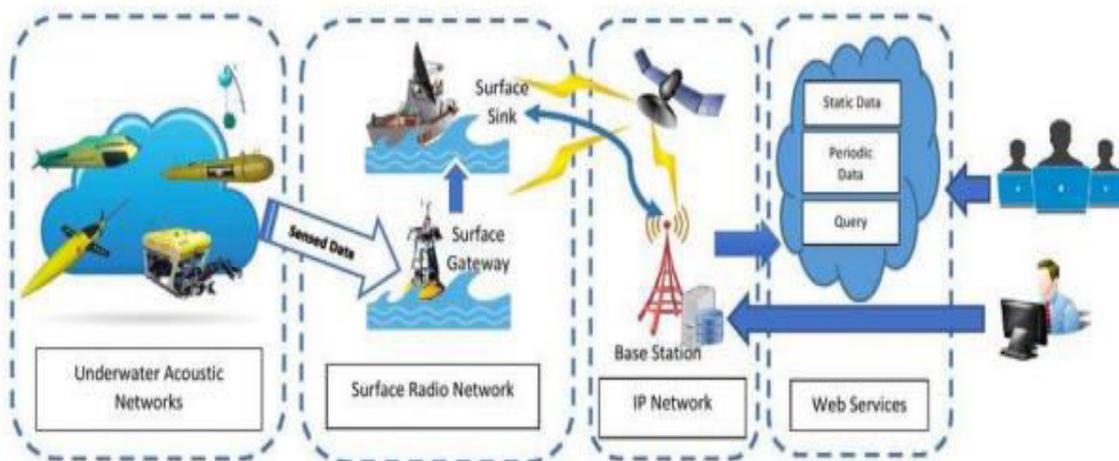


Figure 4: Overview of Underwater Wireless Sensor Networks

#### 4.1 Algorithms Used for UWSN Localization:

##### a. Range-Based Algorithms

Using TDoA, AoA, and RSSI, the range-based technique is accurate for distance and angle measurements. RSSI is challenging to use in UWSNs because of its time-varying nature. The ToA algorithm is the most often used and recommended range-based method by UASNs. One of the most important aspects of a wireless sensor system is agriculture's regionalization (Time Difference of Arrival). TDoA is a well-known approach for underwater localisation. An asynchronous goal may be achieved using TDoA and anchor nodes.

The anchor sensor nodes in Time of Arrival (ToA)-based systems must have a time-symmetric target. The ToA-Based Tracked paradigm is a relatively new one when it comes to synchronization. Since (ToA-TS) emits no beacon emissions while synchronizing time and monitoring the submersible at the same time, satellites may be a preferable choice for localisation.

Each sensor node in this technique to localization may employ the Angle of Arrival (AoA) mechanism to estimate the incident detection signal angles from neighboring sensors. In terms of navigation and layout, the beacon's data is basically meaningless. In this method, angle estimation is presumed to be incorrect.

To assess signal intensity based on distance and spacing between nodes as well as signal broadcasts, several RSSI algorithms are used in the real world. In most cases, the quality of the received signal is influenced by the radio waves' path loss. Attenuation may be considerable if there is a barrier between the transmitter and receiver. The range is less predictable when there is an issue with the connection.

### b. Range-Free Algorithms

If you don't have access to a variety of bearing information, you may still use range-free localization methods to get an approximation of the sensor's node location. There are a variety of algorithms, some of which have a fixed range. We can increase location accuracy while decreasing transmission costs using these techniques. Counting hops, utilizing an area-based technique, or even using the centroid approach are all methods that do not need a range to be considered.

Algorithms Using Hop Counts as a starting point: Antenna sensor nodes may be located using a hop count counting approach or by looking at the corners or edges of the square grid. Solid placement approach, the DV-Hop algorithm, and DHL are all examples of algorithms. Sensor node dispersion is a problem in places where DHL has been given the duty of fixing the unequal and sparse deployment of sensor nodes. When a network's nodes aren't distributed evenly.

APIT and ALS employ an approximation point in a triangle (APIT) as a rough approximation in their area-based localization algorithms. As a key advantage, ALS is very long-lasting and durable. Sound moves at varying speeds under the waves. To properly assess underwater acoustic technology, an accurate nonlinear model is required.

This localization method makes use of a wide variety of centroid data and coarse-grained proximity to pinpoint the precise position of an object. Using centroid-based localization techniques has the drawback of greatly exaggerating the true position of the receiver ( $X_{en}, Y_{en}$ ).

$$X_{en}, Y_{en} = \left( \frac{X_1 + X_2 + X_3 + \dots + X_n}{n}, \frac{Y_1 + Y_2 + Y_3 + \dots + Y_n}{n} \right)$$

The centroid strategy, which emphasises node self-localization, may not be suitable for the 3D network application. Due to their restricted mobility, these sensor nodes are known as semi stationary nodes.

## V. IMPLEMENTATION

As the number of sensors grows, it becomes more difficult to locate them in wireless sensor networks. The depth of water may be determined using the TDoA technique. Anchor nodes are used in the TDoA technique to allow for the accomplishment of goals in an asynchronous manner. Asynchronous ToA-based localization may be useful when the transmission source time is uncertain but ToA measurements provide a positive result due to a synchronization error. Using TDoA-based measurement, which is not dependent on the transmission time of a source transmitter, is one approach. The SDP approach may be used to make the MLE problem more convex, which would further complicate matters. A precise range-based technique is necessary because of the limited GPS signals underwater.

The authors claim that finding and synchronizing audio channels may be accomplished using sequential approaches. Two linear estimating challenges arise when nodes are not time synchronized and the underwater sound speed is undetermined. The communication frequencies used by UL and Anchor nodes cannot be considered to be time-synchronized. There is no such thing as a "time synchronized" water circulation system since the nodes are always moving. New submerged sequential methods for time synchronization and location are described.

This action is delivered across a direct connection between the anchor and United Nations servers. It is possible to accurately predict short-term movement using continuous nodes. Localization environments for s may be created using just two anchor sensors and an undetermined propagation speed.

Different arrival times may be used as a method of localization. Using the time difference between the audio source and each of the anchors, a hyperbola may be generated in order to achieve the necessary pitch shift. Figure 5 shows how the long axis and anchoring point are shown, for example. Source of the hyperbola's audible sound is heard at this intersection.

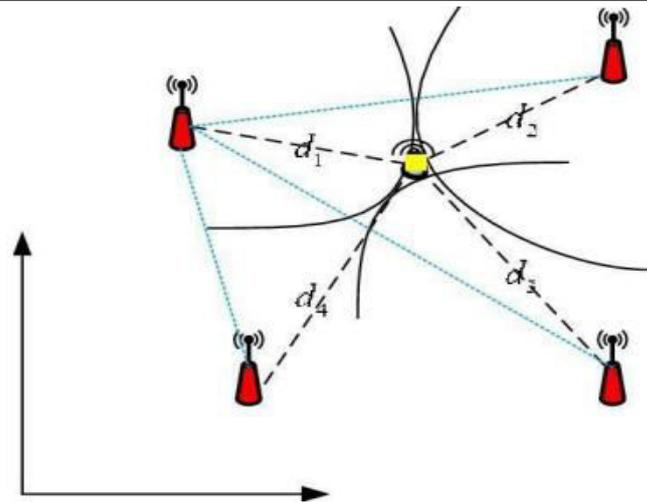


Figure 5: Time Difference of Arrival (TDoA) in 2-Dimensional Under water Plane

VI. System Model of the Under Water Acoustic Sensor Networks

In the UASN communication scenario shown in Figure 6, acoustic-based localization is conceivable. An anchor (sensor) must be placed at a specific location, same as with UASNs. An alternative to permanently mooring anchors is to send them adrift with GPS-enabled equipment that will allow them to be tracked as they drift. Once the surface buoy is located, satellites may send this information to the anchors. Estimate and measure the distance between the anchors and the target by using the provided algorithm's localization processes (agent). The target is picked at random and is expected to stay in this position throughout the estimate phase of localisation.

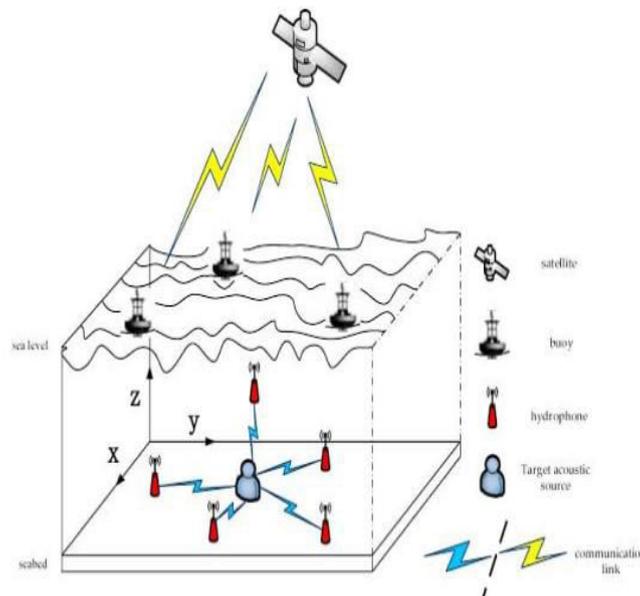


Figure 6: 3-Dimension Model for the Underwater Acoustic Sensor Networks (UASNs).

VII. SIMULATION RESULTS

It is possible to locate an audio source near a microphone array using the TDoA approach. It is possible to detect the source of an audio signal utilizing a difference in sound arrival time, for example, when employing TDoA. You may use it to figure out where a microphone is in relation to the array's source of mic signals. The ocean was home to a TDoA sensor node. The depth, salinity, and temperature of the water all affect the speed of sound in water. Because sound travels small distances, none of these elements are relevant.

It is necessary to take into account the sensor and target ranges for each dimension while utilizing TDoA. Sensor and target location vectors, as well as their start and end values, are included. unsteady footing, based on inaccurate information (penalty term). Eight alternative sensor node numbers and sensor ranges are used in this simulation set. Each measure has a 30-point target range and a 30-point value." Distributing sensor nodes at random in your network is a good place to start, as seen in figure 7. To gain an idea of where sensors and targets are located in the network, the network's density was assessed and nodes were built on the fly as needed.

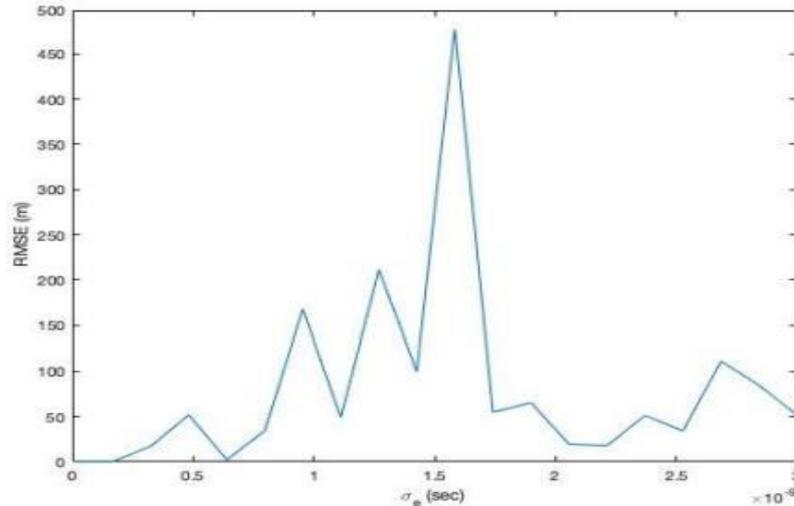


Figure 7.1: Root Mean Square Error (RMSE) Versus Time (Sec)

According to Figure 7.1, the root mean square error obtained for each second fluctuates with the sigma (a measure of uncertainty) (sec). The x-axis represents sigma, while the y-axis represents RMSE. RMSE is measured in meters, whereas sigma is recorded in seconds. There are no misplacement mistakes, and it shows the correct position every single second.

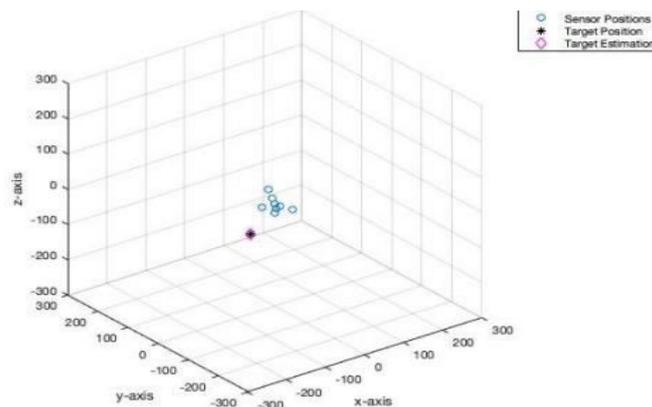


Figure 7.2: Shows the Sensor Position, Target Position and Target Estimation

The sensor's placement is shown in Figure 7.2. The target's position is found and calculated. Clearly, all node placements could be precisely established. During the simulation, a table including all of the important variables is presented for consideration and recording of network performance.

Parameter	value
Number of Sensors	8
Speed of Light	3e8
Sensor Range for Each Dimension	30
Target Range for Each Dimension	300
Trails	1
Initial Estimate Error	20

**PROPOSED ALGORITHM SIMULATION PARAMETERS**

**VIII. CONCLUSION**

All aspects of underwater sound sensor networks, including location and optimization, were studied extensively. submarine locating algorithms are the most often employed because of their uniqueness. As a consequence, there is a huge discrepancy. As a result, the TDoA algorithm's accuracy in determining location has improved. With our TDoA-based localization suggestion, we ran simulations. Using TDoA-based localization, simulation results show that it is more accurate.

UWSNs are still in their infancy when it comes to large-scale deployments. Better therapeutic options are on the horizon. When nodes are mobile and the monitoring area is vast, an assessment of network connection, coverage, energy consumption, and network durability will be conducted (with a large neighborhood range). It

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is possible that this study's findings might help researchers focus on developing systems that can control a small number of underwater vehicles. Future research should concentrate on expanding the bandwidth and autonomous capabilities of vehicle communication systems (such as covering a choice to re-planning decision). The method's applicability is increased thanks to the addition of environmental and subaquatic vehicle models.

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**DR, S. RAJASEKHARA'S WORK KARNATAKA ARCHITECTURE: AN OVER VIEW****Mr. Virupaksha<sup>1</sup> and Dr. S.K. Kallollikar<sup>2</sup>**<sup>1</sup>Ph.D Research Scholar and <sup>2</sup>Professor, Department of History and Archaeology, Krnatak University, Dharwad**ABSTRACT**

*Karnataka Architecture is a study of the architectural achievements of the different dynastic periods of Karnataka with emphasis on the characteristics of each school. It is undoubtedly tinged with his own loyalty to tradition, ancient heritage and philosophical proclivities. In every instance, however, he has adequately rationalized his convictions and beliefs. If history is to be a teacher, of what use it to its students without the passion of conviction and belief? His conviction and belief in truth and only has mentioned. The book is from beginning to end, an argument and evidence to support what is said in preface and what is summarized in the final chapter. Each chapter dealing with the architectural aspects, expounded in a historical method and historical perspective. The book is written in a lucid, simple but scholarly style, carrying graphic and photographic illustration, and densely documented from original source and from multiple disciplines which he had deeply studied.*

*Keywords: Dr.S. Rajasekhara, Art, Architecture, Temples, cave and structural architecture.*

**INTRODUCTION**

Dr. Rajasekhara is one of the greatest art historians of Karnataka has ever seen. Many works and articles on the subject of architecture and art have been published by Sriyutra in both Kannada and English. Among them is Karnataka Architecture. This is one of the works. This work went into print in AD. Before the work was published, there were only a handful of analytical works on architecture. Also, the works were written on the basis of dynasties, noting the architectural diversity of Karnataka. Rajasekhara's present work was created to remedy all these shortcomings.

In his work, Rajasekhara himself explained why he had to write this work. Be prepared in Kannada. Venkobara's ' Architecture of the Mysore Country ' is a work in itself : Explaining Architecture, it is not only a descriptive book, but also a descriptive book, for which Prof. S Rajasekhara, in conjunction with illustration and analysis , has created the work for students and researchers interested in learning architecture . This work is based on the experience gained during his career and the overall result of the lectures he has undertaken in research farming classes.

This work is made up of 115 pages, divided into 6 chapters. In the rest of the works, they can be found in the traditional details, such as geographical features, political detail and direct architectural detail. First, Satavahan Chutu: Kadamba has provided the details of 13, pages. the satavahanas. Commenting on the architecture of the time, Rajasekhara said that temples were few and far between. He also noted that excavations are important for understanding the architecture of his time. Rajasekhara has attempted to discern the art of the Chutu period based on the sculptures found in Banavasi. Analyzed mainly the Talagunda Pranaveshwara , Banavasi Madhukeshwara, Harsi Basadi and Goa caves. In addition, Hanagal, a branch of the Adi Kadamba branch, marked the development of the Kadamba period and the influence of different kingdoms on provincial style.

The second chapter is titled Early Chalukya Architecture, and the authors give a lengthy 32 pages long description of the architectural developments of the Badami Chalukya rule. The authors provide details of the construction of the period from the first Pulakesi to the period of the reign of the second Kirtavarman. Chalukya architecture is described in two main parts, the caves and the royal temples. In addition, sketches and photographs are provided for the reader's benefit wherever necessary. He was the master of detail in the qualities of the Southern sculpture.

The Rasthrakuta Architecture chapter has a description of the temples built by the Rashtrakuta. The authors first mention the bases of the Rashtrakuta temples, and note that the Badami Chalukya temples continued to be Rashtrakuta temples and the emergence of new shrines, and that Rashtrakuta temples were more numerous in North Karnataka than in South Karnataka. In addition, Rajasekhara describes the Rashtrakuta temples under two distinct categories cave architecture and structural architecture.

In the chapter "Later Chalukya Architecture", Badami discusses the Chalukyas of Kalyana, the post-Chalukya family of the Chalukyas. This chapter is organized into a total of 5 categories, Rajasekhara says that the Kalyan Chalukyas are found in a vast area ranging from the Kod village in the Aurangabad district of Maharashtra to the Aralaguppe in the Tumkur district of Karnataka. Drawing, photographing and describing parts of temples, Karnataka's districts Haveri, Gadag, Dharwad, Bellary, Vijayapura and Raichur districts have been identified.

Hoysala Architecture chapter. In this chapter Hoysala architectural bases and temples. The temples of their provide a detailed description of the architecture of the temples, giving a list of the sites in which the Hoysala temples are found , as well as a description of the temples of Eka kuta, Dwikuta, Trikuta , Chaturkuta and Panchkuta.

"Vijayanagara Architecture this chapter is the last chapter of the present work. Rajashekara's architecture depicts the vijayanagar temples found in the hampi region the buildings available here are described in two main parts as religious and civic buildings. In this chapter as in rest of the chapters, the parts of the temples are described in support of the photographs, bibliography and content indexes are provided at the end of the works.

### **CONCLUSION**

Dr. Rajasekhara has made his work very useful by his method of illustrating the text within the text itself. The works of the former authors have failed to realize the architectural development of the Karnataka region. but the fact Prof. Rajasekhar's Karnataka architecture has maintained its own significance with innovation, is not wrong. it is not worthy that although there is much work on architecture in both English and Kannada, they do not reach the level of excellence that this work has reached.in simple language, the ability of the author to interpret the content through the appropriate example is highlighted in the present work and the creation of the work appears in this discern the development of Karnataka's architecture, but it is no mistake that Prof. Rajasekhara's new work on Karnataka Architecture has maintained its own significance. In simple language, the ability of the author to interpret the content through a proper example is highlighted in the work and the creation of the work appears in this regard as the original document. is seen as the original document.

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**OPTIMIZATION OF REPLENISHMENT CYCLE FOR PENTAGONAL FUZZY PARAMETRIC INVENTORY MODEL WITH ADVANCE PAYMENT**

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**R. Vithyadevi<sup>1</sup> and K. Annadurai<sup>2</sup>**

<sup>1</sup>Research Scholar, Mother Teresa Women's University, Kodaikanal- 624101, Assistant Professor, Department of Mathematics, SSM Institute of Engineering and Technology, Dindigul- 624002

<sup>2</sup>Assistant Professor, Department of Mathematics, M.V. Muthiah Government Arts College for Women, Dindigul- 624001

**ABSTRACT**

*This study deliberates optimization of replenishment cycle for pentagonal fuzzy parametric inventory model with advance payment. In this model the costs and demand parameters are fuzzified. For the fuzzy model, we use graded mean integration method and removal of area method to defuzzify the fuzzy total cost and acquire an estimate of replenishment cycle and the buyer's total cost in the fuzzy sense. The analytical development is provided to obtain optimal replenishment cycle and the minimum buyer's total cost of an inventory control system. Finally, a numerical example and graphical representation are provided to demonstrate the theoretical outcomes of fuzzy system with graded mean integration method and removal of area method.*

*Keywords: Fuzzy parametric inventory costs; Optimal replenishment cycle; Pentagonal fuzzy number; graded mean integration method; Removal of area method.*

**1. INTRODUCTION**

Advance payment is a sum of cost that is provided prior to the date that it is contractually due, or in advance of delivery of the products or services that the payment is intended to pay for. Such payments may be structured into a contract or offered to address a specific adversity situation. In this case, the full amount due will be paid in advance. A common reason to offer an advance payment is that someone is in immediate need of funds that will be due even though the person has not yet earned them. Many authors are offered advances on their work to provide them with money to pay off debts and to live on while they finish their books. Some everyday examples of advance payments are simply prepaying your rent or prepaid cell phones or utilities as many people do now. In Chinese automobile industry, advance payment to the manufacturer is a common practice for the 4S (sale, spare-part, service, and survey) stores who are required to pay all of the payment before delivery. In Chinese steel industry, huge steel plants also require advance payment, especially for small buyers. Sometimes, the buyer is offered a price discount if he/she gives advance payment even not required by the seller, such cases can be found in bricks and tile factories in India (Zhang et al. (2014)).

Avishek Chakraborty, (2020) considered the application of pentagonal neutrosophic number in shortest path problem. Bjrck (2009) presented an EOQ inventory model with backorders, where the demand and the lead times are kept triangular fuzzy numbers. Chakraborty et al. (2019) developed the pentagonal fuzzy number its different representations, properties, ranking, defuzzification and application in game problems. Chen (1985) addressed an operations on fuzzy numbers with function principle. Harish Nagar and Priyanka Surana, (2015) extended fuzzy inventory model for deteriorating items with fluctuating demand and using inventory parameters as pentagonal fuzzy numbers. Mahata and Goswami (2013) examined inventory models for items with imperfect quality and shortage backordering in fuzzy environments by employing two types of fuzzy numbers such as trapezoidal and triangular. Maiti et al. (2009) proposed the advance payment and established an inventory model for one article in stochastic situation with price-dependent demand over a finite time horizon. Priyan et al. (2014) developed an economic order quantity inventory system with advance payment and fuzzy parameters. Thangam (2012) incorporated the advance payment scheme and two-echelon trade credits into an EOQ model for perishable items. Vijayan and Kumaran (2008) considered inventory models with partial backorders and lost sales and fuzzy stock-out periods and used signed distance method to defuzzify. Fuzzy set theory, introduced by Zadeh (1965), has been receiving huge attention amongst researchers in production and inventory management. Several authors have applied the fuzzy set concepts to deal with the inventory control problems. Zhang et al. (2014) developed an EOQ model with two types of advance payment, i.e., all payment paid in advance and partial advance payment. Zimmerman (1991) extended fuzzy set theory and its applications. In this paper, an economic order quantity inventory model with advance payment policy is described by establishing fuzziness in the cost and demand parameters. The main contribution of this paper is to establish the mathematical model and propose a solving approach for the economic order quantity inventory problem with advance payment policy in fuzzy random environment. Our main objective is to study the impact and sensitiveness of the impreciseness of cost components and demand rate in the decision variables and the total cost.

In this study, we represent the cost parameters such as ordering cost  $A$ , holding cost  $H$ , purchasing cost  $P$  and demand rate  $D$  by fuzzy number which is pentagonal. For fuzzy model, a method of defuzzification, namely the graded mean integration method and removal of area method, is employed to find the estimate of buyer's total cost in the fuzzy sense. The corresponding optimal replenishment cycle time is derived to minimize the buyer's total cost. Numerical example and graphical representation are supported out to investigate the behavior of our proposed model, and the results are compared with those obtained from the graded mean integration method and removal of area method of fuzzy model.

The article is designed as follows: Section 2 presents the notations and assumptions. Section 3 summaries preliminary concepts that have been used for model constructing purposes. In Section 4, Mathematical model formulation is given. The formulations of graded mean integration method and removal of area method with fuzzy model are discussed in the same section. Then we use a numerical example and graphical representation to illustrate the indication of this paper in Section 5. Finally, conclusions are drawn from the discussion in Section 6.

**2. NOTATIONS AND ASSUMPTIONS**

We adopt the following notations and assumptions in order to develop the proposed model.

**2.1. Notations**

- $T$  Time interval between successive orders (*decision variable*),
- $D$  Demand rate,
- $A$  Ordering cost per order,
- $H$  Unit stock-holding cost per item per unit time excluding interest charges,
- $P$  Unit purchase cost in \$,
- $\zeta$  Price discount factor for advance payment,
- $t$  Length of advance payment,
- $I_c$  Interest charges per \$ investment in stocks per year.

**2.2. Assumptions**

1. The vendor offers price discount for the buyer if all payment is paid in advance.
2. Replenishments are instantaneous and the shortages are not allowed.
3. Time horizon is infinite.

**3. PRELIMINARIES**

**3.1. Fuzzy Set**

A fuzzy set  $\tilde{A}$  on the given universal set  $X$  is a set of ordered pairs on the real line  $R$ ,  $\tilde{A} = \{(x, \mu_{\tilde{A}}(x)) : x \in X\}$  is called a membership function. The membership function is also called as degree of compatibility or a degree of truth of  $X$  in  $\tilde{A}$  which is defined as  $m_{\tilde{A}} : X \rightarrow [0, 1]$ .

**3.2. Pentagonal Fuzzy Number**

A pentagonal fuzzy number  $\tilde{A} = (a, b, c, d, e)$  is represented with membership function  $m_{\tilde{A}}$  as:

$$\mu_{\tilde{A}} = \begin{cases} L_1(x) = \frac{x - a}{b - a}, & a \leq x \leq b, \\ L_2(x) = \frac{x - b}{c - b}, & b \leq x \leq c, \\ 1, & x = c, \\ R_1(x) = \frac{d - x}{d - c}, & c \leq x \leq d, \\ R_2(x) = \frac{e - x}{e - d}, & d \leq x \leq e, \\ 0, & \text{otherwise.} \end{cases}$$

**3.3. Arithmetic Operations on Pentagonal Fuzzy Numbers**

The function principle was introduced by Chen (1985) to treat arithmetical operations on fuzzy numbers. This principle is used for addition, subtraction, multiplication, and division of fuzzy numbers. We define some fuzzy arithmetical operations for the pentagonal fuzzy numbers as follows.

Let  $\tilde{A} = (a_1, a_2, a_3, a_4, a_5)$  and  $\tilde{B} = (b_1, b_2, b_3, b_4, b_5)$  be two pentagonal fuzzy numbers, then

1. The addition of  $\tilde{A}$  and  $\tilde{B}$  is given by  $\tilde{A} \oplus \tilde{B} = (a_1 + b_1, a_2 + b_2, a_3 + b_3, a_4 + b_4, a_5 + b_5)$ , where  $a_1, a_2, a_3, a_4, a_5$  and  $b_1, b_2, b_3, b_4, b_5$  are any real numbers.

2. The multiplication of  $\tilde{A}$  and  $\tilde{B}$  is given by  $\tilde{A} \otimes \tilde{B} = (a_1 b_1, a_2 b_2, a_3 b_3, a_4 b_4, a_5 b_5)$ , here  $a_1, a_2, a_3, a_4, a_5$  and  $b_1, b_2, b_3, b_4, b_5$  are any non-zero positive real numbers.

3. If  $-\tilde{B} = (-b_5, -b_4, -b_3, -b_2, -b_1)$ , then the subtraction of  $\tilde{B}$  from  $\tilde{A}$  is  $\tilde{A} \ominus \tilde{B} = (a_1 - b_5, a_2 - b_4, a_3 - b_3, a_4 - b_2, a_5 - b_1)$ , where  $a_1, a_2, a_3, a_4, a_5$  and  $b_1, b_2, b_3, b_4, b_5$  are any real numbers.

4.  $\frac{1}{\tilde{B}} \otimes \tilde{A} = \left( \frac{a_1}{b_5}, \frac{a_2}{b_4}, \frac{a_3}{b_3}, \frac{a_4}{b_2}, \frac{a_5}{b_1} \right)$ , where  $b_1, b_2, b_3, b_4, b_5$  are all non-zero positive real numbers, then

division of  $\tilde{A}$  and  $\tilde{B}$  is  $\tilde{A} \oslash \tilde{B} = \left( \frac{a_1}{b_5}, \frac{a_2}{b_4}, \frac{a_3}{b_3}, \frac{a_4}{b_2}, \frac{a_5}{b_1} \right)$

5. For any real number  $k$ ,  $k \tilde{A} = \begin{cases} (ka_1, ka_2, ka_3, ka_4, ka_5), k \geq 0 \\ (ka_5, ka_4, ka_3, ka_2, ka_1), k < 0 \end{cases}$

**3.4. Graded Mean Integration Method for Pentagonal Fuzzy Number**

Chen and Hsieh (1999) introduced Graded mean integration representation method based on the integral value of graded mean h-level of generalized fuzzy number to defuzzify the same. Here, generalized fuzzy number is described as follows:

Suppose  $\tilde{A}$  is a generalized fuzzy number as shown in Figure 1. It is described as any fuzzy subset of the real line  $R$ , whose membership function  $\mu_{\tilde{A}}(x)$  satisfies the following conditions.

1.  $\mu_{\tilde{A}}(x)$  is a continuous function in the interval  $[0, 1]$
2.  $\mu_{\tilde{A}}(x)$  is strictly non-decreasing continuous function on the intervals  $[a_1, a_2]$  and  $[a_2, a_3]$
3.  $\mu_{\tilde{A}}(x)$  is strictly non-increasing continuous function on the intervals  $[a_3, a_4]$  and  $[a_4, a_5]$ .

If  $\tilde{A} = (a_1, a_2, a_3, a_4, a_5)$  is a pentagonal fuzzy number then graded mean integration method of  $\tilde{A}$

is defined as  $G(\tilde{A}) = \frac{\int_0^1 h(L^{-1}(h) + R^{-1}(h))dh}{\int_0^1 h dh}$ , with  $0 \leq h \in W_{\tilde{A}}$  and  $0 \leq W_{\tilde{A}} \leq 1$ . Then

$$G(\tilde{A}) = \frac{\int_0^1 h [a_1 + a_2 + (a_3 - a_2)h + a_4 + a_5 - (a_5 - a_4)h] dh}{\int_0^1 h dh} = \frac{1}{12} (a_1 + 3a_2 + 4a_3 + 3a_4 + a_5) \tag{1}$$

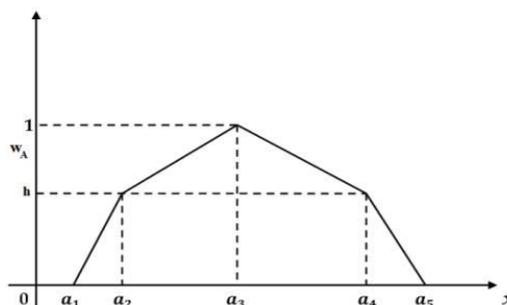


Figure 1: Pentagonal fuzzy number

**3.5. Removal of Area Method for Pentagonal Fuzzy Number**

We consider different types of areas of the corresponding pentagonal fuzzy number as shown below.

Then, we find the following.

$$R_1(\hat{A}, 0) = \text{Area of shaded region for Figure. 2} = \frac{(a_1 + a_2)}{2} \cdot k$$

$$R_2(\hat{A}, 0) = \text{Area of shaded region for Figure. 3} = \frac{(a_2 + a_3)}{2} \cdot (1 - k)$$

$$R_3(\hat{A}, 0) = \text{Area of shaded region for Figure. 4} = a_3 \cdot 1 = a_3$$

$$R_4(\hat{A}, 0) = \text{Area of shaded region for Figure. 5} = \left\{ a_4 \cdot 1 + \frac{(a_4 - a_3)}{2} \cdot (1 - k) \right\}$$

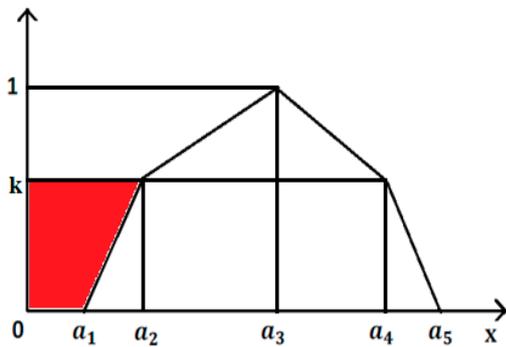


Figure 2. First step for the Removal of Area method

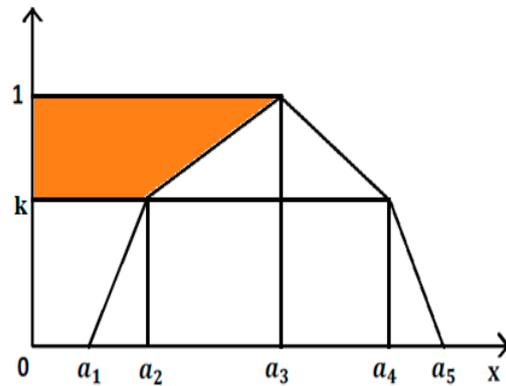


Figure 3. Second step for the Removal of Area method

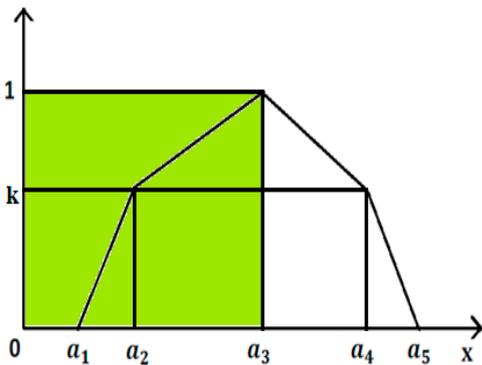


Figure 4. Third step for the Removal of Area method

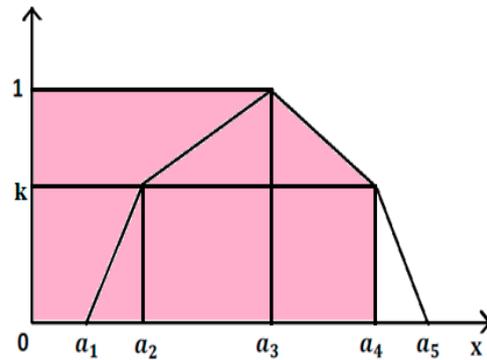


Figure 5. Fourth step for the Removal of Area method

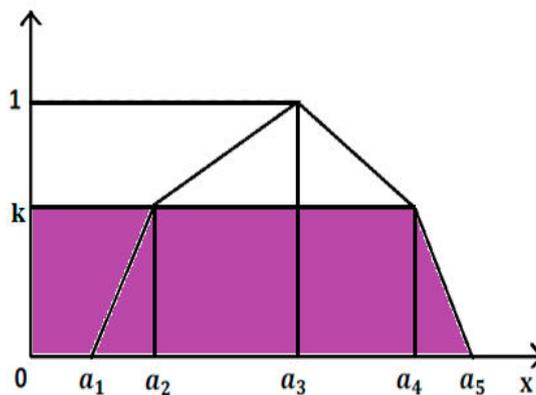


Figure 6. Fifth step for the Removal of Area method

$$R_5(\hat{A}, 0) = \text{Area of shaded region for Figure. 6} = \frac{(a_5 + a_4) \cdot k}{2}$$

Hence, 
$$R(\hat{D}, 0) = \frac{R_1(\hat{A}, 0) + R_2(\hat{A}, 0) + R_3(\hat{A}, 0) + R_4(\hat{A}, 0) + R_5(\hat{A}, 0)}{5}$$

$$R(\hat{D}, 0) = \frac{\frac{(a_1+a_2) \cdot k}{2} + \frac{(a_1+a_2) \cdot k}{2} + (1-\beta) \cdot a_3 + a_4 + \frac{(a_1+a_2) \cdot k}{2} + (1-\beta) \cdot \frac{(a_3+a_4) \cdot k}{2}}{5}$$

For  $k=1$ ,  $R(\hat{D}, 0) = \frac{a_1 + a_2 + 2a_3 + 3a_4 + a_5}{10}$ . (2)

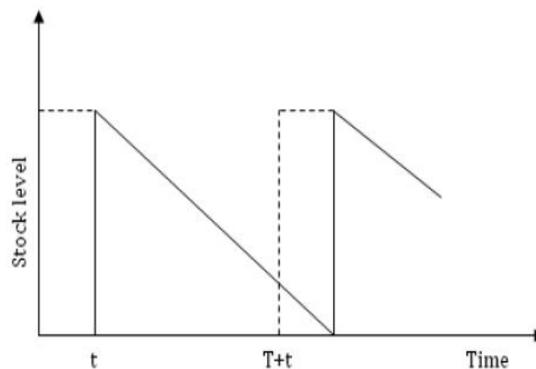
**4. MATHEMATICAL MODEL**

In this study the vendor gives all the payment paid in advance payment term similar to Zhang et al. (2014). In the proposed scenario, the buyer pays a purchase cost  $DTp\zeta$  and incurs an ordering cost  $A$  at time zero. The inventory level before arrival of a procurement is zero. The purchase cost has to be financed at interest rate  $I_c$ , and the loan interest cost equals  $\frac{DTp\zeta I_c t}{T} = Dp\zeta I_c t$  during this period. During the stock period, that is, from time  $t$  to time  $t+T$ , the buyer makes payment to the interest-bearing account immediately after the selling of the goods. As the loan is being paid back, the interest payable is decreasing. On the last day of stock period, the buyer pays the remaining balance. Hence, the average outstanding amount of the loan is  $DTp\zeta$ , and the interest cost  $\frac{DT^2 p\zeta I_c}{2}$  from time  $t$  to time  $t+T$  in one cycle. The physical holding cost is the same as that of the traditional economic order quantity inventory model and is not influenced by the payment terms. The behavior of inventory for this model is depicted in Figure. 6.

Based on the assumptions described above with Figure. 6, the buyer's total cost per unit time can be obtained as Zhang et al. (2014) is

$$\varphi(T) = \frac{A}{T} + \frac{DTH}{2} + Dp\zeta I_c t + \frac{Dp\zeta T I_c}{2}$$
 (3)

where the first term is ordering cost, the second term is holding cost ((excluding interest charge), the third term is cost of interest charges at the time of advance account payment and the last term is cost of interest charges when the goods are kept in stock.



**Figure 7:** Time-weighted inventory when all the payment paid in advance

**4.1. Fuzzy Inventory Model for Economic Order Quantity with Advance Payment:**

There are two types of fuzzy models that developed in this section. The both models considered cost parameters and demand rate are fuzzified using pentagonal fuzzy number. In the first model, graded mean integration method to defuzzify the fuzzy buyer's total cost. In the second model, removal of area method to defuzzify the fuzzy buyer's total cost. We use the differential calculus optimization technique to determine optimal replenishment cycle for better accuracy of minimization of buyer's total cost. Then the fuzzy buyer's total cost, which is composed of fuzzy ordering cost, fuzzy holding cost and fuzzy interest charges cost, is expressed by

$$\tilde{\phi}(T) = (A \otimes T) + (B \otimes T \otimes H) \otimes 2 + (B \otimes p \otimes \zeta \otimes I_c \otimes T) + (B \otimes p \otimes \zeta \otimes T \otimes I_c) \otimes 2 \tag{4}$$

Where  $A, A, \%,$  and  $!$  are the fuzzy arithmetical operators under function principle.

When  $A = (A_1, A_2, A_3, A_4, A_5), B = (D_1, D_2, D_3, D_4, D_5), p = (p_1, p_2, p_3, p_4, p_5)$  and  $H = (H_1, H_2, H_3, H_4, H_5)$  are pentagonal fuzzy number.

To begin with, fuzzy buyer's total cost  $\tilde{\phi}(T)$  by equation (4) is

$$\tilde{\phi}(T) = \left[ \frac{A}{T} + \frac{D_1 H_1}{2} + D_1 p_1 \zeta I_c t + \frac{D_1 p_1 \zeta I_c}{2}, \frac{A}{T} + \frac{D_1 H_2}{2} + D_1 p_2 \zeta I_c t + \frac{D_1 p_2 \zeta I_c}{2}, \frac{A}{T} + \frac{D_1 H_3}{2} + D_1 p_3 \zeta I_c t + \frac{D_1 p_3 \zeta I_c}{2}, \right. \\ \left. \frac{A}{T} + \frac{D_1 H_4}{2} + D_1 p_4 \zeta I_c t + \frac{D_1 p_4 \zeta I_c}{2}, \frac{A}{T} + \frac{D_1 H_5}{2} + D_1 p_5 \zeta I_c t + \frac{D_1 p_5 \zeta I_c}{2} \right]. \tag{5}$$

**Case: 1 The EOQ advance payment model with graded mean integration method:**

Fuzzy buyer's total cost in equation (5) is defuzzified by graded mean integration method in equation (1). The result is

$$G(\tilde{\phi}(T)) = \frac{1}{12} \left[ \left( \frac{A}{T} + \frac{D_1 H_1}{2} + D_1 p_1 \zeta I_c t + \frac{D_1 p_1 \zeta I_c}{2} \right) + 3 \left( \frac{A}{T} + \frac{D_1 H_2}{2} + D_1 p_2 \zeta I_c t + \frac{D_1 p_2 \zeta I_c}{2} \right) + 4 \left( \frac{A}{T} + \frac{D_1 H_3}{2} + D_1 p_3 \zeta I_c t + \frac{D_1 p_3 \zeta I_c}{2} \right) \right. \\ \left. + 3 \left( \frac{A}{T} + \frac{D_1 H_4}{2} + D_1 p_4 \zeta I_c t + \frac{D_1 p_4 \zeta I_c}{2} \right) + \left( \frac{A}{T} + \frac{D_1 H_5}{2} + D_1 p_5 \zeta I_c t + \frac{D_1 p_5 \zeta I_c}{2} \right) \right]. \tag{6}$$

In order to find the minimization of  $G(\tilde{\phi}(T))$  we find the partial derivative of  $G(\tilde{\phi}(T))$  with  $T$  and equate to zero, then we have

By examining the sufficient conditions for a minimum value of  $G(\tilde{\phi}(T))$  second order partial derivatives of  $G(\tilde{\phi}(T))$  with respect to  $T$  and obtain

$$\frac{1}{12} \left[ \left( \frac{-A}{T^2} + \frac{D_1 H_1}{2} + \frac{D_1 p_1 \zeta I_c}{2} \right) + 3 \left( \frac{-A}{T^2} + \frac{D_1 H_2}{2} + \frac{D_1 p_2 \zeta I_c}{2} \right) + 4 \left( \frac{-A}{T^2} + \frac{D_1 H_3}{2} + \frac{D_1 p_3 \zeta I_c}{2} \right) \right. \\ \left. + 3 \left( \frac{-A}{T^2} + \frac{D_1 H_4}{2} + \frac{D_1 p_4 \zeta I_c}{2} \right) + \left( \frac{-A}{T^2} + \frac{D_1 H_5}{2} + \frac{D_1 p_5 \zeta I_c}{2} \right) \right] = 0. \tag{7}$$

$$\frac{\partial^2 G(\tilde{\phi}(T))}{\partial T^2} = \frac{1}{12} \left( \frac{2A}{T^3} + \frac{6A}{T^3} + \frac{8A}{T^3} + \frac{6A}{T^3} + \frac{2A}{T^3} \right) > 0. \tag{8}$$

Therefore,  $G(\tilde{\phi}(T))$  is convex in  $T$ . As a result, examine for the optimal derivatives,  $T^*$  is reduce to find a local minimum. Hence, we obtain the optimal order quantity  $T^*$  by the above equation (7) is,

$$T_G^* = T = \sqrt{\frac{2(A_1 + 3A_2 + 4A_3 + 3A_4 + A_5)}{\left[ (D_1(H_1 + p_1 I_c)) + 3(D_1(H_2 + p_2 I_c)) + 4(D_1(H_3 + p_3 I_c)) + 3(D_1(H_4 + p_4 I_c)) + (D_1(H_5 + p_5 I_c)) \right]}} \tag{9}$$

The minimum buyer's total cost  $G(\tilde{\phi}(T))$  and the optimal replenishment cycle  $T_G^*$  are solutions of fuzzy inventory model with graded mean integration method.

