DETERMINANTS OF EMPLOYEE RETENTION: EVIDENCE FROM IT SECTOR IN BANGALORE CITY

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ABSTRACT

Employee retention is one of the biggest challenges for HR in IT industry. It involves taking appropriate actions to motivate employees to stay in the company for long duration. The main focus of this study is to understand the factors which impact employee retention in software companies. For the study purpose sample of 7 software companies selected in Bangalore and structure questionnaire was prepared based various aspects of the software industry. An effort is made to discover the effectiveness of the retention of the employees in IT industry and how practical they are to retain employees for long duration. The results of this research study have shown that there is significance relationship between age, gender, years of experience with compensation & benefits.

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Keywords: Employee retention, Software industry, compensation & benefits.

Introduction

In present scenario most of the organizations are competing with each other to increase share in market. Potential employees always lead the organization next level (DrPallavi 2020). This paper focuses on the factor affecting employee retention in IT companies. Every employee needs personal growth and professional life and these impacts on compensation and benefits (Roberts, N., Outley, C. 2002). Normally employees move from one organization to another organization for better career development. Today's human resource managers need to focus on the goals of the employee and organization and align them to satisfy the need of the employee retention for long duration (Musser, L.R. 2001&Patgar S 2015, Yeswa L 2016).

There are different human resources practices employed by software companies to increase the retention level (Khan et al., 2014). In employee retention one more aspect is training and development and this is the most important parameter in the human resource management (MaqsoodHaider 2015 and Rasli, A.M., Norhalim, N., Kowang, T.O., Qureshi, M.I. 2014). It is known that hiring of perfect employee is critical for any software company but the retention of the same is big challenging and this is huge investment spending by companies on recruitment, selection, training and development etc for new joiners in

organization (Yamamoto, H. 2011&Anis M.A et al 2011). Cost is defined as "recruiting expense, orientation and training cost, decreased productivity until the new employees gain knowledge and expertise in their domain and also the loss of clients who were dedicated and loyal to the leaving employees" (Kay, 2000). Nowadays human capital is gaining importance because organizations can have a competitive advantage through their distinctiveness and role of human resource productivity increased due to development of various ERP's (Holland et al. 2007, Roberts, N., Outley, C. (2002).

Background of the study

IT industry started was in Mumbai in 1967 with TCS. Indian IT industry development and contribution to worlds information technology sector is of highest reputation like metro cities Mumbai, Delhi, Chennai, Hyderabad and Bangalore have become favorite destination all the Indian multinational companies like Infosys, TCS, Wipro, Tech mahendra, etc (Indian Mirror Report 2020)

Indian IT industry contributes 5.8% of the country's GDP while providing employment to with significant workforce. Annual revenues from outsourcing operation in India were up to US $ 220 billion by the year 2021. The composition of this industry is very different than that of most others; due to the brisk pace of innovation there is an unusually extensive investment in research and development

required. As a result, the industry's workforce consists of a much larger proportion of engineers and other highly-skilled technical workers, relative to other industries, especially since product creation requires creativity, expertise, and precision (Global edge report 2020).

IT industry facing many challenges facing due to lack of expertise, knowledge, experience and long term sustainability etc. This can be overcome by various precautions taken by human resource management. For the purpose of retaining employees, the employers must use those practices which are in favor of the both of them and that will lead towards organization standards (Khan, F., Yusoff, R.M., Khan, A. 2014).

Literature Review

It is defined to be employee retention is great asset for the company. Employee retention is generally the level of commitment involved an employee has towards their company and its core values and beliefs.

Poonam Jindal et al 2016, researcher studied factors influence employee engagement inPharma Company at Hyderabad. Study found that whose level of engagement is higher in pharma companies will be less attrition in other companies. its found that gender & flexible polices, experienced employee and interaction have same level attrition among employees in organization. Study concluded that, to improve the engagement among the employees, based on feedback on manager, acknowledge employee contribution on real time basis and suggested paternity leave policy for male employees in Pharma Company.

Shuana& Nasir Mahmood 2016, Analyzed factors affecting employee engagement in Pakistan and a quality improvement and prosperity of any organization required higher level of commitment and dedication from its employees. Study analyzed the factors that have an impact on employee retention in Pakistan organizations not only benefits human resource management but it helps employees in planning their future career and they concluded that the all the factors that influence employee retention were correlated and not only single factor promotes an employee to leave the

current organization but it's a blend of many reasons.

PallaviBadre 2020. analyzed in IT firms most of the employees in the age group of 20 – 40 years and focus on high salaries and better career development. Study concluded that IT organizations should focus on maintaining sound organization policies to keep employee retention and organizations should focus on employee satisfaction.

Researchers such as Barwl al kurdi et al (2020), Mohammed ali Yousef (2020) and Maryam Tijjani (2018) established in their studies that, employee surely stay and work for the organization goals if suitable strategies adopted and apnplied by companies. In addition, Keller S.B et al (2020) state that employee retention is not only important but retention of high valued skills, long term sustainability and efficient delivery of goods and services by employee is important.

Objective of the study

The objective of the study is to examine the factors affecting employee retention in IT industry at Bangalore city.

Research Methodology

To achieve the objective of the study, a structured questionnaire (Poonam Jindal 2016) was prepared and each question is prepared on a factor of employee retention.Primary data collected using the questionnaire which includes demographical information, qualification, experience and income. The questionnaire also consists study related questions which were designed with the objective of understand employee retention factors like HR policies, compensation benefits and relationship with manager.

Sample of seven software companies selected for the study purpose.All the items in the questionnaire were rated on a five point Likert scale, a total of 300 questionnaires were distributed to IT employees, out of whom 212 completely filled questionnaires were received, hence the response rate was 71% and the average age of the respondents was 31-40.

The sample data analyzed using IBM SPSS Version 24.0 software. Following methods used

for analyzing the data obtained through questionnaire.
- Graphical analysis
- Exploratory Factor Analysis
- Chi-square test for association

Hypothesis

H0: There is no significant relation between Experience and Compensation & benefits:

H1: There is no significant relation Gender and Compensation & benefits:

H2: There is no significant relation Qualification and Compensation & benefits:

DATA ANALYSIS& INTERPRETATION
Organizations and Their Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
	Organization of the respondents.				
Valid	1.Infosys Pvt Ltd	32	15.1	15.1	15.1
	2.Accenture India Pvt Ltd	40	18.9	18.9	34.0
	3.Wipro Ltd	19	9.0	9.0	42.9
	4.Sonata Software Services Ltd	22	10.4	10.4	53.3
	5.Tata Consulting Services	43	20.3	20.3	73.6
	6.Tech Mahindra Software	29	13.7	13.7	87.3
	7.Cap Gemini India Pvt Ltd	27	12.7	12.7	100.0
	Total	212	100.0	100.0	

Table 1 (Source: Own Calculation)

Table 1 shown, We have randomly selected 7 software companies for employee retention analysis. Overall 212 employees took this questionnaire for employee retention in IT sector in Bangalore city.

Demographic profile of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
	Gender of the respondents				
Valid		18	7.8	7.8	7.8
	Male	150	65.2	65.2	73.0
	Female	62	27.0	27.0	100.0
	Total	230	100.0	100.0	

Table 2 (Source: Own Calculation)

Table 2 we can see that, present study includes 212 employees. 150 (71%) respondents were male employees and 62 (29%) respondents are female employees from seven software companies.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Age of the respondents				
Valid	21-30	45	19.6	21.2	21.2
	31-40	69	30.0	32.5	53.8
	41-50	63	27.4	29.7	83.5
	51 and above	35	15.2	16.5	100.0
	Total	212	92.2	100.0	

Table3: Age is the most important variable in assessing factors influencing employee's retention in IT organizations. Large number of employee belongs to two groups 31-40 years and 41-50 years. Every organization has maximum employees belonging to these groups.

Educational qualifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Graduation	175	76.1	82.5	82.5
	Post-graduation	37	16.1	17.5	100.0
	Total	212	92.2	100.0	

Table 4: Education brings the aspiration in life as well as increases the career opportunities for the employees. In above study we found that graduation employees 175 (82.5%) than the post-graduation 37 (17.4%)

Years of Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 to 2	45	19.6	21.2	21.2
	2 to 5	98	42.6	46.2	67.5
	6 to 8	43	18.7	20.3	87.7
	8 and above	26	11.3	12.3	100.0
	Total	212	92.2	100.0	

Table 5: Experience is important criterions which indicate employee commitment towards the organization. In this study found that, 2 to 5 years of experience respondents 98 (80.3%) followed by 0-2 years of experience 45 (21.2).

Monthly income					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15000-25000	75	32.6	35.4	35.4
	25000 – 40000	84	36.5	39.6	75.0
	40000 - 60000	23	10.0	10.8	85.8
	Above 60000	30	13.0	14.2	100.0
	Total	212	92.2	100.0	

Table 6: Income is important criteria for any employee in organization. In this study found that, Rs 25000 to 40000 respondents 88 (41.5%) highest ratio represented in study and followed by Rs. 15000-25000respondents 71 (33.4).