**Case: 2 The EOQ advance payment model with removal of area method:**

Fuzzy buyer's total cost in equation (5) is defuzzified by removal of area method in equation (2). The result is

$$R(\tilde{\phi}(T)) = \frac{1}{10} \left[ \left( \frac{A}{T} + \frac{D_1 H_1}{2} + D_1 p_1 \zeta I_c t + \frac{D_1 p_1 \zeta I_c}{2} \right) + \left( \frac{A}{T} + \frac{D_1 H_2}{2} + D_1 p_2 \zeta I_c t + \frac{D_1 p_2 \zeta I_c}{2} \right) + 2 \left( \frac{A}{T} + \frac{D_1 H_3}{2} + D_1 p_3 \zeta I_c t + \frac{D_1 p_3 \zeta I_c}{2} \right) \right. \\ \left. + 3 \left( \frac{A}{T} + \frac{D_1 H_4}{2} + D_1 p_4 \zeta I_c t + \frac{D_1 p_4 \zeta I_c}{2} \right) + \left( \frac{A}{T} + \frac{D_1 H_5}{2} + D_1 p_5 \zeta I_c t + \frac{D_1 p_5 \zeta I_c}{2} \right) \right]. \tag{10}$$

In order to find the minimization of  $R(\tilde{\phi}(T))$  we find the partial derivative of  $R(\tilde{\phi}(T))$  with  $T$  and equate to zero, then we have

$$\frac{1}{10} \left[ \left( \frac{-A_1}{T^2} + \frac{D_1 H_1}{2} + \frac{D_1 p_1 \zeta I_c}{2} \right) + \left( \frac{-A_2}{T^2} + \frac{D_2 H_2}{2} + \frac{D_2 p_2 \zeta I_c}{2} \right) + 2 \left( \frac{-A_3}{T^2} + \frac{D_3 H_3}{2} + \frac{D_3 p_3 \zeta I_c}{2} \right) + 3 \left( \frac{-A_4}{T^2} + \frac{D_4 H_4}{2} + \frac{D_4 p_4 \zeta I_c}{2} \right) + \left( \frac{-A_5}{T^2} + \frac{D_5 H_5}{2} + \frac{D_5 p_5 \zeta I_c}{2} \right) \right] = 0. \tag{11}$$

By examining the sufficient conditions for a minimum value of  $R(\tilde{\varphi}(T))$  second order partial derivatives of  $R(\tilde{\varphi}(T))$  with respect to  $T$  and obtain

$$\frac{\partial^2 R(\tilde{\varphi}(T))}{\partial T^2} = \frac{1}{10} \left( \frac{2A_1}{T^3} + \frac{2A_2}{T^3} + \frac{4A_3}{T^3} + \frac{6A_4}{T^3} + \frac{2A_5}{T^3} \right) > 0. \tag{12}$$

Therefore,  $R(\tilde{\varphi}(T))$  is convex in  $T$ . As a result, examine for the optimal derivatives,  $T^*$  is reduce to find a local minimum. Hence, we obtain the optimal order quantity  $T^*$  by the above equation (11) is,

$$T_R^* = T = \sqrt{\frac{2(A_1 + A_2 + 2A_3 + 3A_4 + A_5)}{[D_1(H_1 + p_1 \zeta I_c) + D_2(H_2 + p_2 \zeta I_c) + 2(D_3(H_3 + p_3 \zeta I_c)) + 3(D_4(H_4 + p_4 \zeta I_c)) + (D_5(H_5 + p_5 \zeta I_c))]}]} \tag{13}$$

The minimum buyer's total cost  $R(\tilde{\varphi}(T))$  and the optimal replenishment cycle  $T_R^*$  are solutions of fuzzy inventory model with removal of area method.

**5. NUMERICAL ANALYSIS**

Numerical analysis has been prepared to assess the impact of the level of fuzziness in the input parameters over the decision variable. Let us consider an economic order quantity inventory model with the following data:  $\zeta = 0.9, 1.0, 1.1, 1.2, 1.3$ ,  $t = 0.1$ ,  $I_c = \$0.2$ ,  $A = \$30$ ,  $p = \$25$ ,  $H = \$20$  and  $D = 400 \text{ units / year}$ . Zhang et al. (2014)'s statistical data is more suitable for our proposed model. Therefore, we use the same numerical data as in Zhang et al. (2014) to verify the results obtained by this paper. We fixed some pentagonal fuzzy numbers of the input parameters  $\tilde{A} = (20, 25, 30, 35, 40)$ ,  $\tilde{p} = (15, 20, 25, 30, 35)$ ,  $\tilde{H} = (10, 15, 20, 25, 30)$  and  $\tilde{D} = (300, 350, 400, 450, 500)$ .

Applying the proposed models, the optimal solutions are summarized in Table 1. The solutions of first inventory model using equations (6) and (9), we get the minimum buyer's total cost is  $G(\tilde{\varphi}(T))$  and optimal replenishment cycle  $T_G^*$ . The solutions of second inventory model using the equations (10) and (13), we get fuzzy minimum buyer's total cost  $R(\tilde{\varphi}(T))$  and optimal replenishment cycle  $T_R^*$ .

**Table 1:** Optimal solution for fuzzy model

$\zeta$	Graded mean integration method		Removal of area method		Savings % Buyer's total cost
	$T_G^*$	$G(\tilde{\varphi}(T))$	$T_R^*$	$R(\tilde{\varphi}(T))$	
<b>0.9</b>	0.0782	946.81	0.0749	617.25	34.81
<b>1.0</b>	0.0775	974.60	0.0742	633.02	35.05
<b>1.1</b>	0.0767	1002.30	0.0734	648.73	35.28
<b>1.2</b>	0.0760	1029.90	0.0727	664.40	35.49
<b>1.3</b>	0.0752	1057.50	0.0721	680.01	35.70

From the Table 1 we observe that the minimum buyer's total cost and optimal replenishment cycle when we get defuzzify the pentagonal fuzzy number using removal of area method. It is observed that minimum buyer's total cost savings while using the fuzzy model with removal of area method range from 34.81% to 35.70%. It is also indicated that the minimum buyer's total cost and optimal replenishment cycle solutions of fuzzy case with removal of area method considerably fluctuate from the solutions of the fuzzy case with graded mean integration method.

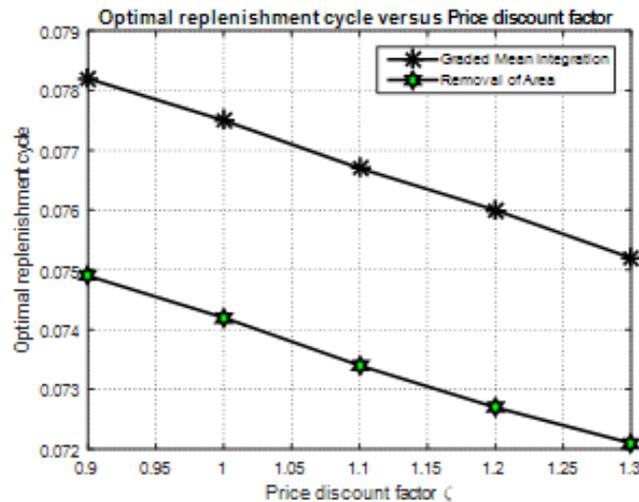


Figure 8: Graphical representation of optimal replenishment cycle versus price discount factor

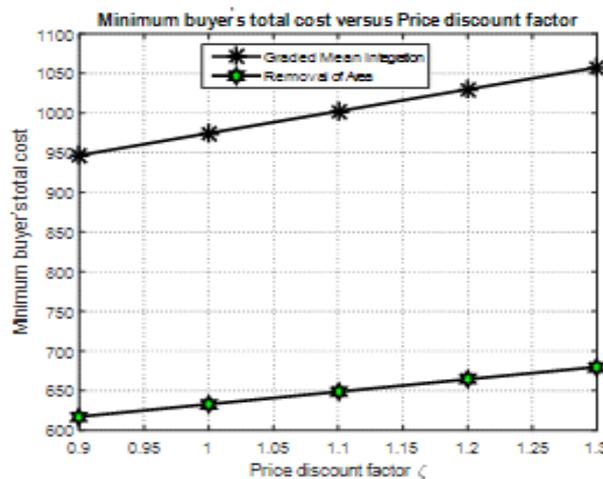


Figure 9: Graphical representation of minimum buyer's total cost versus price discount factor. Graphically represent of the outcomes under different values of price discount factor for advance payment  $\zeta$ . In Figure 7, we observed that the optimal replenishment cycle  $T_G^*$  and  $T_R^*$  decreases when the  $\zeta$  increase and in Figure 8 minimum buyer's total cost  $G(\tilde{\varphi}(T))$  and  $R(\tilde{\varphi}(T))$  increases when the  $\zeta$  increase.

6. CONCLUSION

This paper proposed fuzzy model for an economic order quantity inventory model with advance payment opportunity under fuzzy costs and demand environment. The fuzziness in the cost components and demand are represented by the pentagonal fuzzy number. We use graded mean integration method and removal of area method to defuzzify the fuzzy buyer's total cost and obtain an estimate of the total cost in the fuzzy sense. Traditional differential calculus optimization technique is used to find the optimal solution of the model. Numerical example and graphical representation are provided to compare the graded mean integration method and removal of area method of fuzzy model. Our results indicate that the optimal solutions of the fuzzy model with removal of area method considerably profitable from the solutions of the fuzzy model with graded mean integration method. Hence, the research reveals that in the model, removal of area method provided gainful minimum buyer's total cost and optimal replenishment time.

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**IMPACT OF COVID19 PANDEMIC ON AGRICULTURAL EXPORT**

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**R. D. Vaidkar, N. V. Shende, V. K. Khobarkar and U. T. Dangore**  
PGI and Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra

The challenges posed by the COVID19 pandemic resulted in the disruption of supply chains of various commodities across the globe. Despite this, India's export of agricultural and processed food, including cereals, meat, dairy and poultry products, marine products, and spices, registered a significant increase in the first five months of the current financial year (April-August, 2021-22). The Agriculture Export Policy unveiled in 2018, which entailed state-specific policy implementation through a cluster-based approach, resulted in the upswing in the export of India's agricultural products.

From April 2020, when the COVID19 pandemic started to spread in India, the farming activities were adversely impacted because of supply chain disruptions caused by restrictions on movement to contain the spread of the virus. There were disruptions in the movement of farm inputs, including farm machinery and agricultural labor. However, the prudent policy adopted by the government keeping most of the agricultural activities outside the purview of lockdown measures led to bumper foodgrain and horticultural crops production.

According to the Economic Survey (2020-21), the agriculture and allied sectors was the sole bright spot amid the slide in performance of other sectors, clocking a growth rate of 3.4% at constant prices during 2020-21. Against all adversities, continuous supply of agricultural commodities, especially staples like rice, wheat, pulses, and vegetables, has been maintained, thereby enabling food security. While most countries were stockpiling agricultural products for emergency use amid COVID-induced uncertainty, India's exports of agricultural food products continued uninterrupted. The exports of agriculture and allied products, including marine and plantation products, rose by more than 17% during 2020-21 to USD 41.25 billion compared to the previous fiscal. A significant chunk of India's agricultural products exports was to the United States, China, Bangladesh, United Arab Emirates, Vietnam, Saudi Arabia, Indonesia, Nepal, Iran, and Malaysia.

The growth trend in agricultural and processed food products exports continues in the current fiscal with a hike of 21.8% from April to August of 2021-22 compared to the corresponding period of 2020-21. The other products categories - marine products, spices, tea, coffee, and tobacco also witnessed a significant spike in exports during April-August (2021-22).

According to the Quick Estimates released by the Directorate General of Commercial Intelligence and Statistics (DGCI & S), the overall export by the Agricultural and Processed Food Products Export Development Authority (APEDA) witnessed 21.8% growth in terms of USD during April-August 2021 over the same period of the previous year. The overall export of APEDA products increased from USD 6485 million in April-August 2020 to USD 7902 million in April-August 2021. Marine products and spices exported rose to \$ 3158 million (49.8%): Spices \$ 1687 million (9%), coffee \$ 377 million (19.78%), tea \$ 296 million (5.17%), and tobacco \$ 386 million (17.12%) during April - August (2021-22) compared to the same period last fiscal.

This rise in exports was achieved notwithstanding COVID-19 restrictions. The significant spike in agri-exports is a testimony of the government's commitment to increase farmers' income by boosting exports of the country's agricultural and processed food products. The massive jump in exports of agricultural and processed food products during the first five months of the current fiscal is in continuation to growth in exports witnessed in the financial year 2020-21. According to WTO's trade map, with the total agri-exports of USD 37 billion in 2019, India is ranked at ninth position in the world ranking for agri-exports.

The rice export, which recorded a positive growth of 13.7%, increased from USD 3359 million in April-August 2020 to USD 3820 million in April-August 2021. As per Quick Estimates, while the exports of fresh fruits and vegetables registered a 6.1% growth in terms of USD, the export of processed food products like cereals and miscellaneous processed items reported a growth of 41.9%.

In April-August 2020-21, India exported fresh fruits and vegetables worth USD 1013 million, which rose to USD 1075 million in April-August 2021-22. While India achieved a significant 142.1% increase in the export of cereals, the export of meat, dairy, and poultry products witnessed an increase of 31.1 percent in the first five months of the current fiscal (2021-22).

The export of other cereals increased from USD 157 million in April-August 2020 to USD 379 million in April-August 2021. The export of meat, dairy and poultry products increased from USD 1185 million in April-August 2020 to USD 1554 million in April August 2021. The cashew export rose from USD 144 million in April-August 2020 to USD 185 million in April-August 2021

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The positive trend can be largely attributed to the various initiatives taken by the APEDA for the export promotion of agricultural and processed food products. The APEDA has been organizing B2B exhibitions in different countries, exploring new potential markets through product-specific and general marketing campaigns.

To promote the export of products having Indian GI (Geographical Indications), the APEDA has taken several other initiatives such as virtual Buyer-Seller Meets on agricultural and food products with the UAE, and similar meets on GI products, including handicrafts, with the USA. APEDA also continues to conduct virtual Buyer-Seller Meets with potential importing countries to popularize major agricultural GI products.

The Government unveiled the Agriculture Export Policy in December 2018 to harness the export potential of Indian agriculture through suitable policy instruments, make India a global power in agriculture, and raise farmers' income. The key objectives of the export policy were:

- To diversify export baskets and destinations and boost high-value and value-added agricultural exports, including focusing on perishables.
- To diversify export baskets and destinations and boost high-value and value-added agricultural exports, including focusing on perishables.
- To provide an institutional mechanism for pursuing market access, tackling barriers, and dealing with sanitary and phytosanitary issues.
- To strive to double India's share in world agri-exports by integrating with global value chains.
- Enable farmers to benefit from export opportunities in overseas markets.

Eighteen states, including Maharashtra, Kerala, Nagaland, Tamil Nadu, Assam, Punjab, and Karnataka are in the process of or have finalized their specific action plan to implement the agri export policy. Forty-six unique product-district clusters have been identified for export promotion, and 29 cluster-level committees have been formed under the agriculture export policy. Around 106 products have been identified from 103 districts for harnessing export potentials. During 2020-21, the exports took place from several clusters for the first time. For instance, the export of fresh vegetables and mangoes from Varanasi and black rice from Chandauli has taken place for the first time, directly benefiting farmers of the area. Exports from other clusters -- oranges from Nagpur, bananas from Theni and Anantapur, mangoes from Lucknow, etc. took place in the last fiscal. With solid policy thrust, India's exports of agricultural and allied sector products are poised for sharp spikes in the current fiscal, which is expected to boost farmers' income.

**ANALYSIS OF AVAILABILITY STAYING ON TOURIST VISIT INTEREST IN KOLBANO BEACH TOURISM**

**Sheena Kapitan, Paulina Y. Amtiran and Ronald P.C Fanggidae**

Faculty of Economics and Business, Management Study Program, Nusa Cendana University, Kupang

**ABSTRACT**

The development of tourist attraction is can be separate from the rule of sorrounding. It can be seen with availability of supporting facilities such as lodging facilities. The purpose of this study is to determine the level of satisfaction (expectations) of tourists with the level of performance (reality) the availability of lodging facilities in Kolbano beach. This research used Accidental Sampling method with 100 respondents who visited the Kolbano beach. The data analysis technique used in this study is the Importance Performance Analysis (IPA) method. The results of this study are described in the Cartesian diagram, quadrant I is the main priority whose performance must be considered, quadrant II is an attribute that needs to be maintained, Quadrant III is an attribute that has a low priority and quadrant IV is an attribute that is considered less important for tourists but its performance is good. The research shows that the level of performance (reality) is lower than the level of interest (expectations) of tourists.

*Keywords: Facilities, Importance Performance Analysis (IPA), Satisfaction, Performance, Kolbano Beach.*

**INTRODUCTION**

The Indonesian government through its program tries to encourage sectors that have not been the prima donna of foreign exchange sources to develop, one of which is the tourism sector. One of the government programs is the Wonderful Of Indonesia which is expected to meet the target of twenty million foreign tourist visits in 2019 (Kemenpar, 2018).

The tourism industry is a summary of various business fields that collectively produce products and services which will be directly needed by tourists on their way (Yoeti, 1995). In carrying out a tour or the determination to carry out tourist activities for a tourist, many are influenced by various things, both internally and internally. Travel is carried out by humans to meet their needs in seeking a new experience that they have never had before (Pitana, 2005).

Based on previous research from Masjhoer (2016) states that the level of tourist satisfaction with public facilities is 59.3%, public infrastructure is 59.3% and tourism facilities is 63.4%. Tourists are not satisfied with public facilities, public infrastructure and tourism facilities because tourist expectations are higher than performance (Y> X). And Taufiq's research (2016) states that the level of reality is lower than the overall expectation level of visitors who are not satisfied with the facilities and service quality of the restaurants on Drini beach.

Indonesia has many tourist destinations that have enormous potential, ranging from exotic tourist attractions, amazing natural scenery, and the beauty of various historical and cultural sites in each area that attract tourists to visit.

The Province of East Nusa Tenggara (NTT) is a province located in the eastern part of the Nusa Tenggara archipelago which is known as one of the provinces with very diverse tourist attractions so that it has tourist attractions and tourism potential. NTT Province has various unique tourist destinations in each district. Local governments develop tourist areas so that they can attract both foreign and domestic tourists to visit and can make a major contribution to the economy of the community (NTT DalamAngka, 2018).

**Table 1.1** Number of International and Domestic Tourists in NTT

Year	Tourist				Total	Percentage
	International	Precentage	Domestic	Precentage		
2013	45.107	-	318.658	-	363.765	-
2014	65.939	0.46	331.604	0.04	397.543	0.09
2015	66.860	0.01	374.456	0.12	441.316	0.11
2016	65.499	-0.02	430.582	0.14	496.081	0.12
2017	93.455	0.42	523.083	0.21	616.538	0.24

*Source : NTT Dalam Angka, 2018*

Based on table 1.1 above, it can be seen how the level of foreign tourist visits and local tourists in the last five years has increased or grown from year to year. Foreign tourist visits in 2014 increased by 0.46% to 65,939, in 2015 it increased by 0.1% to 66,860, in 2016 foreign tourist visits decreased -0.02% to 65,499, and in 2017 visits foreign tourists experienced an increase of 0.42% to 93,445. Domestic tourist visits in 2014 increased by 0.04% to 12,946, in 2015 domestic tourist visits increased by 0.12% to 42,852, in 2016 domestic tourist visits increased by 0.14% to 56,126, and in 2017 visits domestic tourists increased 0.21% to 92,501.

Timor Tengah Selatan (TTS) is one of the districts in NTT, which is known as a sandalwood producing district. In addition, TTS district also has tourist attractions that have tourist attractions and potential such as Oehala Waterfall which is located in Mollo Selatan sub-district, Pantai Oetune is located in Kualin sub-district, Mount Mutis Nature Reserve in Tobu District, and Kolbano Beach (Kab.TTS, 2019).

Kolbano Beach is a tourist attraction located in Kolbano District, TTS Regency with an area of approximately seventeen square kilometers. The Kolbano beach attraction is approximately 88 km from Soe city and approximately 149 km from Kupang city which can be reached by land route with a travel time of about four to five hours drive (Kab.TTS, 2019).

Kolbano beach tourism object is known for its beaches have different characteristics and uniqueness from other beaches in NTT Province, namely beaches with thousands of colored stones. Besides that, Kolbano Beach is also the right place to enjoy the sunrise. Kolbano Beach also has a unique large rock that has become a beach icon which is commonly called Batu Fatu'un with a height of about 50 meters and when viewed from the side it will resemble a lion's head.

The development of the attraction of a tourist attraction is inseparable from the surrounding community, for that it is necessary to have the availability of services, facilities, and supporting facilities in order to increase the number of tourists who wish to visit the Kolbano Beach tourist attraction. The development of this tourist attraction is supported by the availability of adequate lodging facilities so that visiting tourists can stay longer at the Kolbano Beach tourist attraction. The following is data on the number of lodgings available at Kolbano Beach attractions and the number of visitors staying.

Name of Inn	Number of Rooms	Number of Visitors		
		2016	2017	2018
Oel Inn	5 rooms	85	97	110
Joy's Homestay	12 rooms	126	147	163

*Source* : Primary Data Processed, 2019

The Oel Inn has 5 rooms which are equipped with standard beds, toilets, and showers as well as clean water available around the clock. Oel Inn is approximately five kilometers from the tourist attraction.

Joy's Homestay provides 12 rooms that are equipped with standard beds with toilets and showers in each of the rooms, and clean water is available around the clock. Joy's Homestay also provides additional facilities such as air conditioning and a shower that are provided in each in-room. Joy's Homestay is about five hundred meters from the attraction

Table 1.2 above, shows that the number of tourist visits who stay from year to year has increased. This is influenced by accessibility, namely the ease of accessing tourist attractions, good road access, and transportation services to tourist attractions as well as more adequate tourism facilities and facilities so as to attract visitors who want to visit Kolbano Beach tourist attraction.

**LITERATURE REVIEW**

**Definition of Tourism**

In Law No. 9 of 1990 concerning Tourism, defines tourism as various kinds of tourist activities supported by various facilities and services provided by the community, businessmen, government, and local governments. Tourism is everything related to tourism and related businesses in that field. Furthermore, it is stated that the tourism business is an activity aimed at providing tourism services or providing or cultivating tourism objects and attractions, tourism facilities business, and other related businesses in the said field.

The term tourism is closely related to the meaning of travel, namely as a change in the temporary residence of a person outside his residence for a reason and not to do something that generates wages. Thus it can be done by one or more people with the aim, among others, to get pleasure and fulfill the desire to know something

(Suswantoro, 1997). To position tourism correctly in the community, travel activities are carried out voluntarily and temporarily to enjoy tourist objects and attractions (Kemenpar, 2010).

### **Definition of Tourist**

According to the International Union Of Official Travel Organization (IOTO 1967), a visitor is any person who comes to a country or other place of residence and usually for any purpose except to travel for a fee. The definition of a domestic tourist based on the World Tourism Organization (WTO 2004) is a resident of a country who travels to a place within the territory of that country, but outside their daily living environment for a period of at least one night and not more than one year and the purpose of the trip is not to earn income from the place visited. Thus there are two categories of visitors, namely:

#### 1. Tourist (tourist)

Visitors who temporarily stay for at least 24 hours in the country they are visiting and the purpose of their trip can be classified into the following classifications:

a. Cruise (leisure) for the benefit of recreation, vacation, health, religious studies, and sports.

b. Family trade relations (business), conferences, missions, and so on.

#### 2. Travelers (excursions), namely temporary visitors who live in a country that is visited in less than 24 hours.

The tourism department uses the definition of tourist as any person who travels and stays temporarily in a place other than his place of residence, for one reason or another is always looking for work. Based on this understanding, tourists are divided into two, namely:

#### **a. Indonesian Tourists (Domestic)**

The definition of a domestic tourist based on the World Tourism Organization (WTO 2004) is a resident of a country who travels to a place within the territory of that country, but outside their daily living environment for a period of at least one night and not more than one year and the purpose of the trip is not to earn income from the place visited.

#### **b. International Tourists**

The definition of foreign tourists (BPS, 2015) is defined as people who travel outside their country of residence, usually for less than 12 months from the country they are visiting for the purpose of not earning income.

Based on the opinion of these experts, the writer can give the understanding that tourists are people who travel outside their region or country for at least 24 hours for various reasons.

### **Definition of Service**

The definition of service according to Kotler (2000) is "service is any act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product". This definition explains that a service is an action offered by one party to another party that is physically intangible and does not give ownership of something. The production of services can be tied or not tied to a physical product.

### **Tourism Facility Business**

Tourism Infrastructure is all facilities that enable tourism to live and develop and provide services to tourists to meet tourist needs. Tourism facilities are the completeness of tourist destinations needed to serve the needs of tourists in enjoying their tour (Suwantoro, 2004).

The development of tourism facilities is tailored to the needs of tourists both qualitatively and quantitatively. Qualitative tourism facilities refer to the number of tourist facilities that must be provided, and quantitatively, namely the quality of services provided.

The development of tourism facilities is tailored to the needs of tourists both qualitatively and quantitatively. Qualitative tourism facilities refer to the number of tourist facilities that must be provided, and quantitatively, namely the quality of services provided.

According to Kreck (in Yoeti, 1995) tourism facilities are divided into:

#### **1. Main Facilities for Tourism**

Basic Tourism Facilities are companies whose lives and lives depend on the influx of people traveling on tour, such as Travel Agents and Tour Operators, tourist attractions and tourist attractions, tourist transport companies, hotels and other types of accommodation, bars and restaurants, and restaurants.

## 2. Tourism Complimentary Facilities

Tourism complimentary facilities are companies or places that provide facilities for recreation, which not only serve to complement basic tourism facilities but the most important thing is to allow tourists to stay longer in a tourist destination. such as tennis courts, golf courses, swimming pools, sailing, surfing, and so on.

## 3. Tourism Support Facilities

Tourism support facilities are companies that support basic facilities and complimentary facilities that not only serve to make tourists stay longer in tourist destinations but function so that tourists spend more or spend more money at the places visited, such as Night Club, Casino, etc. so.

## Definition of Lodging

Lodging or accommodation while traveling or on vacation is a type of residence on a trip where people who have to stay away from home for more than one day need a place to sleep, rest, safety, shelter from cold or rainy temperatures, storage of goods, and access to functions common in households.

## Empirical Study

Several researchers have conducted studies on the Analysis of the Availability of Lodging Facilities in several areas. The overall results of research that have been carried out by previous researchers serve as the basis for this research, and it is true that the research that has been made is different from previous research and can be seen as follows :

**Table 2.1** Previous Research

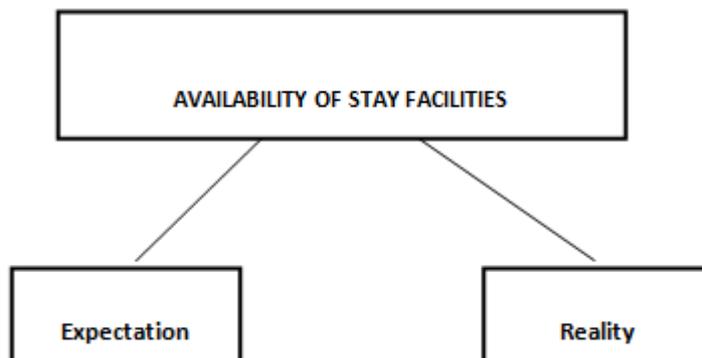
No.	Name	Title	Research Methods	Research Results
1	Ari Budi Sulistiono (2010)	Pengaruh Kualitas Pelayanan, Fasilitas, dan Lokasi Terhadap Keputusan Menginap (Studi pada Tamu Hotel Srandol Indah Semarang)	Multiple Regression Analysis	Service Quality, Facilities and Location have a positive and significant effect on the decision to stay
2	Alfatorry Rheza Syahrul (2015)	Pengaruh Daya Tarik, Fasilitas, dan Aksesibilitas Terhadap Keputusan Wisatawan Asing Berkunjung Kembali Ke Aloita Resort di Kab. Kep. Mentawai	Path Analysis Techniques	Attractiveness, facilities, and accessibility have a positive and significant effect on foreign tourists' decisions to return to Aliota Resort.
3	Oktari Susetyarini dan Jussac Maulana Masjhoer (2016)	Pengukuran Tingkat Kepuasan Wisatawan Terhadap Fasilitas Umum, Prasarana Umum dan Fasilitas Pariwisata di Malioboro Pasca Revitalisasi Kawasan	Importance Performance Analysis (IPA)	The level of tourist satisfaction with public facilities was 59.3%, public infrastructure was 59.3% and tourism facilities were 63.4%. Tourists are not satisfied with public facilities, general infrastructure and tourism facilities because tourist expectations are greater than performance ( $Y > X$ ).
4	Ibnu Al Taufiq (2016)	Kepuasan Pengunjung Terhadap Fasilitas dan Kualitas Pelayanan Rumah Makan di Pantai Drini Kabupaten Gunungkidul	Importance Performance Analysis (IPA)	The level of reality is lower than the overall expectation level of visitors who feel dissatisfied with the facilities and service quality of the restaurants on Drini beach.
5	Ata L. Mbate (2013)	Pengaruh Fasilitas dan Aksesibilitas Terhadap Tingkat Kunjungan Wisatawan Pada Objek Wisata Bu'At di Kab. Timor Tengah Selatan	Multiple Regression Analysis	Facilities and accessibility have a positive and significant effect on the level of tourist visits at Bu'At attractions in Kab. South Central Timor

*Source:* Primary Data Processed, 2019

**Framework**

The development of tourism is very dependent on tourist visits, seeing the increasingly fierce competition between tourist destinations, it is necessary to have the availability of supporting facilities, one of the available tourism facilities is lodging facilities. Lodging facilities are a major concern in order to meet the needs and desires of tourists in order to achieve tourist satisfaction. For clarity, a frame of mind is drawn up to determine whether the availability of lodging facilities meets tourist expectations.

**Picture 2.1** Framework



**RESEARCH METHODS**

**Operational Definition of Research Variables**

A research instrument is an observable tool (Sugiyono, 2009). The instrument in this study was a questionnaire that was arranged based on the indicators of the research variables which were outlined in detail in the questions in the questionnaire and distributed to the respondents.

**Table 3.1** Operational Definition of Research Variables and Measurement Scale

No.	Variable	Operational Definition	Indicator	Item	Measurement Scale
1	Lodging Facilities	Facility is a means provided by the management of tourist objects for services or opportunities for tourists to enjoy	Main Facility	The number of lodgings, the number of rooms, the facilities available at the inn	Ordinal
			Second Facility	Restaurants, public toilets, lopo, parking lots, trash bins, stalls	Ordinal
			Supporting Facilities	Tourist attractions, tourist attractions, accessibility, travel costs, information	Ordinal

*Source : Author, 2019*

**Population and Sample**

Determination of respondents in this study is accidental sampling, namely the determination of respondents based on chance, namely respondents who accidentally / incidentally met a researcher who can be used as a sample if it is considered that the person who happened to be met is suitable as the source of the data.

The determination of this sample size refers to Roscoe's opinion (Sugiyono, In this study, researchers took a sample of 100. As a general rule, the sample size is between 30 and 500.

**Data Measurement Techniques**

The data collection technique used in this study was a questionnaire. The questionnaire is a data collection technique that is carried out by giving several questions or written statements about factual data or opinions relating to the respondent, which are considered facts or known truths and need to be answered by the respondent (Anwar, 2009).

In this study, the measurement of the variable used was the Likert scale. The Likert scale is used to measure the level of approval and disapproval of someone on an object. Each answer to the question posed to the respondent is given a score or weight which is arranged in stages based on the Likert scale as shown in table 3.1 as follows

Category	Value Scale
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5
<i>Source</i> : Sugiyono, 2016	

**Types and Sources of Data**

Sources of data in this study are primary data and secondary data, where primary data is data that is obtained or collected directly in the field by the person conducting the research or those concerned who need it (Hasan, 2002). Primary data in this study are the results of questionnaires distributed to respondents manually. Meanwhile, secondary data is data obtained or collected by people who research existing sources (Hasan, 2002). This data is used to support the primary information that has been obtained, namely from library materials, literature, previous research, books, and so on.

**Data Analysis Technique**

The analysis uses the Importance-Performance Analysis (IPA) method. The Importance-Performance Analysis (IPA) method is a method used to analyze the extent to which a person's level of satisfaction with the performance of a company is based on the results of research on the level of importance and the results of performance will produce a calculation regarding the level of suitability between the level of importance and the level of implementation in a company (Supranto 2011).

Research on the level of suitability and performance results then produced a calculation based on the level of conformity between expectations and reality of lodging facilities and the interest of tourist visits to the Kolbano Beach tourist attraction received.

In this study, there are two variables represented by the letters X and Y, with the slope X being the availability of lodging facilities, while Y is the interest in tourist visits. To measure this level of conformity the formula is used (Supranto, 2011), as follows :

$$Tki = \frac{Xi}{Yi} \times 100\%$$

Furthermore, the horizontal axis (x) will be filled with the level of implementation/expectation score, while the vertical axis (y) is filled with the level of importance / reality. So, the formula for each factor affecting customer expectations:

H	Expectation High	Main Priority A	Maintain Achievement B	
	$\bar{Y}$	C	D	High
	$\bar{Y}$	Low Priority	Exaggerated	
Low		$\bar{X}$	$\bar{X}$	R Reality (Performance /Satisfaction)

Cartesian diagram, which is a rectangular section bounded by two lines that intersect perpendicularly at points (x, y) where (x) is the average of the average score for the level of performance / reality of all factors or attributes and (y) is the average score of the importance level of all factors that influence tourist expectations, the following formula is as follows :

$$\bar{X} = \frac{\sum_{i=1}^N Xi}{K} \text{ Dan } \bar{Y} = \frac{\sum_{i=1}^N Yi}{K}$$

Furthermore, all the attributes of the statement are entered into a Cartesian diagram which is described and divided into four parts divided by two lines that intersect perpendicular to the axis (X axis and Y axis) where the

X axis is the average of the average score The performance / reality according to the attributes of the statement and the Y axis is the average of the average score of the interests / expectations of all the attributes of the statement (Supranto, 2011), as shown in Figure 3.2. :

Harapan	Prioritas Utama A	Pertahankan Prestasi B	High
High $\bar{Y}$			
$\bar{Y}$	C	D	
	Prioritas Rendah	Berlebihan	
Low	$\bar{X}$	$\bar{X}$	Pelaksanaan (Kinerja/Kepuasan)

**Information**

**Quadrant A:** Indicates a factor or attribute that is considered very important that affects the interest of tourist visits, but the manager has not implemented it according to the wishes of tourists so that it is disappointing / dissatisfied

**Quadrant B:** Shows the factors that are considered important that have been successfully implemented according to the wishes / expectations of tourists and are very satisfying and must be maintained.

**Quadrant C:** Shows several factors that are considered less important for tourists. The implementation is carried out fairly or mediocre.

**Quadrant D:** Indicates a factor that is not very important for tourists, but it is implemented very well.

The x-axis is the level of performance of the manager and the Y-axis is the level of visitor / tourist expectations. The X-axis will be filled with the performance / reality level score and the Y-axis will be filled with the expectation / importance level score.

The availability of lodging facilities will be useful if it is in accordance with the expectations of tourists and the implementation that is felt to be very suitable is located in quadrant B. which means that tourist satisfaction becomes reality (x = reality).

**RESULTS AND DISCUSSION**

**Instrument Test**

**Validity Test**

The validity test is a measurement that measures whether or not a research instrument is valid (Ghozali, 2011). The method of measurement is by correlating the scores obtained on each question item with the individual total score. The coefficient r count is compared to the r table value with a significance level of 5% or 0.05. Conversely, if r count > r table it is said to be valid. If r count < r table, it is said that the statement item is invalid.

In this study, the validity test was conducted on the questionnaire on the level of expectation and level of reality (level of performance). The following is table 4.1 Validity Test.

**Table 4.1** Expectation Variable Validity Test

Item/Variabel	R-Count	><	R-Table	Explanation
A1	0,714	>	0,195	VALID
A2	0,632	>	0,195	VALID
A3	0,645	>	0,195	VALID
A4	0,653	>	0,195	VALID
A5	0,711	>	0,195	VALID
A6	0,493	>	0,195	VALID
A7	0,736	>	0,195	VALID
A8	0,661	>	0,195	VALID
A9	0,558	>	0,195	VALID
A10	0,310	>	0,195	VALID

Item/Variabel	R-Count	><	R-Table	Explanation
A11	0,547	>	0,195	VALID
A12	0,510	>	0,195	VALID
A13	0,465	>	0,195	VALID
A14	0,660	>	0,195	VALID
A15	0,345	>	0,195	VALID
A16	0,475	>	0,195	VALID
A17	0,418	>	0,195	VALID
A18	0,265	>	0,195	VALID
A19	0,546	>	0,195	VALID
A20	0,213	>	0,195	VALID
A21	0,498	>	0,195	VALID
A22	0,498	>	0,195	VALID
A23	0,611	>	0,195	VALID
A24	0,674	>	0,195	VALID
A25	0,703	>	0,195	VALID
A26	0,569	>	0,195	VALID
A27	0,554	>	0,195	VALID
A28	0,366	>	0,195	VALID
A29	0,349	>	0,195	VALID
A30	0,428	>	0,195	VALID
A31	0,339	>	0,195	VALID
A32	0,457	>	0,195	VALID
A33	0,264	>	0,195	VALID
A34	0,617	>	0,195	VALID
A35	0,549	>	0,195	VALID

Source : Primary Data Processed, 2019

Based on the validity test of the expected variable in table 4.1, it explains that all the question items in the hope variable have a correlation coefficient (r-count value) greater than r-table 0.195 with a significance level of 5% or 0.05. So it can be stated that all items in the expectation variable are valid.

Furthermore, the test results of the validity of the reality variable can be seen in table 4.2

**Tabel 4.2** Uji Validitas Variabel Kenyataan

Item/Variabel	R-Count	><	R-Table	Explanation
A1	0,419	>	0,195	VALID
A2	0,521	>	0,195	VALID
A3	0,431	>	0,195	VALID
A4	0,558	>	0,195	VALID
A5	0,200	>	0,195	VALID
A6	0,302	>	0,195	VALID
A7	0,302	>	0,195	VALID
A8	0,431	>	0,195	VALID
A9	0,379	>	0,195	VALID
A10	0,512	>	0,195	VALID
A11	0,464	>	0,195	VALID
A12	0,361	>	0,195	VALID
A13	0,362	>	0,195	VALID
A14	0,464	>	0,195	VALID
A15	0,521	>	0,195	VALID
A16	0,431	>	0,195	VALID
A17	0,200	>	0,195	VALID
A18	0,737	>	0,195	VALID
A19	0,530	>	0,195	VALID

Item/Variabel	R-Count	><	R-Table	Explanation
A20	0,530	>	0,195	VALID
A21	0,530	>	0,195	VALID
A22	0,674	>	0,195	VALID
A23	0,366	>	0,195	VALID
A24	0,737	>	0,195	VALID
A25	0,366	>	0,195	VALID
A26	0,429	>	0,195	VALID
A27	0,746	>	0,195	VALID
A28	0,274	>	0,195	VALID
A29	0,533	>	0,195	VALID
A30	0,746	>	0,195	VALID
A31	0,484	>	0,195	VALID
A32	0,500	>	0,195	VALID
A33	0,674	>	0,195	VALID
A34	0,366	>	0,195	VALID
A35	0,429	>	0,195	VALID
<i>Source</i> : Primary Data Processed, 2019				

Based on the validity test of the reality variable in table 4.2, it explains that all question items in the reality variable have a correlation coefficient (r-count value) greater than r-table 0.195 with a significance level of 5% or 0.05. So it can be stated that all items in the reality variable are valid.

**Reliability Test**

Reliability is a series of measurements or a series of measuring instruments that have consistency if the measurements are made using the measuring instrument repeatedly (Sugiono, 2005). In this study, decision making used the Alpha Cronbach technique. An instrument has high reliability if the Cronbach's Alpha Coefficient value is > 0.7 and Cronbach's Alpha If Item Deleted < Cronbach's Coefficient Alpha (Ghozali, 2012). The results of reliability testing for all variables are shown in the table below :

**Table 4.3** Reliability Results

Questionnaire	Alpha Cronbach	Criteria	Explanation
Expectation	0,921	0,7	Reliable
Reality	0,903	0,7	Reliable
<i>Source</i> : Primary Data Processed, 2019			

Based on the results obtained from table 4.3, it can be seen that the expected variable has a Cronbach alpha value of 0.921 and the reality variable has a Cronbach alpha value of 0.903. So it can be said that the variables of expectations and reality are reliable because they have a Cronbach's coefficient alpha value greater than 0.7.