Factors associated with employee retention
Factor analysis helps to find out the three main factors that have to be considered while studying the employee engagement in ITcompanies in Bangalore city (Poonam Jindal. Et al 2016)

Factors	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Total employees
Employee-centered HR policies	10	36	55	63	48	212
Efforts to keep the workforce motivated	8	25	49	71	59	212
Satisfaction with working hours	0	22	37	91	62	212
Security of the job	11	19	67	60	55	212
Resolution of grievances	11	39	25	77	60	212

Table 7: Factor-1: HR Policies
Table 8: Factor-2: **Compensation & benefits**

Factors	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Total employees
Salaries are at par with others at the same level doing similar job	0	13	23	102	74	212
Adequate perks	9	12	32	99	60	212

Post-retirement benefits	0	0	30	122	60	212
Linking of performance with adequate rewards	7	9	22	83	91	212
Foreign trips	0	11	33	90	78	212

From figure 8, one can observe that Compensation & benefits (agree + strongly agree) makes an employee more engaged in companies. A company with a Compensation & benefits policy gives employee expectation will meet the requirements (Martin L). When there is a need for an employee, at times of crises or anyother need,it is very important for the HR manager to interact and sort out the issues (Asrar-ul-Haq.et al) this study found that, these two are key factors in "Compensation & benefits" factor for better employee retention in IT companies.

Table 9: Factor-3: **Relations with Manager**

Factors	Strongly Disagree(1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Total employees
Meeting the superior's expectations	33	19	9	88	63	212
Recognition of efforts by the superiors	41	81	13	44	33	212
Accessibility of superiors	12	34	19	90	57	212
Compatibility with immediate superior	9	39	18	67	79	212

From the above table 9, Relationship with manager plays vital role in every organization. In this study found that, "Recognition of efforts expectations". Same way "Accessibility of superiors" also importance factor to analyzing by the superiors" given more importance and followed by "Meeting the superior's

the employee retention in IT companies in Bangalore.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.946
Bartlett's Test of Sphericity	Approx. Chi-Square	7489.966
	df	91
	Sig.	.000

Table 10, KMO study indicated that sample adequacy (KMO) is appropriate for data analysis. KMO posted 0.946 which is normal maintained at 0.6.

Table 11: Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.890	92.069	92.069	12.890	92.069	92.069
2	.285	2.037	94.106			
3	.247	1.767	95.873			
4	.163	1.166	97.038			
5	.107	.764	97.802			
6	.075	.534	98.336			
7	.063	.452	98.788			
8	.042	.299	99.088			
9	.036	.258	99.345			
10	.028	.197	99.542			
11	.025	.180	99.722			
12	.017	.120	99.842			
13	.014	.102	99.944			

14	.008	.056	100.000			
Extraction Method: Principal Component Analysis.						

Table 11 explains that, 92.069% of the variance in the employee retention by three factors extracted. That is, one can be assured of 92.069 of understanding whether employees are engaged, using the three factors to further study in employee retention. Here total 17 variable variance explained by one factor is 92.069

Rotated component matrix:

Component Matrix	
	Component
	1
HR Policies	.959
Efforts to keep the workforce motivated	.970
Satisfaction with working hours	.978
Security of the job	.961
Resolution of grievances	.974
Compensation & benefits	.963
Adequate perks	.970
Post-retirement benefits	.960
Linking of performance with adequate rewards	.937
Foreign trips	.968
Relations with Manager	.959
Recognition of efforts by the superiors	.888
Accessibility of superiors	.975
Compatibility with immediate superior	.967

Extraction Method: Principal Component Analysis.

Table 12 explained that 17 variables rotated component matrix covered under one component. These values are Eigen values. Here values more than 0.5 considered one group factor.

Studying the association of between Experience and C&Benefits:

Years of Experience * Compensation & benefits Crosstabulation

			Compensation & benefits					
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree	Total
Years of Experience	0 to 2	Count	9	13	23	0	0	45
		% within Years of Experience	20.0%	28.9%	51.1%	0.0%	0.0%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	0.0%	0.0%	21.2%
	2 to 5	Count	0	0	0	91	7	98
		% within Years of Experience	0.0%	0.0%	0.0%	92.9%	7.1%	100.0%
		% within Compensation & benefits	0.0%	0.0%	0.0%	100.0%	9.2%	46.2%
	6 to 8	Count	0	0	0	0	43	43
		% within Years of Experience	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Compensation & benefits	0.0%	0.0%	0.0%	0.0%	56.6%	20.3%
	8 and above	Count	0	0	0	0	26	26
		% within Years of Experience	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Compensation & benefits	0.0%	0.0%	0.0%	0.0%	34.2%	12.3%
Total		Count	9	13	23	91	76	212
		% within Years of Experience	4.2%	6.1%	10.8%	42.9%	35.8%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	390.726[a]	12	.000
Likelihood Ratio	398.911	12	.000
Linear-by-Linear Association	147.575	1	.000
N of Valid Cases	212		

a. 10 cells (50.0%) have expected count less than 5. The minimum expected count is 1.10.

Table 13 gives the results of association between Experience of the respondents and compensation & benefits. Since P value is less than .05, we rejected the null hypothesis. There are 42.9% agreed that software employee are happy with their salaries and benefits and 2 to 5 years of experience employees are agreed 92.9%. We can conclude that, there is significance relationship between experience and compensation and benefits of IT companies in Bangalore city.

Association of between Gender and C&Benefits

Gender of the respondents * Compensation & benefits Crosstabulation

			Compensation & benefits					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree	
Gender of the respondents	Male	Count	9	13	23	91	14	150
		% within Gender of the respondents	6.0%	8.7%	15.3%	60.7%	9.3%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	100.0%	18.4%	70.8%
	Female	Count	0	0	0	0	62	62
		% within Gender of the respondents	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Compensation & benefits	0.0%	0.0%	0.0%	0.0%	81.6%	29.2%
Total		Count	9	13	23	91	76	212
		% within Gender of the respondents	4.2%	6.1%	10.8%	42.9%	35.8%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	156.806[a]	4	.000
Likelihood Ratio	183.624	4	.000
N of Valid Cases	212		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 2.63.

Table 14 explains that p value is less than .05, the null hypothesis is rejected. Here 60.7% of male IT employees agreed that they are happy with compensation and benefits. We conclude that, there is significance between Gender and Compensation benefits.

Association of between Qualification and C& Benefits

Educational qualifications * Compensation & benefits Crosstabulation

			Compensation & benefits					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Disagree	
Educational qualifications	Graduation	Count	9	13	23	91	39	175
		% within Educational qualifications	5.1%	7.4%	13.1%	52.0%	22.3%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	100.0%	51.3%	82.5%
	Post-graduation	Count	0	0	0	0	37	37
		% within Educational qualifications	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
		% within Compensation & benefits	0.0%	0.0%	0.0%	0.0%	48.7%	17.5%
Total		Count	9	13	23	91	76	212
		% within Educational qualifications	4.2%	6.1%	10.8%	42.9%	35.8%	100.0%
		% within Compensation & benefits	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	80.209[a]	4	.000
Likelihood Ratio	91.004	4	.000
Linear-by-Linear Association	40.766	1	.000
N of Valid Cases	212		

a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.57.

Table 15 explains that p value is less than .05, the null hypothesis is rejected. Here 52% of Graduation IT employees agreed that they are happy with compensation and benefits. We conclude that, there is significance relationship between employee qualification and Compensation benefits.

Conclusion

Employee retention is big challenge for IT companies, but it has become more difficult due to the right skills employee findings in the market. Study findings that the employee feels that effective of HR policies have direct and positive relationship with employee retention for long term and the software companies that successfully attract and retain most of the key employees to offer high compensation, positions and dynamic environment in the company. Emploee retention is the most important aspect for the IT companies. The results of employee retention have significant relationship between age, experience, qualification with compensation & benefits. There is the scope of further study in the same area by increasing different industries, increasing the sample size or number of companies.

Reference

1. Anis, A., Khan, M. A., &Humayoun, A. A. (2011). Impact of organizational commitment on job satisfaction and employee retention in pharmaceutical industry. African Journal of Business Management, 5(17), 7316-7324.
2. Armstrong, L., Bluitt-Fisher, J., Lopez-Newman, L., Paul, D. R., & Paul, K. R. (2009). Nonprofits in crisis: How to retain employees in the nonprofit sector.
3. Asrar-ul-Haq, M., &Kuchinke, K. P. (2016). Impact of leadership styles on employees' attitude towards their leader and performance: Empirical evidence from Pakistani banks. Future Business Journal, 2(1), 54-64.
4. Badre, D. (2020). Analyzing The Factors Affecting Employee Retention In IT Organizations At STPI Nagpur. Our Heritage, 68.
5. Egbert, S., & Sharma, R. (2016). Workload, employee engagement and somatic complaints in private sector employees. International Journal of Education and Management Studies, 6(2), 160.
6. Frye, W. D., Kang, S., Huh, C., & Lee, M. J. M. (2020). What factors influence Generation Y's employee retention in the hospitality industry?: An internal marketing approach. International Journal of Hospitality Management, 85, 102352.
7. Jindal, P., Shaikh, M., &Shashank, G. (2017). Employee engagement; tool of talent retention: Study of a pharmaceutical company. SDMIMD Journal of Management, 8(2), 7-16.
8. Khadka, S. (2011). Employee retention in banking industry of Nepal. Rajasthan, India. Singhania University.
9. Khalid, N., Pahi, M. H., & Ahmed, U. (2016). Loosing your best talent: Can leadership retain employees? The dilemma of the banking sector of Hyderabad Sindh, Pakistan: A mediation

investigation. International Review of Management and Marketing, 6(3), 608-616.

10. Lam, C. L., Law, S. F., Loo, Y. J., Ng, W. Y., &Ooi, S. L. (2015). A study on factors affecting employee retention in nursing industry at Klang Valley (Doctoral dissertation, UTAR).

11. Martin, L. (2020). How to retain motivated employees in their jobs?. Economic and Industrial Democracy, 41(4), 910-953.

12. Patgar, S. H. I. V. A. R. A. J., & Kumar, V. (2015). A study on the factors affecting employee retention in a textile industry. International Journal of Recent Research in Civil and Mechanical Engineering, 1(2), 1-5.

13. Yeswa, L. S., &Ombui, K. (2019). Influence of talent management strategies on employee retention in hotel industry in Kenya. International Academic Journal of Human Resource and Business Administration, 3(7), 83-103.

14. Yousuf, S., & Siddiqui, D. A. (2019). Factors Influencing Employee Retention: A Karachi Based Comparative Study on IT and Banking Industry. Yousuf, S. and Siddiqui, DA (2019). Factors Influencing Employee Retention: A Karachi Based Comparative Study on IT and Banking Industry. International Journal of Human Resource Studies, 9(1), 42-62.

AN ANALYSIS OF ADAPTATION MECHANISM OF CLIMATE CHANGE BY PASTORAL POPULATION: CASE STUDY OF JAMMU KASHMIR

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ABSTRACT

Adaptation to climate change means when individuals and communities seek to cope with the consequences of climate change. The process of coping is an age old process. Coping with climate change is a process by which strategies to cope with and take advantage of the consequences of climatic events are developed and implemented. The study analyzed the coping mechanisms of pastoral population of two blocks of Poonch district of Jammu Kashmir. In both the blocks, 80 percent of the respondents reported that they use migration/mobility as a coping mechanism to deal with the climate change. Where as remaining 20 percent reported that they donot move to deal with such situations. The different reasons behind mobility are uncertain rainfall, droughts, floods, etc. But the main reason for pastora lists migration is exploitation of seasonal pasture.

Keywords: *Climate change, pastoral population, migration, coping mechanisms.*

Introduction

It is necessary to understand the socioeconomic pattern of any community to cope with climate change. Coping means when individuals and communities seek to copewith the consequences of climate change. The process of coping is an age old process.Throughout history people have used coping mechanisms to changing conditions, including long-term natural changes in climate. Coping with climate change is a processby which strategies to cope with and take advantage of the consequences of climaticevents are developed and implemented (IPCC, 2001). Vulnerability to climate changedepends on the interactions between changing socioeconomic conditions and climatehazards. The feasibility of its coping mechanism requires socio-economic analyses of theunderlying barriers and opportunities. Therefore, socioeconomic conditions must bedescribed in enough detail to evaluate the merits of policy options.There are various sources which are needed to implement the coping mechanismslike financial capital, social capital, human capital and natural capital. These types ofcapitals are required and relative importance of these capitals will depend on the contextwithin which adaptation is pursued. Climate change is likely to affect the distribution andoccurrence of various infectious diseases. These diseases might lead to increased mortality and morbidity from diseases such as malaria and cholera. Climate change isaffecting not only human health but also livestock health equally. The first and most fundamental characteristic of pastoral societies is their orientation toward livestockgrazing on natural pasture. The income of a pastoral household is derived from specificeconomic activities, livestock and livestock-related activities being the most significantcontributors (Ellis & Swift 1988)**.**

Methods

The paper intends to identify factors constraining pastoralist‟s access to and use of climate changeadaptation options and strategies in pastoral ecosystem of the district. The study is mainly focused on tehsil Mendhar of Poonch district. Multistage purposive sampling technique has been used to select respondents from two blocks of the selected tehsil. The tehsil Mendhar is further divided into two blocks namely block Mendhar and Balakote. There are total 57 villages in both the blocks. Out of 57 villages, 10 villages have been selected from each block with maximum number of pastoralists as the study is mostly based on this community. This study is confined to villages with a high concentration of pastoral population. The main reason behind the selection of these villages is their population with maximum number of STs because these people mostly belong to pastoralists/nomadic communities. The data collection methods employed includes library research, field questionnaire survey and Participatory Rural Appraisals (PRAs). A

structured questionnaire was developed, pre-tested and administered to selected households in the sample villages to get relevant data and information. The questionnaire based field surveys were followed by focused group interviews of a select smaller sample of the representative head of households to collect detail data and information.

Literature Review

According to Hudson and Hudson (1980), the exploitation of seasonal pastures
is not the only reason that livestock herders move. Human population is totally dependent on the livestock as a primary resource for different products. The option of moving to avoid a wide range of hazards in the physical and social environment is an option not available to agricultural people who are tied to their agricultural lands. Pastoralists may move with their herds to avoid insects and disease and to reduce competition with other groups. The movements of pastoralists may be affected by political factors such as international boundaries, local governmental restrictions, and a desire to avoid taxation. Economic factors such as the presence of markets and the willingness of sedentary agriculturalists to lease potential pasture land to nomadic populations. Pastoralism is an ecologically relevant technique in the Indian landscape (Sharma, 2012). According to Salzman (1971)pastoral adaptations to the resource patchiness is due to a high level of climate variability, unpredictability and seasonality. It is also considered as a primary challenge to pastoral nomads and their migratory/mobile lifestyle. They use various strategies to cope with the climate variability. Their survival strategies for adaptation and coping with climate and resource variability and utilizing marginal resources have been studied by many scholars (Ehlers &Schetter, 2001). They do not have permanent settlements or build houses but live in portable dwellings in encampments near the resources. It is necessary for them to have knowledge of their pasture, water resources, rainfall, snowfall, disease, political insecurity and national boundaries with access to markets and infrastructure. All nomads have different social and cultural features. Pastoral nomads have differences in lifestyles, means of subsistence and various types of social organization. Patterns of social organization depend on particular ecological, cultural, political or historical circumstances. Pastoral populations are divided into different groups like tribes, clans and lineages. The social organization of pastoral nomads is based on kinship (Spooner,1973). The UNDP (2006)reported that migration cycles are changing through time, due to changes in climate and other physical elements. New cycles, adjusting to surrounding situations, evolve gradually with droughts. They started doing commercial crop cultivation to secure household grain needs. The main strategies of nomads are diversification, farming, keeping more female animals to avoid losses in dry years, selection of particular types during the wet seasons, long distance movement in search of water and grazing.

Discussion and Findings

Changing climate results in creating many problems for the livestock of the
pastoralists as these people depend on their livestock to support their family. The majority of the pastoralist sample households (75.3%) believed that unpredictable and variable nature of climate is responsible for posing serious threat to the livestock. Similarly, 71.7% of the non-pastoralists also believed that unpredictable and variable nature of climate is responsible for posing a serious threat to their livestock. The majority of the sample households believed that low productivity is a majorproblem followed by diseases, death and weight reduction. About 43% of the pastoralistshouseholds believed that low productivity is the main threat, followed by diseases(27.3%), deaths (18.3%), weight reduction (9.3%), and others (2.0%). On the other hand40.0% non-pastoralists" households are facing low productivity, followed by diseases(34.7%), weight reduction (16.0%), deaths (8.0%), and others (1.0%).In Balakote block, the major threats faced by pastoralists are low productivity(38.0%), diseases (26.3%), deaths (20.7%), weight reduction (11.3%), and others (3.3%).On the other hand, the types of threats faced by non-pastoralists are low productivity(40.7%), diseases (36.7%), weight reduction (14.0%), deaths (7.3%) and others

(1.3%).In Mendhar block, according to pastoralists, the main threats are low productivity(48.0%), diseases (28.0%), deaths (16.0%), weight reduction (7.3%), and others (0.7%). Dry areas have low rainfall which resulted in water shortage. In winters, pastoralists stay in plain areas and in summers, they travel back to the Himalayas where they find abundant water supply and food and fodder for their livestock. The majority of pastoralist households (82.3%) are facing water scarcity problems. Comparatively less proportion of nonpastoralist households (58.0%) are facing water shortage. The livestock sector plays a key role in the food processing industry. Livestock rearing and production of by-products have been major economic activities of the state. It fulfills the high demand for proteins in food products, thereby adding to the nutritional value to food products of its consumers. As a result, there has been a phenomenal growth in the state livestock, both in terms of production and consumption. Climate change affects the livestock health due to extreme heat in summer, less rainfall and less water for livestock and in winter due to extreme cold. The majority of pastoralist households (83.1%) agreed that diseases are causing low productivity in livestock. On the other hand, the majority of non-pastoralist households (82.0%) believed that diseases are not causing low productivity in the livestock. When there are diseases among the livestock, there are chances that their productivity will also suffer. Responsibility for livestock health lies with livestock keepers and the livestock industry. Identifying early signs of disease remains the responsibility of the livestock keeper. The majority of the pastoralist households (53.0%) reported that all these factors are affecting their income level. Comparatively one-fifth of non-pastoralist households reported that all these factors are affecting their income level.

Strategies

Climate change may result in the emergence of new diseases in new locations. Higher temperatures and variable precipitation may lead to new transmission mechanisms

and an increase of vector-borne diseases and parasites. The majority of the pastoralist households (86.0%) are using some strategies to control the diseases in their livestock. Similarly, 81.3% of nonpastoralist households are also using some strategies to control these diseases.

Coping Strategies:The coping strategies in case of infection include traditional method, modern methods and both traditional and modern methods. The majority of the pastoralist households (53.5%) are using traditional methods, followed by modern methods (28.7%) and both (17.8%). On the other hand, 46.7% of non-pastoralist sample households are using modern methods, followed by traditional methods (31.1%) and both (22.2%). In Balakote block, 53.4% of the pastoralists are using traditional methods, followed by modern methods (27.1%) and both (19.5%). On the other hand, 44.5% the non-pastoralists are using modern methods, followed by traditional methods (32.8%) and both (22.7%). In Mendhar block, the more than 50% pastoralists are using traditional methods, followed by modern methods (30.4%) and both (16.0%). On the other hand, 48.8% the non-pastoralists are using modern methods, followed by traditional methods (29.6%) and both (21.6%).