**Level of Conformity**

The data analysis technique used in this study is a method Importance Performance Analysis (IPA), which is a calculation to determine the order of service priorities as measured by the level of suitability to determine the best service priority improvements to achieve customer or visitor satisfaction.

**Table 4.1** Level of Conformity

No. Attribut	Performance Score (Xi)	Impnortance Score (Yi)	Level of Conformity (Tki) (%)
A1	398	367	108,446
A2	418	378	110,582
A3	430	386	111,398
A4	369	384	96,093
A5	333	322	103,416
A6	409	411	99,513
A7	409	398	102,763
A8	430	398	108,040
A9	425	408	104,166
A10	437	430	101,627
A11	351	375	93,6

No. Attribut	Performance Score (Xi)	Imnpotence Score (Yi)	Level of Conformity (Tki) (%)
A12	356	367	97,002
A13	354	368	96,195
A14	351	345	101,739
A15	418	375	111,466
A16	430	354	121,468
A17	333	353	94,334
A18	375	370	101,351
A19	346	359	96,378
A20	346	413	83,777
A21	346	378	91,534
A22	383	378	101,322
A23	336	386	87,046
A24	375	372	100,806
A25	336	365	92,054
A26	361	387	93,281
A27	394	377	104,509
A28	335	400	83,75
A29	363	397	91,435
A30	394	396	99,494
A31	391	409	95,599
A32	394	408	96,568
A33	383	408	93,872
A34	336	349	96,275
A35	361	373	96,782
<b>TOTAL</b>	13206	13344	3467,699
<b>RATA-RATA</b>	99,077		

Source: Primary Data Processed, 2019

**Quadrant Analysis**

Quadrant analysis serves to designate the relationship between the expectations and reality variables.

**Table 4.2** Quadrant Analysis

No. Attribut	Performance Score (Xi)	Level of Reality (Xi)	Importance Score (Yi)	Level of Expectation (Yi)
A1	398	3,98	367	3,67
A2	418	4,18	378	3,78
A3	430	4,3	386	3,86
A4	369	3,69	384	3,84
A5	333	3,33	322	3,22
A6	409	4,09	411	4,11
A7	409	4,09	398	3,98
A8	430	4,3	398	3,98
A9	425	4,25	408	4,08
A10	437	4,37	430	4,3
A11	351	3,51	375	3,75
A12	356	3,56	367	3,67
A13	354	3,54	368	3,68
A14	351	3,51	345	3,45
A15	418	4,18	375	3,75
A16	430	4,3	354	3,54
A17	333	3,33	353	3,53
A18	375	3,75	370	3,7
A19	346	3,46	359	3,59
A20	346	3,46	413	4,13
A21	346	3,46	378	3,78

A22	383	3,83	378	3,78
A23	336	3,36	386	3,86
A24	375	3,75	372	3,72
A25	336	3,36	365	3,65
A26	361	3,61	387	3,87
A27	394	3,94	377	3,77
A28	335	3,35	400	4
A29	363	3,63	397	3,97
A30	394	3,94	396	3,96
A31	391	3,91	409	4,09
A32	394	3,94	408	4,08
A33	383	3,83	408	4,08
A34	336	3,36	349	3,49
A35	361	3,61	373	3,73
<b>TOTAL</b>	13206	132,06	13344	133,44
<b>Average</b>		1,3206		1,3344
		3,773		3,812

Source: Primary Data Processed, 2019

The calculation results are shown in table 4.5, the average value of the expectations and reality variables for each attribute statement is obtained. Where the average value of the expected variable is 3,812 and the average value of the reality variable is 3,773.

The Cartesian diagram is divided into four quadrants with a dividing diameter based on the total average value of the expectation level (Y) of 3,812 and the total average value of the performance level (X) of 3,773.

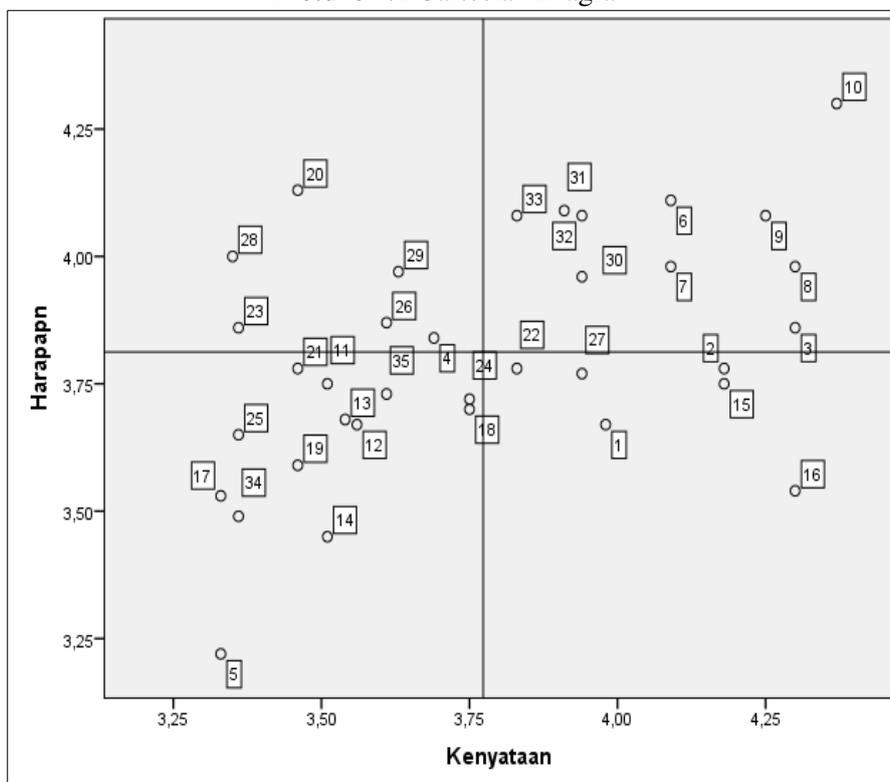
Table 4.6 Average Assessment Level of Expectation and Reality

No.	Statement	Expectation	Reality
1	The building is in good condition	3,67	3,98
2	The location of the inn is strategic	3,78	4,18
3	Access to the inn is easy to reach	3,86	4,3
4	The inn rooms are always available	3,84	3,69
5	The inn's interior design is neat and attractive	3,22	3,33
6	Feel safe while staying	4,11	4,09
7	The condition of the inn rooms are clean and comfortable	3,98	4,09
8	Availability of supporting facilities at the inn (AC / fan, tables, chairs, trash cans)	3,98	4,3
9	The condition of the toilet in a clean one	4,08	4,25
10	Availability of clean water at the inn	4,30	4,37
11	The price of the lodging room is in accordance with the facilities available in the inn	3,75	3,51
12	Hospitality of inn employees	3,67	3,56
13	Employees are willing to help the difficulties faced by inn guests	3,68	3,54
14	The inn's large parking area	3,45	3,51
15	Availability of places to eat around the tourist attraction	3,75	4,18
16	Clean dining conditions	3,54	4,3
17	The price of food at the restaurant is affordable	3,53	3,33
18	Availability of stalls / kiosks in the tourist area	3,70	3,75
19	The price of snacks in the tourist area is affordable	3,59	3,46
20	Availability of public toilets in the tourist area	4,13	3,46
21	Availability of clean water in public toilets	3,78	3,46
22	Availability of adequate lopo in the tourist attraction area	3,78	3,83
23	Lopo condition is good	3,86	3,36
24	Availability of trash cans in the tourist area	3,72	3,75
25	Large parking area in the tourist attraction area	3,65	3,36
26	The parking lot is neatly arranged in the tourist attraction area	3,87	3,61
27	The attitude of the tourist attraction guard (friendly, polite,	3,77	3,94

No.	Statement	Expectation	Reality
	smiling)		
28	Cleanliness in the tourist area	4,00	3,35
29	The condition of the tourist attraction area is safe	3,97	3,63
30	Affordable entrance fee for tourist objects	3,96	3,94
31	Easy access to tourist attractions	4,09	3,91
32	The road conditions to the tourist attraction are good	4,08	3,94
33	Guarantee of security and peace of visitors while in the tourist attraction area	4,08	3,83
34	Availability of public transportation to the location of the tourist attraction	3,49	3,36
35	Hospitality of the community around the tourist attraction	3,73	3,61
Total		133,44	132,06
Average		3,812	3,773

Source : Primary Data Processed, 2019

Picture 4.1 Cartesian Diagram



In Figure 4.4, it can be seen that the placement of attributes/items implies the variables of expectations and reality which are divided into four quadrants. Next will be explained as follows:

**A. Quadrant A**

This quadrant shows the attributes/statements that are considered very important or prioritized but these attributes/statements are lower than visitor expectations. Therefore, attributes/statements that fall into quadrant A are a top priority.

Attributes/statements included in quadrant A are:

1. Lodging rooms are always available
2. Availability of public toilets in the tourist attraction area (20)
3. Lopo good condition (23)
4. Parking lots are neatly arranged in the tourist area (26)
5. Cleanliness in the tourist attraction area (28)

6. Conditions around the tourist attraction area are safe (29).

Things that need to be improved are the need to increase the number of rooms in the inn so that they are always available, improvement of public toilets in the tourist attraction area, repair and addition of lopo facilities in tourist objects, improve cleanliness in the tourist attraction area as well as increased security around the tourist attraction area in order to achieve tourist expectations.

### **B. Quadrant B**

This quadrant indicates that the attribute/statement must be maintained. This is because the level of expectations of visitors is by the level of performance/reality. Attributes/statements that are included in the B quadrant that must be maintained are:

1. Easy access to the inn
2. A sense of security while staying
3. The condition of the inn rooms are clean and comfortable
4. Availability of supporting facilities at the inn (AC / fan, tables, chairs, trash cans)
5. Clean toilet conditions
6. Availability of clean water at the inn
7. Affordable entrance fees for tourist objects
8. Easy access to tourist attractions
9. The road conditions to the tourist attraction are good
10. Guarantee the security and tranquility of visitors while in the tourist attraction area

Items/attributes that are included in quadrant B are items that must be maintained by the manager of tourism objects, lodging managers and the government because items that are included in quadrant B are deemed to have reached the expectations of visitors to the Kolbano beach tourism object so they need to be maintained.

### **C. Quadrant C**

This quadrant shows the variables that are considered less important for visitors/tourists and their implementation/performance is considered moderate or mediocre. Visitors ignore these attributes/items so that the manager of the Kolbano beach tourism object does not make improvements to these attributes/items.

Attributes/items included in the C quadrant are:

1. The inn's interior design is neat and attractive (5)
2. The price of the lodging room is by the existing facilities in the inn
3. Hospitality of inn employees
4. Employees are willing to help with the difficulties faced by inn guests
5. Spacious lodging parking area
6. The price of eating at affordable places to eat
7. Availability of stalls/kiosks in the tourist area
8. Prices for snacks in the tourist area are affordable
9. Availability of clean water in public toilets
10. Availability of trash bins in the tourist area
11. Large parking area in the tourist attraction area
12. Availability of public transportation to the tourist attraction
12. Hospitality of the community around the tourist attraction

Quadrant C shows attributes that are considered less important for visitors to tourist attractions and the performance carried out by the manager is also mediocre. However, it does not rule out that in the future the attributes included in the C quadrant will become important attributes for visitors, so the manager needs to consider them.

**D. Quadrant D**

This quadrant shows attributes/items that are not very important to visitors/respondents but their performance is very good or excessive. So there is no need to make improvements to attributes/items that are included in the D quadrant, namely:

1. The building is in good condition
2. The location of the inn is strategic
3. Availability of places to eat around tourist attractions
4. Clean dining conditions
5. Availability of adequate lopo in the tourist attraction area
6. Attitudes possessed by tourist attraction guards (friendly, polite, smiling)

Attributes/items are considered not very important but the performance/reality that has been done has exceeded the expectations of visitors so that the management of the tourist attraction does not need to make improvements.

**CONCLUSION**

The data analysis technique used in this study uses the Importance Performance Analysis (IPA) method regarding the availability of lodging facilities at the Kolbano beach tourism object. It can be concluded from the results of this study that the average value of the real variable is 3.773 and the average value of the expected variable is 3,812. So it can be stated that the availability of lodging facilities at the Kolbano tourist attraction is still below the expectations of visitors/tourists.

**SUGGESTION**

Based on this research, several suggestions can be entered:

1. Judging from the results of the research that the accommodation at the Kolbano beach tourist attraction is still below the expectations of visitors/tourists, the government and the management of the inn to improve and improve existing facilities in tourist objects and inns so that they are in line with the expectations of visitors/tourists and attract tourists to visit the Kolbano beach attraction.
2. For the next researcher who will examine the Kolbano beach tourism object to add the attributes/question items related to the Kolbano beach tourism object.

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**LIST OF EDITS**

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**PROBLEMS FACED BY WOMEN WARD CORPORATORS IN DURG MUNICIPAL CORPORATION (DMC)**

**Khushboo Dhoke\*<sup>1</sup> and Dr. S. N. Jha<sup>2</sup>**

<sup>1</sup>Phd Scholar and <sup>2</sup>Professor, Department of Commerce, V.Y.T. PG Autonomous College, Hemchand Yadav Vishwavidyalaya, Durg, Chhattisgarh

**ABSTRACT**

*Municipal Corporation is local urban body that is empowered by government for socio- economic development of any urban area. An elected body of corporators/councilors from a specific ward makes up the Municipal Corporation. Since Durg is Tier-II city in Chhattisgarh, thus the city is managed by Durg Municipal Corporation (DMC). DMC is Chhattisgarh’s fourth largest Urban Local Government (ULB). There are many women municipal corporators in DMC. Keeping in view the challenges faced by the DMC, one among them is the problems faced by the women corporators when they come in direct contact with the people in their respective wards. The present study was conducted to highlight the basic ground problems faced by the women corporators in their wards. The data was collected from the women municipal corporators through a pre-tested and validated questionnaire. From 60 wards 25 wards of DMC are represented by women councilors. That means 41.6 % of DMC is under control of women corporators. Thus women corporators in DMC represent a significant ratio. A total of 32% women corporators present in the DMC are facing problems in their respective wards. Some of the problem faced women corporators of DMC are; mental harassment, sexual harassment, discrimination at work place, political culture, cultural barrier, lack of education. Lack of skill, and corruption across DMCs. In order to increase the work efficiency of the DMC, it’s essential to address the problems face by the women corporators by the state government. Once these problems are eradicated the objective of DMC can be fulfilled efficiently.*

*Keywords: DMC, Development, Women corporators, Problems.*

**INTRODUCTION**

Urban Local Government (ULG) is set up for the development and sustainability of urban areas. Urban local government is a significant institution in India because of the numerous attempts that have been taken to improve service levels in urban areas. In India, the Municipal Corporation is the name of the urban local government that strives to develop any city having a population of more than one million people (Arindam and Kidokoro, 2018). These municipal corporations are in charge of socioeconomic growth in the urban areas. Corporators are the members of a Municipal Corporation who are directly elected by the people (Mattewada, 2017). The Municipal Corporation is made up of a committee that consists of a Mayor and Corporators (Ashish and Kanchan, 2001). The structure of urban local governments determines the place where these governments have to work (Fig-1). The central role of Municipal Corporation is to deliver services in close contact with every aspect of the community. These local urban bodies create a local environment in which the area under its jurisdiction is developed (Bhargava, 1971).



**Fig-1: Structure of Urban Local Bodies**

Women can participate in governance through urban local bodies (ULBs), which is the most accessible method, making governance structures and procedures more egalitarian, inclusive, and accountable. In India, ULB includes issues with growth such access to water, sanitation, and transportation as well as the

introduction of social assistance programmes and identification of their intended recipients. Women delegates are expected to give a deeper awareness of the particular needs and concerns affecting women and children in their communities since they have better access to the grassroots. As a Municipal Corporator, they are engaged in local policy and decision-making and have close ties to the community. At every level of government, the aspect of women becoming elected members is tracked properly. However, the total participation of women in politics is not very satisfactory, despite the excellent track record of having women in every major position in India. The role of women in the civic services through urban local bodies has becoming prominent, but due to many factors/problems which women face at the ground/wards their proper participation in the urban local bodies is restricted. These problems vary from one local urban body to another. Reporting these problems from each local urban body is a concern of pivotal importance. In this context, the present study aims to discuss the problems faced by women corporators at ground in Durg Municipal Corporation.

### RESEARCH METHODOLOGY

Durg Municipal Corporation (DMC), is Chhattisgarh's fourth largest Urban Local Government (ULB). With the existence of the Bhilai Steel Plant (BSP) and other allied businesses, the city is adjacent to Bhilai, which is the centre of commercial and industrial operations. DMC has been efficiently working in its urban local area and other civic activities. The active involvement of the women in DMC has not been yet achieved. The problems which restrict the women in the participation of DMC have not yet been reported. In the present study the problems which women corporators face on ground were addressed. Purposive sampling technique was used to fulfill the research objective. The respondents in the present study are women corporators as they have to face problems in their respective wards. For data collection in the current study, the researcher used an interview schedule. The quantitative data was collected by applying closed-end-questions in a self structured questionnaire. A pilot study was conducted and then a self structured questionnaire was developed. An expert validity of the questionnaire was done then the questionnaire was tested with the help of pre-testing techniques. The data was collected from the women corporators through a pre-tested and validated questionnaire. The main focus of this was on the attitudes, perspectives and problems faced by women corporators in Durg Municipal Corporation (DMC). The researcher used the library to gather secondary data with reference to study even before beginning the fieldwork. The secondary data for this study was carefully assembled using books, journals, magazines, research publications, daily newspapers, government reports, etc. Once the responses of the respondents were collected from the survey, then the data was interpreted and presented through tables and graphs.

### RESULTS

Women are strong leaders who can transform society. However, because of male dominance, people have long wanted that their elected representative would also represent them. Leaders should be aware of their issues and available at all times. They have high hopes for their leader and high expectations of their ward corporator. India is a nation where men predominate; as a result of this patriarchal system, people only support male leaders so that corporations may cooperate with people. But, still the participation of women in the urban local bodies occurs. In DMC there are 60 wards which are managed by 60 municipal corporators headed by a Mayor.

**Table-1:** Urban Local Body of Durg Chhattisgarh, India

S.No	Urban Local Body (ULB)	Urban Local Body Type	No of Wards
01	Durg	Municipal Corporation	60
02	Bhilai	Municipal Corporation	70
03	Risali	Municipal Corporation	40
04	Bhilai Charoda	Municipal Corporation	40
05	Ashiwara	Municipality	15
06	Kumahari	Municipality	24
07	Jamul	Municipality	20
08	Dhamdha	Nagar Panhayat	15
09	Patan	Nagar Panhayat	15
10	Utai	Nagar Panhayat	15
11	Amleshwar	Nagar Panhayat	-

\*Source:www.durg.gov.in

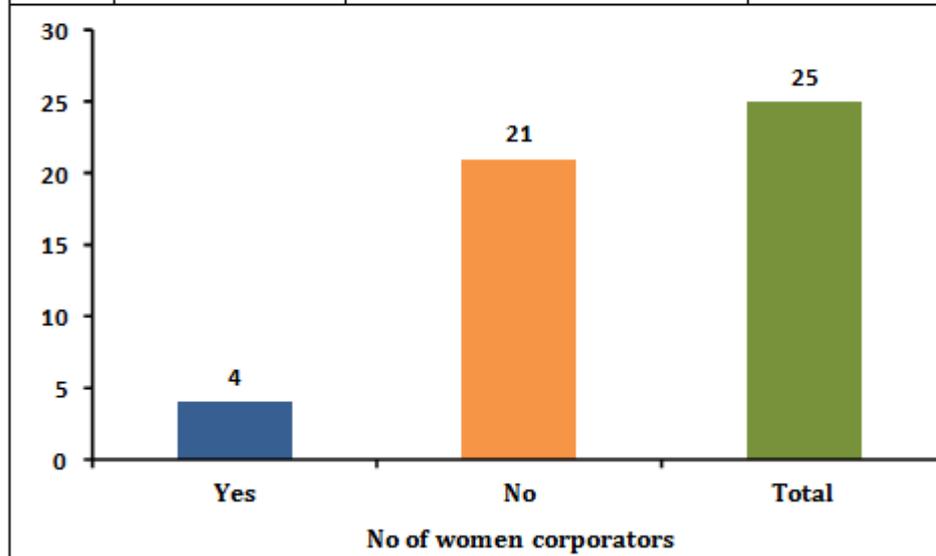
From 60 wards 25 wards of DMC are represented by women councilors. That means 41.6 % of DMC is under control of women corporators. Thus women corporators in DMC represent a significant ratio. In the

present study we observe that out of 25 women corporators only 4 women corporators are facing problems on ground in their respective wards (Table-2). The remaining women corporators are running their wards smoothly.

It was reported that majority of the women corporators (84%) doesn't mentioned any sort of problems facing by them in the wards. However a support from the political party, family and the family prestige were the main reasons to eliminate the problems(Table-2). Only 16% women corporators raised the issue that they are facing problems in their respective wards.

**Table-2:** Classification of women corporators facing problems in DMC, Chhattisgarh

S.No	Item	No of women corporators	Percentage
01	Yes	4	16
02	No	21	84
03	Total	25	100



**Problems Faced By the Women Corporators in DMC, Chhattisgarh**

In the present study we observed that a majority of the women corporators displayed that they don't face any problem in their respective wards. But a few women corporators are facing problems in their respective wards. The major problems which women corporators are facing the DMC, Chhattisgarh wards are given under; Some of the factors that discourage women from actively participating in DMC include a decline in moral standards, an increase in the use of money to gain political power, a rapid criminalization of society and politics, the politicisation of criminals, a fear of character assassination, and muscle power that reflects the country's worsening socio-economic crisis. The situation of women corporators is significantly impacted by these activities.

The majority of the women took part in ward elections for the first time during this survey. Therefore, some of the main barriers that women face in municipal corporations become their responsibility. Examples include a lack of political knowledge, improper understanding of the 74<sup>th</sup> Amendment acts, rules, and regulations, a lack of familiarity with municipal corporation administration, issues, urban development, fear and insecurity, a lack of budget knowledge, lack of education, and a lack of experience in public life. These factors are taken as problems by the women corporators in the municipal corporation.

According to women themselves, household responsibilities, a lack of financial support, lack of community and family support, lack of political awareness, cultural barriers, a lack of education, and male dominance in decision-making are the main reasons why women are weak in urban local government. The significant amount of time that women corporators devote to household duties, child care, and other rote tasks was frequently mentioned as one of the main barriers in the DMC. Moreover any social engagement beyond the comfort zone of women corporators creates additional strain.

Political parties were evidently represented in the corporation. But because women corporators were only put up as candidates for the reserved seats, the political parties mirror the dominant political culture, which is

patriarchal. Thus, promoting the women engagement in the political process is a fundamental obligation of political parties women division. They should establish themselves as role models for females, shattering the norm of male supremacy.

Widespread corruption in the nation is a serious problem. Corrupt practices are particularly common in government and politics. The strongest and oldest relationship between politics and corruption exists today. This also applies to women corporators. Whether they reject corruption or accept it, they are both adversely impacted. They believe it is difficult to confront or criticise it because they are relatively fresh to the political scene. However, women corporators may have a significant part in controlling it.

Other challenges include the structure of the system and the dedication of the political parties to gender equality. Despite the fact that all political parties support women participation in politics, each party builds on its strength and is dominated by male hierarchy. In India, political parties often only offer a small number of tickets to women who wish to run for office. They view women as a potential vote pool, thus in their election manifestos, alluring promises are made. They completely forget everything after the election. Because of this, victorious candidates do not hold accountable positions in government. Additionally, in politics, power and wealth are important. Women corporators are frequently the targets of various sorts of aggression in an effort to discourage them from actively participating in politics.

### CONCLUSION

Municipal Corporations have existed for a very long time as the body of the people. Women were never fully integrated into this system, but with the introduction of the 33 percent and 13 percent seats reserved for women in local urban/rural government, women started taking part in politics. The main goal of the present study is to examine the problems that women ward corporators are facing in municipal corporations. Data of this study was obtained from interviews with women ward corporators in the Durg Municipal Corporation (DMC) of Chhattisgarh. The result suggests that across all the 60 wards of DMC, 25 wards were managed by women ward corporators. Among these 25 women ward corporators only 4 (i.e 16%) report that they are facing problems in DMC, however the majority of women ward corporators (84% i.e. 21) don't report any problem facing in DMC. The study observed that the major problems faced by women ward corporators were political culture, corruption, harassment, lack of knowledge, lack of culture, tradition, male dominance, etc. DMC must take key note to these issues to eradicate these problems which women ward corporators are facing, in order to manage the developmental activity of their respective wards in a sustainable way.

### CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest with the submission of this manuscript.

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## REVIEW ON: RESPIRATORY INFECTION

Usturge Pooja S.<sup>1</sup>, Dr. Panchabhai Vivek B.<sup>2\*</sup> and Jadhav shweta C.<sup>1</sup><sup>1,3</sup> Department of Quality Assurance, Channabasweshwar Pharmacy College (Degree), Latur. (M.S.)<sup>2\*</sup> Department of Pharmaceutical Chemistry, Channabasweshwar Pharmacy College(Degree), Latur. (M.S.)**ABSTRACT**

*A frequent acute respiratory infection that affects the alveoli and distal airways, pneumonia is a serious health issue that affects people of all ages worldwide and is linked to significant morbidity and both short- and long-term mortality. To improve treatment and outcomes for pneumonia, national and international recommendations addressing its management have been published in recent years. Pathogen features play a less important influence in disease development than does the host immune response. The diagnosis of pneumonia is both simple and complex. Recent research is challenging our concept of pneumonia and radiological gold standards that have underpinned research for decades.*

*Keywords: Pneumonia, Respiratory infection, Diagnosis, Pathogen.*

**INTRODUCTION**

Acute infectious disease with a bacterial etiology that is characterized by localized lesions of the lungs and respiratory alveoli with exudation is known as pneumonia.

When pneumonia is an acute infectious disease by definition, it is superfluous to use the term "urgent" diagnostic "pneumonia," especially since the term "chronic pneumonia" is not employed.

A common lung illness called pneumonia is characterized by a buildup of pus and other fluids in the lung air sacs (alveoli). The structures known as lung air sacs aid in the exchange of oxygen and carbon dioxide. Breathing becomes difficult in them due to pus accumulation. Bacteria, viruses, fungus, or parasites are just a few of the several microorganisms (germs) that can cause pneumonia. These microorganisms are released into the air when an infected person coughs or sneezes, and inhaling in this air causes the person to become ill. As a result, the illness is spreadable. It affects millions of people globally and comes in many different forms. It affects people of all ages. Depending on the type of organism involved, age, and general health of the individual, the illness might range from moderate to severe. There are three types of pneumonia: community-acquired, hospital-acquired, and pneumonia in people with damaged immune systems (individuals with weakened immune system).

Acute respiratory infections like pneumonia are typically brought on by bacteria or viruses. It is the leading infectious cause of death in children globally and can cause mild to severe sickness in persons of all ages.

More than 808 000 children under the age of five died from pneumonia in 2017, which accounted for 15% of all pediatric fatalities. Adults over 65 and those with underlying medical conditions are other groups of persons who are susceptible to pneumonia.

**CAUSES OF PNEUMONIA**

Pneumonia can be brought on by numerous bacteria. In the air we breathe, bacteria and viruses are the most prevalent. Usually, your body protects you from harmful bacteria getting into your lungs. But even if your health is normally strong, these viruses occasionally have the capacity to overwhelm your immune system.

Pneumonia can be brought on by bacterial, viral, or fungal diseases.

The most frequent cause is bacteria. Pneumonia caused by bacteria can happen on its own. It may also appear after you've experienced some viral infections like the flu or a cold. Pneumonia can be brought on by a variety of microorganisms, including: pneumonia streptococcus

Legionnaires' disease, also known as Legionella pneumophila, is a type of pneumonia. pneumonia Mycoplasma pneumoniae Chlamydia Influenza virus, hemophilus

**Bacterial Pneumonia:** pneumococcal pneumonia numerous bacteria cause this kind. Streptococcus pneumoniae is the most prevalent. It typically happens when the body is compromised in some way, such as through disease, inadequate nutrition, ageing, or decreased immunity, and the germs are able to enter the lungs. All ages can be affected by bacterial

pneumonia, but if you misuse alcohol, smoke cigarettes, are physically weak, have just had surgery, have a respiratory condition or viral infection, or have a compromised immune system, your risk increases.

**Viral Pneumonia:** This type accounts for about one-third of all pneumonia cases and is brought on by a number of viruses, including the flu (influenza). If you have viral pneumonia, you might be more susceptible to developing bacterial pneumonia.

**Mycoplasma Pneumonia:** Typical pneumonia is the name given to this variety, which has slightly different symptoms and physical indicators. *Mycoplasma pneumoniae* is the bacterium that causes it. It typically results in a broad, moderate pneumonia that affects people of all ages.

**Other Pneumonias:** Other, less frequent pneumonias may be brought on by different pathogens, like fungus.

### Pathophysiology

Pneumonia is an acute lung inflammation (pneumonitis) brought on by an infection. Bacterial, mycobacterium, viral, fungal or parasitic infections are all possible. Healthcare practitioners need to keep in mind that the term "pneumonia" actually refers to a range of syndromes brought on by diverse causes that result in inflammation and aftereffects.

Any infectious organisms that make it to the alveoli are most likely quite virulent because they have already managed to get beyond the host's physical defences. By overpowering the macrophages, they may produce a fibrin-rich exudate that fills the infected and nearby alveolar spaces, causing them to adhere to one another and become airless. Neutrophils multiply as a result of the inflammatory reaction. This may cause pulmonary oedema and fibrosis, which both limit lung growth by harming the lung tissue.

People with compromised cell-mediated immunity are more vulnerable to contracting infections from fungi, viruses, and other low-virulence intracellular organisms like *Pneumocystis pneumonia*.

Some bacteria, like *Pseudomonas*, have a strong affinity for the tracheal lining and the biofilm of an endotracheal tube, which makes it challenging to remove them from the airways and contributes to their virulent nature.

### Sign and Symptoms

Pneumonia can present with mild to severe signs and symptoms, depending on the type of germ that caused the illness, your age, and general health. Mild signs and symptoms frequently resemble cold or flu symptoms, but they linger longer.

Pneumonia symptoms and signs might include:

When you cough or breathe, your chest hurts

Confusion or shifts in consciousness (in adults age 65 and older) Coughing, which could result in phlegm

Fatigue

High temperature, perspiration, and chills

A body temperature that is below average (in adults older than age 65 and people with weak immune systems) diarrhoea, vomiting, or nauseous breathing difficulty

Infants and newborns may not exhibit any symptoms of the infection. Or they might vomit, have a fever and cough, seem agitated or exhausted and lacking in energy, have trouble breathing, or have trouble eating

### Diagnosis of Pneumonia

To make the diagnosis. Chest X-rays are one type of laboratory test that may be used to confirm an infection, assess its severity, and rule out other chest illnesses. To pinpoint the precise organism causing the infection, blood and sputum tests are conducted. Pulse oximetry is used to measure the oxygen flow through the blood, which reveals how well the lungs are working.

Your doctor will enquire about your symptoms, including when and how they first appeared. You might be questioned about potential exposures to determine whether your infection is brought on by bacteria, viruses, or fungi, such as:

Any recent journeys Your line of work

Involvement with animals

Exposure to sick people at work, school, or home Whether you recently experienced a different ailment.

### Medical history:

Chest x-ray: During an x-ray examination, your doctor will be able to see your heart, blood vessels, and lungs to help determine whether you have pneumonia. The radiologist will search for infiltrates, which are white areas in

the lungs that signify an infection, when interpreting the x-ray. This examination will also assist in identifying any pneumonia-related problems you may have, such as abscesses or pleural effusions (fluid surrounding the lungs).

**CT of the lungs:** A CT scan of the chest can be performed to detect pneumonia that may be more difficult to spot on a normal x-ray and to see finer features within the lungs. Additionally, a CT scan provides a detailed view of the airways (trachea and bronchi) and can be used to ascertain whether pneumonia may be connected to.

### **Treatment of Pneumonia**

Whether pneumonia is bacterial or viral typically affects the course of treatment. Antiviral medicines are administered instead of antibiotics for viral pneumonia. Recovery often takes one to three weeks for the person.

Antibiotics are frequently used to treat patients with bacterial pneumonia in order to eradicate the illness. In order to enhance overall health, medications are provided to treat pain, fever, and cough in addition to providing enough rest, a nutritious diet, and lots of fluids. In serious cases, hospitalization and oxygen therapy are advised. If the underlying medical issue is still present, treatment is required along with routine follow-up visits.

The severity of your pneumonia will determine how quickly they get better. As a rule of thumb, after:

After one week, the fever should have subsided.

Chest discomfort and mucus production should have significantly decreased after 4 weeks. After six weeks, the cough and dyspnea should have significantly decreased.

Most symptoms should have subsided after three months, but you can still feel extremely exhausted (fatigue)

Most folks will feel normal within six months.

The type of pneumonia you have, its severity, and your general health will all affect how you are treated.

### **Medications on Prescription**

To help treat your pneumonia, your doctor might recommend a drug. Depending on the precise reason of your pneumonia, you may receive a different prescription.

Most cases of bacterial pneumonia can be treated with oral antibiotics. Even if you start to feel better, always finish the complete course of antibiotics. Failure to do so could delay the healing of the infection and make future treatments more difficult.

Viral infections cannot be treated with antibiotics. Your doctor could occasionally recommend an antiviral. With at-home treatment, viral pneumonia cases frequently get better on their own. Fungal pneumonia is treated with antifungal medicines. To get rid of the infection, you might need to take this medicine for a few weeks.

### **OTC Medications**

If necessary, your doctor may also advise using over-the-counter (OTC) drugs to treat your discomfort and fever. These may consist of:

Ibuprofen and aspirin (Advil, Motrin)

The pain reliever acetaminophen (Tylenol)

Additionally, your doctor can advise cough medicine to lessen your cough so you can get some rest. You don't want to completely get rid of the fluid from your lungs because coughing helps remove it from your lungs.

### **A Home Remedy**

There are certain things you may do to assist ease symptoms even though home cures don't truly treat pneumonia.

One of the most typical signs of pneumonia is coughing. Gargling with salt water or consuming peppermint tea are two natural remedies for coughing.

A fever can be reduced with cool compresses. Chills can be relieved by drinking warm liquids or eating a warm bowl of soup. Here are some additional home cures.

Getting lots of rest and consuming plenty of fluids will aid in your recovery and help you avoid a recurrence.

Despite the fact that home remedies can lessen symptoms, it's crucial to follow your treatment plan. Follow the directions on any prescription medication.

**Hospitalization**

You might require hospitalization if your symptoms are very severe or if you have additional health issues. In the hospital, medical professionals can monitor your breathing, temperature, and heart rate. Hospital care may consist of: antibiotics administered straight into a vein respiratory therapy, which involves administering particular drugs directly into the lungs, or instruction in breathing exercises to maximize oxygenation oxygen therapy to maintain oxygen levels in your bloodstream (received through a nasal tube, face mask, or ventilator, depending on severity)

**CONCLUSION**

Pneumonia is a common illness in developing nations like India, with risk factors including lower maternal education, delayed complementary feeding onset, incomplete immunisation, indoor air pollution, and lower socioeconomic condition, which is a situation typically seen in urban slums. A widespread illness, pneumonia is often treatable in industrialised nations but frequently fatal in underdeveloped nations. Advanced dementia patients frequently require parenteral antibiotics for pneumonia, a typical final event for which they are at risk. Advance care planning, the patient's cultural background, and the clinical characteristics of the probable pneumonia episode have the greatest influence on the treatment's rigour.

With 5,000 children worldwide dying from pneumonia every day, pneumonia is a persistent, real threat that should elicit similar reactions. Research and action are urgently needed.

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**THE IMPLEMENTATION OF SPATIAL POLICY IN KUPANG CITY**

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**Hendrik Toda, Jeny J. Therik and Cataryn V. Adam**  
Nusa Cendana University

**ABSTRACT**

**Purpose:** *The purpose of this study is to analyze and describe the implementation of spatial policy in Kupang City using Edward III's model.*

**Research Methodology:** *The type of research used in this research is descriptive research with a qualitative approach.*

**Results:** *The results of this study indicate that there are still deficiencies in the implementation both in terms of communication, human resources, dispositions, and regulations or policies.*

**Limitations:** *This study does not include sufficient detailed data to describe the problem being studied.*

**Contribution:** *The results of this study can be used as material for information and evaluation of the implementation of spatial planning policies in Kupang City.*

**Keywords:** *Government, Policy, Spatial Planning*

**1. INTRODUCTION**

A city space should not only be present physically but should give added value or other meaning. The development of a city cannot be separated from the needs of city residents for public space facilities. As the main element in urban area development, spatial planning is a tool to coordinate sustainable urban development. Urban spatial planning is carried out to improve the quality of the urban environment in a harmonious and balanced manner between environmental development and community life. In line with the mandate of the Law of the Republic of Indonesia Number 24 of 1992 concerning Spatial Planning, the discourse on the concept of urban development is starting to pay attention to ecological factors.

In the concept of sustainable development, urban space needs to be arranged so that it can provide a balance of the environment and comfortable support for humans and other creatures in carrying out activities and maintaining their normal survival. City space must be used wisely and efficiently to allow the utilization of natural resources contained to be optimally utilized for the greatest welfare of the people. If space utilization is not properly regulated, there will likely be a waste of space utilization and a decrease in spatial quality. Therefore, a spatial planning policy is needed to regulate its use based on the size of the activity, the type of activity, the function of the location, the quality of the space, and the aesthetics of the environment.

The problem of spatial planning is a multi-sectoral picture, especially after the implementation of the concept of regional autonomy. Autonomy policy in the implementation of spatial planning, with its various pros and cons, is one of the opportunities that can bring the application of spatial planning closer to local problems. The limitations of the central government in following very complex local dynamics have often resulted in failures in various spatial planning cases.

In the context of spatial planning, the provincial government and the district/city government have a closely related relationship. The governor as the provincial government leader still has the authority to provide direction to districts/cities in taking various spatial planning policies in the regions. This is intended so that there is no impression that regents/mayors act independently in determining spatial planning policies. The form of policy is in the form of determination, direction, and release (Tarigan, 2005).

In line with this, the provisions of Article 63 paragraph (2) point a and paragraph (3) point a of Law of the Republic of Indonesia Number 32 of 2009 concerning Environmental Protection and Management state that the provincial government and regency/city governments have the authority to determine policies at the local level. The policies referred to here include policies related to spatial planning. The decentralization policy regarding spatial planning authority is expressly stated in Article 10 and Article 11 of Law of the Republic of Indonesia Number 26 of 2007 concerning Spatial Planning. In Article 10 paragraph (2), it is stated that the authority of the provincial government in the implementation of spatial planning includes: planning, utilization, and control of spatial use in provincial areas,

One city in Indonesia that has been granted autonomous authority to manage its households in a spatial context is Kupang City. Currently, Kupang City is still unable to fulfill the obligation of 30% green open space as mandated by the law. Public spaces that have been placed for residents to gather and interact, such as sports

fields, city parks, tourist areas, and art arenas are slowly but steadily disappearing and being replaced by malls, shopping centers, and shophouses or office houses. Besides that, the conditions of the public spaces also face quality problems. This is consistent with William H. Whyte's statement in his writing entitled "Why many public spaces fail", stating that public spaces often look neat, clean, and quiet/empty. This condition seems as if they want to say "no people, no problem" (Whyte, 1980). However, when the public space is empty/quiet or damaged, then that public space may have something wrong with the design, the government, or the community.

To cover all shortcomings related to spatial planning in Kupang City, the Kupang City government continues to improve and is trying to change the stigma that appears in the community that Kupang City will become a shop house city with a policy of converting government-owned vacant lands into public spaces and revitalizing parks that lay dormant after years of neglect. This requires simultaneous cooperation between the government, in this case, the Mayor of Kupang, and the people of Kupang City as the target group for policies that utilize public spaces in the process of formulating policies on spatial planning in Kupang City.

Community involvement in the process of public policy is in the form of public discussions, which are then used as input into the policy agenda. One of the requirements for social order in the public policy decision-making process is to involve the participation of the community's political power for the sake of strengthening civil society (Messabia et al, 2012).

Normatively, the community has the right to be involved in spatial planning. It can be seen in the preamble to point d of the Law of the Republic of Indonesia Number 26 of 2007 concerning Spatial Planning which states that the existence of limited space and the growing public understanding of the importance of spatial planning for a transparent, effective, and participatory spatial planning is needed to create a safe, comfortable, productive, and sustainable space.

Thus, it can be stated that spatial planning is carried out by various government agencies by involving the community as already mentioned and/or non-governmental stakeholders in spatial planning, which in its implementation must be carried out in a coordinated manner, both at the administrative level of government and between the government and the community to avoid handling gaps or handling overlaps to achieve spatial planning goals that can be achieved. accommodate all interests. This research was conducted to analyze and describe simply the implementation of the Mayor's policy and the implementation of spatial planning in Kupang City.

## **2. LITERATURE REVIEW**

### **Public Policy**

Etymologically, the term policy comes from Greek, Sanskrit, and Latin. The roots of the Greek and Sanskrit words polis (city-state) and pur (city) were developed in Latin into politia (state) and finally in mid-English policie, which means dealing with public or government administration matters. The etymological origin of the word policy is the same as other important words: police and politics (Dunn, 2003).

State policies often referred to as public policies, state policies, or government policies, actually have the same meaning. Friedrich (1969) in Agustino (2016) stated that: "A policy is a series of actions proposed by a person, group, government, or a certain environment by showing the constraints of opportunities for implementing the proposed policy to achieve certain goals".

Another policy definition put forward by Nugroho (2003) makes a formulation of understanding of public policy. First, public policies are policies made by state administrators or public administrators. So, public policy is everything that the government does and does not do. Second, public policy is a policy that regulates life together or public life, not the life of an individual. Public policy governs everything in the domain of public administrator institutions. Public policy regulates common problems or personal or group problems that have become problems of the entire community in that area. Third, the meaning of policy as a series of activities or actions was added by Friedrich (1969) in Agustino (2016) who defined policy as an action that led to goals proposed by a person, group, or government in a certain environment in connection with certain obstacles while looking for opportunities to achieve goals or realize the desired goals to achieve a goal.

Besides that, public policy is also described as a judgment that has the intention to solve problems that certainly appears in some activities because of the government in the government administration (Nubatonis, Kase, & Nursalam, 2021).

Furthermore, Islamy (2004) defined state policy as what the government claimed to do or not to do. The country's policies are the goals or objectives of government programs. Easton gave the meaning of state policy

as the allocation of values by force (legally) to all members of society. The definition of state policy has the following implications:

1. That the state policy in its first form is in the form of stipulating government actions.
2. That state policy is not only sufficiently stated but also implemented in a tangible form.
3. That state policy, whether it does something or does not do something, has and is based on certain aims and objectives.
4. That state policy must always be aimed at the interests of all members of society (Islamy, 2004).

### **Spatial Planning Policy**

The spatial policy emphasizes two words namely "Procedure" and "Space". The word Procedure (KBBI, 2022) has a meaning as a rule (usually used in compound words) and arrangements; how to arrange; system. While the word Space (Wahid, 2014) has a meaning of a container that has three elements, namely earth, water, and air. Mangunsuharjo (1990) has long interpreted space as a container of human life and the natural resources contained in its experience which includes the earth, water, and air as a unit. A similar understanding of space is also contained in the Job Creation Law (2020) which states that space is a container that includes land space, sea space, and air space, including space in the earth as a unitary territory, where humans and other creatures live, carry out activities and maintain survival. Recognizing the importance of space in a country, the 1945 Constitution article 33 paragraph (3) says that the earth, water, and natural wealth contained in it are controlled by the state and used for the greatest prosperity of the people. Thus, it can be said that spatial planning is interpreted as an effort to regulate the spatial arrangement of a region/region/region to create economic, socio-cultural, and political benefits, and benefit the development of the people of the region.

In this context, spatial arrangement is believed to be the right approach to realizing the cohesiveness of managing natural resources and artificial resources in a useful and successful manner. It is hoped that by adhering to the rules of spatial arrangement, the quality of national territory space can be maintained for the realization of general welfare and social justice by the constitutional foundation of the Constitution of the Republic of Indonesia. In 1945 paragraph 1 of spatial planning in Indonesia has been regulated by the Law of the Republic of Indonesia Number 26 of 2007 concerning Spatial Planning (UUPR) which has now been amended by Law No.11 of 2020 concerning Job Creation. UUPR stipulates that each region must establish a Provincial and district/city Spatial Plan. The determination of the Spatial Plan of this Region is strongly related to and affects the issue of sustainable food agricultural land protection, as well as the rescue of forest areas.

Spatial planning activities consist of 3 (three) interrelated activities, namely: spatial planning, spatial utilization, and control of space utilization through spatial plan products in the form of Regional Spatial Plans (RTRW) which hierarchically consist of National Regional Spatial Planning (RTRWN), Provincial Spatial Plan (RTRWP), and Regency / City Spatial Plan (RTRW Regency/City). The three spatial plans must be summarized in a development plan as a reference in the implementation of sustainable development planning in Indonesia. As the main law (core) in the implementation of spatial arrangement, the Spatial Planning Law is expected to realize a spatial plan that can optimize and integrate various development sector activities, both in the use of natural resources and artificial resources (Parsa, 2014: 4).

The implementation of spatial planning is based on certain objectives that have generally been described earlier above. In the Spatial Law article, 3 mentioned the implementation of spatial arrangements aimed at realizing a safe, comfortable, productive, and continuing national territory space based on archipelago insights and national resilience with:

1. The realization of harmony between the natural environment and the artificial environment
2. The realization of cohesion in the use of natural resources and artificial resources by paying attention to human resources, and
3. The realization of space function protection and prevention of negative impacts on the environment due to the use of space.

Broadly, the spatial policy becomes an important policy for all citizens of the world. Pour policy became an important basis for countries in building a better living environment than today. For example, in Continental Europe, there is a spatial policy that prioritizes the use of environmentally friendly infrastructure called Green Infrastructure (GI). This policy has been widely implemented in European countries since 2013. Slatmo et al (2019) mention that the central idea behind GI is an understanding of the physical environment that is not built as an infrastructure capable of providing various benefits to society, including the ability to conserve

biodiversity; provide food, feed, fuel, and fiber; to adapt and mitigate climate change and to contribute to the improvement of human health and quality of life.

The spatial policy also allows humans to solve population problems. Every year the population continues to increase. Of course, this has an impact on the availability of land for residential needs and production needs such as agriculture, plantations to industry. Girot and Pamudjianto (2019) mentioned that rapid growth provides an increase in the utilization of narrow spaces to move. Of course, a good spatial policy and properly studied will have a good impact on spatial governance in various regions including regions in Indonesia. With the spatial policy, the government can regulate the distribution of land use in their respective regions. This will certainly lead to a better and more equitable development direction.

So far, the spatial policy is a policy that boils down to the interests of the community. Therefore, community involvement in the implementation of spatial policies is a must. The government as the organizer of the policy requires a popular development paradigm. The intended paradigm is not only to use the name of the people to carry out a particular policy but also to take a good approach and communication with the community as the main stakeholder. The problem is, that the implementation of spatial policies in Indonesia often ignores the participation of the community and is often carried out without a good approach and communication. Nugroho and Sugiri research (2009) which reviewed the spatial policy in Semarang City found that the implementation of spatial policy did not go well and even aggravated existing problems. This research also highlights those spatial policies tend to be made reactively to respond to factual problems that occur without the commitment of the government and the community to solve existing problems.

Meanwhile, research conducted by Atthahara and Rizki (2019) found that the spatial policy carried out by Karawang Regency had a significant positive impact such as rapid regional growth, the pace of society towards industrialization society, and improved living standards although it still left some socio-cultural and environmental problems. The positive impact of implementing spatial policies in Karawang cannot be separated from good communication, the availability of quality human resources, good bureaucracy, and the readiness of regional device organizations in implementing spatial policies together with the community.

#### Edward III Public Policy Implementation Model

As a public policy implemented, the spatial policy can be studied theoretically with the policy implementation model of Edward III (1980: 21). Edward III's policy model reveals 4 crucial factors or variables in the implementation of public policy. These factors are:

##### **1. Communication**

Effective implementation occurs when decision-makers already know what they are doing. It can work when communication goes well. Communication is needed so that decision-makers and implementors will be more consistent in implementing every policy that will be implemented in society.

##### **2. Resources**

However clear and consistent the provisions or rules and however accurate the delivery of these provisions and rules, if the policy implementers responsible for implementing the policy lack the resources to implement the policy that lacks the resources to carry out the policies that lack the resources to do the work effectively then the implementation of the policy will not be effective.

##### **3. Disposition**

If a policy implementation wants to be effective then policy implementers must not only know what will be done but must also have the ability to carry it out so that in practice there is no bias.

##### **4. Bureaucratic Structure**

Such a complex policy demands the cooperation of many people, when the bureaucratic structure is not conducive to the available policies, this will make resources ineffective and hinder the course of policy.

In addition, the implementation of policy as stated by Mwesigwa (2021) is the translating process of the initiatives and goals of the policy into projects, procedures, programs, and/or regulations. Moreover, Nubatonis, Kase, & Nursalam (2021) explained that the determination of the formulation and goals of the policy is the key to starting the policy implementation stage.

### **3. RESEARCH METHODOLOGY**

#### **Types of Research**

This research is descriptive research with a qualitative approach. As qualitative descriptive research, this study focuses primarily on analyzing and evaluating spatial policies in Kupang City to provide a factual picture of the implementation of spatial policies in Kupang City.

**Research Area**

This research was conducted in Kupang City, East Nusa Tenggara Province, Indonesia specifically in the City Spatial Detail Plan Area which includes 7 Parts of the City Area, namely:

1. City Area I covers an area of 1,643,882 Ha, consisting of 3 (three) sub-districts, namely part of Kelapa Lima District, Kota Raja District, part of Kota Lama District, part of Oebobo District, part of Alak District, and part of Maulafa District, which includes 23 (twenty-three) villages, namely; Nun Baun Delha Village, Nunhila, Manutapen, Fatufeto, Mantasi, LLBK, Solor, Tode Kisar, Fatubesi, Oeba, Merdeka, Bonipoi, Airmata, Oetete, Nunleu, Kuanino, Oebobo, Oebufu, Naikoten I, Naikoten II, Airnona, Bakunase I, Bakunase II, Naikolan.
2. City Area II covers an area of 1246,326 Ha consisting of 3 (three) sub-district areas, namely part of Kelapa Lima Subdistrict, part of Kota Lama District, and part of Oebobo District which includes 7 (seven) villages; Fatululi Village, Nefonak Village (area 34 ha), Pasir Panjang Village (area 88 ha), Kelapa Lima Village, West Oesapa Village, Tuak Daun Merah Village, and Kayuputih Village.
3. City Area III covers an area of 1962,910 Ha, consisting of 3 (three) sub-district areas, namely part of Kelapa Lima District, part of Oebobo District, and part of Maulafa District which includes 5 (five) villages, namely Penfui Village, Oesapa Village, Lasiana Village, Liliba Village, and South Oesapa Village.
4. City Area IV covers an area of 4,114,497 Ha consisting of 2 (two) sub-district areas, namely part of Alak District and a small part of Maulafa District which includes 8 (eight) villages, namely Alak Village, Batuplat Village, Manulai II Village, Naioni Village, Namosain Village, Nun Baun Sabu Village, Pankase Oeleta Village, and Sikumana Village.
5. City Area V covers an area of 1,210,723 Ha, consisting of 2 (two) sub-districts, namely Maulafa District and Oebobo District which includes 9 (nine) Villages, namely Kolhua Village, Bello, Maulafa, Oebufu, Liliba, Naimata, Penfui, Sikumana, Oepura.
6. City Area VI covers an area of 4,467,223 Ha, consisting of 2 (two) sub-district areas, namely Maulafa District and Alak District which includes 2 (two) villages, namely Fatukoa Village, and Naioni Village.
7. City Area VII covers part of Sikumana Village, part of Bello Village, part of Kolhua Village in Maulafa District, and part of Alak District with City Area Center located in Bello Village.

**Data Collection**

The data used in this study is primary data or data obtained directly from the data source. The data collection was conducted by interviewing 32 informants. The stages of data collection are carried out as Creswell argues (2016: 254-255) namely qualitative observation, qualitative interview, and qualitative documents.

**Data Analysis**

The data that has been obtained is then analyzed and interpreted using Edward III's Public Policy Implementation Model as mentioned in the literature review. The results of the analysis are then described and presented in a qualitative narrative about the chronology of events, themes (sub-themes, special illustrations, perspectives, and quotations), relationships between themes, visuals, images, or tables regarding the Implementation of The Mayor's Policy in Public Space Arrangement in Kupang City.

**4. RESULTS AND DISCUSSIONS**

In the study of public administration, the public concept was put forward by Frederickson (1997) who saw the public from five perspectives, namely: (a) the public as an interest group; (b) the public as rational voters (c) the public as a representative of society; (d) the public as consumers, and (e) the public as citizens. In this case, the public is seen as an individual who has multiple perspectives and independence in carrying out various social actions that have an impact on others.

The public policy context sees that the existence of public space is strongly influenced by the context of governance, namely the distribution of power between the state, market, and society more broadly (Wasisto, 2016). Public space is one of the physical means that in its development requires a public policy. Public space includes public goods and is used for the public interest.

Kupang City's public space policy is regulated in the Kupang City Regional Regulation on the Detailed Layout Plan in Kupang City for 2011-2031. With the enactment of this spatial planning policy in Kupang City, a substantial question arises that whether the public space can become an arena and discourse for public communication or in other words, whether the public is capable of communicating something that can encourage freedom of thought and act egalitarianly in public spaces in Kupang City. Whereas, space is

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considered by the public to be accessible to the public without restrictions and fosters communication and interaction in the community of Kupang City. Therefore, it needs a deeper discussion to answer it.

The success or failure of a public policy product is ultimately determined at the level of its implementation. In simple terms, policy implementation is an action in the process of proving a policy. Moreover, Nubatonis, Kase, & Nursalam (2021) stated that the implementation of public policy is a practical stage that is distinguished from the formulation of policy and it can be seen as a priority stage. To see how the mayor's policies do in managing public spaces in Kupang City, the authors use a policy implementation model from Edward III (1980), which reveals 4 factors or variables, which are crucial in the implementation of public policy. These factors are communication, resource, disposition, and bureaucratic structure which will be discussed further in the discussion below:

### **Communication**

Effective implementation occurs when decision-makers already know what they are doing. It can run if communication goes well. Communication is needed so that decision-makers and implementers will be more consistent in implementing every policy that will be applied in society.

Communication has an important role in policy implementation because no matter how good a policy is, without being well communicated, it certainly will not succeed in achieving policy objectives. Therefore, policies must be communicated by the implementers of the policies appropriately and by using the right channels as well. This is in line with what Edward III said, "The first requirement for effective policy implementation is that those who implement a decision must know what they are supposed to do. Policy decisions and implementation orders must be followed. Naturally, these communications need to be accurate and implementers must accurately perceive them. Many obstacles lie in the path of transmission of implementation communication" (Edward III, 1980).

How far the mayor's communication goes in implementing spatial planning policies in Kupang City can be seen from three dimensions, namely transmission, clarity, and consistency (Edward III, 1980). Policy transmission is related to the way of delivering policy information, clarity is related to policy clarity, and consistency is related to the level of policy consistency.

For more details on the communication dimensions of the mayor in the implementation of spatial planning policies in Kupang City, the authors will describe the following: Transmission or delivery of information related to this spatial planning policy. According to observations, interviews, and documentation, the Kupang City Government, which in this case, is the Mayor of Kupang along with related agencies, has submitted information about the regional spatial plan in Kupang City. The Kupang municipal government, which in this case, is the mayor represented by the Kupang City Regional Development Planning Agency and the Kupang City Communication and Information Agency, conducts socialization with the community, either individually or in groups so that people know about the allocation of space in Kupang City. So, when applying for a permit to build a building, they already know the designation of the space in advance. Even, the Kupang City Government has informed through both print and non-print media regarding the allocation of space in Kupang City.

Regarding the clarity of this spatial planning policy, according to the results of observations, interviews, and documentation, it is known that basically, the spatial planning policy in Kupang City is clear. The Kupang City Regional Regulation concerning the Detailed Spatial Planning in Kupang City for 2011-2031 is a minor policy of the Law of the Republic of Indonesia Number 26 of 2007 concerning Spatial Planning (UUPR) and this Regional Regulation, it clearly states how the regional spatial planning in Kupang City for 2011-2031 should be. In addition, the Kupang City Government is also following up with other regulations to achieve the spatial planning policy objectives. On the other hand, when people apply for a building permit (IMB), the apparatus will provide information related to information on city plans as the basis for granting the IMB.

According to the results of this study, consistency in policy implementation shows that basically, the Kupang City Government has made efforts to implement what is mandated in the Kupang City Regional Regulation concerning the Detailed Spatial Planning in Kupang City for 2011-2031. However, there are still violations in spatial planning, where there are several problems over land-use change due to the behavior of individuals and lack of community concern. Thus, the implementation of the spatial planning policy in terms of communication, in essence, the Kupang City Government has carried out socialization about the city spatial plan to the public but there are still obstacles in terms of consistency of information provided and community participation.

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**Resource**

However clear and consistent the provisions or rules and however accurate the delivery of the provisions and rules maybe, if the policy implementers who are responsible for implementing the policy lack the resources to implement the policy and lack the resources to do the work effectively, then the implementation of the policy will not be effective.

Resources are the second factor after communication that will influence the success of policy implementation. Policy resources are anything that is used to support the success of the policy being implemented. This is in line with what Edward stated: "No matter how clear and consistent implementation orders are and no matter how accurately they are transmitted, if the personnel responsible for carrying out policies lack the resources to do an effective job, then the implementation of the policies will not be effective. Important resources include staff of the proper size and with the necessary expertise, adequate information on how to implement relevant policies and on the compliance of the others involved in implementation, the authority to ensure that policies are carried out as they are intended, and facilities (including buildings, equipment, land, and supplies) in which or with which to provide services. Insufficient resources will mean that laws will not be enforced, services will not be provided, and there will be no reasonable regulation in policy implementation".

In its implementation in Kupang City, to measure the resources in implementing this policy can be seen from the Staff, Information, Authority, and Facilities (Edwards III, 1980). However, in the implementation of this spatial planning policy, according to the results of the research, it is seen that it is still lacking in terms of both the quantity and quality of the human resources who are in charge of monitoring space utilization, and the human resources who do have expertise are still limited.

In implementing this Kupang City spatial planning policy, of course, the Mayor of Kupang City collaborates with other related agencies such as the Kupang City Spatial Planning Coordination Agency, Kupang City Public Works and Spatial Planning Office, Kupang City Environment, and Sanitation Service, and Kupang City Civil Service Police Unit. When viewed from the information aspect, this is related to all processed data, which have information value owned by the Kupang City Regional Development Planning Agency. Related to this information resource, the Regional Development Planning Agency of Kupang City has all the information to support the implementation of this spatial planning policy. In addition, the authority is fully owned by the Kupang City Regional Development Planning Agency in implementing the Kupang City spatial planning. Facilities for implementing this policy have been supported by policy implementers by providing infrastructure, both buildings and supporting equipment.

The implementation of the spatial planning policy is seen from the resources. The resources to implement this policy are sufficiently available, but from the Human Resources aspect, it is still lacking to supervise and control violations of spatial planning and building layout.

**Disposition**

If a policy implementation is to be effective, policy implementers must not only know what to do but must also have the ability to implement it so that in practice, there is no bias.

The disposition or attitude of the implementer is needed in policy implementation. Even though communication and resources to support policy implementation are good, if the policy implementer has a bad attitude, then of course the policy implementation will not be effective. This statement is in line with the opinion expressed by Edward III (1980) that "The dispositions or attitudes of implementation are the third critical factor in our approach to the study of public policy implementation. If the implementation is to proceed effectively, not only must implementers know what to do and have the capability to do it, but they must also desire to carry out a policy. Most implementers can exercise considerable discretion in the implementation of policies. One of the reasons for this is their independence from their nominal superiors who formulate the policies. Another reason is the complexity of the policies themselves. How implementers exercise their direction, however, depends largely upon their dispositions toward the policies. Their attitudes, in turn, will be influenced by their view toward the policies per se and by how they see the policies affecting their organizational personal interest".

Dispositions can be measured from the Effects of Disposition (level of compliance with executors) and Incentives (Edward III, 1980). The implementation of spatial planning policies in Kupang City can be seen from these two aspects. The level of compliance of implementers in the implementation of the spatial planning policy in Kupang City generally has good characteristics, but there are still unscrupulous officers who violate the land-use change cases. The level of compliance of the implementers can also be seen from the sense of responsibility, commitment, and sincerity of the policy implementers in implementing this spatial planning policy.

Incentives are related to awards or rewards given to policy implementers in implementing spatial planning policies. This incentive has been regulated in Regional Regulation No. 18/2011 article 1 paragraph 68-69 which states that incentives are instruments or efforts to provide rewards for the implementation of activities that are in line with the spatial plan. According to research results, the Kupang City Government following applicable regulations has provided incentives for policy implementers, and vice versa, some disincentives are tools to prevent, limit growth, or reduce activities that are not in line with the spatial plan. Therefore, if an action violates or does not comply with the Kupang City spatial plan, sanctions will be imposed.

Thus, the implementation of the spatial planning policy is seen from the disposition factor. In general, the implementing apparatus of the policy has made efforts to implement and enforce this policy, but there are still people who violate it, resulting in violations of land-use change, thereby reducing water absorption in Kupang City.

### **Bureaucratic Structure**

Such complex policies require the cooperation of many people. When the bureaucratic structure is not conducive to the available policies, this will make resources ineffective and hinder the running of policies.

The bureaucratic structure is the last sub-variable that affects the success of policy implementation. The bureaucratic structure will provide an overview of the implementers of policies in exercising their authority as well as the division of labor so that there is no overlapping in the implementation of duties in implementing policies. This bureaucratic structure must of course be arranged in such a way that policy objectives are achieved effectively, as stated by Edwards III (1980) that "Policy implementers may know what to do and have sufficient desire and resources to do it, but they may still be hampered in implementation by the structures of the organizations in which they serve. Two prominent characteristics of bureaucracies are Standard Operating Procedures (SOPs) and Fragmentation the former implementers developed as an internal response to the limited time and resources of implementers and the desire for uniformity in the operation of complex and widely dispersed organizations; they often remain in force due to bureaucratic inertia".

Two aspects are used to measure this bureaucratic structure, namely Standard Operating Procedures (SOP) and Fragmentation (Edwards III, 1980). This SOP is related to the following work procedures, including personnel involved in implementing the policy. SOP on the one hand will assist in policy implementation if the SOP follows the changes that occur, but on the other hand, it will be the opposite if it is not adaptive to changes.

The Mayor of Kupang City and the Public Works and City Planning Agency of the Kupang City Regional Development Planning Agency in coordination with other Regional Work Units (SKPD) in the Kupang City area carry out the implementation of the spatial planning policy in Kupang City. Based on Regional Regulation No.13 / 2007 concerning the Establishment and Organizational Structure of the Kupang City Regional Office, the Kupang City Regional Development Planning Agency has the main task of carrying out some of the Regional Government affairs in the fields of public works, spatial planning, and housing based on the principles of autonomy and assistance.

In implementing this spatial planning policy, several RTBL documents have been compiled as well as the KRK Standard Operating Procedure (SOP) and the site plan legalization. However, there are still obstacles, namely the absence of a mayor regulation regarding the procedures for controlling spatial planning and buildings in Kupang City and procedures for controlling building violations. Also, there is no clarity on the authority regarding spatial planning and building control and control of buildings that violate it.

Fragmentation in the implementation of spatial planning policies in Kupang City will certainly have an impact on the successful implementation of this policy. The Mayor of Kupang delegated his authority to the Public Works and City Planning Agency and the Kupang City Regional Development Planning Agency. Of course, he did not implement it himself, but several related agencies were also there. Therefore, coordination between SKPD is needed. However, based on the research results, there is still a lack of coordination between SOPDs related to spatial and building control due to the absence of strong rules in conducting spatial planning and building control.

Thus, the implementation of the spatial planning policy in Kupang City in terms of the bureaucratic structure has formed a fairly good bureaucratic structure with the existence of SKPD which is authorized to implement this policy. But on the other hand, coordination between SKPDs must be improved and more emphasized by regulations to regulate the violation of spatial planning and building layout.

## 5. CONCLUSION

The mayor's policies in spatial planning in Kupang City have generally been implemented quite well, but several problems are still encountered in the implementation. The implementation of spatial planning policies in Kupang City seen from the aspect of communication, in principle, is that the Kupang City Government has socialized with the community regarding tare city spaces but the participation of the society in realizing this orderly space is still lacking. There are sufficient resources to implement this policy, but there is still a lack of human resources in quantity and quality to carry out supervision and control in spatial planning and building layout violations.

Meanwhile, from the disposition aspect, policy implementers have characteristics that are quite good for the successful implementation of this spatial planning policy, although there are still some cases of land conversion. The bureaucratic structure in the implementation of this policy also has a fairly strong basis with the issuance of the Kupang City Regulation on Detailed Spatial Planning in Kupang City 2011-2031 and other policies that also support spatial planning and buildings in Kupang City. However, on the other hand, improvements must be made in terms of regulations to be firmer in dealing with violations related to spatial planning and violations of buildings and spaces in Kupang City.

## LIMITATION AND FUTURE RESEARCH

This research focuses only on Mayor's Policy on Spatial Planning in Kupang City and this study does not include sufficient detailed data to describe the problem under study. Researchers suggest increasing the number of respondents from all parties involved to further clarify and deepen this study.

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**THE INFLUENCE OF ELECTRONIC WORD OF MOUTH (E-WOM) ON THE INSTAGRAM FOLLOWERS VISITING DECISIONS AT 9D CINEMA FANTASY KUPANG TRADE CENTER (KTC) KUPANG CITY**

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**Marla Frida Muskanan, Ronald P.C. Fanggal and Paulina Y. Amtiran**  
Management, Faculty of Economic and Business, Nusa Cendana University

**ABSTRACT**

*This study aims to determine how significant the influence of Electronic Word of Mouth (E-WOM) on the Instagram Followers Visiting Decisions at 9D Cinema Fantasy Selfie House Kupang Trade Center (KTC). The research method used in this study was carried out systematically based on the research objectives with a questionnaire method via a google form. The population in this study refers to the number of followers of the @maskermurah ktc Instagram account, which is 2856 people, this study took 100 people as the respondents. The analytical method used is random sampling, multiple regression analysis, F-test, and a t - test. The results of this study indicate that electronic word of mouth has a significant influence on visiting decisions, intensity has a significant influence on visiting decisions, valence of opinion has no significant influence on visiting decisions, content has a significant influence on visiting decisions, helping the company has a significant influence on visiting decisions. Electronic Word of Mouth consisting of Intensity, Valence Of Opinion, Content and Helping the Company simultaneously influence the decision to visit Instagram Followers 9D Cinema Fantasy Selfie House Kupang Trade Center (KTC) Kupang City. This shows that the more Electronic Word of Mouth (e-WOM) on Instagram social media has a significant influence on the decision to visit.*

*Keywords: Content, Electronic Word Of Mouth, Helping the Company, Intensity, Valence of Opinion, Visiting Decisions.*

**INTRODUCTION**

Technology is developing rapidly, especially with a vast global marketplace for trading in goods and services by the development of the internet. The internet has been adopted as an essential medium in many developed countries, by offering a variety of products in huge area coverage. This phenomenon guides companies to promote and improve the image of their products and services through a website.

Jansen (2009) quoted by Putra, Tanamal, & Mubaraq (2015) states that although it is similar to the form of word of mouth (WOM), e-WOM offers various ways to exchange information, many of them anonymously or in secret. The difference between WOM and e-WOM can be distinguished based on the media used. The use of traditional WOM is usually face to face (face to face), while the use of e-WOM is usually online through cyberspace (Lomi, Bessie & Kasim, 2016). From the various existing literature, e-WOM measurement can use various dimensions according to several theories from experts. In this study, researchers used four dimensions elaborated from two theories according to Jeong & Jang (2011) ; Goyette, Richard, Bergeron & Marticotte (2010), namely Intensity, Valence of Opinion, Content and Helping the Company.

Social media is a means for consumers to share text, image, audio, and video information with each other with companies, and vice versa (Kotler & Keller, 2016).

The widespread use of social media Instagram can be used as social media marketing, and has also been taken advantage of by local startups, one of which is 9D Cinema Fantasy Selfie House KTC Kupang. 9D Cinema Fantasy Selfie House KTC Kupang is one of the first local businesses to be present in Kupang City, East Nusa Tenggara, where on June 18 2019 at Grand Opening was held. From the results of the researchers' initial observations, the Rumah Selfie was targeted for millennials because they could take selfies at all the spots that had been provided. A part from Selfie House, there is also a playground for children, a 9D cinema and also a mini cafe.

Seeing the development of technology and the internet in Indonesia as well as the great opportunities for promotion, 9D Cinema Fantasy Selfie House KTC uses social media Instagram as a means of publication and promotion. Through the Instagram social media account, namely @ maskermurah ktc with a following of 2856 people and still growing as time goes by. This @ maskermurah ktc Instagram account was created with the aim of reposting consumer posts, or promotional information, and information on products and services offered by 9D Cinema Fantasy. In addition, the @ maskermurah ktc account can be a means or media to comment on promotions or products offered. Consumers can also send their photos to the @ maskermurah ktc Instagram account by tagging the photo by including the Instagram @ maskermurah ktc account and can also add a

location to the photo to be uploaded to then choose the best one to be uploaded to the Instagram account @ maskermurah ktc and then marked as and comments by other Instagram @ maskermurah ktc follower accounts.

The selection of two or more alternative types of purchasing decision choices is the purchase decision, which means that there must be several alternative choices so that someone can make a decision (Schiffman & Kanuk, 2009). Purchasing decisions that arise with consumers are the stages that consumers go through before a purchase decision occurs. Many Instagram users access the 9D Cinema Fantasy account page, upload, share or post a status that contains mentions of 9D Cinema Fantasy so that more people are exposed to information about 9D Cinema Fantasy. This can be one of the factors triggering consumer buying interest to decide to visiting the place.

In connection with the description above, researchers are interested in using one of the social media, namely Instagram as a tool to measure e-WOM towards visiting decisions because the use of Instagram is widely used in Indonesia, and the use of Instagram as a promotional medium for companies or business people becomes attractive because of the decision. Visiting a customer will be greatly influenced by comments and reviews from other consumers via Instagram social media. Researchers are interested in discussing the 9D Cinema Fantasy Selfie House because this place is the first time it has been established in Kupang City, and in just a few months its Instagram followers have reached thousands. With the existence of (e-WOM), consumers have made 9D Cinema Fantasy Selfie House a hot topic to be discussed in Instagram social media. Satisfied consumers will recommend 9D Cinema Fantasy by uploading photos, comments and giving likes on the Instagram account @ maskermurah ktc which in the end information about the place will spread throughout the community.

Based on this description, the researcher wants to know whether the dimensions of the Electronic Word of Mouth (Intensity, Valance of Opinion, Content and Helping the Company) can influence or not affect the Instagram Followers Visiting Decisions on a 9D Cinema Fantasy, and whether Instagram social media is one of the consumer interest in deciding to visit 9D Cinema Fantasy or other promotional media has become a trigger factor to encourage the visiting decisions.

## **LITERATURE REVIEW**

### **Marketing Management**

According to the American Marketing Association (AMA) in Kotler & Keller (2008) offers the following formal definition: marketing is an organizational function and a series of processes for creating, communicating, and providing value to customers and for managing customer relationships in a way that benefits the organization and its stakeholders.

As in accordance with to Kotler & Keller (2008) the series of tasks required for successful marketing management include developing marketing strategies and plans, capturing marketing understanding, dealing with customers, building strong brands, shaping market marketing, delivering and communicating value, and creating growth, long-term.

From this understanding it can be concluded that marketing in a company plays a very important role, because marketing is one of the activities carried out by individuals or groups to meet needs and desires by creating, exchanging offers, and to maintain the company's survival in obtaining profits.

### **Marketing Mix**

The marketing mix is a tool for marketers, which consists of various elements of a marketing program that must be taken into account in order to successfully implement the established marketing and positioning strategies (Lupiyoadi, 2011).

According to Kotler and Armstrong (2014) the marketing mix comprises of the multitude of things a company can do to impact the demand for its items, comprising of 4P, Product, Price, Place and Promotion.

1. A product, a blend of goods and services offered by the company to the objective market, including: assortment, quality, plan, highlights, brand name, and bundling.

Products are the whole concept of objects or processes that provide a number of benefits to consumers. Products in the restaurant business are very dependent on experience. Products can be in the form of a complete package consisting of food, beverages, services, atmosphere and comfort that satisfies the needs and desires of consumers and creates an unforgettable impression. Diners at restaurants pay for the total dining experience not just for the food. The level of restaurant products can be described in three levels, namely: the core product, the formal product, and the assessment product. Restaurant products can also be analyzed the same as other

products, for example: atmosphere, product development, product positioning, product life cycle. Make food products taste good and have a uniqueness so that they can penetrate the market. Good food will attract buyers to keep coming back and become loyal customers.

Meanwhile, unique means different in the form of presentation, modification of food, recipes, services, or anything that can attract the attention of buyers. In order for an ingredient to attract attention (looks unique) it must be processed and varied, so that various food products are obtained with attractive appearance, shape, texture, color, aroma and taste. To make such a product does not always have to use expensive basic materials. Other decisions regarding product policies that need attention are regarding the model, brand, label and packaging. For this reason, there are several possibilities, for example, making certain models to characterize part or all of the products marketed by the company.

The packaging strategy should be directed at creating additional benefits, for example, increasing the resilience of quality protection, having a promotional effect and so on. Meanwhile, decisions regarding labeling should clarify information to consumers, have a promotional effect and so on. Product attributes include:

- a. Brand, brand is a name, symbol or symbol, term, design which is expected to provide an identity and a preference to a competitor's product.
  - b. Packaging, packaging is a process related to the design of the container or packaging for a product.
  - c. Labeling, labeling is a part of a product that conveys information about the product and the seller. A label is also part of the packaging, and packaging is part of the product tag.
  - d. Complementary services.
  - e. Guarantee, is a promise that is the obligation of producers for their products to consumers.
2. Price is a measure of cash that should be paid by the customers to get an item, including: assortment, quality, plan, highlights, brand name, and bundling.

Location selection is the most expensive investment value, because the location can be said to determine whether or not visitors are crowded. Business locations that are on the side of the road or in a strategic place are enough to attract visitors to simply stop by and taste the dishes and concepts offered. Indeed, getting a strategic location is expensive. Location is an important factor in achieving the success of a restaurant, which concerns, among others, good visibility, easy access, convenience, curb side appeal, parking. The channel decision will affect two things, namely sales reach and cost. Each alternative channel chosen is clearly influenced by other elements in the company's marketing mix. For example, the goals to be achieved, the characteristics of the target market and the characteristics of the products offered. Assessment of channel alternatives is based on economic, effectiveness and control criteria.

3. Place, the activities of the company that make items accessible to target customers include: Location, dissemination channels, supplies, transportation and coordinations.

Small steps in the form of promotion in various ways to achieve unattainable marketing targets. Promotion is an activity carried out by restaurants to find consumers, not only to come once, but also consumers who will make repeat purchases (customers). The purpose of promotion is to increase awareness, increase consumer perception, attract first-time buyers, achieve a higher percentage of repeat consumers, create brand loyalty, increase average check, increase sales at certain foods or special times, and introduce new menus.

Promotional methods that can be done include the mouth by mouth promotion, participating in certain events, holding special discounts at certain times, giving customers a member card. It can also be done through promotions such as billboards, inserts in newspapers and mass media or using banners. Besides that, it creates a unique restaurant concept and is liked by customers. The marketing mix policy will certainly be more successful if what has been programmed is communicated in a good order. Communicating the company's program to the consumer community can be done with four variables, namely:

- a. Advertising ; A form of non-personal presentation and promotion of ideas, goods, and services paid for by certain sponsors.
- b. Personal Selling ; Oral presentation in a conversation with one or more prospective buyers aimed at creating sales.
- c. Publicity ; Driving non-personal demand for a product, service or idea using commercial news in the mass media and sponsors are not charged a direct fee.

- d. Publicity ; Driving non-personal demand for a product, service or idea using commercial news in the mass media and sponsors are not charged a direct fee.
  - e. Sales Promotion ; Marketing activities other than personal selling, advertising and publicity that encourage consumer buying and effectiveness.
4. Promotion implies activities that pass on the advantages of the item and convince customers to get it, including: Advertising and Sales Promotion.

Price is also an important consideration in choosing a restaurant. The factors that influence the price applied in a restaurant are: the relationship between supply and demand, decreased customer loyalty, sales mix, competitive prices, overhead costs, psychological aspects, the need to make a profit. The way to determine the right price is to look at the selling price of similar competitors, of course, with roughly the same quality and portion of food. Then, set the selling price of the food product a little cheaper than the selling price of similar competitor products so that consumers want to try the food products offered at the restaurant. But the selling price may not always be lower than similar competitors, if the restaurant has special characteristics that attract consumers. So that the restaurant has more value than similar competitor restaurants.

Decisions about selling prices have broad implications for both companies and consumers. Prices that are too high can lead to the possibility of decreasing competitiveness. Conversely, low prices can cause losses, especially when costs increase. This will especially be a problem for start-up companies. The goal will greatly affect the level of the selling price to be set by the company. The objectives of determining the selling price are:

- a. For Survival ; if the company is in a condition of facing very intense competition, shifting consumer desires for unemployed capacity, then what the company wants is how to survive in conditions to continue to exist in its business world, the company will determine selling price can cover fixed and variable only.
- b. Market Penetration ; if the company wants to strengthen the market share of the products it markets, the company will set a low selling price. With the policy of low selling prices, it is expected that buyers will be very sensitive to prices, the cost per unit will be smaller along with the increasing sales and will push competitors.
- c. Maximize Profits in the Short Term If the company determines to get the highest possible profit, it will set a high selling price.
- d. Get Money Fast as possible. If the company is in financial trouble, it will set a low selling price in order to get cash quickly.
- e. For Excellence In Product Quality A company may aim that the quality of the products it markets is always the best. For that we need continuous research and development.

From the above definition, it very well may be reasoned that the marketing mix has components that are extremely influential in deals on the grounds that these components can impact purchaser interest in settling purchasing decisions.

### **Sales Promotion**

Sales promotion, which is the center element in a marketing campaign, comprises of an assortment of impetus instruments, generally short-term, that is, intended to stimulate a quicker or bigger purchase of a specific item or service by a customer or commerce (Kotler & Keller, 2018).

As indicated by Kotler & Keller (2018) Ads offer motivation to purchase, while sales promotions offer an impetus to purchase. Sales promotions include tools for consumer promotion (tests, coupons, money discount offers, rebates, charges, gifts, support grants, free preliminaries, guarantees, related promotions, cross promotions, point of buy displays, and exhibitions); commerce promotions (discounts, impetus for advertising and shows and gifts); business and sales force advancement (career expos and shows, salesperson contests, and special advertisements).

### **Electronic Word of Mouth (e-WOM)**

According to Kotler & Keller (2009) word of mouth marketing is communication, oral, written, and electronic between Public that relates to excellence or experience of buying or using products or services. As per Litvin et al. (2008), the Electronic Word of Mouth is all forms of informal information, communication aimed at consumers through internet-based technology identified by utilization or attributes of specific goods and services. According to Goyette et al. (2010) divided the Electronic Word of Mouth into three dimensions, namely:

1. Intensity is e-WOM is the number of assessments composed of buyers on a social networking site. The pointers of force are ; a) Frequency of accessing data from social networking sites ; b) Frequency of cooperation with users of social networking sites ; c) The quantity of audits composed by users of social networking sites.
2. Valence of Opinion is positive consumer interest in a product, service and brand, based on the opinions and recommendations of other consumers. The indicators of Valence of Opinion include : a) Positive comments from users of social networking sites and b) Recommendations from users of social networking sites.
3. Content is information from social networking sites related to products and services. Markers of Content include ; a) Information on spot variations that exist in a place ; b) Quality information and ; c) Price information.
4. Helping the Company is the result of customer satisfaction with the product and the subsequent desire to help the company.

In this study, researchers only used 4 dimensions that have been elaborated from the two theories previously described by Jeong and Jang (2011) and Goyette et al. (2010) namely Intensity, Valence of Opinion, Content and Helping the Company. This is the reason of the measurements that have been explained are viable with the Electronic Word of Mouth (e-WOM) research on the Instagram Followers Visiting Decisions at 9D Cinema Fantasy Rumah Selfie KTC Kupang City.

### **Visiting Decision / Purchase Decision**

According to Kotler, et al., (2014) "Consumer purchasing behavior is the buying behavior of the individual that means the final consumer who buys goods and services for personal consumption". So behavior here means consumers about thinking, considerations, actions and feelings customer at the time of choosing a product to satisfy needs and his wish. As in accordance with to Schiffman & Kanuk (2007) the decision is a selection of two or more of the alternatives. In this case, an alternative choice must be available when process determination decisions are made. Alternative options used as a comparison or reference when the decision will be determined.

The purchase decision as from Kotler & Armstrong (2007) is a phase in the purchaser's decision-making where buyers really purchase. To have the option to impact consumer purchasing decisions, companies should comprehend the stages a buyer goes through in making a buy. The phases of a buy as from Kotler (2007) are as follows:

1. Problem Introduction / Need Introduction. The purchasing interaction begins when the purchaser perceives an issue or need, this need can be set off by inside and outside improvements.
2. Consumer information search. Buyer's decision-making process, where buyers are moved to look for extra data, shoppers may just expand consideration or may likewise look for data actionable. Wellsprings of customer data are separated into four gatherings, specifically ; a) Personal sources: family, friends, neighbors, acquaintances ; b) Commercial sources: publicizing, sales staff, bundling ; c) General sources: broad communications and customer associations ; d) Source of experience: have handled, used the item.
3. Evaluation of alternatives. The purchasing decision process in which consumers use data to assess different elective choices inside various decisions. Assessments frequently reflect convictions and perspectives. Through acting and learning, both of them, then influence consumer buying behavior.
4. Determine the purchase. At this stage, the customer really purchases the item. The customer's purchase decision is to purchase the most favored property, yet two elements can emerge between the goal to purchase and the decision to purchase. The primary factor is the attitudes of others, because consumers may form purchasing tendencies based on expected opinions. The second factor is unanticipated situations that can arise and change purchase intentions.
5. Post purchase behavior. The buying process where consumers make a further move in the wake of making a buy dependent on their fulfillment or disappointment with the item.

### **Social Media Instagram**

Social media is an online media where users can easily participate, share, and create content including blogs, social networks or social networks, wikis, forums and virtual worlds. Blogs, social networks and wikis are perhaps the most common forms of social media used by people around the world (Afriani, 2011).

Through Instagram, goods / services products are offered by uploading short photos or videos, or using hashtags, namely labels / tags in the form of a word prefixed with a marked symbol (#) which makes it easier for users to find scattered photos with certain labels, which means that tagging our photos is an effective way to get new followers and share with more people (Atmoko, 2012).

**Electronic Word of Mouth Relationship and Visiting Decisions**

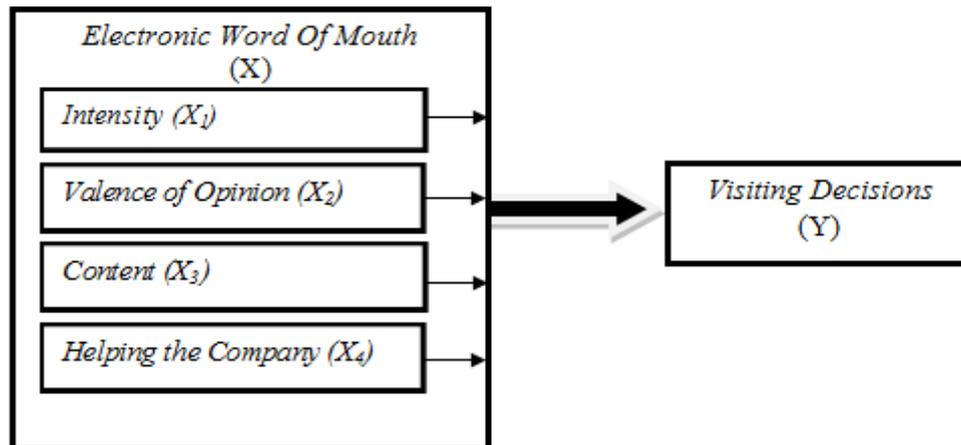
According to Thureau et al., (2004), Electronic Word of Mouth (e-WOM) is a form of marketing communication that contains positive or negative statements made by potential consumers, as well as former consumers about a product, which is available to many people through internet social media. Electronic Word of Mouth (e-WOM) is a marketing communication that is carried out online through Internet social media (Schiffman & Kanuk in Haekal, 2016).

In the research, Zhang et al, (2010) quoted by Sari (2012), it is that when there is a trade of data through the Electronic Word of Mouth, customers will assess the product. According to Sari (2012), the Electronic Word of Mouth (e-WOM) has a positive influence on consumer purchase interest. In addition, Thureau, Hennig, Gwinner, Wals & Gremier (2004) said that this new type of WOM (e-WOM) has become a significant factor in molding other purchaser behavior, for example in a sharing review platform or community, undoubtedly able to influence consumer buying interest.