In case of death or disease the economic conditions of sample households suffer. About 87.3% of the pastoralists reported that they have to incur extra expenditure on treatment in case of diseases and loss of sources of income in the event of death, in some cases they have to sell their livestock to meet extra expenditure. On the other hand, less than half of the non-pastoralist sample households reported that diseases and deaths have negative effect on their economic situation.

Methods Adapted

There is a relationship between diseases and deaths and bad economic conditions.

They have to incur extra expenditure on treatment in case of diseases and loss of sources of income in case of death. More than 50% pastoralist households reported that they lost the source of income in case of death, and they have to incur on treatment in case of disease

(48.1%). On the other hand, 57.8% non-pastoralist households reported that they have to spend money on treatment and experienced loss of source of income in case of death (42.2%). In some cases, respondents sell their livestock to meet extra expenditure. More than fifty percent pastoralist sample households (52.0%) agreed that they sell their livestock to meet extra expenditure as compared to non-pastoralists (11.3%) in the study area. The sample households use different methods to deal with situations like diseases and deaths. Instead of selling their animals, they also prefer to borrow money from the moneylenders, banks, relatives, and community or any other method. The majority of the

sample households agreed that they borrow money from relatives and community. About 36.7% pastoralist households borrow from relatives, followed by the

community (35.6%), others (11.0%), banks (10.0%), and money lenders (6.0%) to meet extra expenditure on diseases. On the other hand, the non-pastoralist households (36.7%) take loans from banks, (20.0%) borrow from relatives, followed by others (20.0%), loan from the community (19.3%), and money lenders (4.0%).

In Balakote block, the majority of the pastoralists borrowed money from relatives

(43.3%), followed by community (32.7%), money lenders (9.3%), banks (8.7%), and others (6.0%). On the other hand, 38% non-pastoralist households take loan from banks, followed by relatives (20.7%), others (20.0%), community (16.7%) and money lenders (4.7%). In Mendhar block, 38.7 % pastoralists are taking loan from community, followed by relatives (30.0%), others (12.7%), banks (11.3%) and money lenders (7.3%). On the other hand, 35.3% non-pastoralists are taking loan from banks, followed community (22.0%), others (20.0%), relatives (19.3%), and money lenders (3.3%).

Exclusion from grazing lands

Pastoralists are mostly excluded from grazing lands because of many reasons.
One of the main reasons is that they cannot use their earlier traditional grazing pastures because they mostly use forest areas for grazing now the

forest official's don"t let them graze their animals because of various forest protection laws. There is pressure among the pastoral population regarding this issue because their whole system depends on these grazing pastures. The majority of the pastoralist sample households (78.0%) agreed that their exclusion from traditional grazing pastures created pressure on whole pastoral systems, and they have to travel even more to survive. On the other hand, 15% of nonpastoralist sample households reported that their exclusion has created pressure on them because they don"t have their own grazing land they cannot move with their livestock.

Use of Migration as an Adaptation Strategy

In both the blocks, 80 percent of the respondents reported that they use migration/mobility as a coping mechanism to deal with the climate change. They move from one place to another in search of new pastures for their animals. They use mobility as a shield from the climate change. Whereas remaining 20 percent reported that they do not move to deal with such situations. Factors affecting migration: Pastoralists move because of uncertain rainfall, droughts; floods and cloud bursts into the area andlandslides. The majority of the pastoralist households (88.0%) agreed that uncertainrainfall is the main factor, followed by droughts (31.3%), landslides (14.7%), floods(7.7%), and cloudbursts (2.3%). The different reasons behind mobility are uncertain rainfall, droughts, floods, etc.But the main reason for pastoralist's migration is exploitation of seasonal pasture.The main reasons for mobility are lack ofseasonal pastures (60.3%), followed by search of food and fodder (24.0%) and waterscarcity (15.7%). The migration/mobility has also been caused by pull and push factors which help these people to move, whether to gain access to something or to avoid clashes between other groups in the area. The pull

Factors responsible for mobility are search of new pasture land (59.3%), better access to the market (18.7%), abundant rainfall (11.3%), and water availability (10.7%). There are also push factors which are responsible for the migration of these people. These push factors create pressure on the people to move against their

will to survive. The push factors responsible for mobility are climatic factors (36.7%), economic factors (26.7%), political factors (13.7%), ecological factors (11.3%), social factors (9.3%), and others (2.3%).

Coping Mechanisms

The pastoralists" households have used coping mechanisms to deal with climate change which are sedentarization and farming (46%), mobility (29.3%) and diversification (24.7%). On the other hand, the coping mechanisms used by nonpastoralist households are others (66.7%) and diversification (33.3%).

The nomadic pastoralists move throughout the year with their family and livestock because they do not have any permanent homestead. On the other hand, the semi-nomadic pastoralists do not move throughout the year because they have a permanent home at one place, and they follow a seasonal migration pattern. The majority of the pastoralists (89.3%) follow a seasonal migration pattern and other 10.7% of them move throughout the year in search of food and fodder for their livestock because they do not have any permanent homestead. Migration is arguably the most complex demographic variable. Migration pattern concerning an area depends on the topography of the area. Most of the parts of the district Poonch are hilly with some valleys. According to pastoralist sample households the migration patterns are plains to plains (27.3%), plains to the hills (27.3%), hills to plains (24.0%), and hills to hills (21.4%) in the study area. While moving from one place to another, they face many difficulties. These challenges prohibit their movements. Landslides, road blockage, loss of vegetation, loss of property, etc. are the main hindrances in their movements. The main hindrances are road blockage (32.7%), landslides (19.3%), loss of vegetation (17.3%), loss of property (16.7%), and lack of road and transport facilities (14.0%), which have created a problem for them in their movement.

Problems Faced By Sample Households

The majority of respondents agreed that they do not have free access to forest land, and they face many problems while grazing their animals in the forests. Three fourth of the

pastoralist households are facing problems while grazing their animals in forest land, while 11% non-pastoralist households (11.0%) are facing such problems. The main problems faced by pastoralist sample households while grazing their animals on forest land are permit needed (64.7%), punitive taxes (22.0%), and others (13.3%). Same is the case with non-pastoralist sample households, others for instance permit required (35.3%), and punitive taxes (9.3%) are the main problems.

In Balakote block, the problems faced by pastoralists are permit needed to get access to the forest area (60.0%), followed by punitive taxes (24.7%) and others (15.3%). On the other hand, the problems faced by non-pastoralists are permit needed (34.0%) and punitive taxes (8.0%). In Mendhar block, the problems faced by pastoralists are permit needed to get access to the forest area (69.3%), followed by punitive taxes (19.3%) and others (11.4%). On the other hand, the problems faced by non-pastoralists are permitting needed (36.7%) and punitive taxes (10.6%).

Conclusion

In both the blocks, 80 percent of the respondents reported that they use migration/mobility as a coping mechanism to deal with the climate change. They move from one place to another in search of new pastures for their animals. They use mobility as a shield from the climate change. Whereas remaining 20 percent reported that they do not move to deal with such situations. Pastoralists move because of uncertain rainfall, droughts; floods and cloud bursts into the area and landslides. The majority of the pastoralist households (88.0%) agreed that uncertain rainfall is the main factor, followed by droughts (31.3%), landslides (14.7%), floods (7.7%), and cloudbursts (2.3%). The different reasons behind mobility are uncertain rainfall, droughts, floods, etc. But the main reason for pastoralist"s migration is exploitation of seasonal pasture. The main reasons for mobility are lack of seasonal pastures (60.3%), followed by search of food and fodder (24.0%) and water scarcity (15.7%). The other reasons for their mobility are new pastures for their herds (59.3%), to avoid competition with other

sedentary groups (22.0%) and better access to the market to sell their products at some favourable prices (18.7%). Three-fourth of the pastoralist households (75.3%) reported that restriction on mobility is a bad thing because, without migration, they cannot survive. They have no pasture land available for their livestock throughout the year. The migration/mobility has been caused by pull and push factors which help these people to move, whether to gain access to something or to avoid clashes Between other groups in the area. The pull factors responsible for mobility are search of new pasture land (59.3%), better access to the market (18.7%), abundant rainfall (11.3%), and water availability (10.7%). There are also push factors which are responsible for the migration of these people. These push factors create pressure on the people to move against their will to survive. The push factors responsible for mobility are climatic factors (36.7%), economic factors (26.7%), political factors (13.7%), ecological factors (11.3%), social factors (9.3%), and others (2.3%). The pastoralists" households have used coping mechanisms to deal with climate change which are sedentarization and farming (46%), mobility (29.3%) and diversification (24.7%). On the other hand, the coping mechanisms used by nonpastoralist households are others (66.7%) and diversification (33.3%). While moving from one place to another, they face many difficulties. These challenges prohibit their movements. Landslides, road blockage, loss of vegetation, loss of property, etc. are the main hindrances in their movements. The main hindrances are road blockage (32.7%), landslides (19.3%), loss of vegetation (17.3%), loss of property (16.7%), and lack of road and transport facilities (14.0%), which have created a problem for them in their movement. The main reason for less migration according to pastoralists (40.7%) is climate change, followed by climate change is not responsible for less migration (37.7%) and others (21.6%). The main reasons for sedentarization of pastoralists are socio-economic and political external forces (36.0%), resources limitations (22.4%), environmental forces (21.3%), and internal socioeconomic forces (20.3%).