From the above opinion, it can be concluded that the Electronic Word, of which is carried out between consumers affects each other because the Electronic Word of Mouth is widely used by consumers to seek reviews or opinions about a product through websites and social media. Positive and negative opinions through social media and certain sites can influence potential customers to decide whether to visiting a place or not.

**RESEARCH FRAMEWORK**

The conceptual framework is a conceptual model of how to relate to various factors that have been identified as problems in research. The framework that can be proposed is as follows: Electronic Word of Mouth consisting of Intensity, Valence of Opinion, Content and Helping the Company is used as an independent variable (X), while the visiting decisions is used as the dependent variable (Y) which is presented in the following figure 1 :



**Figure 1.** Research Framework

**RESEARCH HYPOTHESIS**

Based on the formulation of the problem, research objectives and theoretical studies that have been put forward, the research hypothesis can be formulated as follows:

Ho: Electronic Word of Mouth (X) which consists of Intensity, Valence of Opinion, Content, and Helping the Company simultaneously and partially has no significant effect on visiting decisions.

Ha: Electronic Word of Mouth (X) which consists of Intensity, Valence of Opinion, Content and Helping the Company simultaneously and partially affects the Visiting Decision (Y).

**RESEARCH METHODS**

The population in this study was the Instagram followers of 9D Cinema Fantasy Rumah Selfie KTC Kupang City totaling 2856 followers. This study uses a purposive sampling technique. These considerations are adjusted to the criteria found in the population, namely Instagram followers who have been exposed to information about 9D Cinema Fantasy Rumah Selfie. In this study, sampling was adjusted to the Slovin formula (Indrawan & Yaniawati, 2014) totaling 100 respondents.

**Data Collection Technique**

Data collection in this study was carried out by ; a) Questionnaire: In this study, researchers will send a questionnaire to 9D Cinema Fantasy Instagram Followers via Direct Message (DM) ; b) Observation: direct observation of the object to be studied, namely 9D Cinema Fantasy ; c) Literature study and internet surfing ; d) Documentation. In the form of photos, as well as screenshots through browsing or through social media accounts related to the object of research.

**Data Analysis Technique**

The data analysis technique used in this study is to use multiple regression analysis with the formulation :

$$Y = a + bX_1 + bX_2 + bX_3 + bX_4 + e$$

**RESULT AND DISCUSSION**

**Normality Test**

Normality test was conducted to determine the data that had been collected was normally distributed. If the significant value is greater than 5%, it can be concluded that the data used are normally distributed and if the significant value is less than 5%, it can be concluded that the data is not normally distributed. Normality test results can be seen in table 1 ;

**Table 1: Normality Test**

		Unstandardized Residual
N		100
	Mean	,0000000
Normal Parameters <sup>a,b</sup>	Std.	5,76448414
	Deviation	
	Absolute	,111
Most Extreme Differences	Positive	,065
	Negative	-,111
Kolmogorov-Smirnov Z		1,114
Asymp. Sig. (2-tailed)		,167

*Source:* Data Analysis,2020

Based on the test results presented in table 1.1, it is known that the significant value of 0.167 is greater than 0.05, which means that the data used is spread normally.

**Multicollinearity Test**

Multicollinearity is a linear relationship between the independent variables X in the multiple regression model. Multicollinearity detection can be seen through the value of variance inflation factors (VIF). The test criteria is that if the VIF value is less than 10 then there is no multicollinearity between the independent variables.

**Table 2. Multicollinearity Test**

Model	Collinearity Statistics		Conclusion
	Tolerance	VIF	
Intensity (X <sub>1</sub> )	,521	1,921	There is no multicollinearity
Valence of Opinion (X <sub>2</sub> )	,417	2,396	
Content (X <sub>3</sub> )	,429	2,333	
Helping the Company (X <sub>4</sub> )	,367	2,722	

*Source:* Data Analysis, 2020

Based on table 1.2 above, it can be seen that there is no multicollinearity because it has a tolerance above 0.1 and a VIF below 10.

**Heteroskedasticity Test**

Heteroscedasticity test is done by regressing the absolute residual value with the independent variables in the model. Heteroscedasticity test can be seen in figure 2, below :

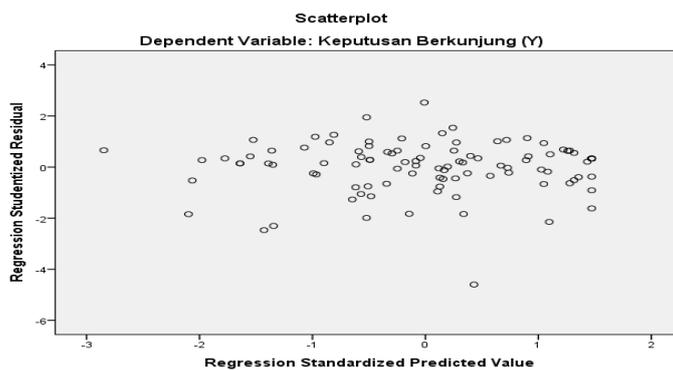


Figure 2. Heteroscedasticity Test

Figure 2.2 shows the results of the heteroscedasticity test with the scatter plot method showing that the dots do not form a certain pattern such as gathering in the middle of a narrowing or there is no clear pattern so there is no heteroscedasticity.

**Multiple Linear Regression Analysis**

The results of multiple linear regression analysis using the output of the SPSS 21 application can be seen in table 1.3 below:

Table 3. Multiple Regression Analysis Results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	,792	3,811		,208	,836
Intensity (X <sub>1</sub> )	1,699	,375	,370	4,528	,000
Valence of Opinion (X <sub>2</sub> )	,312	,422	,067	,740	,461
Content (X <sub>3</sub> )	1,312	,392	,301	3,343	,001
Helping the Company(X <sub>4</sub> )	1,247	,589	,206	2,117	,037

Source: Data Analysis, 2020

Table 3 regression coefficients show numbers that can form equations in multiple regression models, these equations can be seen below:

$$Y = 0,792 + 1,699X_1 + 0,312X_2 + 1,312X_3 + 1,247X_4$$

The multiple regression model equation above shows that the independent variables analyzed, namely the variables Intensity (X<sub>1</sub>), Valence of Opinion (X<sub>2</sub>), Content (X<sub>3</sub>), Helping the Company (X<sub>4</sub>), has a positive effect on the dependent variable (Y), namely the Visiting Decisions.

**Determinant Coefficient (R<sup>2</sup>)**

The results of the data analysis show in table 4 that the value of the coefficient of determination (R<sup>2</sup>) between the independent variable and the dependent variable in this study is 0,656. This means that 65% of e-WOM is influenced by varying intensity, valence of opinion, content and helping the company.

Table 4. Determinant Coefficient

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,819 <sup>a</sup>	,670	,656	5,73456

Source: Data Analysis, 2020

**Hypothesis Testing**

**a. t Test**

Table 5. t Test

Hypothesis	Dimentions	t value	Sig.	Informatin
Ha <sub>1</sub>	Intensity	4,528	0,000	Accepted
Ha <sub>2</sub>	Valence of Opinion	0,740	0,461	Rejected
Ha <sub>3</sub>	Content	3,343	0,001	Accepted
Ha <sub>4</sub>	Helping the Company	2,117	0,037	Accepted

Source: Data Analysis, 2020

Based on table 5, the dimension of Intensity ( $X_1$ ) shows the t-count value of 4.528. The Intensity dimension has a significant value of  $0.000 < 0.05$ . Based on these results  $Ha_1$  is accepted, so it can be concluded that there is a significant influence of the Intensity dimension on the Instagram Followers Visiting Decisions to the 9D Cinema Fantasy Selfie House KTC Kupang City.

The dimension of Valence of Opinion ( $X_2$ ) shows the t-count value of 0.740. The dimension of Valence of Opinion has a significant value of  $0.461 > 0.05$ . Based on these results  $Ha_2$  is rejected, so it can be concluded that there is no significant effect of the Valence of Opinion dimension on the Instagram Followers Visiting Decisions to 9D Cinema Fantasy Selfie House KTC Kupang City.

The Content dimension ( $X_3$ ) shows the t-count value of 3.343. The Content dimension has a significant value of  $0.001 < 0.05$ . Based on these results  $Ha_3$  is accepted, so it can be concluded that there is a significant influence of the Content dimension on the Instagram Followers Visiting Decisions to the 9D Cinema Fantasy Selfie House KTC Kupang City.

The dimensions of Helping the Company ( $X_4$ ) show the t-count value of 2.117. The Helping the Company dimension has a significant value of  $0.037 < 0.05$ . Based on these results  $Ha_4$  is accepted, so it can be concluded that there is a significant influence of the Helping the Company dimension on the Instagram Followers Visiting Decisions to the 9D Cinema Fantasy Selfie House KTC Kupang City.

**b. F Test**

The limit of the significance value used to test the hypothesis is 0.05. If the significant value is below 0.05 then  $H_0$  is rejected, on the contrary, if the significant value is above 0.05 then  $H_0$  is accepted.

**Table 6. F Test**

Model	Sum of Squares	Df	Mean Square	F	,000 <sup>b</sup>
Regression	6348,021	4	1587,005	48,259	,000 <sup>b</sup>
Residual	3124,089	95	32,885		
Total	9472,110	99			

*Source:* Data Analysis, 2020

Based on the research results in table 6 it can be seen that the significance value shows the value, 000 which means that  $H_0$  is rejected and  $H_a$  is accepted. It can be concluded that there is an influence of Electronic Word of Mouth on the Instagram Followers Visiting Decisions.

**CONCLUSION**

Based on the research results, the following conclusions can be drawn:

1. Electronic Word of Mouth which consists of Intensity, Valence Of Opinion, Content and Helping the Company simultaneously influences the Instagram Followers Visiting Decisions at 9D Cinema Fantasy Selfie House KTC Kupang City. This shows that the more Electronic Word of Mouth (e-WOM) on Instagram social media has a significant influence on visiting decisions.
2. Intensity, Content, and Helping the Company partially significant effect on the Instagram Followers Visiting Decisions 9D Cinema Fantasy Selfie House KTC Kupang City.
3. Valence of opinion does not have a partial significant effect on the Instagram Followers Visiting Decisions 9D Cinema Fantasy Selfie House KTC Kupang City.

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**TOTAL QUALITY MANAGEMENT (TQM) AS A SIGNIFICANT ISSUE IN THE CONTEMPORARY STRATEGIC MANAGEMENT****<sup>1</sup>Dr. Satish Kumar and <sup>2</sup>Ms. Neha Dubey**<sup>1</sup>Associate Professor and <sup>2</sup>Assistant Professor, Parul Institute of Social Work, Parul University, Vadodara**ABSTRACT**

*The benefit of TQM is in its ability to provide a competitive edge for a company in the highly turbulent modern business environment under the conditions of globalization. TQM is also capable of increasing product quality and customer satisfaction due to increased customer focus, which adds exceptional value to it in the modern business settings.*

*The definition of TQM is vary from individual to individual but from organization perspective it mainly focus on customers satisfaction which leads o overall growth of the organization. TQM enables the organization to acquire effectiveness, flexibility, and competitiveness in operations; it also assists in reduction of waste due to the emphasis on prevention efforts instead of detection and correction of mistakes (Rawlins 19-20) which may vary in manufacturing and service sector.*

*The TQM approach based on the assumption that a company can survive only due to continuous improvement of quality. Therefore, the TQM approach to the design of the organizational processes is focused on quality improvement, improvement of customer orientation and satisfaction, reduction of costs and throughput periods. Total Quality Management (TQM) is a comparatively new concept in the area of strategic management. The TQM practices always include the top management commitment to the integration of TQM across all organizational levels. Along with long term commitment of the organization and involvement of each and every member of the organization.*

*In order to survive in the competitive business world it is essential for all the organization to give much emphasis on training an education which will increase the human potential of the organization; continuous improvement and innovation will become the benchmarks of TQM integration in the organization.*

*Keywords: TQM, Strategic Management, Organization*

**INTRODUCTION**

TQM may be translated as follows:

- Total – Everything (Each person in the company is involved for a broadly understood quality (if possible also the customers and suppliers).
- Quality – Degree of Excellence (Requirements of customers are fully met).
- Management – Art, act or way of organizing, controlling, planning, and directing to achieve certain goals. (The management of each level, especially the highest one, supports and actively participated in the implementation of the pro-quality culture in the company.

**Definition of Quality:** Different people interpret quality differently. Few can define quality in measurable terms that can be proved operationalized. When asked what differentiates their product or service;

- The banker will answer” service”
- The healthcare worker will answer “quality health care”
- The hotel employee will answer “customer satisfaction”
- The manufacturer will simply answer “quality product”

**Five Approaches of Defining Quality**

- ✓ Harvard professor David Garvin, in his book Managing Quality summarized five principal approaches to define quality.
- ✓ Transcendent
- ✓ Product based
- ✓ User based
- ✓ Manufacturing based

✓ Value based

**Transcendental View**

- Those who hold the transcendental view would say “I can’t define it, but I know it when I see it”
- Advertisers are fond of promoting products in these terms.
- “Where shopping is a pleasure” (supermarket). “We love to fly and it shows” (airline).
- Television and print media are awash with such indefinable claims.
- Quality is difficult to define or to operationalize.

**Product Based**

- Quality is viewed as a quantifiable or measurable characteristic or attribute. For example durability or reliability can be measured and the engineer can design to that benchmark.
- Quality is determined objectively.
- Although this approach has many benefits, it has limitation as well. Where quality is based on individual taste or preference, the benchmark for measurement may be misleading.

**User Based**

It is based on idea that quality is an individual matter and products that best satisfy their preferences are those with the highest quality. This is rational approach but leads to two problems;

- Consumer preference vary widely and it is difficult to aggregate these preferences into products with wide appeal. This leads to the choice between a niche strategy or a market aggregation approach which tries to identify those product attributes that meet the needs of the largest number of consumers.
- Another problem concerns the answer to the question “Are quality and customer satisfaction the same?” the answer is probably not.

**Manufacturing Based**

- Manufacturing-based definitions are concerned primarily with engineering and manufacturing practices and use the universal definition of “conformance to requirements”. Requirements or specifications are established by design and any deviation implies a reduction in quality. The concept applies to services as well as product. Excellence in quality is not necessarily in the eye of the beholder but rather in the standards set by the organization.
- This approach has the serious weakness. The consumer’s perception of quality is equated with conformance and hence is internally focused.

**Value Based**

- It is defined in term of costs and prices as well as number of other attributes. Thus, the consumer’s purchased decision is based on quality at an acceptable price. This approach is reflected in the popular Consumer Reports magazine which ranks products and services based on two criteria: Quality and Value.

**Evolution of Quality Concepts**

1) Fitness to standard: A product is of quality if it is what it is supposed to be.

- Definition: conformance to the specifications: The quality is checked by comparison between the output and the specifications.
- Methods: - Standardization; Statistical quality control; Inspection.
- Drawbacks: - Inspectors are "the enemy"; Inspections do not add any value; - Conformance to specifications does not mean conformance to needs.

2) Fitness of use: A product is of quality if it performs as expected not as specified.

- The difference between the intended use of a product (its specification) and its real use.
- Definition: Conformance to the expected use
- Note that the fitness of use is difficult to reach since this use may vary over customers and time.
- Methods: market research / contact: Added the world of marketing. The only way is to ask the consumer.
- Drawbacks: - Inspectors are "the enemy"- Inspections do not add any.

- Fitness of use requires fitness to the new specifications and therefore also requires inspections.
- Higher quality implies better inspection and therefore higher costs. Too large inspection costs could also be dangerous.
- The answer is then Instead of "inspecting" the quality of the product, the focus came on "building" the quality in the product.

## 2) Fitness of Cost:

- High quality in the eye of the users but now at low or reasonable cost.
- Definition: conformance to the expected use and to the expected price.
- To reach this goal you need to reduce the variability of the processes so that no products have to be discarded (and therefore none need to be checked).
- The only way of reaching this goal is to control the processes and not the products.
- Methods: Statistical quality control (SQC) - Stochastic process control (SPC);- Providing feedback at each step; Promote participation of the workers in the design and improvement;
- SPC is a technique aiming at controlling the process by which products are made. The aim is to detect any disfunctioning of the process.
- Worker should provide some feedback on the work.
- The goal is first to detect any mistake as quickly as possible and second to allow some learning to take place.

Drawbacks: - everybody can copy

## Differences between Manufacturing and Service Organizations.

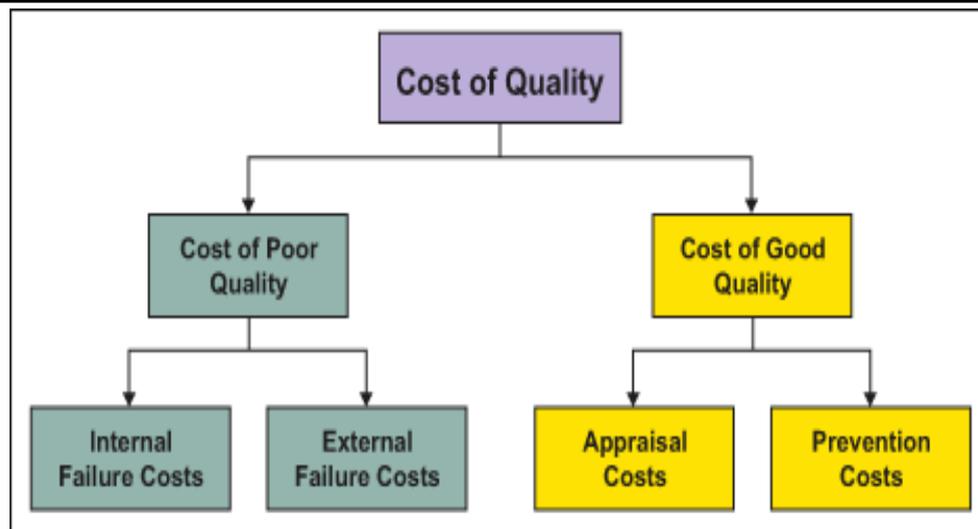
- Manufacturing organizations produce a tangible product that can be seen, touched, and directly measured. Examples include cars, CD players, clothes computers, and food items.
- Therefore, quality definitions in manufacturing usually focus on tangible product features.

The most common quality definition in manufacturing:

- Conformance: The degree to which a product characteristic meets preset standards.
- Performance—such as acceleration of a vehicle;
- Reliability—The product will function as expected without failure;
- Features—the extras that are included beyond the basic characteristics
- Durability—expected operational life of the product;
- Serviceability—how readily a product can be repaired.
- The relative importance of these definitions is based on the preferences of each individual customer. It is easy to see how different customers can have different definitions in mind when they speak of high product quality.

## Service Organization

- Service organizations produce a product that is intangible.
- The complete product cannot be seen or touched. Rather, it is experienced.
- Examples include delivery of health care, experience of staying at a vacation resort, and learning at a university. The intangible nature of the product makes defining quality difficult.
- Since a service is experienced, perceptions can be highly subjective. and quality of services is often defined by perceptual factors.
- These include responsiveness to customer needs, courtesy and friendliness of staff, promptness in resolving complaints, and atmosphere, time—the amount of time a customer has to wait for the service; and consistency—the degree to which the service is the same each time.



### Cost of Quality

- Can be divided into two categories.
- The first category consists of costs necessary for achieving high quality, which are called Quality Control Costs.
- Prevention costs 2. Appraisal costs.
- The second category consists of the cost consequences of poor quality, which are called Quality failure costs.
- External failure costs and internal failure costs.
- The first two costs are incurred in the hope of preventing the second two.

### Prevention Costs

- **Are all costs incurred in the process of preventing poor quality from occurring.**
- They include quality planning costs, such as the costs of developing and implementing a quality plan. The costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications.
- Employee training in quality measurement is included as part of this cost, as well as the costs of maintaining records of information and data related to quality.

### Appraisal costs

- **Are incurred in the process of uncovering defects.**
- **They include the** cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. The costs of worker time spent measuring quality and the cost of equipment used for quality appraisal.

### Quality Failure Costs

- Internal failure costs: are associated with discovering poor product quality before the product reaches the customer site.
- One type of internal failure cost is rework, which is the cost of correcting the defective item.
- Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called scrap, and its costs include all the material, labor, and machine cost spent in producing the defective product.

### External Failure Costs

- Are associated with quality problems that occur at the customer site.
- These costs can be particularly damaging because customer faith and loyalty can be difficult to regain.
- They include everything from customer complaints, product returns, and repairs, to warranty claims, recalls, and even litigation costs resulting from product liability issues.
- A final component of this cost is lost sales and lost customers.

- Examples include auto manufacturers whose products have been recalled due to major malfunctions such as problematic braking systems and airlines that have experienced a crash with many fatalities. External failure can sometimes put a company out of business almost overnight.
- Companies that consider quality important invest heavily in prevention and appraisal costs in order to prevent internal and external failure costs. The earlier defects are found, the less costly they are to correct. For example, detecting and correcting defects during product design and product production is considerably less expensive than when the defects are found at the customer site.
- External failure costs tend to be particularly high for service organizations. The reason is that with a service the customer spends much time in the service delivery system, and there are fewer opportunities to correct defects than there are in manufacturing. Examples of external failure in services include an airline that has overbooked flights, long delays in airline service, and lost luggage.

**Effects of Poor Quality**

- Low customer satisfaction
- Low productivity, sales & profit
- Low morale of workforce
- More re-work, material & labour costs
- High inspection costs
- Delay in shipping
- High repair costs
- Higher inventory costs
- **Greater waste of material**
- **Evaluation of business parameters**

<b>Business parameter</b>	<b>Taiwan Mean</b>	<b>Rank</b>	<b>Japan Mean</b>	<b>Rank</b>	<b>Korea Mean</b>	<b>Rank</b>
Market price	4.11	5	4.20	4	4.08	5
Product quality	4.72	1	4.88	1	4.56	1
Delivery	3.98	7	4.48	2	4.32	3
Advertising	3.00	9	3.20	9	2.89	9
Service before sale	4.02	6	3.56	8	3.27	8
Service after sale	4.49	4	4.20	4	4.00	6
Assortment	3.94	8	3.68	7	3.73	7
Warranty	4.68	2	3.80	6	4.38	2
Handling of complaints	4.55	3	4.48	2	4.21	4

**Basic Concepts of TQM**

- Customer Focus
- Continuous Process Improvement - Kaizen
- Employee Empowerment – Everyone is responsible for quality
- Quality is free - focus on defect prevention rather than defect detection for it is always cheaper to do it right the first time
- Customer-Supplier Partnerships
- Management by fact. By numbers. By data – Balanced scoreboard (financial, customer, process, learning)

**What Is TQM?**

TQM is the integration of all functions and processes within an organization in order to achieve continuous improvement of the quality of goods and services. The goal is customer satisfaction.

The essence of Total Quality Management is a common sense dedication to understanding what the customer wants and then using people and science to set up systems to deliver products and services that delight the customer.

**Definition:**

- Definition: TQM is a management philosophy, a continuous improvement approach to doing business through a new management model.
- TQM is a comprehensive management system which:
  - ✓ Focuses on meeting owners’/customers’ needs, by providing quality services at a reasonable cost.
  - ✓ Focuses on continuous improvement.
  - ✓ Recognizes role of everyone in the organization.
  - ✓ Focuses on the way tasks are accomplished.
  - ✓ Emphasizes teamwork.

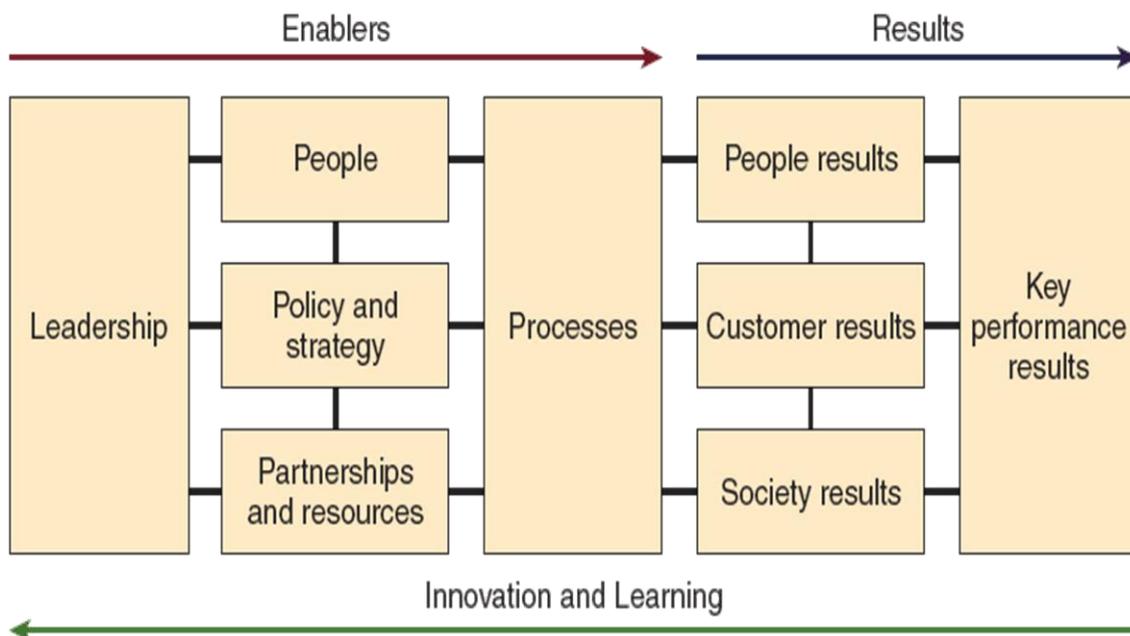
**Elements of TQM**

- Leadership: Top management vision, planning and support.
- Employee involvement: All employees assume responsibility for the quality of their work.
- Product/Process Excellence: Involves the process for continuous improvement.
- Continuous Improvement
  - ✓ A concept that recognizes that quality improvement is a journey with no end and that there is a need for continually looking for new approaches for improving quality.
  - Customer Focus on “Fitness for Use”
    - ✓ Design quality: Specific characteristics of a product that determine its value in the marketplace.
    - ✓ Conformance quality: The degree to which a product meets its design specifications.

**What’s The Goal of TQM?**

“Do the right things **right** the first time, every time.”

Overview of Excellence Model

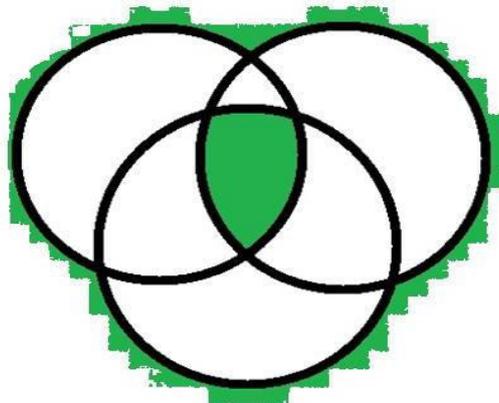


<b>Traditional Approach</b>	<b>Continuous Improvement</b>
<ul style="list-style-type: none"> <li>■ Market-share focus</li> <li>■ Individuals</li> <li>■ Focus on ‘who’ and ‘why’</li> <li>■ Short-term focus</li> <li>■ Product focus</li> <li>■ Innovation</li> <li>■ Fire fighting</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer focus</li> <li>■ Cross-functional teams</li> <li>■ Focus on “what” and “how”</li> <li>■ Long-term focus</li> <li>■ Continuous improvement</li> <li>■ Process improvement focus</li> <li>■ Incremental improvements</li> <li>■ Problem solving</li> </ul>

**TQ: Transforming an Organization**

<b>From</b>	<b>To</b>
Motivation through fear and loyalty	Motivation through shared vision
Attitude: “It’s their problem”	Ownership of every problem affecting the customer
Attitude: “the way we’ve always done it”	Continuous improvement
Decisions based on assumptions/ judgment calls.	Decisions based on data and facts
Everything begins and ends with management	Everything begins and ends with customers
Crisis management and recovery	Doing it right the first time
Crisis management and recovery	Choosing scientific AND

**Customer Satisfaction: Three Part System**



- ✓ Human Resource Management
- ✓ Customer Expectations
- ✓ Company Operations (Processes)
- ✓ Customer Satisfaction

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**CLOUD USAGE AUTHENTICATION SCENARIOS BASED API ACCESS**

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**Aakib Jawed Khan and Shabana Mehfuz**

Department of Electrical Engineering, Jamia Millia Islamia, New Delhi-110025, India

**ABSTRACT**

*Cloud computing (CC) belongs to a set of policies, protocols, technologies through which one can access shared resources such as storage, applications, networks and services at relatively low cost. To make the concept simpler if you are a Gmail, Facebook, snap chat, drop box, or any other online service you belong to a cloud user. Despite the tremendous advantages, one big threat which must be concerned is data security in the cloud. There is a dozen of threats we are being exposed while availing cloud services. Insufficient identity and access management, insecure interfaces and API's, hijacking, advanced persistent threats, data threats and much other need to concern before using cloud platform. The services under cloud computing spreads across three categories namely IaaS, PaaS, SaaS. Cloud uses private, Public and hybrid models for the deployment of cloud services. The working scenario of cloud services are user friendly. Resources are ordered and accounts are managed through browser-based dashboards. Some uses rest API's and command line interfaces to offer multiple options.*

*Keywords: Cloud Computing, Cloud Services, API, PAM.*

**BACKGROUND TO PROBLEM**

Most cloud inferences in the present climate provide APIs as a means of management and interaction of the inferences. However, this raise concerns in terms of susceptibility of the cloud server in respect to encryption, activity monitoring and authentication (Allen & Overy, 2015). It is further noted that the multitenancy in cloud computing raises concerns for increased system vulnerabilities, even though this aspect is managed amongst other IT needs of the companies. Even as organizations evolve their understanding and application of computing servers and software, the development of awareness and technical skills is also raised in malicious insiders and hijackers. This in turn raises concerns for cyber-attacks and advanced persistent threats (APTs), through the means of spear phishing, malware loaded USB drives, compromised third-party networks and direct attacks amongst others (Barthelus, 2016).

Other threats in this respect include direct attacks and possible loss of all data, inability to access the scope of infiltration through internal stakeholders in respect to data manipulation and stealing, DoS attacks and service abuse. It is reflected that the premise of cloud computing is sharing of technology to increase innovation, overcome infrastructural limitations and facilitate growth through increased server interaction. However, this sharing also raises concerns in respect to system over-ride and shared business risks for many organizations. Reflecting upon the challenges of the cloud, Wueest et al. (2015) notes that multiple layers are a reason for increased vulnerabilities of the service, and further notes that the system offers multiple layers which serves to enhance the attack surface. Understandably the process has limitations in the form of SQL injection flaws, challenges associated with shared resources, data breaches, insecure interface APIs and misconfiguration issues (Wueest et al. 2015).

Over the years, concerns in respect to insecure interfaces and APIS, data loss and leakage, hardware failure and presence of malicious inference with respect to cloud has been acknowledged (Cloud security Alliance, 2013). In their review Raghavendra et al. (2015) notes that most people fail to consider the security of the data before storage in their cloud computing service. Reflecting upon the security measures provided by the vendors, Raghvendra et al. (2015) notes that the main measures are in the form of data centers and application servers such as Web Sphere Application Server, which is a Java EJB supported technology-based application platform. However, despite such advancements most users reflect that their level of confidence in respect to the security of their cloud services is meager. Through the course of this review, a reflection upon the challenges and risks and flaws associated with the cloud computing has been noted. This work then proposes an effective solution for securing cloud-based paradigm.

For past decade, PAM has been treated as a solution for only those scenarios when internal technical professional employees (System Administrators, DBAs) need to interact with datacenter servers (Unix boxes, Oracle databases) to execute patching, upgrade kind of activity on the native OS, databases or other installed applications. PAM scenarios during these interactions and also available solutions have matured a lot. However, with the wide adoption of Cloud platforms like AWS and Azure and the need to have a completely automated DevOps pipeline, the interactions that technical professionals have with PaaS, SaaS and mainly IaaS

platforms, have undergone drastic changes. Thus, this work examines the current security aspects offered by PAM and then proposes a new solution to counter these security vulnerabilities.

**CLASSIFICATION OF CC**

Cloud computing administrations are comprehensively characterized into three sections, for example Framework as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Data as a Service (DaaS). In ongoing year, distributed computing administrations have gotten much consideration by cloud network. This can be checked from the significance of the distributed computing system. This structure was created to inspire and display just the cloud computing. There are diverse distributed computing administrations for various kinds of framework like data framework, online framework, constant framework and so forth. Elicitation of cloud for these kinds of frameworks is a significant research issue. Subsequently, the target of this paper is to group different mist administrations for Information System so prerequisites expert can without much of a stretch distinguish the total rundown of distributed computing methods as indicated by their need in early period of cloud administrations structure[12] as shown in Figure. 3.

**RESEARCH STATEMENT**

The purpose of the study was to reflect upon the challenges and security issues of the Cloud Computing Systems. In this aspect the main motives of the research thus is to

In this respect the main objectives of the organizations include,

- a. Evaluate the privacy and security issues in respect to cloud computing present in the industry.
- b. Highlight gaps from PAM capabilities standpoint, in the current API Security models that only focus on authentication, authorization, encryption, signatures and other threat attacks like malwares, DOS etc.
- c. Propose and demonstrate a solution based to overcome these security vulnerabilities.

**LITERATURE REVIEW**

Figure 1 (a) and 1 (b) summarizes the main aspects of the cloud paradigm. The main aspects which make the cloud computing a successful computational model are the layered architecture of the cloud; its on-demand self-service capabilities, and the various types of service models (Mena, 2011).

The cloud architecture is a layered architecture comprising of four layers the hardware layer consisting of the datacentres, the infrastructure layer the platform layer and the application layer. All together this layer function as a computing platform serving each other layer to provide storage and processing abilities to applications and services. Cloud services can be classified as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). In the Software as a Service (SaaS) cloud services the applications are generally made accessible through the thin clients or web browser and these applications are running on the cloud environment. In the Platform as a Service (PaaS) provides a common system support-based services like operating system support services, software development framework-based services to its clients. In the Infrastructure as a Service (IaaS) based services the cloud provides processing abilities, storage capabilities and the network resources to the users (Crowe, 2012).

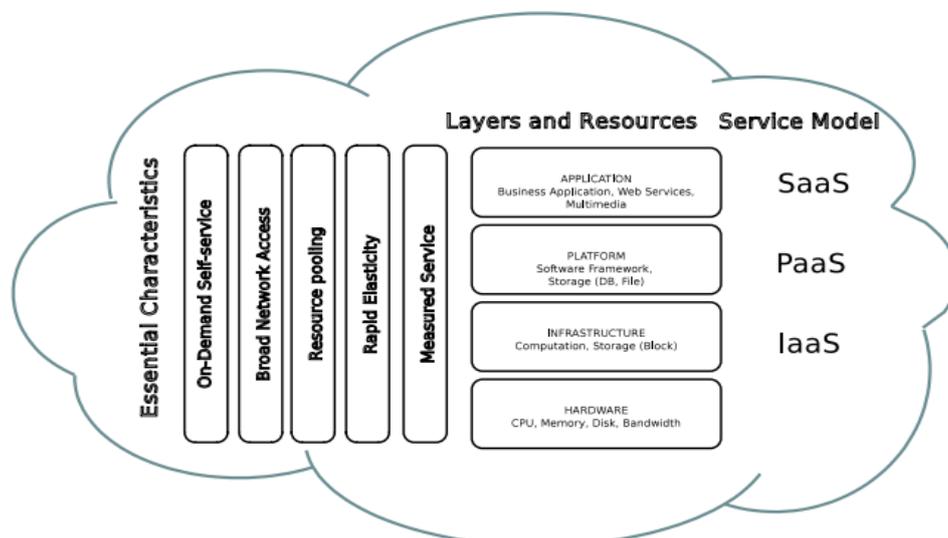


Figure 1 (a): Cloud Security Challenges

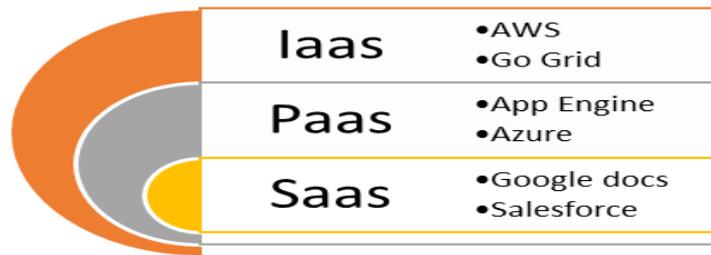


Figure 1 (b): CC Services

Figure 2 summaries the security challenges in the cloud (Aakib & Shabana, 2022).

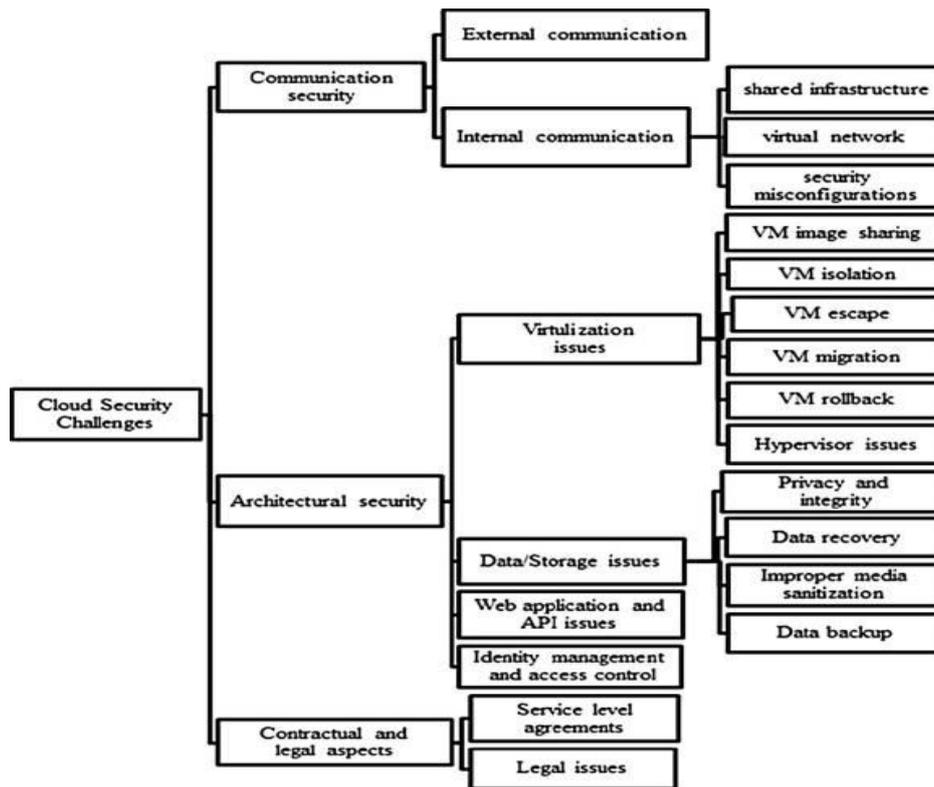


Figure2: Cloud Security Challenges

1. Organizations which have already deployed cloud computing face certain difficulties especially they have many constraints in implementation. Thus, the major challenges faced by organizations in making use of cloud computing are as follows:
  - a. Lack of trust: because customers still feel that cloud providers may not guarantee the security and privacy controls as needed by the organizations. Even the survey result shows that the security and privacy are the major concerns(Bisong, 2011).
  - b. Resistance to changing the traditional working styles.
  - c. In some cases, the cloud computing service providers don't provide privileges to audit the data. Such results in a lack of governance (Agarwall, 2011).
  - d. Due to rise in the number of vendors in the market, some vendors overcommit for resources and functionalities. But in order to maintain their revenue in profit, these vendors cut short some value system services like limit the cloud access, etc. This results in customer dissatisfaction. Thus, it is necessary to have a good thorough checkup of vendor services before deploying (Hamlen, 2010).
  - e. Security issues like network breaks, poor encryption key usage and management, public management interface, separation failure, and privilege abuse (Gonzalez et al,2012).

**API**

An API is a set of functions or routines that accomplish specific tasks or provide a simplified method of interacting with a software component, often allowing the automation of common processes that interact with services running on other machines. APIs can be in the form of a library that includes specifications for

routines, data structures, object classes and variables, or simply a specification of remote calls exposed to the API consumer. Some APIs are based on international standards such as POSIX (Portable Operating System Interface), while others are made public in open source or vendor documentation. For example, Microsoft's Windows API enables developers to create software for the Windows platform.

### **Major Security Issues Associated with PAM**

The major challenges lie in the area of network security, interfaces, Virtualization, governance, compliance and legal issues. The work concentrates on problem associated with interfaces and role of PAM in the same. The API makes the cloud computing process easier and aids in automating complex business requirements such as configuring cloud instances for multiple providers and use of third-party platform for cloud and on-premises needs. The confidentiality, integrity, availability and accountability can be harmed if the API is insecure. Choosing a set of secured channels, providing proper authentication and authorization, enabling message protection and delivering best code and development practices are some key areas which should be focused for API security. Proper penetration tests and vulnerability assessments. PAM(privileged access management) often known as privileged Account Management or Privileged Session management allows a user to access or perform critical functions on server. In order to safeguard data and prevent vulnerabilities PAM is preferred in organization especially when the employees are huge in number.

### **How PAM Functions?**

A streamlining is required to authorize and monitor privileged users to allow relevant functions. The basic functions delivered by PAM are that it grants privileges only to the systems where the users have authentication. They see to it that the access is granted only when it is needed and revoked once the session expires. The privileged users need not have local or system passwords, thereby saving time. PAM can manage heterogeneous systems and can provide a central access to the users. It runs an audit trail for every privileged operation which cannot be altered. The entire architecture of PAM can be broken down into different components namely Access manager which acts as a single point defining policy and reinforcement for access management. The super admin can manage the accounts in the access manager. Next is the password vault by which the access can be controlled towards critical systems. The actions taken during a privileged session is tracked by a session manager. PAM is different from identity management. The former deals with privileged access users while the latter focus on authentication and authorization. PAM shows closeness for purpose. The gaps or limitations of PAM in API and CL are due to the inherent agility, integrity and scalability of cloud. The limitations of PAM in a broader picture need to be concentrated in the following areas. The policies, permissions or roles to access the key entities Management Consoles(CLIs), Cloud APIs and assets or workloads are static in nature. The user lifecycle seems to have interruptions leading to termination cloud access for users. This can lead to data breaches. One of the expensive functionalities lies in calculation of least privileged access. This is based on JSON policies and permissions and calculations often need finest refinements continuously. The shared Id concept and jumpboxes frequently facing failure in privileged access which impacts user experience. The activity logs are rising in huge volume making the monitoring difficult. The velocity and volume of these stands as a barrier for efficient activity monitoring.