References

1. IPCC (2001). The Scientific Basis. Contribution of Working Group I to the Third Assessment
2. Report of the Intergovernmental Panel on Climate Change, Cambridge University Press,Cambridge, UK and New York, USA.
3. Ellis, J.E., and Swift, D.M. (1988). Stability of African pastoral ecosystems: alternativeparadigms and implications for development. Journal of Range Management, 41 (6): 458
4. Salzman, P.C. (1980). When Nomads Settle-Processes of Sedentarisation as Adaptation and Response. Praeger, New York.
5. Sousson, J., Shestra, B., and Uprety, L., (1995). The Social Dynamics of Deforestation: acase study from Nepal. Casterton Hill: Parthenon.
6. Kohler-Rollefson, I. & Mathias, E. (2010). Animating Diversity: Supporting endogenousdevelopment of livestock keepers. Development, 53(3), (425–428).
7. IPCC (2007), Op. cit.
8. Nori, M. & Davies, J. (2008). Climate change and livelihoods. Managing and mitigatingclimate change through pastoralism. Policy matters.
9. Macchi& ICIMOD (2010), Op. cit.
10. Jodha, N. S. (1997). „Mountain agriculture". In: Mountains of the World: A global priority.
11. New York and Carnforth Lancashire: The Parthenon Publishing Group.
12. O"Brien, K. &Leichenko, R. M. (2000). „Double exposure: Assessing the impacts of climatechange within the context of economic globalization."Global Environmental Change 10:221-232.
13. IPCC (2007), Op. cit.
14. Macchi, M. (2011). Framework for community-based climate vulnerability and capacityassessment in mountain areas. Kathmandu: ICIMOD.

MOTHERHOOD AS IMPOSITION AND ACQUISITION IN MANJUKAPUR'S CUSTODY

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ABSTRACT

The novel Custody revolves around the custody of children and the identity of woman as mother. Motherhood has been a burning issue for the feminists who want to change it from "necessity" to "choice". In the early years of Women's Movement, the feminists appeared to be unsympathetic and radical who felt child bearing and rearing were obstacles for women's progress and advocated the liberation of women from the practice of motherhood. This is especially true of Simonede Beauvoir and ShulamithFirestone,but gradually feminine capacity of child bearing received a reevaluation in the works of Baker Miller and others. In society motherhood is supposed to be central for women. Childbirth is related to the productivity of women. In present era of science when there is development of new reproductive technologies, like IVF(in vitro fertilization) and HRT(hormone replacement therapy), it has become a live issue for the feminist to discuss. Feminist'sfavours that women do not want to lose this very identity. They want their identity as "mother" but not as "necessity" but as "choice". Betty Friedan's The Second Stage (1981) focuses on this issue with the exploration of the lives of women with its focus on American women. Here we want to explore the identity of woman as mother that is always considered the "necessity" for woman because it is her duty to give birth to children by considering it a moral obligation, especially in Indian society. But now the struggle is to make it "choice" instead of accepting it as "necessity". The study of this novel makes us aware of the different types of women characters where some are seen in their search of identity as mother; as necessity or as choice. Shagun and Ishita come out as promising women characters who raise their voice against the narrow thinking of the society and struggle to search out their identity as mothers. But, there are also some women characters, specially who belong to the the first generation like Shagun's and Ishita's mother and mother-in-law, who are seen confining themselves to the narrow world made for them by patriarchal society and wish to maintain this patriarchal system where motherhood is as imposed identity.

Introduction

As the title of the novel is Custody, so the whole novel revolves around the custody of children and the identity of woman as mother. Motherhood has been a burning issue for the feminists who want to change it from "necessity" to "choice". In the early years of Women's Movement, the feminists appeared to be unsympathetic and radical who felt child bearing and rearing were obstacle for women's progress and advocated the liberation of women from the practice of motherhood. This is especially true of Simone De Beauvoirand ShulamithFirestone,but gradually feminine capacity of child bearing received a reevaluation in the works of Baker Miller and others.

In society motherhood is supposed to be central for women. Childbirth is related to productivity of women and there is need of "rewomanization" of childbirth that is discussed by Margaret Stephens in Visibility and Power: Essays on Women in Society and Development. In present era of science when there is development of new reproductive technologies, like IVF(in vitro fertilization) and HRT(hormone replacement therapy), it has become a live issue for the feminist to discuss. There is a feminist group who opposes technologies like IVF. The group is Feminist International Network of Resistance and Genetic Engineering. This group of writers and supporters say that the science at the basis of technologies show the way to men to snatch the woman-centred process from women's control that snatches their identity as "mother". Women do not want to lose this very identity. They want their identity as "mother" but not as "necessity" but as "choice". Betty Friedan's The Second Stage (1981) focuses on this issue with the vast exploration of the lives of women with its focus on American women. Here I want to explore the identity of woman as mother that is always considered the "necessity" for woman because it is her duty to beget children by considering it a moral obligation, especially in Indian society. But now the struggle is to make it "choice" instead of accepting it as "necessity". This question of

"necessity" and "choice" of motherhood is one of the main issues of debate between White feminists and Black feminists. White feminists think that motherhood is an obstacle on the way that leads to the outside world and they can overcome it by giving it up. On the other hand Black feminists do not consider it a serious obstacle to their freedom as women. Black feminists accept "mothering as societal shaped rather than a mere biologically construct" . So for White feminists who relate motherhood with biological construction it may be choice because they have their control on their body but for Black feminists motherhood is the part of societal and cultural existence. The concept of "Womanism" is in Black Feminism favours for maintaining the differences that woman has from man. Defining the word "womanist", it is said that womanist is a woman who loves women and praises women's culture and power as something that is needed into the world as a whole. Womanism addresses the racist and classist perspective of white feminism and actively opposes separatist ideologies. It includes the word "man", recognizing that Black men are an integral part of Black women's lives same as their children, lovers, and family members. Womanism shows the ways in which black women support and empower black men, and it serves as a tool for understanding the Black woman's relationship to men as different from the white woman's. It seeks to understand and praise the sexual power of Black women while recognizing a history of physical harassment.

With the long struggle of feminists in the early twentieth century, women had been given the suffrage and opportunity to get higher education. The changing scenario of women's struggle that is called the Second- Wave-feminism exposed the gender politics where women are projected inferior and weak in the society that is male-dominated as well as in literature as Kate Millett deals with this in her Sexual Politics(1970).The Second Wave of feminism demanded the equality for women with men. It discarded this notion that women being different from men should be segregated. It accepted that biologically women are different from men but it should not be the basis of discrimination.

But after nineteen-eighties, with the emergence of Third-Wave-Feminism, the perception of women regarding their biological difference has changed. Now women instead of regarding their physiological structure as inferior to that of men, consider it the source of power because being mother they recognize their mothering and nurturing skill as power as well as the part of their personhood (Patnaik, 2004). Now the struggle is only to make others realize the importance of their beings as providers of mothering and nurturing shelter that is necessary for the formation of a happy family. But, like the women before the twentieth century they do not want to be 'whole time mother 'but being mother according to their choice (Chachra, 2011). Betty Friedan advocates it when she writes, "The point is that equality-the rights for which women have been fighting for over a century-was, is, necessary, for women to be able to affirm their own personhood, and in the fullest sense of choice, motherhood. The point is, the movement to equality and the personhood of women isn't finished until motherhood is a fully free choice."

This new perception does not advocates equality in inequality but calls for the value and maintaining the differences of women from men. As bell hooks discusses about this in Feminism Theory from Margin to Centre by saying that motherhood and mothering is given only to woman and it is to secure their identity as mother that gives women "power".

The novel Custody has two central female characters- Shagun and Ishita. We start with Shagun. For Shagun her identity as mother is her choice that she struggled to keep till the end. She raises her voice against patriarchy when she is forced to live a life that was devoid of love of her husband and full of sorrow because of her husband's negligence. As the novel starts, she is found making love with her lover. It shows that unlike traditional woman, she gives voice to her desire and initiates to have a partner who loves her most. Shagun's fight with her husband Raman for the custody of her two children Arjun and Roohi shows clearly that she does not want to lose her identity as mother and so she uses all possible steps to get the possession of her children. Even

being in the company of her lover Ashok, she never forgets her children- "Against the word 'children' she had no defense. Drearily she thought yes, what about children? She couldn't leave them; she didn't see how she could take them. Ashok had a transferrable job: even if he got an extension, he would eventually go, and she, she would have to stay."

She never thinks to leave her children. She takes a quick decision to get a divorce from her husband, but life without her children was unacceptable to her. She continues her fight with her ex-husband without losing hope till she in succeeds getting the custody of Arjun, though Raman wins the custody of Roohi because of Ishita. She, as it seems, unlike a traditional mother, does not only want to remain the producer of the children who have always their father as protector. When she is not allowed to visit her children, her heart feels agony, finding herself helpless to claim the possession of her children to whom she has given birth. She expresses her agony when she says to her husband Raman, "Don't make this harder. I have left you the best part of the marriage. Surely my freedom is not too much to ask in exchange."

Though in order to get married with Ashok, Shagun is ready to give the custody of the children but she impatiently waits to meet the children, that shows her desire to uphold her identity as mother. She keeps visiting her children having visitation right, though now she has a new husband Ashok. It shows her loyalty and love for her children. When she is not allowed to visit Roohi, she gets impatient. She knows that all the medical certificates were false because being forced by the love of Ishita for Roohi, Raman pretends Roohi is ill . She had done the same when she had stopped Raman from visiting Roohi and Arjun. She did this and is labeled selfish. But, why? Dose she fear that she can lose her children? This fear may be because traditionally the father is given the possession of the children. As Mrs.Kaushik, Raman's mother says, "And you will see them. God will not allow a father and his children to be separated. She struggles hard to fight against the image of mother only as a producer of children and the father its protector. And so after about five years, she again files the case of

custody and by winning the custody of her son Arjun, she succeeds in maintaining her identity as mother that is her choice.

She is attracted to Ashok and seeks to justify this by looking for flaws in Raman. Her marriage was not a comfortable space because she was not one to confine herself to traditional role, as the novelist writes, "Later she decided she must have been unhappier than she realized. She had been brought up to marry, to be wife, mother and daughter-in-law. She had never questioned this destiny, it was the one pursued by everyone she knew."

She wants to act in films and do advertisements. It was her suppressed desire because she before marriage always wished to be a model though she never got support for it from her parents. Even after marriage she could not get support from her husband Raman to take up modeling as a career. "You don't wish me to have a life of my own? saysShagun.

Shagun wants to keep her identity as mother, infact. Even after being involved in a extra-marital relationship with Ashok, she never wished to leave her children and start a new life with Ashok. When her mother cautioned her about her indifference towards Raman would result in difficulties for the children, she thought about them.

When it was disclosed to Raman that she was having an affair with Ashok, she was scared. She accepted it openly and was ready to get a divorce from Raman. When her mother tried to compel her to step back, she found it impossible:….Shagun thought it was useless presenting her mother with any problem, she was too old fashioned, she had been the recipient of Raman's homeopathy for too long. Well, how could she blame her? A woman with her values was incapable of visualizing a companionship beyond the mundane of domestic life. That soul, that body that has flowered with Ashok could not now be asked to fold its petals and return to its bud like state.

When Raman returned from hospital after his treatment, Shagun's was pity aroused and she tried to mend her relationship with Raman, but it was Ashok who kept on injecting poison in her mind against Raman. Shagun was confused about what to do. Raman's gentle words of forgiveness impelled her to return, but soon the

words of Ashok- "the right to live freely" pushed her back to continue her relation with Ashok who always taught her about the independence of woman. Shagun's break with Raman is not an easy decision. She thought again and again to break her relationship with Raman as she had come very far in her relationship with Ashok. Her sense of obligation again pushed her to maintain her relation with Raman, though it would joyless and uninteresting. Finally, she decided to tell Ashok about her decision, but she changes her mind when again Ashok filled her mind with many thoughts and the hope to live a free life according to her own wishes. The company of Ashok was always full of happiness for her- "She sank down next to him; she knew she would have to pay heavily for this happiness, but at least, dear God, she would have a happiness she never had before. If she were to die tomorrow, it would be as a fulfilled woman." It made her finally to break her relationship with Raman. Now starts the question of custody. Shagun always wanted to have her children with her. She never thought to live a life without them. Where there is a question of motherly feeling, she was blessed with it. Even though she was living with Ashok she made it clear to him she would need her children. Ashok decided to manage it through court and give Shagun the custody of children. While Nandan, a cousin and lawyer, helped to file a case from Raman's side. When Shagun found that the court notice had declared her of an evil and immoral influence on the children, it hurt her most. She was not ready to give up her children and so was ready to go through court case facing all difficulties.

The problems and conflicts that were taking place between Shagun and Raman had started impacting the life of their children. Without the company of his father, Arjun, their son, started doing badly in subjects like mathematics and science that his father used to teach him. So the innocent children also became sufferers. The distraction from his studies that Arjun was facing made Shagunmore tense. Arjun started complaining of pain in his leg making excuses to avoid school. He was missing the solace and enjoyment he had when his mother and father were living together. It all made Shagun distressed and "she understood he could never feel for the boy, it was her fault for leaving the child's father, she would pay for her sins for the rest of her life."

For Shagun, it was difficult to handle Arjun who started withdrawing from studies. He was in adolescent stage and was undergoing the discomfort adjusting with his mother who was staying with a man who was a stranger for him in a new house. She took help of Ashok to manage the situation, and decided to get him admitted in Dehradun Public Academy (DPA).

Arjun always desired to share everything with his father, but his mother always managed to distract him. She was trying to create love in Arjun for Ashok by reminding him of all the benefit he was getting from Ashok, yet for Arjun it was difficult to give the place of his father to someone else. Shagun as a mother was trying to fulfill her responsibilities but she was helpless to play the role of father too. She thinks that by getting Arjun admitted in DPA, she was giving Arjun something especial that his father would never be able to do.

So in Shagun, one can find a loving mother. She left Raman because she found a loving heart in Ashok. But her responsibilities as a mother made her undergo mental upheavals. She is concerned about how to make her children happy. She gets support from Ashok to give a good upbringing to her children as Arjun finally got admitted in DPA. It is worth considering if women are trapped by biology. Shagun cannot overcome her maternal feelings. She teaches herself to hate Raman, but her conscience does not allow her to do the same with their children. It can be said Shagun wants the best of both worlds- she wants Ashok and the lifestyle he can give her and the children from her first marriage too.

On the 16th February,the day the case was to come up before the judge, she tried to teach all to Arjun that would make the case in his favour. The boy was told not tell anything about uncle Ashok Khanna and to state he is living at his Nani's house with his mother and sister. Shagun was doing her best to create a hatred for his father in his mind. And finally the visitation right was provided.With her break up from Raman Shagun now thinks only of

starting a new life with Ashok but is also sad at being a part time mother after getting the visitation rights to have her children only in half of their holidays, as the novelist has written, "It would take time to get used to her new status as part time mother. Once they were in their own apartment in New York she would regain her equilibrium" .The love of Ashok had made her to sacrifice so much for this love of hers. But there was something in her for Raman that made her feel that she made Raman suffer too. "She felt guilty about Raman".

Thinking about morality in the Indian context, it seems that Shagun did not do right to leave her husband as well as her children for the sake of her love for Ashok who always instigated her to have her right to live freely without any obligation. She could have managed to live happily with Raman making a balance between her passion for love and responsibilities. She only desired love from Raman without trying to understand his official burden. Kapur has not shown Raman be a cruel man. So, it seems very difficult to support Shagun for her step to break up her marriage and marry Ashok, sacrificing the happiness of her children too. But if we think about the freedom and independence Shagun got support from Ashok to fulfill her desire to be a model that was a suppressed desire she had from before her marriage we can get another perspective. She was not given proper attention by Raman to know about her desire. When she was given a role in advertisement in the Brand where Ashok and Raman both worked, she was given an opportunity to realise her ambition. She was praised for her performance by Ashok but not by Raman. When she started working in more ads with the support of Ashok still Raman did not give her support or do something to satisfy her. This gave Ashok the opportunity to come close to her. The distance between her and Raman made her come close to Ashok. But it has to be accepted that to fulfill her desire and to give fuel to her passion, she made the children undergo mental trauma and discomfort. Roohi was too young to understand but Arjun suffered a lot being in his teenage. The Ashok-Shagun affair has parallels with the Raju-Rosie relationship in R.K. Narayan's The Guide. In The Guide Rosie's passion for dance

is suppressed by her husband Mario. Raju uses this tension to seduce Rosie. Both Shagun and Rosie are women who have a hidden desire to be something more than a housewife. This desire is exploited by unscrupulous people. However, Shagun's case is complicated by motherhood, which is the whole point of the novel Custody.

Being attracted to Ashok, Shagun left Raman. Ashok promised to help her to have her children. But soon Shagun felt that in the matter of children she was not getting Ashok's full support especially for Roohi. She felt dejected and shared her feelings to her mother in a letter:

"Perhaps I was foolish to believe, but he did promise to keep me happy for ever. Not that I have reproached him with anything. Our life together would not have been possible if I had regretted my past."

"Still what happened to that promise? I guess when you are in love you experience some momentary delusion then the glow fades and things look ordinary again. Of course, I adore my life here, but sometimes I feel its foundations are fragile."

Shagun comes across as a woman torn between her desire and her responsibilities. Ashok promises an independent life. She is free to pursue to her dream of passion and career. From a middle class Delhi housewife, she is transported to a life of corporate glamour. But she is also a mother and it is here that the conflict begins. She wants it all- Ashok, children, career.

The other major character is Ishita. Her mind get is that of a feminist that demands equality for man and woman. When she was given proposal by a family that "wanted a homely family-minded girl," it made her resentful. But her hesitation was of no use because she had to surrender to the will of her parents to accept the proposal. As there was a demand for grand children within a year, it made the life of Ishita impossible when she did not show any sign of pregnancy, "Producing grandchildren was a moral obligation."

Ishita's infertility renders her unable to play the role of a mother that is a necessity for her married life. She can been seen as shackled to tradition where woman is given the duty to

beget a child, and if she fails to perform this duty she is subjected to inflictions as is done with Ishita. She gets married with Suryakant with no thought to go outside to make her career because she knows that the women of the family didn't work; daughters-in-law were obviously expected to devote themselves in household works. She feels happy by having a loving family. But soon all the love disappears when she fails to give birth to a child.

She undergoes all medical treatment of IVF in the hope of satisfying this necessity of being a mother. With her mother she also visits the astrologer and wears the stone in which she has no faith earlier. But all her efforts go in vain. She is neglected by her husband and reproached by her mother-in-law as a "shameless woman". She hates her body because it is now useless unable to conceive and thus to perform this necessary role of a mother. She agreed to give divorce to Suryakanta. She thought whether a woman has only that identity that is imposed on her. She was unable to play the role of mother and so was treated badly and was not valued for her identity as an individual- "It didn't take long for the loving atmosphere around Ishita to grow so thin that it became hard for her to breathe. Was it possible for them all to change towards her, SK, Chandrakanta and Tarakanta? Hadn't they valued her for herself?"