The session identity information used for API, workloads and consoles shows an inconsistency. The present scenarios show that an organization is having multiple subscriptions and different business process can lead to non-synchronous life cycles leading to unauthorized access to critical assets. Some of the best practices in PAM is to have an integration of privileged identity access management. A review must be conducted for all privileged accounts, continuously monitoring the user activities, passwords must be changed regularly to avoid risk and threats. The online security access must be ensured and organization must be defended against internal and external threats. The solutions taken so far focusing security analysis are fine tuning the access control by making the owner to express and enforce a flexible access for each user.

### **Developments and Models in Cloud Computing to Defend the Threats**

Adding more access privileged confidentiality. One of the developments in the area of security was a new secure file system, Plutus, providing a strong security even with an untrusted server. Data is stored in an encrypted version and the distribution of key OS follows a decentralized management. Client key management performance and application based on cryptography reduces the overheads. A basic file system named Plutus was introduced to analyze, detect and prevent data modifications which are unauthorized. It could identify the differences in read and write access. It was capable of preventing any change which alters user privileges. Physical devices were saved from data leakage attacks caused by server issues, administrator being from untrusted source and device being a stole one. File sharing policies and key distribution by users were prevented to add security. The intensive operations based on cryptography were allowed to happen at end systems to

impose better scalability in servers. The design gave a model which included features like it created file groups and key are shared in a group among files without compromising the security. The keys required to invoice, manage and distribute are reduced in number by key aggregation. A file is thus decomposed into several blocks and an encrypted key is associated with each block known as file lock box keys. These keys are distributed among writers and readers. Read write differentiation is another feature with the use of file lock keys, the keys are divided into file sign keys for writers and file verify keys for readers. Revocations are an additional overhead, sometimes expensive. A delayed re encryption is introduced as a cost-effective measure. Key rotation is also introduced to add security for revocations. Server verified writes are added to prevent unauthorized writes and access. The security strength and scalability is enhanced as cryptography is performed in servers not on clients.

A network file system having good control over the access and a better deployment strategy to maintain the data integrity was SiRiUS. Different models were proposed to defend threats and security.

The cloud multiple tenancy model proposed by NIST. One common physical server runs different applications for client services. A virtualization procedure is run to partition the requests from clients and group them as segments and procedure equivalent in nature. Virtualization is achieved by sharing and isolation functionalities. Distributed computing is the base for the design. Client requirements are satisfied and economic scalability was achieved to a greater extent.

The Cloud Risk Accumulation Model proposed by CSA inspects the security threats of cloud computing. The different service platforms are analyzed. IaaS offers Maximum extensibility. The security capabilities and abilities seem to improve when used in own particular network. PaaS has more extensibility than SaaS. A greater adaptability is seen by PaaS when it comes to extra security execution to clients. user extensibility is characterized SaaS is minimum.

Another model developed was by Jerico forum's cloud cube model. The deployment models are blended together. It separates the physical area into internal and external where real information is stored. The information stored in the internal cloud lacks security than that of external storage. A secure model can be designed by utilizing the combination of internal and external storage. The capacity to change information from one cloud to another has also been given consideration in this design. The client's security is viewed as parameterized or deparametrised depending upon the signal from firewall. Different cloud shapes are identified to label and differentiate among inside user and outside user.

Multi-Clouds Database Model provides database storage in multi-cloud service provider. The multi cloud concept reduces data threats and enhances security to a better extent. The mystery sharing method and information being imitated among few clouds is used to give security and protect client's information.

While considering security, Cloud Cube Model by JericoFormu's and Multi-Clouds Database Model outstands the NIST's Cloud Multiple Tenancy Model and The Cloud Risk Accumulation Model of CSA. The future work may be extended taking into considerations the principles of distributed computing to design a model.

### **Summary**

In the literature review, an introduction towards cloud computing followed by the role of PAM in cloud computing was summarized. The functioning of PAM and major security issues in PAM were given consideration. An analysis of different models and methods put forward to reduce the threats in cloud computing were reviewed. The major issues were lack of context assignment and access, data leakage and breaches, determining access which is should be given priority and poor user experience. A solution should be proposed to alleviate the issues thus maintaining the confidentiality, integrity and security of data.

### **PROPOSED SOLUTION**

The proposed solution makes use of Cloud Usage Patterns to create usage scenarios for the users and thus grant access and do the task of privilege access management. The solution for different challenges is as below:

1. The first focus lies in monitoring the access management. Improper privileged access management and access calculation is one the reason behind data security. The approach to find a solution begins with usage patterns of cloud computing. They are used to solutions for problems that occur frequently. The main advantage of analysing usage pattern is that feasible solutions developed can be implemented in any user problems irrespective of the software, languages and middleware. There are number of cloud models proposed by research team like CSA, NIST. The usage pattern analysis is one way of extending the model and finding a deployment method and a model which can fit a particular application. There are number of compound patterns in cloud computing. The main application of this pattern analysis is when number of

users accessing the cloud is huge. An application of this pattern analysis is in facebook.salesforce.com and other social networking sites. The outcome of such pattern analysis is to build a model that can decide when to grant and when to drop the access request. Automating such a model further eliminates human effort to calculate and take decisions. When number of requests served increases, the system examines the usage pattern and upon reaching a finite limit, the access must be prioritized and served. Controlling the access intelligently can result in better user experience. The granting and dropping mechanism should be administrated properly in order to implement an efficient solution. The number of access must be increased only in case of emergency and that too in controlled manner. It should not be held for too long, a drop back mechanism should work in parallel to bring down the access once emergency is being served. Building a model using cloud usage patterns, automating it and an administrative control over it can bring a solution for access management and better user experience.

2. Another major challenge is that in some cases even after termination, user seems to have access to cloud this is termed as residual access. This can breach or leak information posing a threat to data security. The approach to mitigate this issue is to that usage-pattern-based model must be integrated with joiner mover leaver (JML) to terminate users after a particular session. It is just a potential analysis of what happens when a user gets terminated and how it affects the application. The number of users given access must be always appropriate to ensure security. Managing JML increases the efficiency of access management. The JML process can briefly explained as when a new user enters the life cycle, the access that can be granted, session timing and storage access all are calculated using joiner process. The predictions are to reduce the complexity of the network with the intervention of new user. The mover process takes care of actions which require control and access change, data transfer between users etc. The process of suspending, revoking access and deactivating the session and user if required to enhance security is taken care by leaver process. Thus, automating JML process along with integrating into the user model build can enhance data security and access management to a greater extent. It also aids in identity management. The leaver process and their decision have been importance when shared folders and shared services and distribution services are being access by a user. The risks imposed on security and computational overheads seem to reduce with the intervention of JML.
3. Identity access management is yet another issue that can cause leakage of information. The solution towards identity management is to extend PAM capabilities into platforms like CI/CD and DevOps. The main concern to bring DevOps into focus is to create a virtual identity provider who can manage and connect different user identities. These user will be connected to systems (windows, Mac,linux) and servers based on cloud and also with web based applications through SAML , wired or Wi-Fi networks. The identity and access management solutions can show a better improvement with the inclusion of DevOps. There will be different platforms in an environment. Hence a centralized control approach must be followed for DevOps integrated identity and access management. Integrating DevOps enables to track people, tools and servers to add on security and access management which cannot be done by the traditional methodology and security approaches. The DevOps security must be evaluated by using performance metrics and monitoring strategies. DevOps belongs to a set of continuous integration process and thus consideration must be given to check and test the integrated system for security and access management. The solution is imposing infrastructure as code or configuration as code. This will enable the strategy of continuous integration, deployment and delivery. The integration parts aim in correlating and combining the work done at individual platforms and combining into one to maintain uniqueness. The delivery aims at eliminate points that resist development of life cycle. The deployment focus on automation whenever a major change is reflected in the code. The entire delivery pipeline is composed of all these three, integration, delivery and deployment. Degree of automation is associated with deployment. The developer has to be strong enough to implement the strategy properly and test it against the automation. Once your platform is built, the tools need to integrate with the platform. If the deployment frequency is high, testing needs a lot of time. Another approach to test the platforms once the tools are integrated is to use Machine Learning algorithms.
4. Another main security issue is due to the volume and velocity of the data. At a time,a lot of users logs into the cloud, they process, ends session and this happens 24X7 a day. A day's statistics would reveal millions of logs. In order to maintain the privileged information big data platforms must be brought inside the model to store the necessary data. The PAM monitoring must be efficient and consistent. The logs and session information must be streamed from multiple platforms to a big data platform. The storage thus obtained from diverse platforms must be correlated and analyzed to make the privileged access activity monitoring efficient. Different strategies must be applied to extract meaningful information from logs which is then used for privileged access management.

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**CONCLUSION**

The overall idea can be consoled and summarized as follows. The cloud is exposed to wide variants of business processes and subscriptions. The various business process and non-synchronized life cycle can lead to unauthorized access and leakage of information. Thus, there is a strong need to extend the PAM capabilities to predict, forecast and eliminate the security risks and safeguard data. The Dynamic PAM model presents a solution not as single. It is a network composed of several components and proper implementation and synchronization of these components are necessary for an effective step towards the solution. The entire solution development can be summarized as developing a model who intelligently decides when to hike and when to drop access. The model should be capable of finding out the emergency situations and sessions where the access needs to be increased. The calculation of session and revoking of access once the session end must be handled properly. Adding a centralized administration to control the entire process is more important in this context. The JML tags and process must be then integrated to control the life cycle. The JML adds security to access management and identity management as well. The unauthorized access and leakage of data can be eliminated efficient and residual access can be alleviated to a much higher percent. The entire model should be then extended to DevOps, CI and CD platforms. Despite the DevOps capabilities, the openness and transparency of DevOps can impose security threats. Therefore, once integration is done, proper performance metric evaluations and monitoring activities must be carried out to evaluate the efficiency of the developed model. The logs monitoring and management is extended to a big data platform. The execution of solution needs a proper choice of the system, model which can be exposed to number of users. The model developed must be tested in a real time environment and performance evaluation results must be analyzed to see the outcome of the model. Dynamic PAM performance can fill the gaps of Traditional PAM as it is integrated and modeled with the current trending and efficient platforms. Successful access management by dynamic PAM can bring a trademark in the future solutions. Organizations striving hard to achieve efficiency in access and identity management can implement this methodology in future. The complexity of the solution can be further cut down by choice of cloud model, architecture and development platforms. A strong code also add efficiency to the solution.

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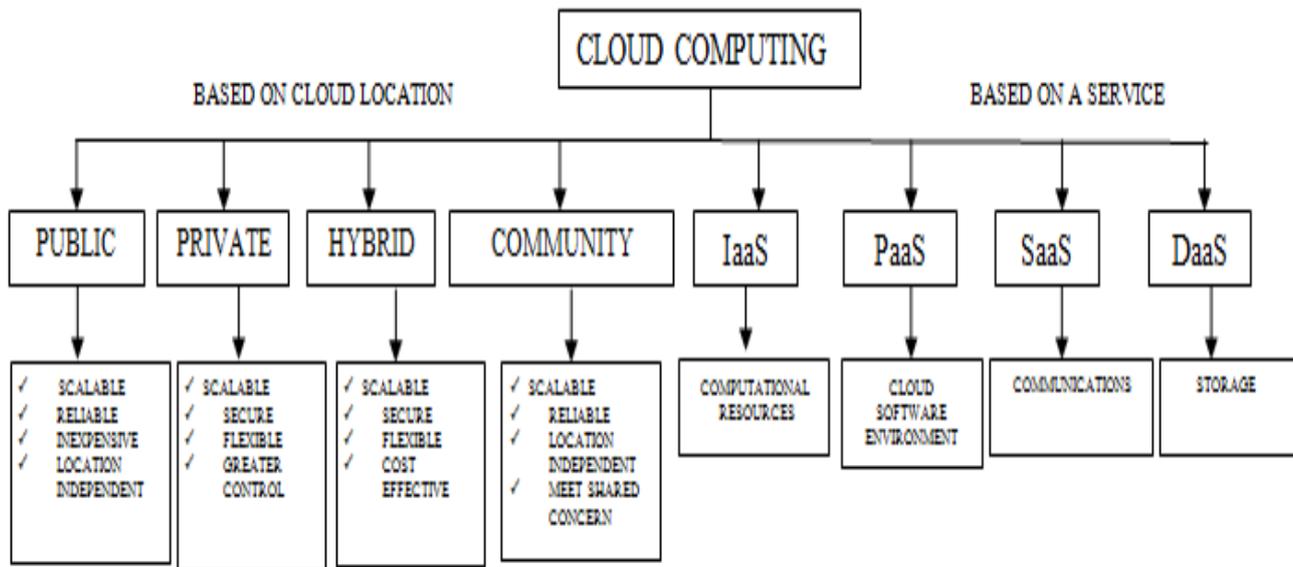


Figure 3: Classification of Cloud Computing

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**IMPACT OF CAPITAL STRUCTURE ON FINANCIAL PERFORMANCE OF INDIAN FAST-MOVING CONSUMER GOODS COMPANIES****Archit Bansal<sup>1</sup>, Tanishka Rai<sup>2</sup> and Dr. Prashant Sharma<sup>3</sup>**<sup>1,2</sup>Student and <sup>3</sup>Assistant Professor, Department of Management ITM Gwalior**ABSTRACT**

*This study examines the capital structure and its impact on financial performance of Fast-moving consumer goods companies in India between the financial cycles 2017-2018 to 2021-2022. For the purpose of the study the data has been composed from the secondary sources i.e., from the Periodic reports of the select sample companies. Multiple Regression and correlation was used to data analysis. The variables applied for the study are Debt Equity Ratio, Long Term Debt Ratio and Debt Asset Ratio as the Independent Variable and Gross Profit Margin Ratio (GPM), Net Profit Margin Ratio (NPM), Return on Capital Employed Ratio (ROCE), Return on Assets Ratio (ROA) and Return on Equity Ratio (ROE) as the Dependent Variables. The result revealed that there's a positive relationship and significant impact on financial performance of the selected enterprises.*

*Keywords: Capital Structure, Financial Performance, Ratios, Regression Analysis*

**INTRODUCTION**

In Finance, Capital structure is defined as an mixture of company's long-term debt, specific short-term debt, common equity and preferred equity. The capital structure is how an establishment finances its overall operations and the growth by using different sources of finances. Debt comes in the form of bond issues or long-term notes overdue, while equity is classified as common stock, preferred stock or retained earnings. Financing of working capital is also considered as a part of capital structure. Financial performance is a subjective measure of how well a firm can use assets from its primary mode of business and generate revenues. The term is also used as a general measure of a firm's overall financial health over a given period.

**LITERATURE REVIEW**

**Gaur, Reeti (2017)** Working Capital is the sources where it can be possible to find out the Pre-determining for the financial management of companies. For maintaining a good liquidity position in the business without overlapping the stages of profit determination. It provided the proof of companies on Singapore Stock Exchange in the commencing period from 2004 to 2011. Further it was also had a strong influence on the profitability apart from the working capital management.

**Kaur, Rajinder (2017)** The working capital and profitability position of the selected companies of the FMCG industry or to examine the impact of the working capital is the main objective of the study. Moreover, for the selection of the technique were applied on the structure measurement scale. All the numeric terms like mean, standard deviation, min, max is evaluated perfectly and the observation are correct. It can able to find out the possibility of the financial condition of the companies.

**Desai, Jay (2019)** The research paper evaluates the food processing industry which investigates all the factor affecting market share whether they are shows upwards or downwards or the asset size of the food processing industry of India. It includes tangibility, liquidity operation cash flows, growth opportunity etc. The main objective of this research paper is to know the variables affecting or the determinants of the debt and equity of the particular's food processing. By this in this research paper there are many of the hypothesis were mentioned to evaluate or enhance the whole structure of the food processing industry of India.

**Lim, Steve C, Macias, Antonio J Moeller, Thomas (2020)** A substantial and increasing proportion of company assets consists of intangible assets. Despite their growing importance, internally-generated intangible assets square measure mostly absent from balance sheets and different company reports. Researchers have long recognized that intangible assets are critically necessary to firm value and have a control on firms' financial policies. as Associate in Nursinging example, the patents of Apple and Pfizer, etc. Our primary objective is to document the character and extent of the relation between intangible assets and monetary leverage.

**Tine Dot Dang and Thi Van Trang Do (2021)** researcher suggested that Capital structure has a significant positive impact on firm value in the food and libation assiduity, but has a significant negative effect on the value of the establishment in non-commercial trade and FMCG INDUSTRIES, as well as real estate assiduity, while has an insignificant influence on enterprise value considering all diligence.

**RESEARCH METHODOLOGY**

The use of quantitative methods is based on the purpose of research to test the hypotheses. Data samples come from secondary data, where data collections come from financial statements of selected companies with the help of prowess data and The data used in the empirical analysis is derived from the data base of www.moneycontrol.com which includes the published financial statements of all the sample firms. From the collected data, variables will be measured and the existing theories or hypotheses will be verified through statistical tool. In this research, the correlation and regression has been used for data analysis. Smart PLS and SPSS used for proposed Model and data analysis. Researchers selected five companies which has been listed in stock exchange on the basis of their performance. The period selected for this study consists of 5 years ranging from 2017-18 till 2021-22

**Sample Companies for Study**

S.No.	Company's Name
1	Godrej Consumer Products Ltd.
2	Britannia Industries
3	Marico
4	Dabur India Ltd.
5	Nestle India

**Objective Of Study**

The objective of study is to investigate the role of capital structure on financial performance of selected FMCG Company which are listed in stock exchanges of India with the help of various dependent and independent variables.

**Hypotheses**

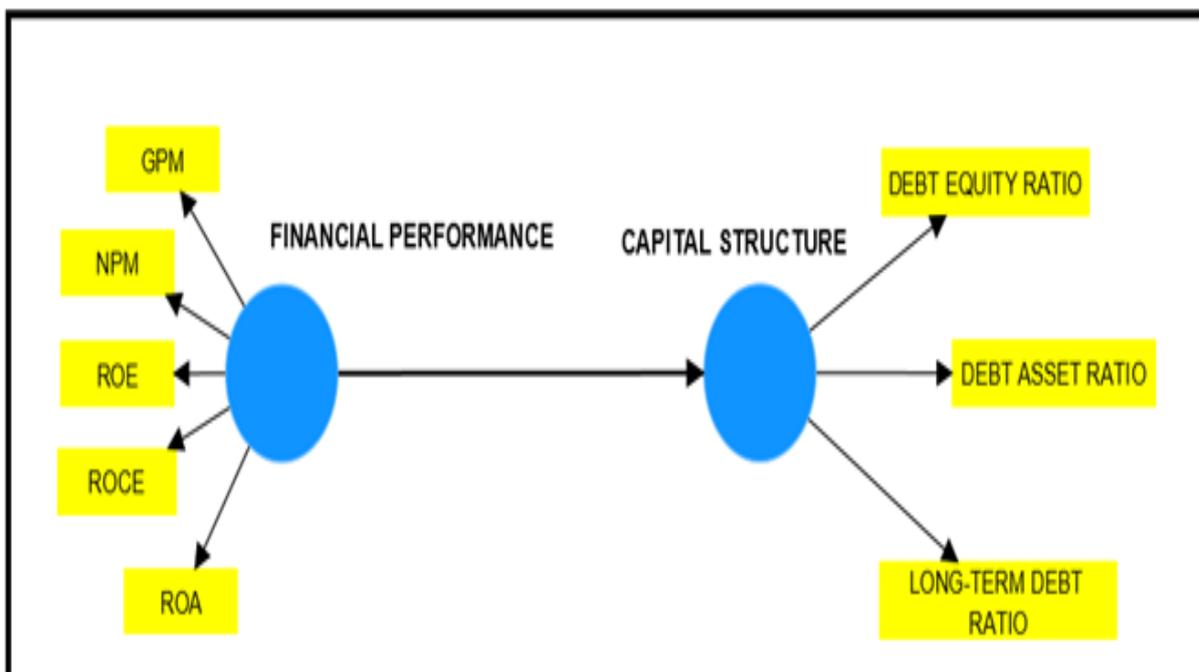
The present study examines the following hypotheses:

**H1:** -There is a negative relationship between debt equity ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

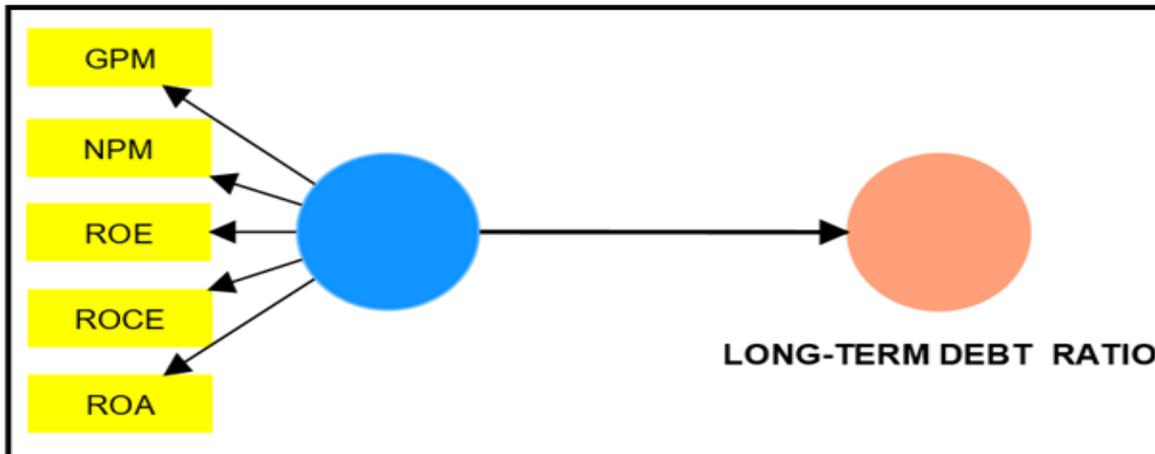
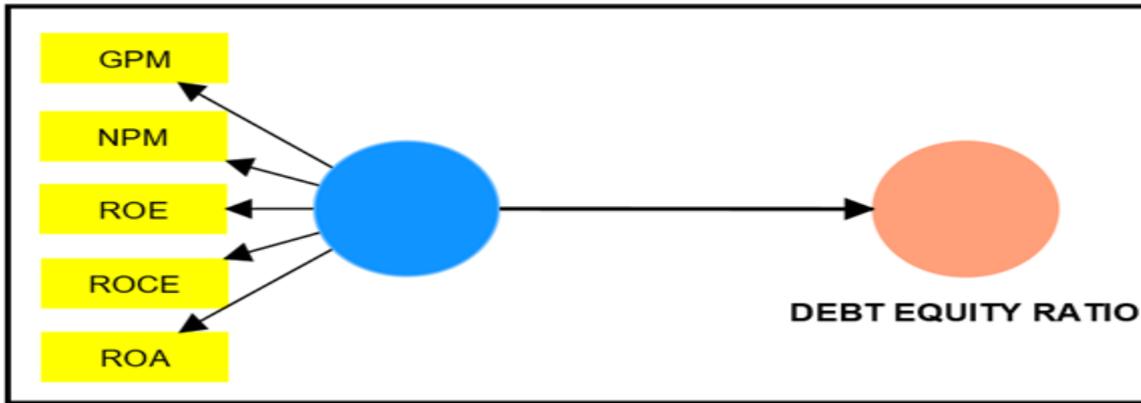
**H2:** - There is a positive relationship between debt asset ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

**H3:** - There is a positive relationship between long term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

**H4:** capital structure is significantly impact on the financial performance of the FMCG COMPANY in India.



This model shows that financial performance is based on capital structure of any company or any industries.



\*These models are generated by SMART PLS4.

**Data Analysis and Interpretation**

**Descriptive Statistics**

The following table shows the maximum, minimum, mean & standard deviation and also consist of number of samples and variance of each capital structure and financial performance variables.

**Table-1**

	N	Maximum	Minimum	Mean	StandardDeviation
<b>DER</b>	5	.02	.35	.0940	.14150
<b>DAR</b>	5	.00	5.93	1.6862	2.44465
<b>LTDR</b>	5	.07	.38	.1639	.13353
<b>GPM</b>	5	39	.51	.4428	.04612
<b>NPM</b>	5	12.11	21.77	16.7812	3.75769
<b>ROE</b>	5	23.76	77.63	40.8688	21.88042
<b>ROCE</b>	5	27.11	48.84	38.6960	9.91965
<b>ROA</b>	5	17.61	23.29	20.9480	<b>2.54339</b>

*Source-* Result Generated by SPSS

**Correlation Analysis**

H1, H2, H3 Correlation between capital structure variables (debt equity ratio, debt asset ratio and long-term debt ratio) and financial performance variables (GPM, NPM, ROCE, ROA, ROE) of Indian FMCG's.

**CORRELATION MATRIX**

**Table-2**

Variables	GPM	NPM	ROCE	ROE	ROA	DER	DAR	LTDR
<b>GPM</b>	1							
<b>NPM</b>	0.642	1						
<b>ROCE</b>	-0.788	-.960**	1					
<b>ROE</b>	-0.769	-0.637	0.818	1				

<b>ROA</b>	-0.532	-0.756	0.793	0.687	1			
<b>DER</b>	-0.349	-0.692	0.533	0.016	0.118	1		
<b>DAR</b>	-0.204	-0.598	0.419	-0.092	-0.017	.984**	1	
<b>LTDR</b>	-0.599	-0.026	0.304	0.771	0.278	-0.481	-0.567	1

Source- Result Generated by SPSS

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Table: Correlation Matrix**

The above correlation table indicates the relationship between debt equity ratio, debt asset ratio and long-term debt ratio are as follows:

1. Correlation between debt equity ratio and GPM, NPM, ROCE, ROA, ROE is positive as well as negative because R values of debt equity ratio& GPM is-0.349, debt equity ratio and NPM is -0.692, debt equityratio and ROA is 0.016, debt equity ratio and ROCE is 0.533, debt equity & ROE is 0.016.
2. Correlation between debt asset ratio and GPM, NPM, ROCE, ROA, ROE is positive as well as negative because R values of debt asset & GPM is -0.204, debt asset ratio and NPM is -0.598, debt asset ratio and ROA is -0.017, ROCE is 0.419, debt equity & ROE is -0.092.
3. Correlation between long term debt ratio and GPM, NPM, ROCE, ROA, ROE is both negative and positive because R values of long-term debt ratio& GPM is -0.599, long term debt ratio and NPM is -0.026, long term debt ratio and ROA is 0.278, long term debt ratio and ROCE is -0.304, long term debt & ROE is 0.771.

According to the above result we can accept the hypothesis H1 and H2 but cannot accept H3 because the results indicate the negative relationship between debt equity ratio and financial performance variables & positive relationship between debt asset ratio but it shows negative relationship between long-term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE and ROA)

**REGRESSION ANALYSIS**

Regression analysis is a mathematical method to measure the impact of one (independent) variable on other (dependent) variables. In this part, the researcher has used this to test the hypothesis H4 to measure the impact of capital structure on financial performance.

H4: Capital structure is significantly impact on the financial performance of the selected FMCG companies listed in various Indian stock exchanges.

**Regression analysis between independent variable debt equity ratio and financial performance variables Table-3**

<b>Debt EquityRatio</b>	<b>R Square</b>	<b>SignificanceLevel</b>	<b>Standard CoefficientBeta</b>
<b>DER onGPM</b>	0.122	0.565	-0.349
<b>DER on NPM</b>	0.478	0.196	-0.692
<b>DER onROE</b>	0	0.98	0.16
<b>DER on ROCE</b>	0.284	0.355	0.533
<b>DER onROA</b>	0.014	0.85	0.118

Table: Regression analysis of debt equity ratio

**I) Regression Analysis Between Debt Equity Ratio and GPM**

Based on the above table  $R^2 = 0.122$  That means 12.2% of the variation in the GPM is determined by in the variation of debt equity ratio other remaining 87.8% is undetermined with a significant level of 0.565. This means 100% of variation of GPM may be caused by other variables.

**II) Regression Analysis Between Debt Equity Ratio and NPM**

Based on the above table  $R^2 = 0.478$  That means 47.8% of the variation in the NPM is determined by in the variation of debt equity ratio other remaining 52.2% is undetermined with a significant level of 0.196. This means 52.2% of variation of NPM may be caused by other variables.

**III) Regression Analysis Between Debt Equity Ratio and ROE**

Based on the above table  $R^2 = 0.000$ . That means 0% of the variation in the ROE is determined by in the variation of debt equity ratio other remaining 100% is undetermined with a significant level of 0.98. This means 100% of variation of ROE may be caused by other variables.

**IV) Regression Analysis Between Debt Equity Ratio and ROCE**

Based on the above table  $R^2 = 0.284$ . That means 28.4 % of the variation in the ROCE is determined by in the variation of debt equity ratio other remaining 71.6% is undetermined with a significant level of 0.355. This means 71.6 % of variation of ROCE may be caused by other variables

**V) Regression Analysis Between Debt Equity Ratio and ROA**

Based on the above table  $R^2 = 0.014$ . That means 1.4 % of the variation in the ROA is determined by in the variation of debt equity ratio other remaining 98.6% is undetermined with a significant level of 0.355. This means 98.6% of variation of ROA may be caused by other variables.

**Regression analysis between independent variable debt asset ratio and financial performance variables**

**Table 4**

Debt	R Square	SignificanceLevel	Standard CoefficientBeta
DAR on GPM	0.042	0.742	-0.204
DAR on NPM	.598a	0.287	-0.598
DAR on ROE	0.008	0.883	-0.092
DAR on ROCE	0.175	0.483	0.419
DAR on ROA	0	0.978	-0.017

**Table:** Regression analysis of debt asset ratio

**I) Regression Analysis Between Debt Asset Ratio and GPM**

Based on the above table  $R^2 = 0.042$ . That means 4.2% of the variation in the GPM is determined by in the variation of debt asset ratio other remaining 95.8% is undetermined with a significant level of 0.742. This means 95.8% of variation of GPM may be caused by other variables.

**II) Regression Analysis Between Debt Asset Ratio and NPM**

Based on the above table  $R^2 = 0.598a$ . That means 59.8 % of the variation in the NPM is determined by in the variation of debt asset ratio other remaining 40.2% is undetermined with a significant level of 0.287. This means 40.2% of variation of NPM may be caused by other variables.

**III) Regression Analysis Between Debt Asset Ratio and ROE**

Based on the above table  $R^2 = 0.008$ . That means .8% of the variation in the ROE is determined by in the variation of debt asset ratio other remaining 99.2% is undetermined with a significant level of 0.883. This means 99.2% of variation of ROE may be caused by other variables.

**IV) Regression Analysis Between Debt Asset Ratio and ROCE**

Based on the above table  $R^2 = 0.175$ . That means 17.5 % of the variation in the ROCE is determined by in the variation of debt asset ratio other remaining 82.5% is undetermined with a significant level of .483. This means 82.5 % of variation of ROCE may be caused by other variables

**V) Regression Analysis Between Debt Asset Ratio and ROA**

Based on the above table  $R^2 = 0.0$ . That means 00% of the variation in the ROA is determined by in the variation of debt asset ratio other remaining 100% is undetermined with a significant level of 0.099. This means 0.978% of variation of ROA may be caused by other variables.

**Regression Analysis between Independent Variable Long-Term Debt Ratio and Financial Performance Variables.**

**Table-5**

Long Term DebtRatio	R Square	SignificanceLevel	Standard CoefficientBeta
LTDR on GPM	.599a	0.286	-0.599
LTDR on NPM	0.001	0.967	-0.026
LTDR on ROE	.771a	0.127	0.771
LTDR on ROCE	0.092	0.619	0.304
LTDR on ROA	.278a	0.651	0.278

**Table:** Regression analysis of long-term debt ratio

**I) Regression Analysis Between Long-Term Debt Ratio and GPM**

Based on the above table  $R^2 = 0.599$ . That means 59.9% of the variation in the GPM is determined by in the variation of long-term debt ratio other remaining 40.1% is undetermined with a significant level of 0.286. This means 40.1% of variation of GPM may be caused by other variables.

**II) Regression Analysis Between Long-Term Debt Ratio and NPM**

Based on the above table  $R^2 = 0.001$ . That means 0.1% of the variation in the NPM is determined by in the variation of long-term debt ratio other remaining 99.9% is undetermined with a significant level of 0.967. This means 99.9% of variation of NPM may be caused by other variables.

**III) Regression Analysis Between Long-Term Debt Ratio and ROE**

Based on the above table  $R^2 = 0.771$ . That means 77.1 % of the variation in the ROE is determined by in the variation of long-term debt ratio other remaining 22.9.% is undetermined with a significant level of 0.127. This means 22.9% of variation of ROE may be caused by other variables.

**IV) Regression Analysis Between Long-Term Debt Ratio and ROCE**

Based on the above table  $R^2 = 0.092$ . That means 9.2 % of the variation in the ROCE is determined by in the variation of long-term debt ratio other remaining 91.8% is undetermined with a significant level of 0.619. This means 91.8% of variation of ROCE may be caused by other variables

**V) Regression Analysis Between Long-Term Debt Ratio and ROA**

Based on the above table  $R^2 = .278$ . That means 27.8 % of the variation in the ROA is determined by in the variation of long-term debt ratio other remaining 72.2% is undetermined with a significant level of 0.651. This means 72.2% of variation of ROA may be caused by other variables.

Therefore, the above results point out the capital structure variables are significantly impact on financial performance of INDIAN FMCG companies, and hypothesis H4 is accepted by the researcher.

**FINDINGS & CONCLUSIONS**

Here the GPM, NPM, ROCE, ROA, ROA are considered as dependent variables to test the hypothesis & Debt equity ratio, debt asset ratio & long-term debt ratio are considered as independent variables. Based on the regression analysis the following findings are discovered.

12.2% of variation in gross profit is explained by debt equity ratio and remaining 87.8% may becausedby other variables. 47.8% of variation in net profit is explained by debt equity ratio and remaining 52.2% may be caused by other variables. 00% of variation in ROE is explained by debt equity ratio and remaining 100% may be caused by other variables. 28.4% of variation in ROCE is explained by debt equity ratio and remaining 71.6% may be caused by other variables. 1.4% of variation in ROA is explained by debt equity ratio and remaining 98.6% may be caused by other variables. 4.2% of variation in gross profit is explained by debt assetratio and remaining 95.8% may be caused by other variables. 59.8% of variation in net profit is explained by debt asset ratio and remaining 40.2% may be caused by other variables. .8% of variation in ROE is explained by debt asset ratio and remaining 99.2% may be caused by other variables.

17.5% of variation in ROCE is explained by debt asset ratio and remaining 82.5% may be caused by other variables. 00% of variation in ROA is explained by debt asset ratio and remaining 100% may be caused by other variables. 59.9% of variation in gross profit is explained by long term debt ratio and remaining 40.1% may be caused by other variables. 0.1% of variation in net profit is explained by long term debt ratio and remaining 99.9% may be caused by other variables. 77.1% of variation in ROE is explained by long term debt ratio and remaining 22.9% may be caused by other variables. 9.2% of variation in ROCE is explained by long term debt ratio and remaining 90.8% may be caused by other variables. 27.8% of variation in ROA is explained by long term debt ratio and remaining 72.2% may be caused by other variables. When we focus on debt and equity position of FMCG Industries, we found that firms are more attracted towards the equity only, very few amounts of financing are done by issuing debentures. So, we can say that the FMCG INDUSTRIES. However, we have considered the measures on the basis of total average of each, so we can agree with hypothesis.

This paper been finished with the important goals to what extend capital structure impact on financial performance of selected companies. Researcher concludes there is both advantageous & negative courting between capital structure and financial performance. And also, capital structure has very high effect on financial performance of the firms. In case of RETURN ON CAPITAL EMPLOYED (ROCE) and RETURN ON ASSETS (ROA) and capital structure has much less great impact on the economic performance of the corporations .in case of Gross profit (GPM), net profit (NPM) and goes back on fairness (ROE). So, we finish that something be the sample of capital shape the economic overall performance of the FMCG Industries is changing due to different factors inside the firms or in the economy. So, the Industry need to concentrate on the sample of capital structure.

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**SUGGESTIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH**

The researcher has experienced the ability to provide inspiration and recommendation for in addition researcherto advantage greater worth if any studies can be conducted with the aid of them on this subject.

- There are such a lot of sectors in India however for the studies simplest one region i.e.FMCG sector is considered, so other sectors also can be studies and the size of the businesses can also be multiplied.
- Just a few strategies are used to test speculation which includes correlation & regression. Further the researcher can add a great deal form of strategies to generalize their findings inclusive of ANOVA, descriptive information and so forth.
- Most effective secondary facts are accumulated to evaluation to do this research. Similarly, researchers may additionally use secondary information by travelling to every enterprise.

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**THE EFFECTIVENESS OF GESTALT GROUP THERAPY ON PSYCHOLOGICAL WELL-BEING AMONG ALCOHOL DEPENDENCE SYNDROME PATIENTS ADMITTED IN SELECTED DE-ADDICTION CENTERS, AT JAIPUR**

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**Dr. Rajendra Prasad Sharma**

Associate Professor, Mahatma Gandhi Nursing College, Jaipur

**ABSTRACT**

*Alcohol use disorder is a pattern of alcohol use that involves problems controlling the drinking, being preoccupied with alcohol continuing to use alcohol even when it causes problems, having to drink more to get the same effect or having withdrawal symptoms when rapidly decrease or stop drinking.*

**Objectives**

- *To assess the pre-test and post-test level of psychological well-being among alcoholic patients in experimental group and control group.*
- *To find out the effectiveness of gestalt group therapy on psychological well-being among alcoholic patients in experimental group.*
- *To compare the pre-test and post-test level of psychological well-being among alcoholic patients in experimental group and control group.*
- *To associate the post-test level of psychological well-being among alcoholic patients in experimental group and control group with their selected demographic variables.*

**Hypotheses**

*All Hypotheses were tested at 0.05 level of significance.*

- *H1 - The mean post-test level of psychological well-being among alcoholic patients in experimental group will be significantly higher than the mean post-test level in control group.*
- *H2 - The mean post-test level of psychological well-being among alcoholic patients in experimental group will be significantly higher than their mean pre-test level.*
- *H3 - The mean post-test level of psychological well-being among alcoholic patients in control group will be lower than their mean pre-test level.*
- *H4 - There will be a significant association between the post-test level of psychological well-being among alcoholic patients in experimental group and control group with their selected demographic variables.*

**Recommendation:**

- A true experimental study can be conducted to assess the effectiveness of group therapy on psychological well-being among alcohol dependents*
- A study can be conducted to assess the effectiveness of the group therapy to reduce the negative behavior on level of depression and psychological well-being among alcohol dependence syndrome patients.*
- An experimental study can be done to assess the effectiveness of gestalt therapy on improving self-awareness among alcohol dependence syndrome patients.*

**Conclusion**

*Result of the study was concluded that practicing gestalt group therapy to the alcoholic patient was very effective in improving the level of psychological well-being. Therefore the investigator felt that more importance should be given for gestalt group therapy to improving the level of psychological well-being.*

**INTRODUCTION**

Alcoholism is a very complex disease. There is no single cause of alcoholism. There are number of risk factors that play a role in the development of an alcohol addiction. Both internal and external factors contribute to the development of alcoholism. Internal factors include genetics, psychological conditions, personality, personal choice and drinking history. External factors include family, environment, religion, social and cultural norms, age, education and job status.

Alcohol has immediate effect which includes slowed reaction time, blackouts, inability to walk properly, impaired judgment, memory impairment and slurred speech. Alcohol use disorders can lead to permanent and debilitating health condition. Thiamine deficiency, sleep trouble and mental health disorder such as catatonic

schizophrenia cognitive problems include diminished attention span and problems with motor co-ordination a condition that causes a voluntarily flap or shake their hands. In severe cases, hepatic encephalopathy can develop.

### **NEED FOR THE STUDY**

Alcoholism is an emerging social problem in our country. Most of the problems are aroused due to alcoholism. The complications also increasing because of prevalence of alcoholism. Alcohol dependence syndrome patient's psychological well-being and a quality of life get affected because of alcoholism. There are limited techniques to improve psychological well-being in our country setup. Gestalt group therapy was also a one of the technique to improve psychological well-being of alcohol dependence syndrome patients. There are very minimal studies are done in this area.

Alcohol use Disorder in the US estimated 6.2% of adult over about 15.1 million people had an alcohol use disorder. The prevalence of heavy drinking, binge drinking and alcohol use disorders are highest among men aged between 18 to 24 years who are unemployed.

### **OBJECTIVES**

- To assess the pre-test and post-test level of psychological well-being among alcoholic patients in experimental group and control group.
- To find out the effectiveness of gestalt group therapy on psychological well-being among alcoholic patients in experimental group.
- To compare the pre-test and post-test level of psychological well-being among alcoholic patients in experimental group and control group.
- To associate the post-test level of psychological well-being among alcoholic patients in experimental group and control group with their selected demographic variables.

### **HYPOTHESES**

- H1 - The mean post-test level of psychological well-being among alcoholic patients in experimental group will be significantly higher than the mean post-test level in control group.
- H2 - The mean post-test level of psychological well-being among alcoholic patients in experimental group will be significantly higher than their mean pre-test level.
- H3 - The mean post-test level of psychological well-being among alcoholic patients in control group will be lower than their mean pre-test level.
- H4 - There will be a significant association between the post-test level of psychological well-being among alcoholic patients in experimental group and control group with their selected demographic variables.

### **METHODOLOGY**

#### **POPULATION**

- The population of the study was alcoholic patients between the age group of 20 to 60 years who were admitted in selected de-addiction center.

#### **TARGET POPULATION**

- The target population of the study was alcoholic patients who were mild and moderate level of psychological well-being.

#### **ACCESSIBLE POPULATION**

- The accessible population of the study was alcoholic patients with mild level of psychological well-being and moderate level of psychological well-being who were admitted rehabilitation center and de-addiction center.

#### **SAMPLE**

- The alcoholic patients in the age group of 20 to 60 years from rehabilitation center and de addiction center who fulfilled the inclusive criteria and exclusive criteria were the samples of the study.

#### **SAMPLE SIZE**

- The sample size consists of 60 alcoholic patients. Among them, 30 samples were allotted to experimental group and 30 samples were allotted to control group.

**SAMPLING TECHNIQUE**

- Non- probability purposive sampling technique was used to select the samples.

**VARIABLES**

**Independent variable**

- The independent variable of this study was Gestalt group therapy.

**Dependent variable**

- The dependent variable of this study was psychological well-being.

**RESEARCH APPROACH**

- The research approach used for the study was quantitative research approach.

**RESEARCH DESIGN**

- The research design adopted for the study was quasi-experimental pre-test and post-test control group design.