She is divorced and forced to live a painful life. Her parents again force her to remarry. She feels herself torn between the expectation of her parents and her desire to give a new start to her life. She meets the boy her mother wants her to, but all her enthusiasm has gone away. She makes herself busy by engaging herself with Mrs. Hingorani in an NGO. Being surrounded by slum children, she feels a satisfaction. She feels a motherly feeling in her that makes her indispensible for those children and later on for Roohi. She craves to possess Roohi and wants to satisfy her thwarted motherhood. She agrees to be a step mother to Roohi by getting married with Raman. The "stepmother" is a term loaded with negative connotation. A stepmother is evil almost by definition. Kapur has invested the role of "stepmother" with a new significance. The stepmother Ishita is as loving and possessive about Roohi as her biological mother, Shagun.

Is this love for a child and desire for the identity of a mother that forces Ishita to bind her self again in marriage? The answer may be yes, because she wants her identity as a mother. It doesn't matter her body is an obstacle for it. Her idea for adoption is also a call of her instinct that longs for the identity of a mother that is now 'choice' for her. The happiness she feels when Raman wins the custody of Roohi compensates for all the sorrows that she had suffered for not being capable of begetting a child. Kapur has dealt with problems of imposed motherhood by conservative patriarchy. She delineates the sufferings that a woman faces when she is unable to play the role of mother. A woman never wishes to deny this role as it is a feeling that gives her pleasure. So, it is not right to torture a woman when she faces the problem of infertility. The feminists raise their voice to change this mind set. As in an article "Motherhood and Maternity-Feminist Critiques", it is said that feminist theorists and writers challenge the traditional concept of motherhood prevailed in conservative patriarchies. However, it is important to emphasize that feminists do not reject maternity and focueson the woman centered experience of birthing and mothering. Their project is to interrogate the myths and assumptions that is the realityof maternal experience (Amaron&Moyo, 2013). Feminist voices seek to liberate motherhood from the institution and the myth that confine it to the narrow playing field of the conventional family, leaving no space for women to choose alternative identities.

Ishita agreed to work for slum children. It was a new experience for her to give these slum children recognition and encouraged self respect. Ishita devoted herself in this work. She also participated in protest against the nuclear device tested in Pokhran desert with Mrs. Hingorani. She collected a lot of donations for the upliftment of the slum children. Now Ishita felt the value of her life. It made her to "feel valued for the first time by the outside world." Ishita was finding solace in her work, but her parents were still in search of a man for Ishita to remarry her in order to keep her happy,

though for Ishita- "she was married to her work, not one suitor could give her a similar satisfaction.

Her parents still kept on searching a bridegroom for Ishita. They had given a proposal by an IPS officer; a divorcee. Ishita was not ready for this marriage. For Ishita Mrs. Hingorani was a source of inspiration. She encouraged her for further studies to get a secured job and independence. When Ishita visited a couple who was celebrating the naming ceremony of their adopted daughter, it made her to think why she could not do the same as was done by this couple. "This woman, instead of being punished for her barrenness, was bleaming with happiness. Her husband instead of looking for a new wife was content to beam with her. It wasn't fair. But she was amazed when she comes to know that they gave a fake infertility certificate to adopt a child only to come out of the narrow mindedness to have a child of their own flesh and blood.

With news of Raman's divorce, it made Mrs. Rajora to choose Raman as her son-in-law. She got a good opportunity when Ishita was invited on Sunday by Mrs. Kaushik. Now Ishita and Raman started sharing their problems and sad memories of the past with each other. And the day came when they came close physically too. She was happy with her new family. She loves Roohi and felt hurt when Arjun tried to poison Roohi against her. She did her best to get Roohi admitted in a good school. She was satisfied with the joy and pleasure she was getting from her new family especially from Raman and Roohi. When Shagun on vacation in India claimed Roohi and accused Raman of not sending her without any reason, it made Ishita stop this shunting of Roohi from here to there because of her tender age. She also feared that

it might be that Shagun would not return Roohi to them. Her love for Roohi can be felt in these lines, "I think my heart will break", Ishita said as they got into the elevator. "I can't bear this half here-half there. I have given her everything not because of you, because of her."

Thus Ishita comes out as an essentialist feminist who tries to bring a change in narrow mind set of patriarchy. She does her best to safeguard the value of marriage and family, but also raises her voice against injustice. She suffers a lot during her first marriage, but does not lose her confidence to make a new start. Unlike Shagun, she keeps the value of family and succeeds to have individuality and identity as mother. Essentialist feminists do not regard femininity a necessarily negative state. They celebrate woman's uniqueness- especially motherhood and mothering. The Black feminists also enriched feminism by emphasizing the role and importance of motherhood. "Womanism" differs from feminism in chiefly celebrating women's experiences.

Thus the study of this novel make us aware of the different types of women characters where some are seen successful in their search of identity as individual whereas some are seen as failures (Amin, 1977). Shagun and Ishita come out as promising women characters who raise their voice against the narrow thinking of the society and struggle to search our their identity as individuals. But, there are also some women characters, specially who belong to the the first generation like Shagun's and Ishita's mother and mother-in-law, who are seen confining themselves to the narrow world made for them by patriarchal society and wish to maintain this patriarchal system.

References

1. Beauvoir, Simone de.The Second Sex. Trans. Constance Borde& Sheila Malovany- Chevallier, London: Vintage, 2009.
2. Hooks, Bell.Feminist Theory from Margin to Centre. Boston: South End Press, 1984.
3. Kapur, Manju. Custody. Noida: Randam House India, 2011.
4. Rich, Adrienne. Of Women Born: Motherhood as Experiences and lntuition. London Virago, 1977.
5. Sahgal, Nayantara. "The Woman in India: A Historical Perspective," Span, 15, No. 1 (January 1974).
6. Warake, N.S. "Quest for Identity and Survival: A Study of ManjuKapur's Home". Journal of Literature, Culture and Media Studies.2.4 (2010).

A FINANCIAL PERFORMANCE ANALYSIS OF MICRO FINANCIAL PRODUCT AND SERVICES: A CASE STUDY OF ALWAR, RAJASTHAN

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ABSTRACT

Micro finance is a powerful tool to alleviate poverty. Micro finance products and services are including micro credit, micro insurance, micro savings and micro finance training. This research aims to identify the impact of micro finance products and services on micro finance institution's financial performance. Descriptive and inferential research design is used to measure the all dimension of this study. 372 sample size to be used for this study. Sample data are measure by SPSS. To accomplished the aim of this present study regression correlation model to be developed. The results shows that due to positive impact of micro finance products and services the financial performance also increase of the micro finance institutions.

Keywords: *Micro finance product, Poverty alleviation, financial performance*

Introduction

Rajasthan also suffered from poverty. Most of the poor population are struggling with food and shelter due to poverty. Micro finance is a powerful tool to reduce the poverty. Micro financial institution were started with this common aims to generate income, increase the living standard, reduce the poverty and provides the basic needs to the poor population. Mohd. Yunus (2007) knows the founder of micro finance institutions and small banks says that micro finance helps to poor people to access the basis needs.

Koech, (2011) concluded in his study that micro finance are provides help to poor people to reduce poverty. Micro finance system is the factor of economic and business growth. Vipinet. al. (2015)conducted a study on the rural areas of Uttar Pradesh and Madhya Pradesh, in order to identify the importance and role of microfinance in the rural areas. The findings of the study stated that most of the microfinance schemes are governed by government agencies and nationalized banks. In other terms they also stated that the spread of SHGs is not vital in selected areas of study and the effect of the same can be seen on the number of members that have joined the same i.e. the ratio on yearly basis is too low. Other findings state that the number of meetings, for the groups is too less and even all the members are not present in such meetings. Then on the other hand researchers also stated that MFIs and

SHGs are the only source for the rural people to avail the said services. Nikita (2014)the researcher has deployed on the relevance of MFIs and other bank linkage programs to assess their role in financial assistance of poor people i.e. from rural and urban areas. The findings of the study stated the since its inception in 2012 and 2013 some of the programs have lost their pace and the overall system has loosen up in providing assistance to people. Then on the other hand the researcher has also mentioned the reasons for this slowdown i.e. increase in NPAs, not only in case of SHGs but also for other banks related schemes. This outstanding has prevented the banks to come forward and support the cause. The researcher suggests that the related agencies may come forward for slow and gradual recovery of loans and help the borrowers to find ways and means to put their money in more appropriate form. Mahanta et. al. (2012)Conducted a study on the relevance of microcredit scheme in rural areas, the findings of the study stated that there is a great scope of such schemes and agencies in real terms, the only major requirement is to decorate them according to the need of people and not according the size of population i.e. major beneficiaries should be identified in a given area on the basis of some demographic components and then schemes should be put forward to them only. If the agencies are able to find the real needy people then it will be easier for them to find ways and means to put this

money in good use, accordingly the NPAs will reduce and the rural people will also get benefitted. Singh et al (2018) focused on the need of providing training to all the beneficiaries, before and after, providing them with relevant amount of money. This is building up the required confidence in them and motivates them to put the said money in good use. On the other hand they will become liable to attain next instalment of said loan with easy process. The researcher stated that the training programs may include the skills related to local specializations and even general skills of rearing animals, agriculture related work, etc. this will assist them to start their own micro enterprise and make financially independent. Christopher et al (2010)conducted a comparative between India and Nigeria for the need and availability of micro credit in selected rural areas. The focus was on the role of microfinance on the development of small and medium enterprises. 150 such enterprises were selected in both the countries and assessment is done on the basis of their duration of incorporation and present scenario of their returns and profits. The findings of the study stated that only those microenterprise have developed, whose owners have attended various training programs of government and NGOs, completion of training programs one of the major component of study. Findings of the study stated that the success rate of trained entrepreneurs was high as compared to layman people and if the business was established then most of the time they were facing financial problems related to payments and recovery.