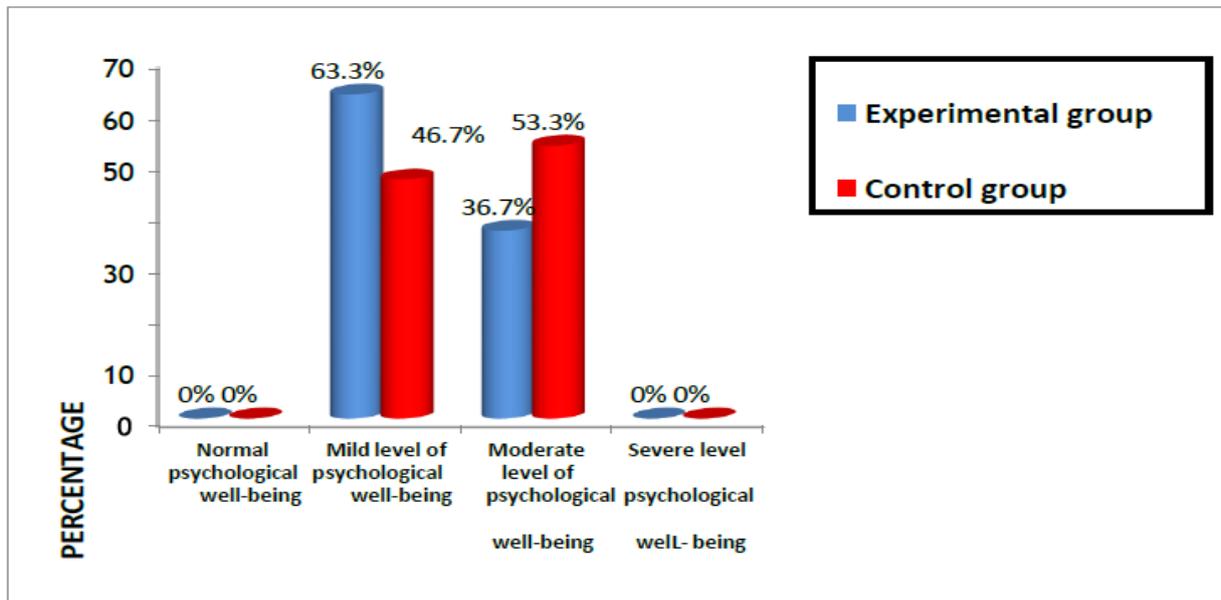


Figure 1: Percentage distribution of the pre-test level of psychological well-being among alcoholic patients in experimental group and control group.

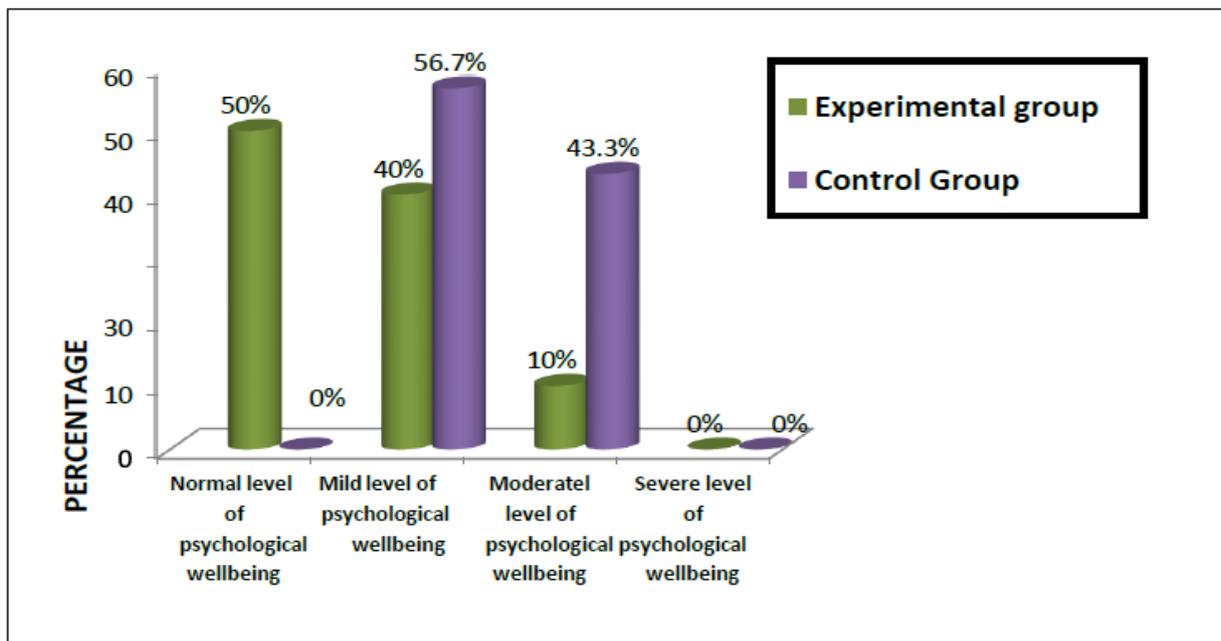


Figure 2: Percentage distribution of the post-test level of psychological well-being among alcoholic patients in experimental group.

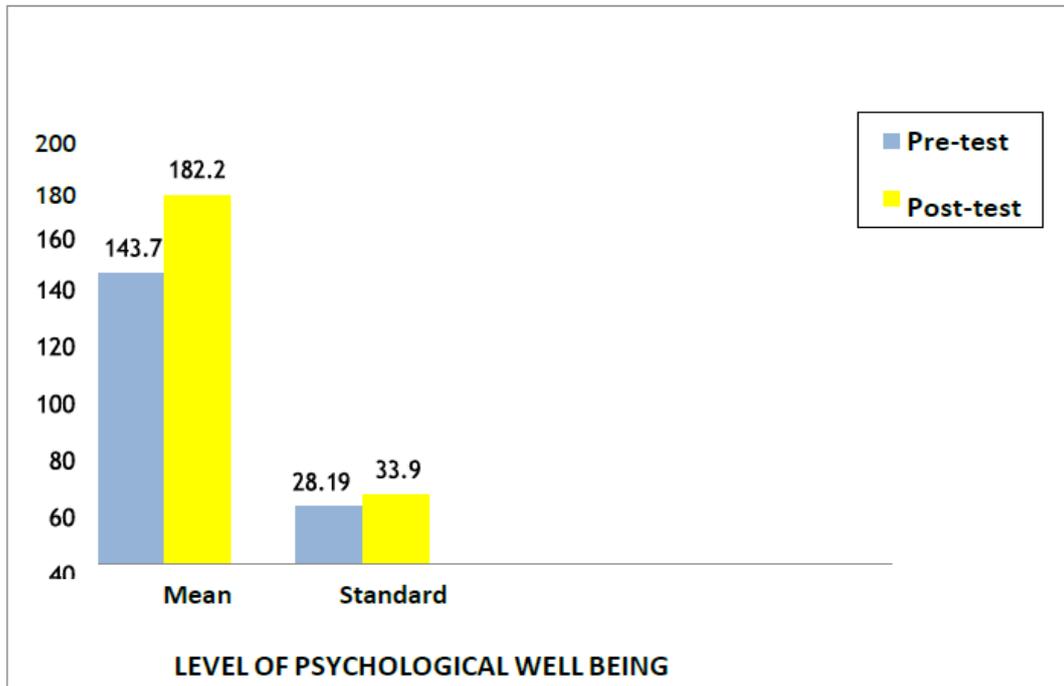


Figure 3: Mean and standard deviation of the Pre-test and Post-test level of psychological well-being among alcoholic patients in experimental group.

**CONCLUSION**

From the result of the study, it was concluded that providing gestalt group therapy was very effective in improving the level of psychological well-being among alcoholic patients and it brings self-awareness. Therefore the investigator felt that more importance should be given for gestalt group therapy to improve the psychological well-being among alcohol-patients.

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**DESIGN, SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL EVALUATION OF 1,3-DIARYLTRIAZENE SUBSTITUTED SULPHACETAMIDE SODIUM DERIVATIVES AS ANTIOXIDANT**

**Rajat Saini\*, Arvind Kumar and Amal Kumar**

Department of Pharmaceutical Chemistry, S. D. College of Pharmacy and Vocational Studies, Bhopa Road  
Muzaffarnagar 251001, India

**ABSTRACT**

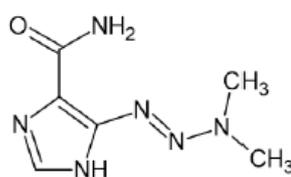
In the past few decades, 1,3-diaryltriazenes had been synthesized and investigated their biological and pharmacological profiles. 1,3-diaryltriazene compounds shows many activities like- anticancer, antioxidant, antimicrobial and anti-diabetic activities. The present study is focused on synthesis of novel series of 1,3-diaryltriazene derivatives from diazonium salt of sulfacetamide sodium and substituted aniline via continuous stirring at 0°C temp. for 3 hrs. A different color of compounds is obtained and the five novel compounds are confirmed by spectral analysis of NMR, MASS spectroscopy and FTIR. Antioxidant activity of the newly synthesized compound have been investigated by many radical scavenging assays. Compound SSR1 (4-[3-(4-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) and SSR5 (4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have highest antioxidant potency presented (IC<sub>50</sub> value are 241.70 and 256.37 µg/mL respectively for DPPH method. In NO(nitric oxide) radical scavenging assay, compound SSR1(4-[3-(4-methylphenyl)-triaz-1-en-1-yl]-N- sulfanilyl acetamide sodium) and SSR5(4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N- sulfanilyl acetamide sodium) have highest antioxidant value 75.80 % and 73.80 % respectively and reducing power antioxidant assay of the five compounds (SSR1-SSR5) were evaluated, compound SSR5 (4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have highest antioxidant value.

**Keywords:** 1,3-diaryltriazene, Antioxidant, Sulpha drug, Free radicals, Scavenging methods, Oxidative stress.

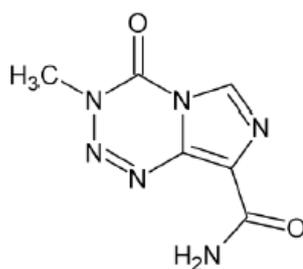
**INTRODUCTION**

**1.1. Triazene:**

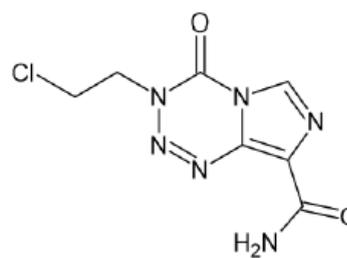
Triazene's are a class of nitrogen containing azo compound that hold three adjacent nitrogen atoms, (R-N=N-NH-R<sup>1</sup>) and this three-nitrogen atom responsible for the physiochemical and biological properties of the molecule.<sup>[1-2]</sup> Triazenyl group is the essential active moiety of triazene compounds<sup>[3-4]</sup> and they have broad spectrum of biological activities such as lipid lowering, antioxidant, antidiabetic, anti-inflammatory, antifungal, antibacterial, insecticidal and analgesic agents.<sup>[5-10]</sup> Triazene can be used as biological and chemical reagents in industry and involved in organic synthesis. Metallic complexes of triazene are show anti-tumor and anticancer activity. Some triazene substituted compounds such as Dacarbazine (DTIC), Temozolomide (TMZ), Mitozolomide (INN) which are used in clinical practice. These compounds have been used to developed anticancer drug due to their low toxicity and good pharmacokinetic properties.<sup>[11-15]</sup>



Dacarbazine (DTIC)



Temozolomide (TMZ)



Mitozolomide(INN)

**Figure 1. Triazene substituted compounds**

1,3-Di aryltriazene substituted sulfonamide having inhibition effect on different metabolic enzymes which are responsible for many diseases. This type of triazene compound has been studied as potent metabolic enzyme inhibitors.<sup>[16]</sup>

**1.2. Antioxidant:**

Antioxidant are substance that able to either delay or prevent or slow the oxidation of the substrate by reacting and eliminating oxidizing free radicals, and reduced oxidative stress, DNA mutation and other parameters of cell damage.<sup>[17-19]</sup> It may be used as food additives, which prevent foods from oxidation and increase their self-life by lipid per-oxidation retardation process. They are also involved in industrial products to reduce or prevent the oxidative degradation of many products like plastics, rubbers and adhesive and widely used to prevent rancidity of lipsticks and moisturizers.<sup>[20-21]</sup>

**1.2.1. Oxidative stress:**

The imbalance between the generations of reactive species (ROS- reactive oxygen specie and RNS- reactive nitrogen species) and ability to neutralize free radical into the living organism are known as Oxidative Stress. Reactive species are known as free radicals which are release in living organism during various chemical reaction on the metabolism procedure. It was reported that over 100 diseases are correlated with oxidative stress. It is involved in immune response to viral respiratory infections.<sup>[22-24]</sup>



**Image-1. Cell damage due to oxidative stress.**

**Table: 1.** Oxidative stress related diseases.

S.no.	Chronic conditions (Disease)
1	Cancer
2	Parkinson’s diseases
3	Diabetes
4	High blood pressure
5	Atherosclerosis
6	Stoke
7	Asthma
8	Male infertility
9	Chronic fatigue syndrome
10	Inflammatory disorder
11	Alzheimer’s disease

**1.2.1.1. Free radicals:**

The ions, atoms, or molecules which have unpaired electron (single electron) are known as free radicals. They are highly reactive and unstable due to this, free radical quickly react with other molecules in to the living organism and make some damage which are responsible for many kinds of disease. Free radicals are including superoxide [O<sub>2</sub><sup>•-</sup>], peroxy [ROO<sup>•</sup>], alkoxy [RO<sup>•</sup>], hydroxyl [OH<sup>•</sup>] and nitric oxide [NO<sup>•</sup>] radicals which responsible for many chronic health problems such as, [Neurodegenerative conditions, (Parkinson, Huntington’s disease and Alzheimer), inflammation, cardiovascular disease and cancer]. Reactive oxygen species mainly found in the electron transport chain [ETC] at the mitochondrial inner membrane where energy is generated in the form of ATP.<sup>[25-28]</sup> The production of ROS is dependent on the metabolic pathway, environmental pollution, UV irradiation and others.<sup>[29-31]</sup>

**1.2.2. Antioxidant reactivity:**

Antioxidant is the compounds that protect body from toxic effect of free radicals. If free radical is not removing from the body, they cause a chain reaction which is responsible for oxidative stress. The protective mechanism

of antioxidant is by decomposing peroxidase, scavenging free radicals or binding with p-oxidant metal ion. The mechanism of antioxidant is dependent on the redox reactions in which unpaired of electron is transfer from one compound (molecule) to the other compound and the loss of electrons are used to maintain oxidation states on the both sides. [32]

Antioxidants acts at different levels and it classify into three categories on the basis of mechanism of action. [33]

### 1- Primary antioxidants-

This antioxidant responsible to preventing the initiation of chain reaction by suppressing the formation of free radical. (Example- Catalase, Selenoprotein, ferritin, Transferrin, Lactoferrin, Glutathione peroxidase, Carotenoid etc.)

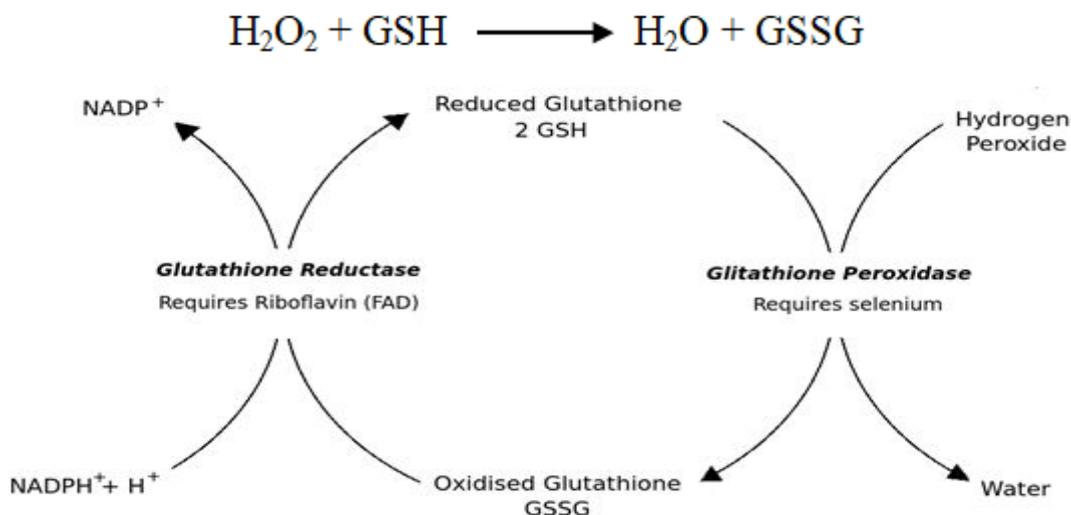


Figure 2. Prevention of chain reaction initiation by Glutathione peroxidase.

### 2- Secondary antioxidants-

Those antioxidants which are involved by interrupting chain sequence of scavenging free radicals generated chain reaction and braking chain propagation reaction.

### 3- Tertiary antioxidants-

They act by removing peroxidase, thereby preventing further generation of reactive species and repair to oxidized molecules. (Example- Proteolytic enzyme, Enzyme of DNA)

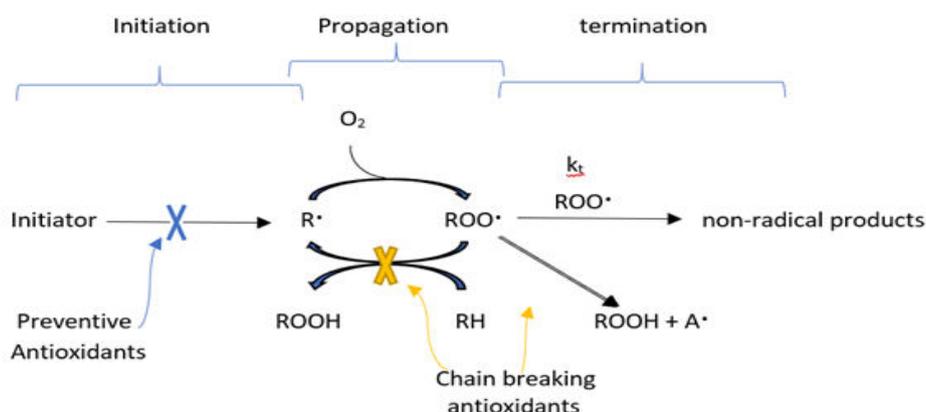


Figure 3. Mechanism action of antioxidant.

On the basis of above information, the present work is aimed to synthesize novel 1,3-diaryl triazene substituted sulfonamides sodium derivatives (SSR1-SSR5) and evaluate their antioxidant activity.

## EXPERIMENTAL

### Material and methods:

All the chemicals and solvents, purchased from Merck (India), Spectrochem (India), Sigma-Aldrich (India), CDH (India) and S.D. Fine were used without further purification. Thin layer chromatographic analysis of compounds was performed on silica gel G coated glass plates. The adsorbent silica gel G was coated to a

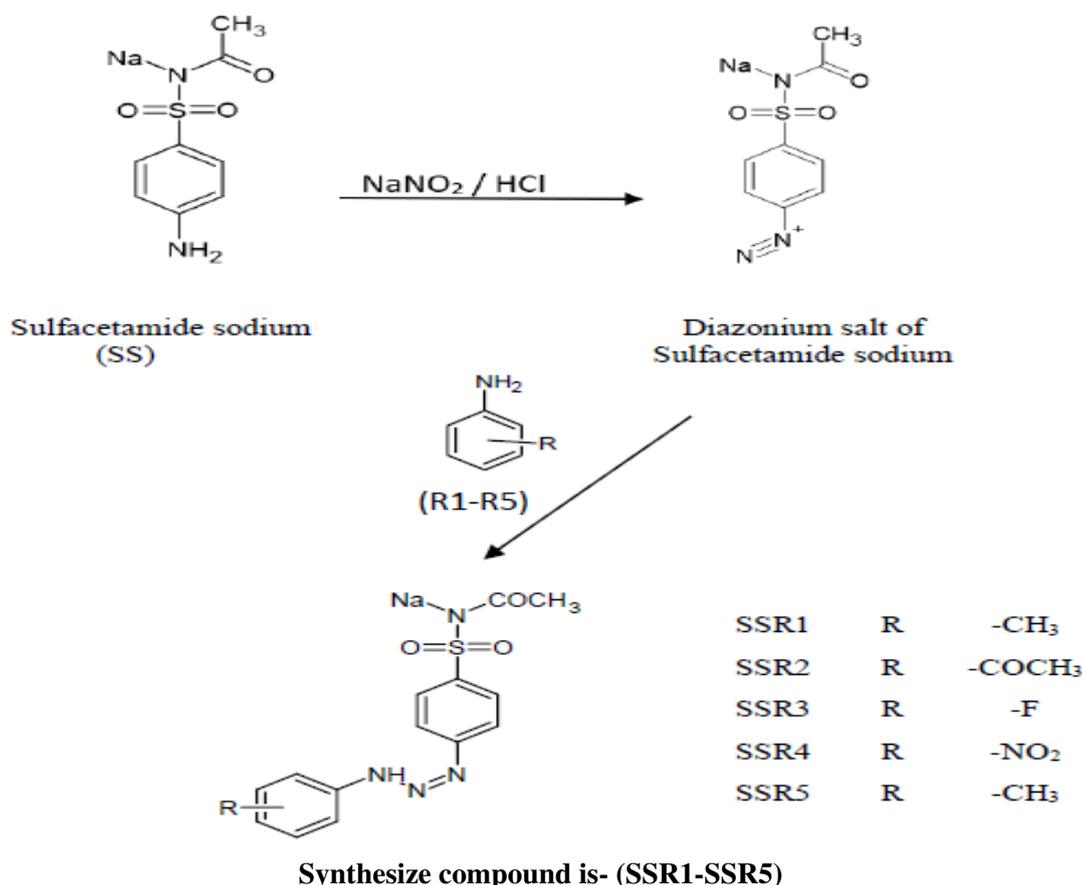
thickness of about 0.25 mm on previously cleaned TLC plates of 20x5 cm using conventional spreader. The plates were placed in hot air oven at 105°C for 30 min. The solutions of compounds were applied as a spot on the activated plate about 2 cm above from the lower edge. The mobile phases were selected according to the polarity of compounds. Melting points were determined by using open capillary melting point apparatus and are reported uncorrected. Compounds were placed in one end of the sealed capillary and placed in the caves made for the capillary. Thermometer was placed in the cave. The temperature at which compound starts melting and the temperature at which it completely melts was recorded as a melting point range. Infra-red spectra of synthesized compounds were recorded in Perkin Elmer – Spectrum RX- IFTIR spectrometer. The proton-nuclear-magnetic resonance spectra of synthesized compound were record on Bruker 500MHz High Resolution NMR spectrometer by TMS an internal level. DMSO was used as solvent to record <sup>1</sup>H NMR spectra. Chemical shifts were reported in ppm (δ) and signals were represented as singlet (s), doublet (d) and multiplet (m). and Mass -to- charge ratio (m/z) of the molecules of synthesized compound (SSR1-SSR5) was identified by the MICROMASS Q-TOF micro-Mass spectrometer.

#### General procedure for the synthesis of compounds [SSR1-SSR5]:

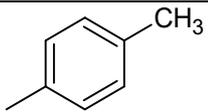
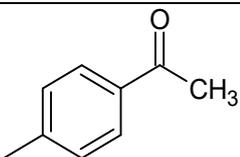
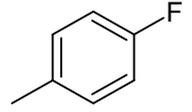
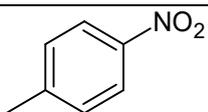
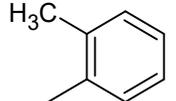
First step, a solution of standard compound (Sulfacetamide sodium) in 1.5 ml of concentrated HCl and 10 ml of cooled water at 0-5°C was prepared with continuous stirring in a conical flask. In another beaker, 7mmol of sodium nitrite was dissolved in 5 ml water and added drop wise in conical flask for about 20-25 minutes with stirring on the magnetic stirrer until mixed well. Geoffrey D. Picard et al, the conversion of iodine starch paper color white to blue indicated the formation of diazonium salt.<sup>[34]</sup>

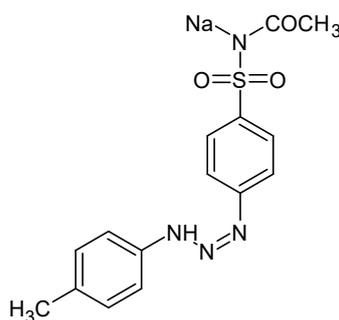
Second step, a solution of substituted aniline (R1-R5) was prepared by dissolved 5mmol of substituted aniline with 5 ml of methanol in a beaker. this solution was added to diazonium salt solution with continuous stirring for 3 hours and maintain the temperature of reaction mixture between 0-5°C. The pH of reaction mixture was adjusted around 5-7 by adding sodium acetate buffer and monitored the reaction through TLC. The reaction mixture was allowed to stand for 24 hours at room temperature in dark place. The colorful mass was obtained and then was filtered, washed with cold water, dried and crystallized from ethanol. The anilines which are used in the synthesis of sulfa drug based 1,3-diaryltriazeno derivatives are as follows: 4-methyl aniline (1), 4-amino acetophenone (2), 4-fluoro aniline (3), 4- nitro aniline (4) and 2- methyl aniline (5). The obtained colorful products (SSR1-SSR5) were characterized by FT-IR, <sup>1</sup>HNMR, MASS spectroscopy and melting points.

Scheme: 1.



**Chemicals and conditions:**(i) H<sub>2</sub>O, con. HCL, NaNO<sub>2</sub>, 0-5°C, ½ hr;(ii) substituted aromatic anilines (R1-R5), CH<sub>3</sub>-OH, H<sub>2</sub>O, saturated sodium acetate 0-5°C, stirring 3hr, r.m. overnight.

S.no.	Compounds	R	Molecular formula	Calculated Molecular Weight
1.	SSR1		C <sub>15</sub> H <sub>15</sub> N <sub>4</sub> NaO <sub>3</sub> S	354.36
2.	SSR2		C <sub>16</sub> H <sub>15</sub> N <sub>4</sub> NaO <sub>4</sub> S	382.36
3.	SSR3		C <sub>14</sub> H <sub>12</sub> FN <sub>4</sub> NaO <sub>3</sub> S	358.32
4.	SSR4		C <sub>14</sub> H <sub>12</sub> N <sub>5</sub> NaO <sub>5</sub> S	385.33
5.	SSR5		C <sub>15</sub> H <sub>15</sub> N <sub>4</sub> NaO <sub>3</sub> S	354.36

**Table: 2.** Physical data of all compounds substituted Aniline.**Characterization of the synthesized compounds (SSR1-SSR5)-****Compound-1: 4-[3-(4-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium (SSR1)****Physical parameters:**

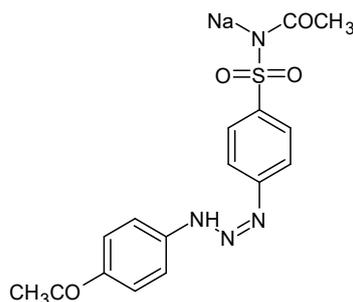
Percentage yield: 60%

Color: Carrot color

Melting Point: 159-161°C

R<sub>f</sub> value: 0.65Molecular formula: C<sub>15</sub>H<sub>15</sub>N<sub>4</sub>NaO<sub>3</sub>S

**Characterization:** FT-IR: NH(3238cm<sup>-1</sup>), N=N(1598cm<sup>-1</sup>), S=O(1150cm<sup>-1</sup>), C-N(1500cm<sup>-1</sup>), C=O(1687cm<sup>-1</sup>), CH<sub>3</sub>(1259cm<sup>-1</sup>); <sup>1</sup>H-NMR(DMSOd<sub>6</sub> -500MHz), δ7.62-8.15(m,8H,Ar-H), 2.51-2.58(d, 3H,-CH<sub>3</sub>), 1.94(s, 3H,-CO-CH<sub>3</sub>), 13.15(s,1H, NH). MS(m/z):354.07. M<sup>+</sup>.

**Compound-2: 4-[3-(4-acetyl-phenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium (SSR2)****Physical parameters:**

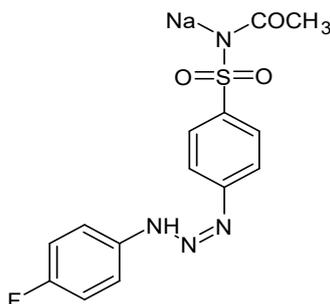
Percentage yield: 57%

Color: Yellow color

Melting Point: 178-280°C

R<sub>f</sub> value: 0.68Molecular formula: C<sub>16</sub>H<sub>15</sub>N<sub>4</sub>NaO<sub>4</sub>S

**Characterization:** FT-IR: NH(3250-3054cm<sup>-1</sup>), N=N(1509cm<sup>-1</sup>), S=O(1148cm<sup>-1</sup>), C-N(1442 cm<sup>-1</sup>), C=O(1604cm<sup>-1</sup>), CH<sub>3</sub>(1335cm<sup>-1</sup>); <sup>1</sup>H-NMR (DMSO<sub>d</sub><sub>6</sub> -500MHz), δ7.62-8.15 (m,8H,Ar-H), 2.51-2.58(d,3H, -CH<sub>3</sub>), 1.94(s,3H,-CO-CH<sub>3</sub>), 12.15(s,1H,NH). MS(m/z):354.07. M<sup>+</sup>.

**Compound-3: 4-[3-(4-fluoro phenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium (SSR3)****Physical parameters:**

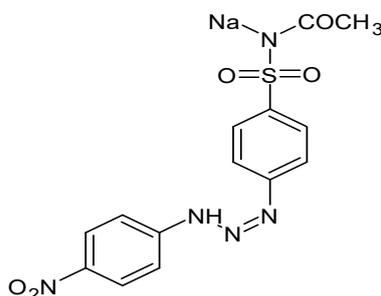
Percentage yield: 57%

Color: Grey color

Melting Point: 169-172°C

R<sub>f</sub> value: 0.75Molecular formula: C<sub>14</sub>H<sub>12</sub>FN<sub>4</sub>NaO<sub>3</sub>S

**Characterization:** FT-IR: NH(3272-3092 cm<sup>-1</sup>),N=N(1599cm<sup>-1</sup>), S=O(1155cm<sup>-1</sup>), C-N(1456 cm<sup>-1</sup>), C=O(1687cm<sup>-1</sup>), CH<sub>3</sub>(1306cm<sup>-1</sup>); <sup>1</sup>H-NMR(DMSO<sub>d</sub><sub>6</sub> -500 MHz), δ7.93-8.80 (m, 8H,Ar-H), 1.94 (s,3H,-CO-CH<sub>3</sub>), 10.04(s,1H,NH). MS(m/z):358.09. M<sup>+</sup>.

**Compound-4: 4-[3-(4-nitrophenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium(SSR4)**

**Physical parameters:**

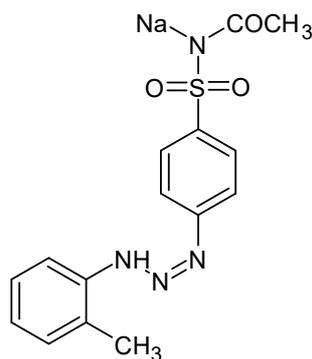
Percentage yield: 49%

Color: Turmeric color

Melting Point: 165-167 °C

R<sub>f</sub> value: 0.64Molecular formula: C<sub>14</sub>H<sub>12</sub>N<sub>5</sub>NaO<sub>5</sub>S

**Characterization:** FT-IR: NH (3243-3053cm<sup>-1</sup>), N=N(1599cm<sup>-1</sup>), S=O(1154cm<sup>-1</sup>), C-N(1441 cm<sup>-1</sup>), C=O(1644 cm<sup>-1</sup>), CH<sub>3</sub>(1266 cm<sup>-1</sup>); <sup>1</sup>H-NMR (DMSO<sub>d</sub><sub>6</sub> -500MHz), δ6.93-7.54 (m,8H, Ar-H), 2.51-2.58(d,3H,-CO-CH<sub>3</sub>), 13.15 (s,1H,NH). MS(m/z):385.08. M<sup>+</sup>.

**Compound-5: 4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium (SSR5)****Physical parameters:**

Percentage yield: 51%

Color: Reddish color

Melting Point: 167-69°C

R<sub>f</sub> value: 0.65Molecular formula: C<sub>15</sub>H<sub>15</sub>N<sub>4</sub>NaO<sub>3</sub>S

**Characterization:** FT-IR: NH(3238 cm<sup>-1</sup>), N=N(1598cm<sup>-1</sup>), S=O (1150cm<sup>-1</sup>), C-N(1452cm<sup>-1</sup>), C=O(1635cm<sup>-1</sup>), CH<sub>3</sub> (1259cm<sup>-1</sup>); <sup>1</sup>H-NMR(DMSO d<sub>6</sub> -500 MHz), δ7.61-8.14 (m,8H,Ar-H), 1.94 (d,3H, -CO-CH<sub>3</sub>), 2.51-2.58(d, 3H,-CH<sub>3</sub>), 13.15(s,1H,NH). MS(m/z):354.07. M<sup>+</sup>.

**PHARMACOLOGICAL EVALUATION:****Antioxidant methods:**

The measurement of free radical scavenging activity of sulfa drug based triazene is continually related free radical scavenging method to search the in-vitro activity. Antioxidant activity of newly synthesized 1,3-diaryl triazene sulfacetamide sodium derivatives were evaluated by various method.

Nitric oxide scavenging assay. <sup>[35]</sup>Reducing power antioxidant assay, <sup>[36]</sup>DPPH radical scavenging method, <sup>[37]</sup>

Standard compound was also analyses for their antioxidant properties and a comparative study was done with the novel synthesized compounds.

**Nitric oxide scavenging assay:**

Ebrahimzadeh et al. procedure was adopted to calculate the scavenging capacity of the synthesized compounds against nitric oxide radical. The procedure was carried out with nitroprusside which responsible for the formation of nitric oxide. Nitric oxide is converted into nitrite ion when it's come in the contact of oxygen. Griess reagent are involved in the reaction and formed a colored complex with nitrite ion. The antioxidant compounds reduced the formation of nitrite ion and the color of final mixture in depend on the potency of

antioxidant. So, if the compound has more antioxidant activity, then the colorless solution obtained. The absorbance of colored mixture was read at 546nm against the blank.

The compounds were primarily subjected for evaluating their antioxidant activity by nitric oxide scavenging assay. The result are shown in the table-8. synthesized compound SSR1 (75.8%), SSR2 (64.8%), SSR3 (20.2%), SSR4 (39.4%) and SSR5 (73.2%) have been represented the highest antioxidant values at 10 ( $\mu\text{g/mL}$ ) concentration of sample with respect to standard ascorbic acid. compound SSR1 (4-[3-(4-methylphenyl) -triaz-1-en-1-yl] -N- sulfanilyl acetamide sodium) and SSR5 (4-[3-(2-methylphenyl) -triaz-1-en-1-yl] -N- sulfanilyl acetamide sodium) have highest antioxidant value 75.80 % and 73.80 % respectively.

#### Reducing power antioxidant assay:

Reducing powers antioxidant assays is a developed assay for measure antioxidant capacity of samples, which is based on conversion of the ferric ion to ferrous ion by antioxidant molecules forming the colored complex. This procedure was adopted to calculate the scavenging capacity of synthesized compounds, in which different concentration (10, 25, 50 & 100 $\mu\text{g/ml}$ ) of synthesized compounds and standard was prepared with methanol. For the further procedure phosphate buffer (2.5ml, 0.2M, pH-6.6) and potassium ferricyanide (2.5ml, 1% solution) added to each test tube including the blank test tube. Incubated the all-test tube mixture at 50 °C temperature for 25min. and after 25min. Trichloroacetic acid (2.5 mL, 10%) added. Then centrifuge mixture at 2500rpm for 10min and separated out upper layer of mixture. Then dissolved the supernatant with distilled water (2.5mL) and ferric chloride (0.5mL) 0.1% solution and read absorbance at 700nm and to calculate the scavenging activity (%) using following equation.

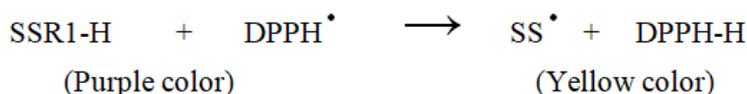
$$\text{Scavenging effect (\%)} = \left[ \frac{\text{Abs}_{\text{control}} - \text{Abs}_{\text{sample}}}{\text{Abs}_{\text{control}}} \right] \times 100$$

\*Abs<sub>control</sub> - Absorbance of control, Abs<sub>sample</sub> - Absorbance of sample.

The reducing power antioxidant assay was used to determine the reducing power of compounds (SSR1-SSR5) to clarify the relationship between the antioxidant effect and the reducing power (Table-9). It was found that compound SSR1 (4-[3-(4-methylphenyl) -triaz-1-en-1-yl] -N- sulfanilyl acetamide sodium) showed relatively low antioxidant power as compared to other compounds whereas compound SSR5 (4-[3-(2-methylphenyl) -triaz-1-en-1-yl] -N- sulfanilyl acetamide sodium) shown relatively high antioxidant power 0.472 optical density value.

#### DPPH free radical scavenging method:

Procedure was adopted to calculate the scavenging potency of the synthesized compounds against DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical reagent. In this method, the reduction of the purple DPPH free radical is occurring due to the accepting electron or radical hydrogen from antioxidant (SSR1-H).



Firstly, prepared a solution of each newly synthesized compound up to 125 $\mu\text{L}$  with separate concentration (25-290  $\mu\text{g/ml}$ ). This solution was added in 125 $\mu\text{L}$  Preparation of DPPH solution by dissolving of DPPH (8g) in 100ml methanol and mixed well. Mixture was kept in dark place at 25-27°C for half an hour for generation of free radical. Then with help of UV chamber, measuring absorbance at 515nm, and calculated % DPPH scavenging effects of compounds (Table-1). The result was indicated by IC<sub>50</sub> values and ascorbic acid is used as reference to compared DPPH scavenging effect of synthesized compound and IC<sub>50</sub> value of ascorbic acid is 29.12 $\mu\text{g/mL}$ , for DPPH method.

calculate the scavenging activity (%) by using following equation.

$$\text{DPPH scavenging effect (\%)} = \left[ \frac{\text{Abs}_{\text{control}} - \text{Abs}_{\text{sample}}}{\text{Abs}_{\text{control}}} \right] \times 100$$

\*Abs<sub>control</sub> - Absorbance of control, Abs<sub>sample</sub> - Absorbance of sample.

In DPPH method compounds SSR1, SSR2, SSR3, SSR4 and SSR5 having IC<sub>50</sub> values of 241.7, 212.5, 131.9, 180.5 and 256.3  $\mu\text{g/mL}$  respectively, compared to the standard Ascorbic acid 23.11  $\mu\text{g/mL}$  (Table-10). In the Table-11, the examination results were expressed that, 35.6% of compound SSR1, 17% of compound SSR2, 34% of compound SSR3, 18% of compound SSR4, and 39.6% of compound SSR5 have exhibited the highest antioxidant values with compare to standard Ascorbic acid in the DPPH method with respect to the dosage concentration of 100  $\mu\text{g/ml}$ . Among the compounds SSR1 to SSR5, compound SSR5 founds to have excellent antioxidant activity by using DPPH method than other compounds with 100  $\mu\text{g/mL}$  concentration. This activity can be comparable with standard Ascorbic acid.

## RESULT AND DISCUSSION

### Drug design strategy and chemistry:

The synthesis of novel compound is designed on the basis of recent studies in which observed that newly synthesized 1, 3-diaryltriazene substituted sulfonamides have a potent and effective activity against free radicals. So, in present work our intent to change the sulfacetamide sodium from 1<sup>o</sup> amine to triazene moiety and applied it on DPPH radical scavenging, reducing power antioxidant assay and (NO)Nitric oxide radical scavenging assay method to calculate the antioxidant potency. In a study, antioxidant capacity of sulfonamide (sulfathiazole, Sulfa isoxazole, sulfamethoxazole) triazene derivatives detected by DPPH and ABTS assay. They having highest antioxidant capacity and IC<sub>50</sub> value were found in the range 488-858.5 $\mu\text{g/mL}$  for DPPH and 54.12-48 $\mu\text{g/mL}$  for ABTS. <sup>[38]</sup> In another study, series of 1,3-diaryltriazenesulfonamide were synthesized and calculated it IC<sub>50</sub> value found in the range 114.89 $\pm$ 2.50 to 813.65 $\pm$ 1.18 and >1000  $\mu\text{g/mL}$  for DPPH and 25.31 $\pm$ 0.21 to 610.34 $\pm$ 3.07 and >1000  $\mu\text{g/mL}$  for ABTS. <sup>[39]</sup> In the present study, A series of structurally diverse 1,3-diaryltriazene substituted sulfonamide sodium derivatives were synthesized according to modified synthetic route as presented in scheme-1. The final compound confirmed by FTIR, <sup>1</sup>HNMR and MASS spectroscopy.

### Biological evaluation:

#### Antioxidant activity:

All the five synthesized compounds (SSR1-SSR5) were screened for their possible in vitro antioxidant activity through different in vitro modules such as 1,1-Diphenyl-2-picrylhydrazyl radical (DPPH), nitric oxide (NO) radical scavenging and ferric ion reducing antioxidant power assay. Observed results indicated that, few of the tested compounds are significant in their antioxidant properties.

Absorbance of synthesized compounds at various concentration ( $\mu\text{g/ml}$ ) in nitric oxide radical scavenging model.

**Table: 3. Absorbance of SSR1**

Absorbance of SSR1 compound at concentration in nitric oxide radical scavenging model	
Concentration ( $\mu\text{g/ml}$ )	Absorbance
10	0.121 $\pm$ 0.004
25	0.099 $\pm$ 0.006
50	0.135 $\pm$ 0.003
100	0.151 $\pm$ 0.001

**Table: 4. Absorbance of SSR2**

Absorbance of SSR2 compound at concentration in nitric oxide radical scavenging model	
Concentration ( $\mu\text{g/ml}$ )	Absorbance
10	0.176 $\pm$ 0.007
25	0.325 $\pm$ 0.004
50	0.406 $\pm$ 0.026
100	0.483 $\pm$ 0.023

**Table: 5. Absorbance of SSR3**

Absorbance of SSR3 compound at concentration in nitric oxide radical scavenging model	
Concentration ( $\mu\text{g/ml}$ )	Absorbance
10	0.399 $\pm$ 0.002
25	0.426 $\pm$ 0.006
50	0.495 $\pm$ 0.005
100	1.229 $\pm$ 0.001

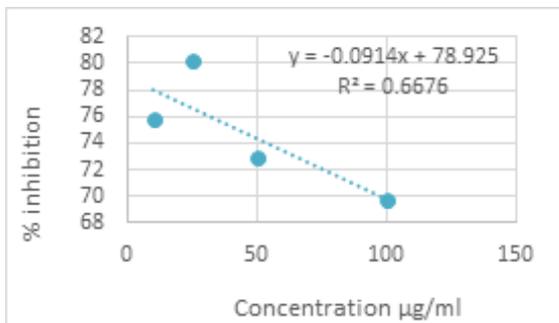
**Table: 6. Absorbance of SSR4**

Absorbance of SSR4 compound at concentration in nitric oxide radical scavenging model	
Concentration (µg/ml)	Absorbance
10	0.303±0.010
25	0.610±0.011
50	1.165±0.024
100	2.000±0.173

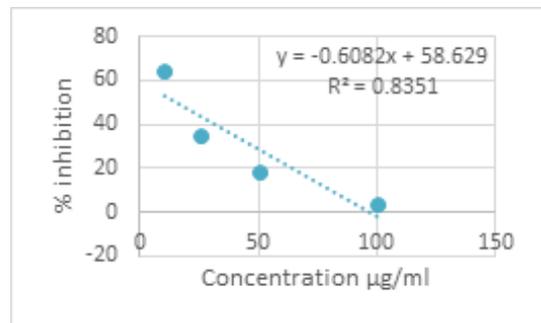
**Table: 7. Absorbance of SSR5**

Absorbance of SSR5 compound at concentration in nitric oxide radical scavenging model	
Concentration (µg/ml)	Absorbance
10	0.131±0.057
25	0.127±0.036
50	0.250±0.083
100	0.301±0.019

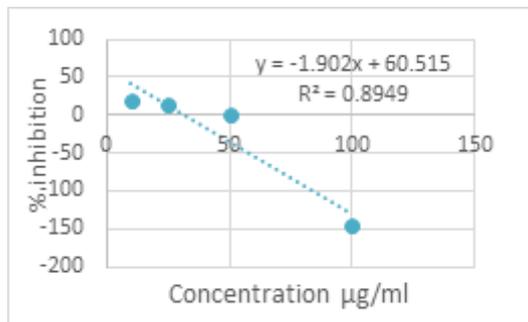
Percentage inhibition of the synthesized compounds at various concentration (µg/ml) in nitric oxide radical scavenging model.



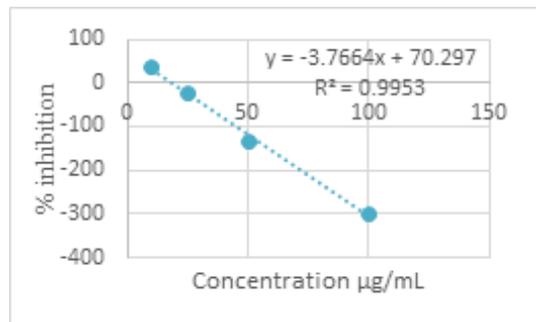
**Figure 4. Percentage inhibition of SSR1**



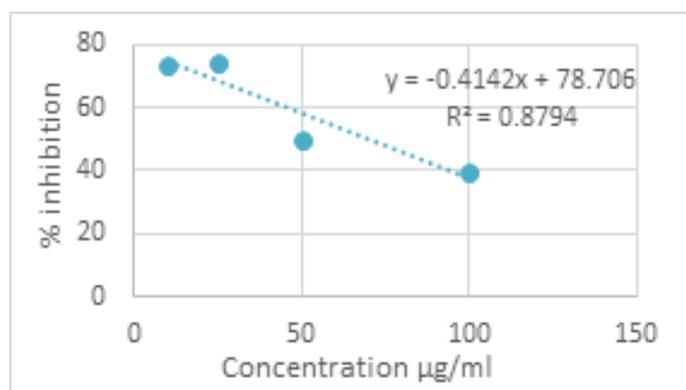
**Figure 5. Percentage inhibition of SSR2**



**Figure 6. Percentage inhibition of SSR3**



**Figure 7. Percentage inhibition of SSR4**



**Figure 8. Percentage inhibition of SSR5**

**Table 8: Antioxidant activity percentage comparison study with standard and synthesized compounds in Nitric oxide (NO) method**

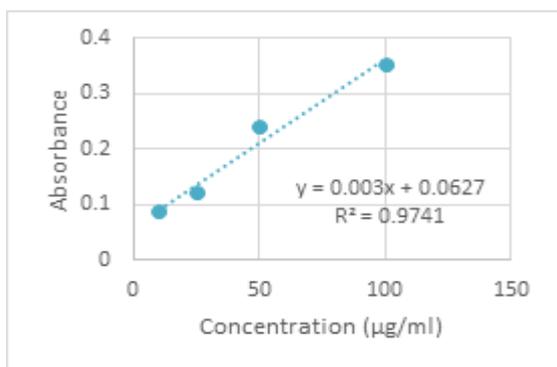
S.no.	Compound	Standard % (Ascorbic acid)	Concentration (µg/ml)			
			10	25	50	100
1	SSR1	100	75.8	80.2	73	69.8
2	SSR2	100	64.8	35	18.8	3.4
3	SSR3	100	20.2	14.8	1	-145.8
4	SSR4	100	39.4	-22	-133	-300
5	SSR5	100	73.8	74.6	50	39.8

**Table: 9. Reducing power of compounds (SSR1-SSR5).**

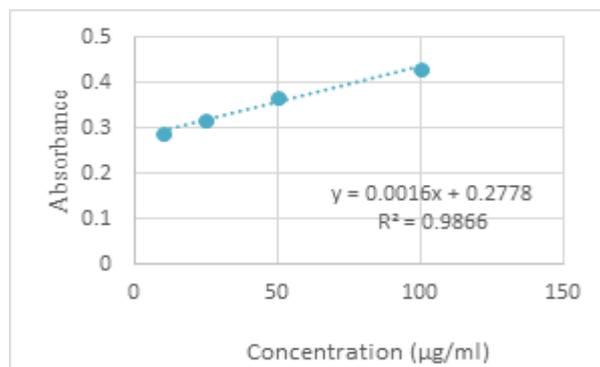
Compound (OD)	Concentration			
	10	25	50	100
SSR1	0.288	0.317	0.367	0.431
SSR2	0.295	0.323	0.385	0.421
SSR3	0.302	0.379	0.401	0.395
SSR4	0.332	0.383	0.425	0.428
SSR5	0.301	0.344	0.416	0.472
Control	0.042	0.042	0.042	0.042

\*Data expressed the means of three replicates (OD-optical density)

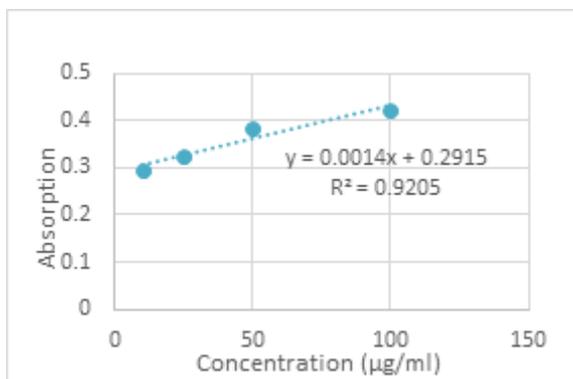
Ferric reducing power determination of standard ascorbic acid and synthesized compounds (SSR1-SSR5):



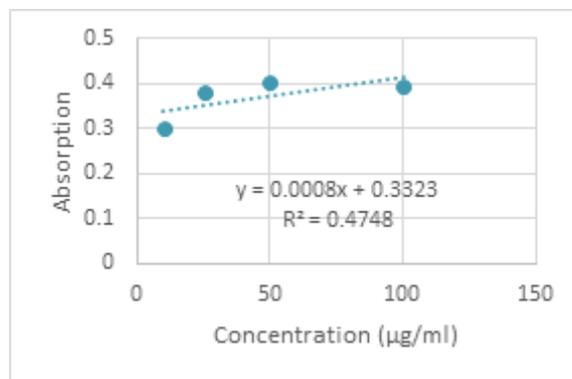
**Figure 9. Ferric reducing power determination of standard ascorbic acid**



**Figure 10. Ferric reducing power determination of SSR1**



**Figure 11. Ferric reducing power determination of SSR2**



**Figure 12. Ferric reducing power determination of SSR3**

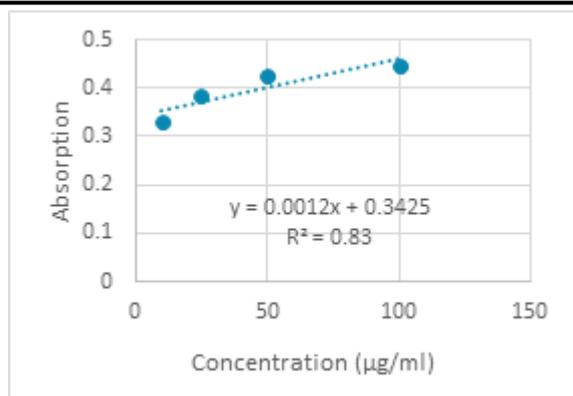


Figure 13. Ferric reducing power determination of SSR4

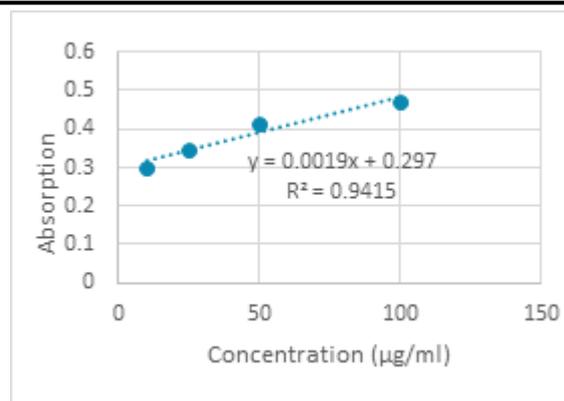


Figure 14. Ferric reducing power determination of SSR5

Table 10. The in-vitro antioxidant activity of compounds (SSR1-SSR5) in DPPH method

S.no.	Compound	Concentration (µg/ml)				
		10	25	50	100	IC50
1	SSR1	6.2	17.65	23.95	30.50	241.7±15.50
2	SSR2	11.13	20.85	29.64	44.51	212.5±3.27
3	SSR3	43.08	58.18	57.34	61.68	131.9±12.78
4	SSR4	22.57	27.28	35.86	42.75	180.5±7.31
5	SSR5	11.28	20.61	25.91	39.11	256.37±2.27
6	Ascorbic acid	27.49	41.07	49.15	67.30	23.11±2.05

\*Scavenging activity values were the means of three replicates

Table 11. Antioxidant activity percentage comparison study with standard and synthesized compounds in DPPH method

S.no.	Compound	Standard % (Ascorbic acid)	Concentration (µg/ml)			
			10	25	50	100
1	SSR1	100	23.6	25	28.2	35.6
2	SSR2	100	20.2	7.8	5	17
3	SSR3	100	28	30	23	34
4	SSR4	100	8	5.6	7.4	18
5	SSR5	100	36.2	33	29.6	39.6

## CONCLUSION

In the present research work, five newly 1, 3-diaryltriazene compounds were synthesized by substituted aromatic aniline with diazonium salt of Sulphacetamide sodium and characterized by spectral analytical techniques. On basis of results, all five 1,3-diaryltriazene compounds were shown antioxidant activity which is investigated by DPPH free radical scavenging assay, reducing power antioxidant assay and nitric oxide (NO) radical scavenging assays. Compound SSR1(4-[3-(4-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) and SSR5(4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have highest antioxidant activity presented IC<sub>50</sub> value 241.70µg/mL and 256.37µg/mL respectively and compound SSR3 and compound SSR4 (4-[3-(4-nitrophenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have lowest antioxidant activity presented IC<sub>50</sub> value 131.90µg/mL and 180.50µg/mL respectively for DPPH method. In nitric oxide (NO) radical scavenging assay, compound SSR1(4-[3-(4-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) and SSR5(4-[3-(2-methylphenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have highest antioxidant value 75.80 % and 73.80 % respectively and reducing power antioxidant assay of the five compounds (SSR1-SSR5) were evaluated, compound SSR5(4-[3-(2-methyl phenyl) -triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have highest and compound SSR3(4-[3-(4-fluoro phenyl)-triaz-1-en-1-yl]-N-sulfanilyl acetamide sodium) have lowest antioxidant value. If the compounds further explored, they can be more potent for multi-target or disease.

## ACKNOWLEDGEMENT

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to lab SAIF, PU, Chandigarh for recording the  $^1\text{H}$ NMR, FT-IR and MASS spectra of the synthesized compounds.

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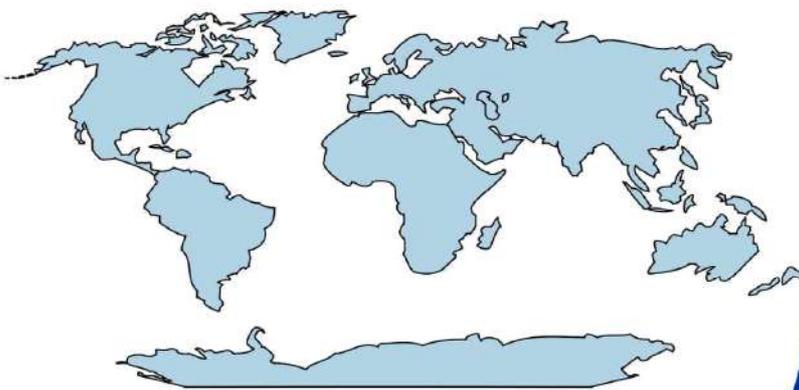
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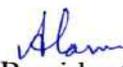
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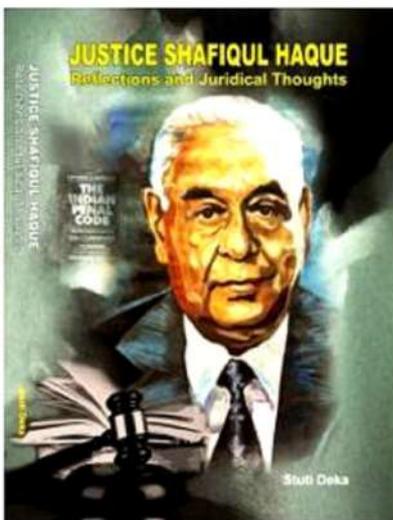


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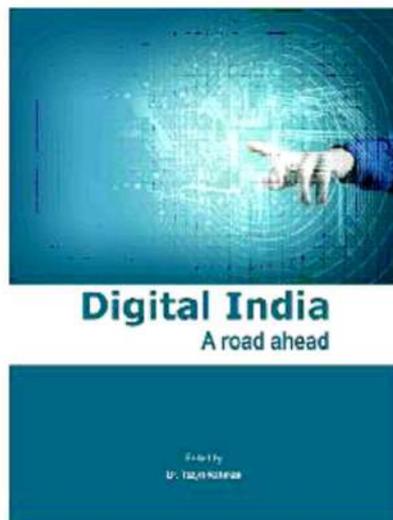
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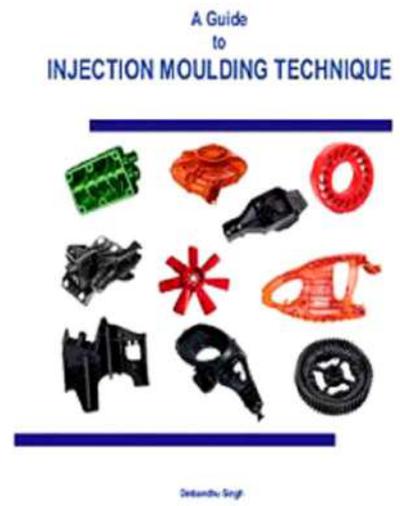
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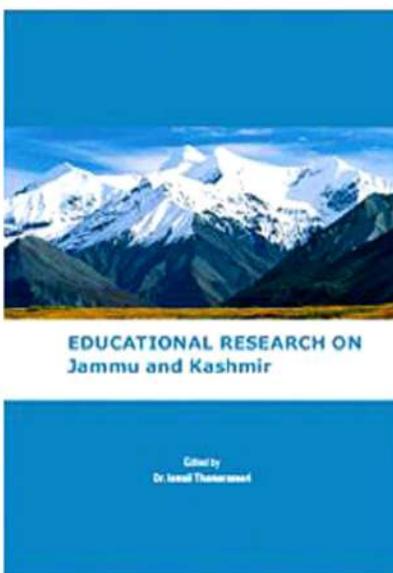
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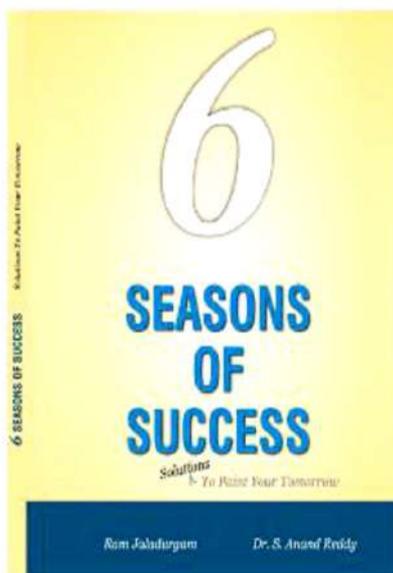
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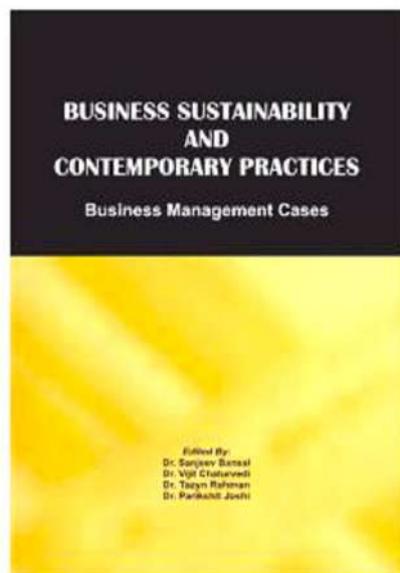
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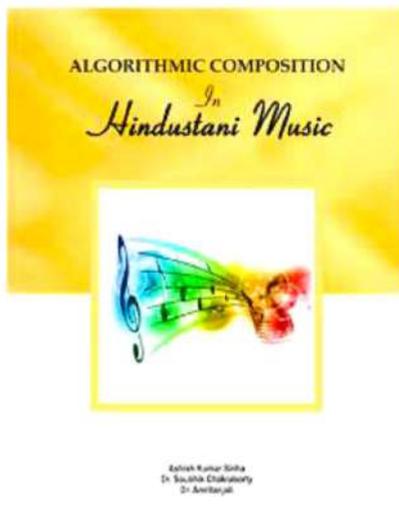
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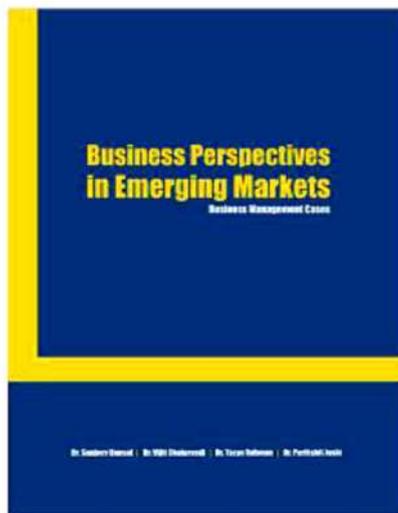
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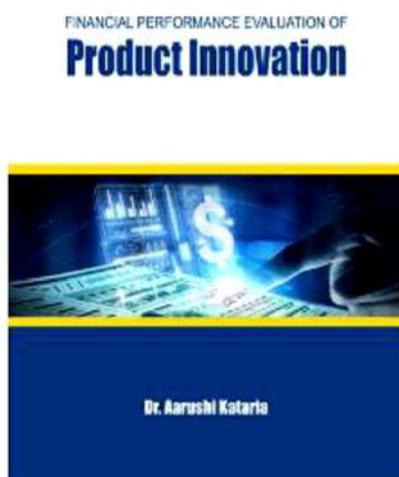
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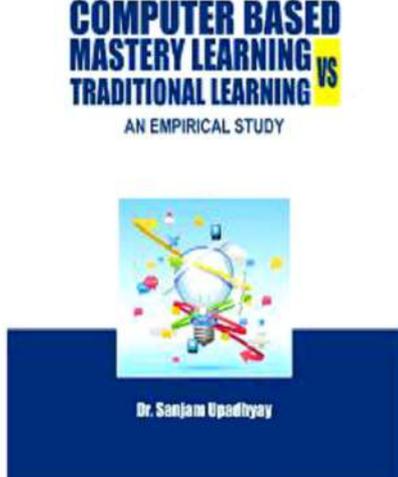
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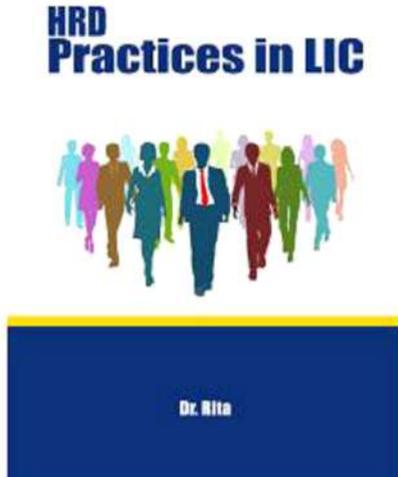
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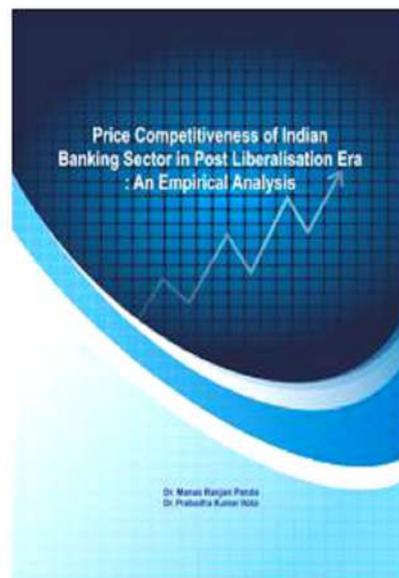
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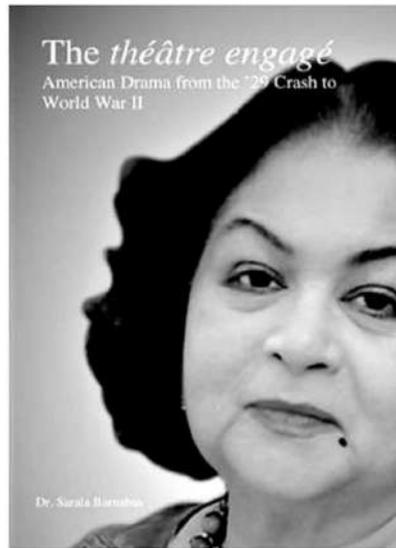
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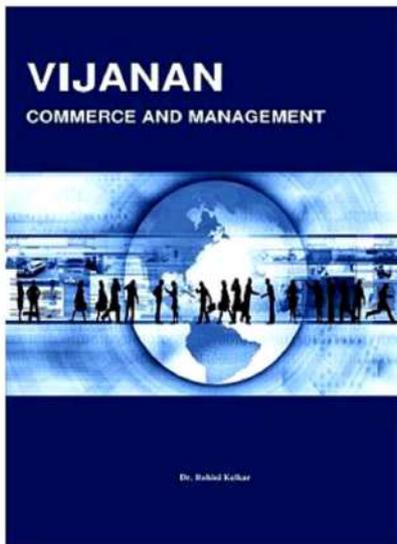
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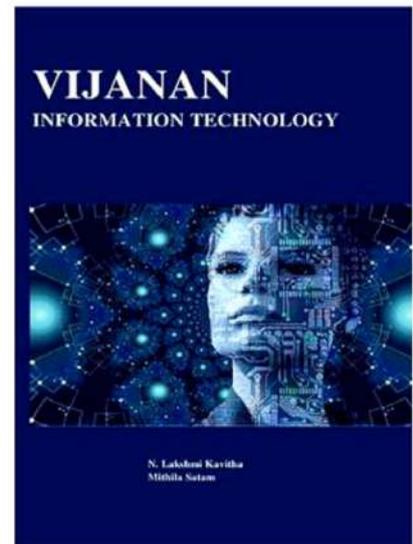
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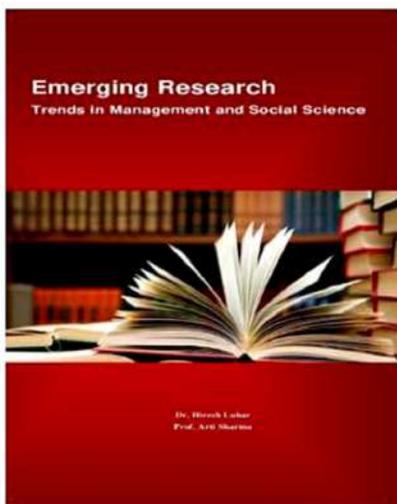
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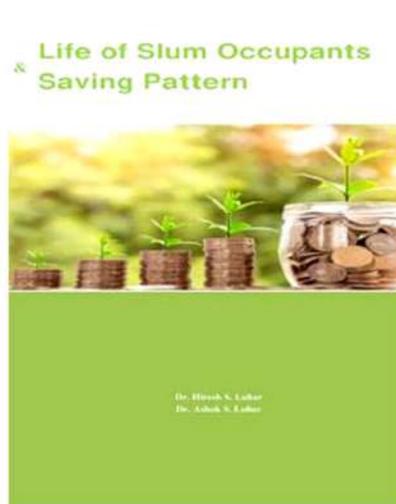
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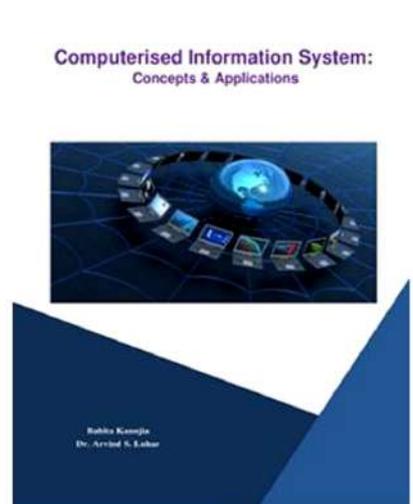
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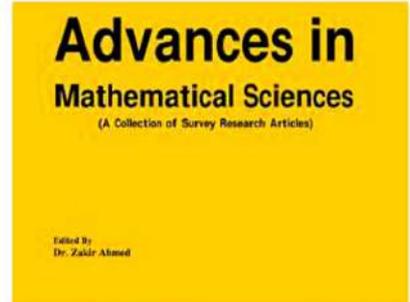
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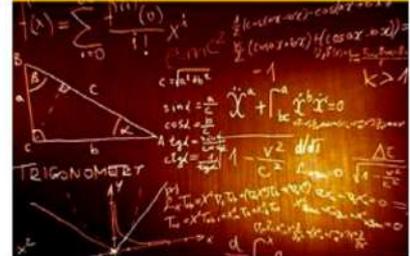
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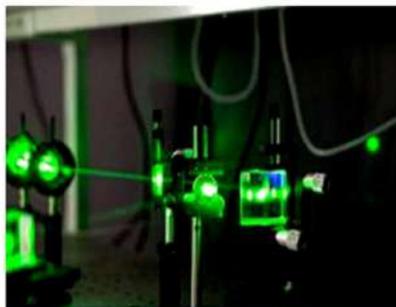


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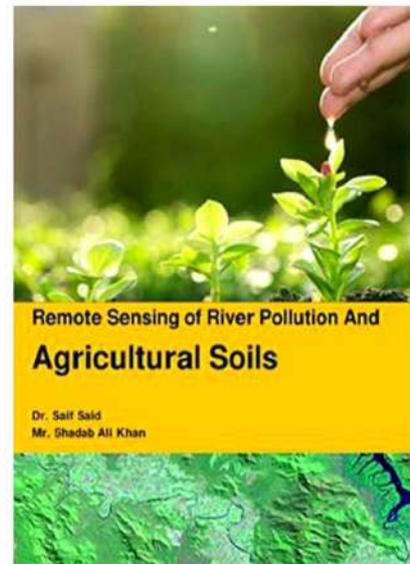
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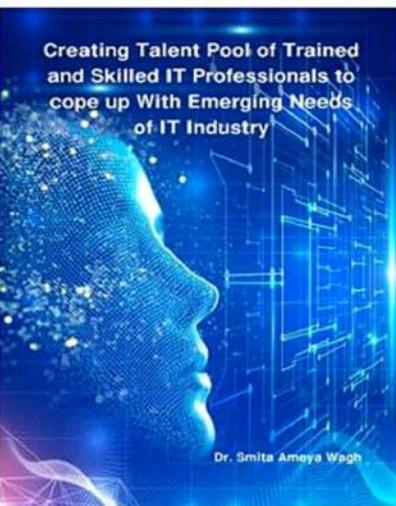
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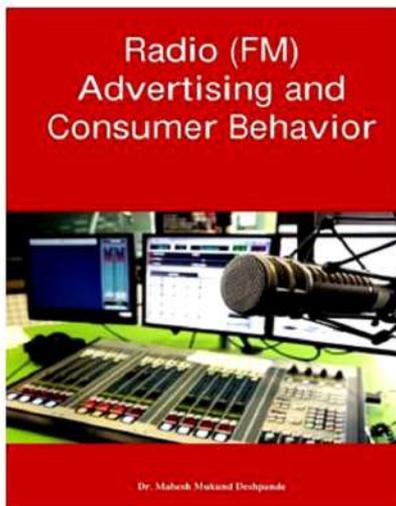
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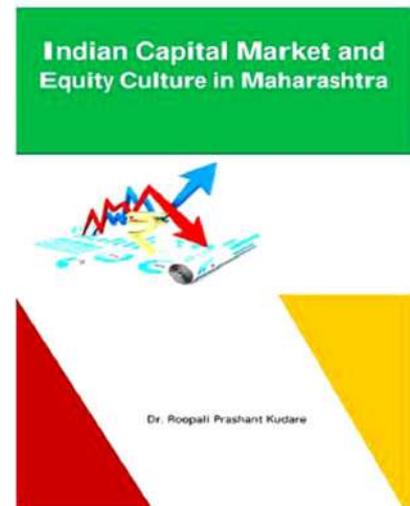
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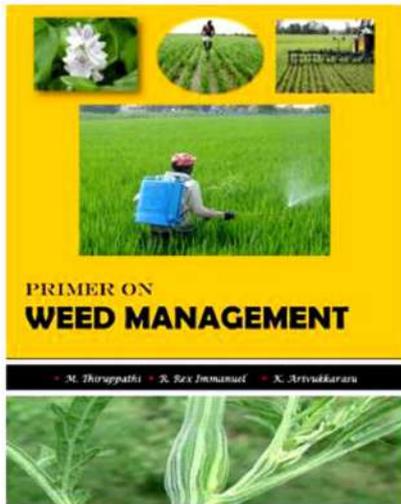
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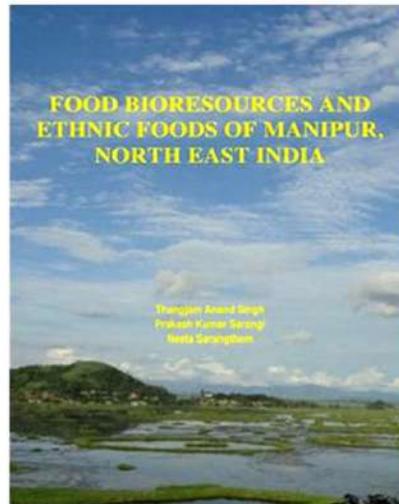
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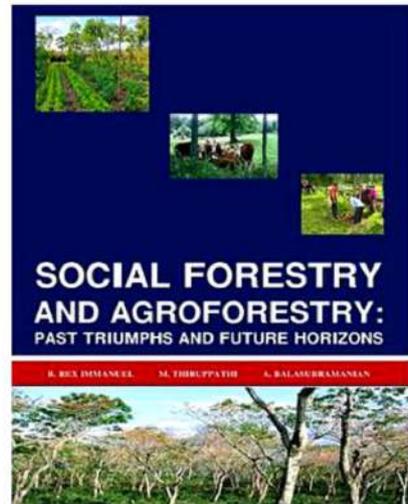
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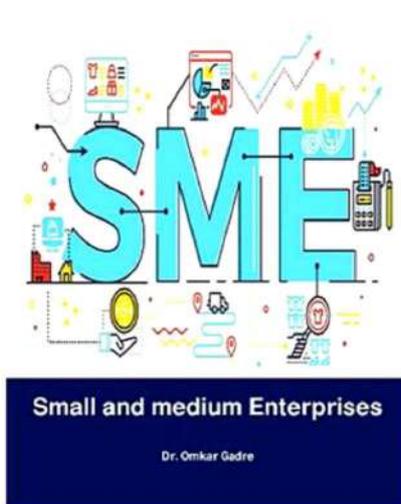
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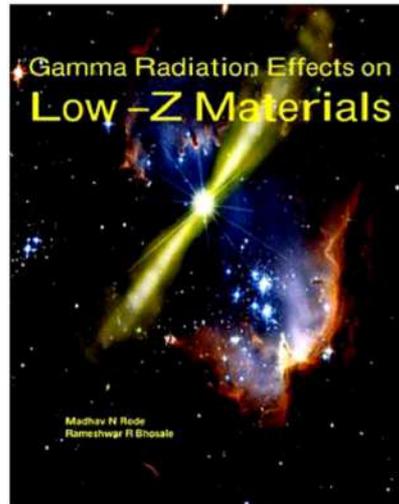
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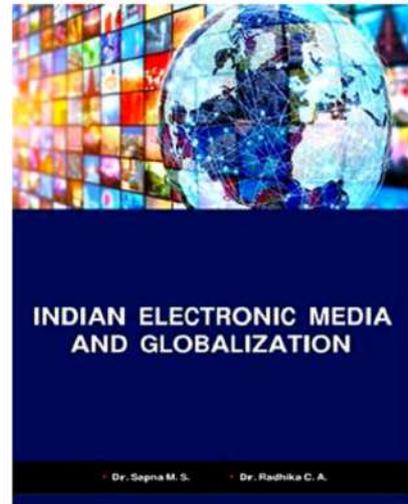
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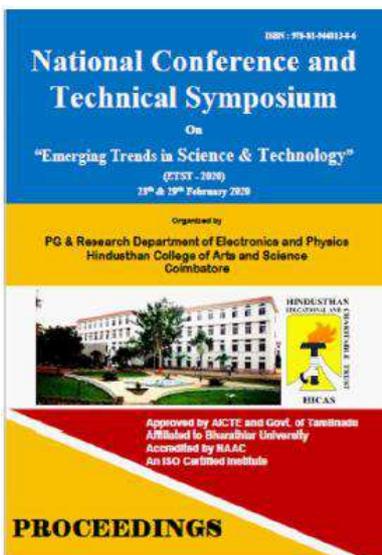
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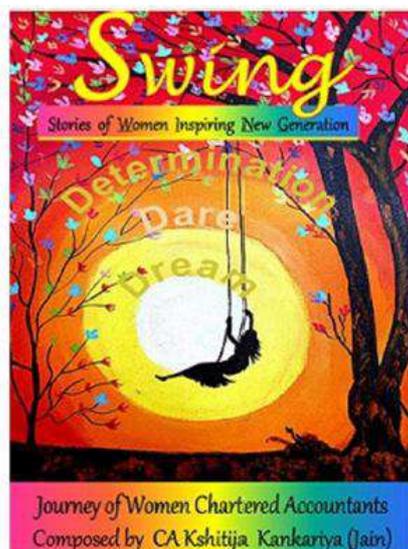
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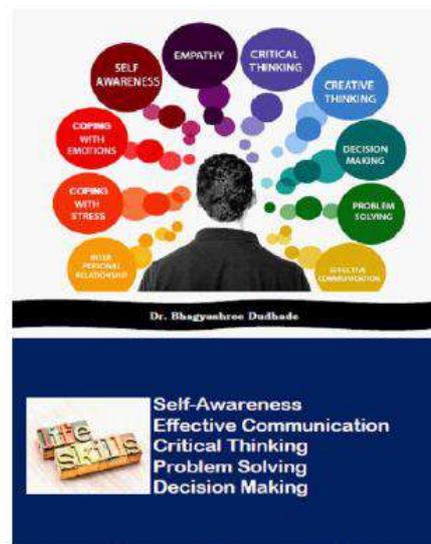
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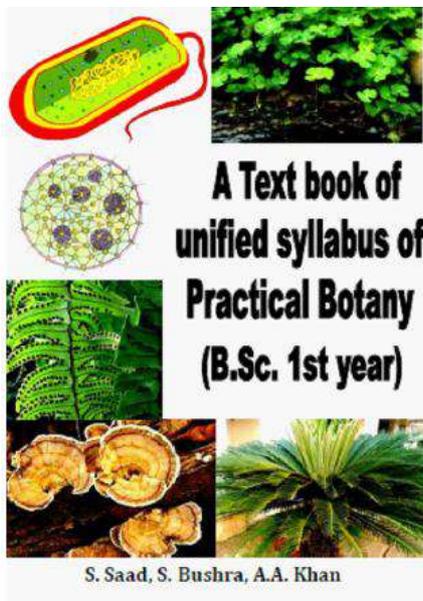
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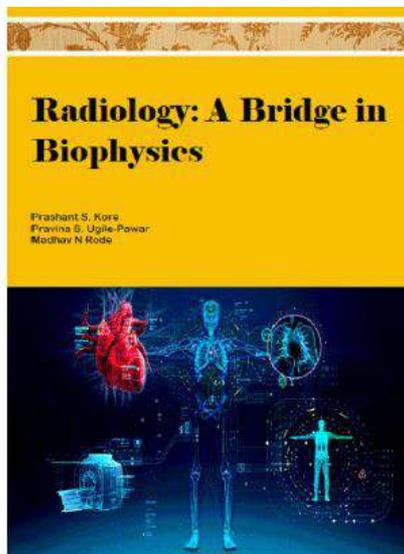


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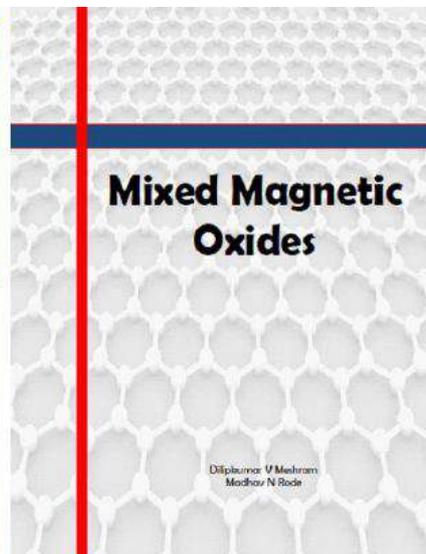
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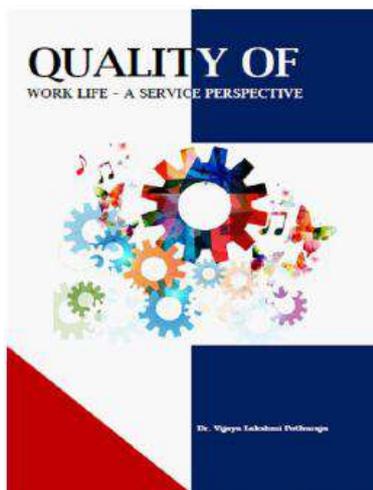
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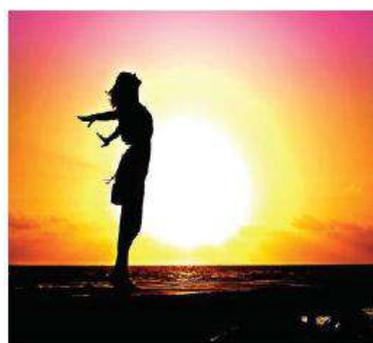
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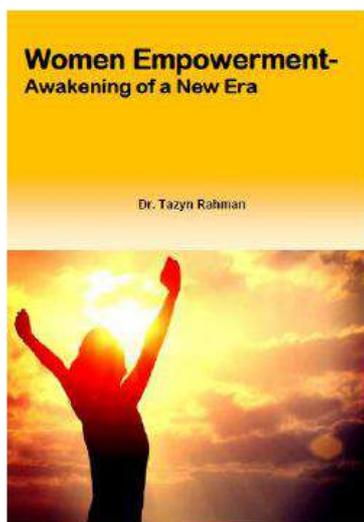
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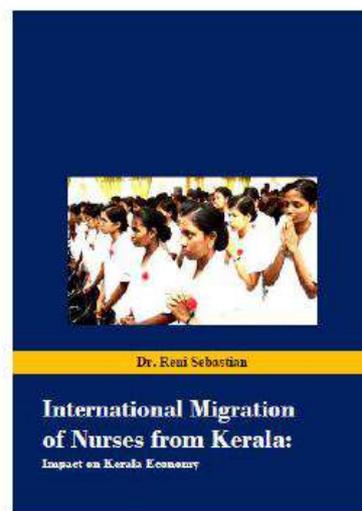
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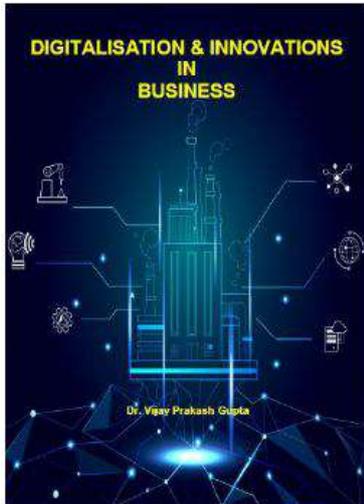
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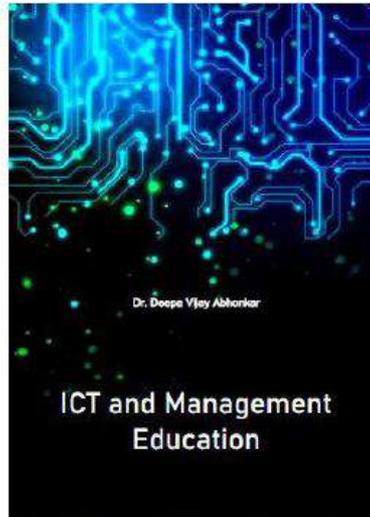
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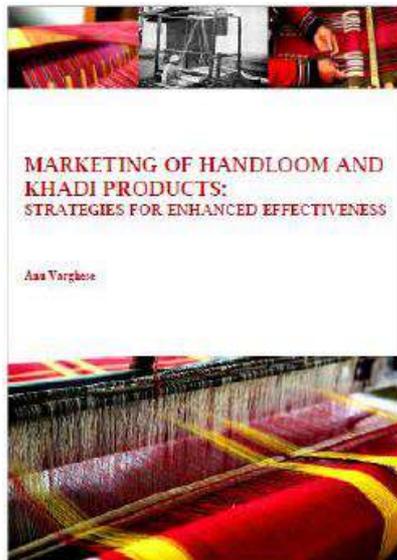
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