Statement of the problem

Most of the study was done to know the empowerment, profit, revenue but no study done on the micro finance product and services. More studies need to be done focusing on effects of the product and services offered by the micro finance institutions. This study intended to bridge this gape by forcing on the effects of the products provided by micro finance institution's financial performance

Research objective

- To analysis the impact of micro credit on financial performance of micro financial institution

- To analysis the impact of micro saving on financial performance of micro financial institution
- To analysis the impact of micro insurance on financial performance of micro financial institution
- To analysis the impact of micro finance training on financial performance of micro financial institution

Research Hypotheses

H_{01}: Micro credit has no significant impact on financial performance of micro financial institution.

H_{02}: Micro saving has no significant impact on financial performance of micro financial institution.

H_{03}: Micro insurance has no significant impact on financial performance of micro financial institution.

H_{04}: Micro finance training has no significant impact on financial performance of micro financial institution.

Research Methodology

The researcher applied descriptive method to evaluate the relationship between financial performance of micro financial institution and micro finance products and services. Researcher collected data and information on the descriptive type. Descriptive research ishelps to identify the variables and provide help to construct hypotheses. To accomplish for this present study researcher employed descriptive design in this study.

Sampling and Data collection

Researcher constructs a schedule to collect data from the micro financial beneficiaries. Most of the beneficiaries are analphabetic they are not able to read and write the question. Researcher used randomly sampling from the group of micro finance beneficiaries being carried by the micro finance institutions. Researcher constructs a questionnaire which is filled by Micro finance owner, manager and employee. The sample size is 372 and it determine at 95% and 99% on confidence interval. 304 sample data are received. The primary data are collected on the basis of slovin's formula.

Data Analysis and presentation

To analysis the collected data inferential and descriptive method are used. To understand the relationship between the relationships between financial performances of micro financial institution and micro finance products and services correlation and regression model to be used in this study. The primary data was analysis with the statistical tool of SPSS.

To evaluate the data the following model are established:
FP = a + b1X1 + b2X2 + b3X3 + b4X4 + e
FP = Financial performance, B = coefficient of variable, a = constant, e= error

X1= Micro credit, X2= Micro saving, X3= Micro insurance, X4= Micro finance training.

Results and Discussion

The impact of micro credit on financial performance of micro financial institution

Some questions are related to the micro credit were asked to the respondent to analysis the performance of micro financial product of their business. The representation of result was done through frequency tables and central tendency are as follows:

Table:1-The impact of micro credit on financial performance of micro financial institution

| Micro Credit statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
Impact of mode of disbursement	0%	0%	10.9%	65.3%	23.8%	4.08%
Impact of long term loan	0%	0%	10.9%	79.2%	9.9%	3.99%
Impact of short term loan	0%	0%	9.9%	79.2%	10.9%	4.01%
Impact of medium term loan	0%	0%	10.9%	69.3%	19.8%	4.09%
Impact of repayment period	0%	1.0%	19.8%	57.4%	21.8%	4.00%
Impact of duration to loan receive loan	0%	0%	1%	69.3%	29.7%	4.29%
Impact of interest rate	0%	0%	5.9%	79.2%	14.9%	4.13%
Impact of leading limited offers	0%	5.9%	21.8%	67.3%	5.0%	3.71%
Impact of security on loan	0%	0%	5.0%	90.1%	5.0%	4.0%
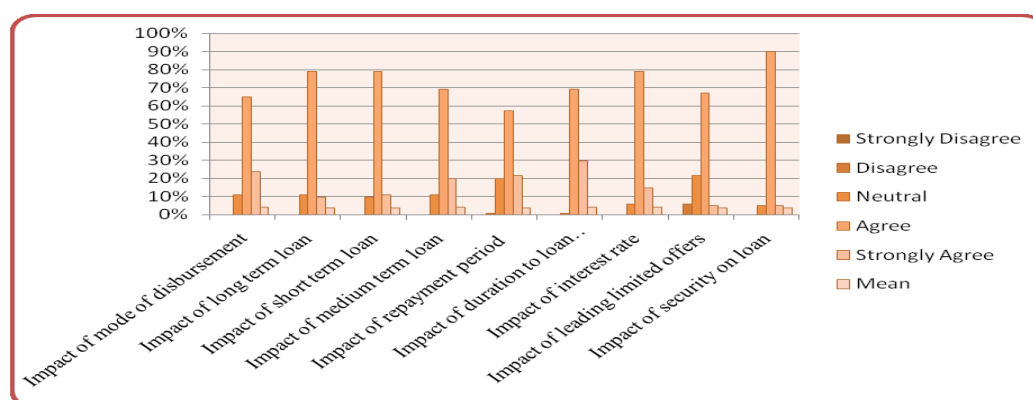
Figure: 1- The impact of micro credit on financial performance of micro financial institution

Discussion

From the analysis the above data it can be observed that mean weight is higher to the statement of duration to loan receive loan from the micro financial institution affect the financial performance of the business leads with 4.29%. After that mean weight higher to the statement of rate of interest on loan offered by the micro financial institutions affected the

financial performance of the business leads with 4.13%. Mean weight higher to the statement of medium term loan offered by the micro finance institutions affected the financial performance of the business leads with 4.09%. Mean weight higher to the statement of mode of disbursement of loan from the micro financial institutions affected the financial performance of the business leads with 4.08%. Mean weight higher to the statement of short term loan

offered by the micro finance institutions affected the financial performance of the business leads with 4.01%. Mean weight higher to the statement of security requirement on loan and loan repayment period offered by micro finance institutions affected the financial performance of the business leads with 4.0%. Mean weight lower to the statement of long term loan offered by the micro finance institutions affected the financial performance of the business leads with 3.99%. Mean weight lower to the statement of the maximum lending limited offered by the micro finance institutions affected the financial performance of the

business leads with 3.71%. This analysis concludes that duration to receive the loan is highly affected on the micro financial performance.

The impact of micro saving on financial performance of micro financial institution

Some questions are related to the micro credit were asked to the respondent to analysis the performance of micro financial product of their business. The representation of result was done through frequency tables and central tendency are as follows:

Table: 2- The impact of micro saving on financial performance of micro financial institution

| Micro savingsstatements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
Impact of various types of saving account	0%	0%	8.9%	79.2%	11.9%	4.03%
Impact of micro saving services	0%	0%	0%	28.7%	70.3%	4.69%
Impact of minimum savings allowed	0%	0%	30.7%	69.3%	0%	3.69%
Impact of saving through mobile banking	0%	0%	60.4%	39.6%	0%	3.40%
Impact of interest rate on saving	0%	0%	30.7%	59.4%	9.9%	3.79%
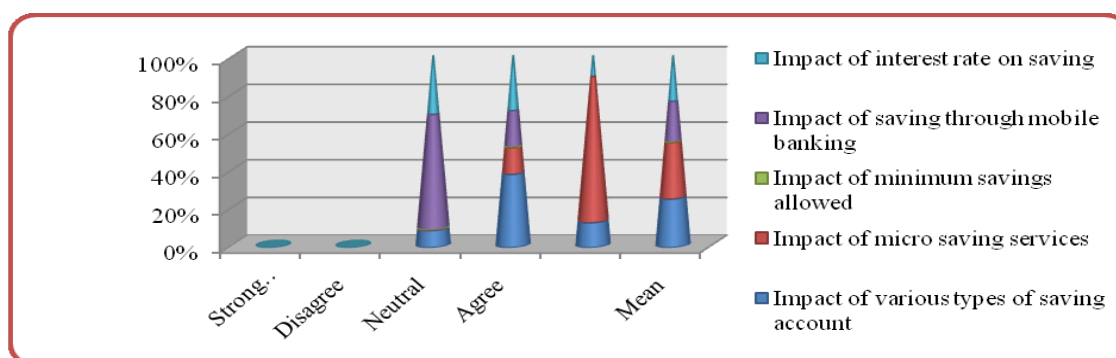
Figure: 2- The impact of micro saving on financial performance of micro financial institution

Discussion

From the analysis the above data it can be observed that mean weight is higher to thestatement of micro saving services offered by the micro financial institution affect the financial performance of the business leads with 4.69%. Mean weight is higher to the statement of various types of saving accounts offered by the micro financial institution affect the financial performance of the business leads with 4.03%. Mean weight is higher to the statement

of interested rate of saving offered by the micro financial institution affect the financial performance of the business leads with 3.79%. Mean weight is lower to the statement of minimum saving allowed by the micro financial institution affect the financial performance of the business leads with 3.69%. Mean weight is lower to the statement of micro saving services offered by the micro financial institution affect the financial performance of the business leads with 3.40%.This discussion concluded that micro saving services are affected the most of

financial performance of micro finance institutions.

The impact of micro insurance on financial performance of micro financial institution

Some questions are related to the micro insurance were asked to the respondent to analysis the performance of micro financial product of their business. The representation of result was done through frequency tables and central tendency are as follows:

Table:3 The impact of micro insurance on financial performance of micro financial institution

Micro Insurance statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
Impact of time period taken to pay for the risk after occurrence	0%	0%	10.9%	79.2%	9.9%	3.99%
Impact of insurance covers	0%	69.3%	29.7%	1%	0%	2.32%
Impact of amount of insurance premiums paid	0%	1%	28.2%	70.8%	0%	3.68%
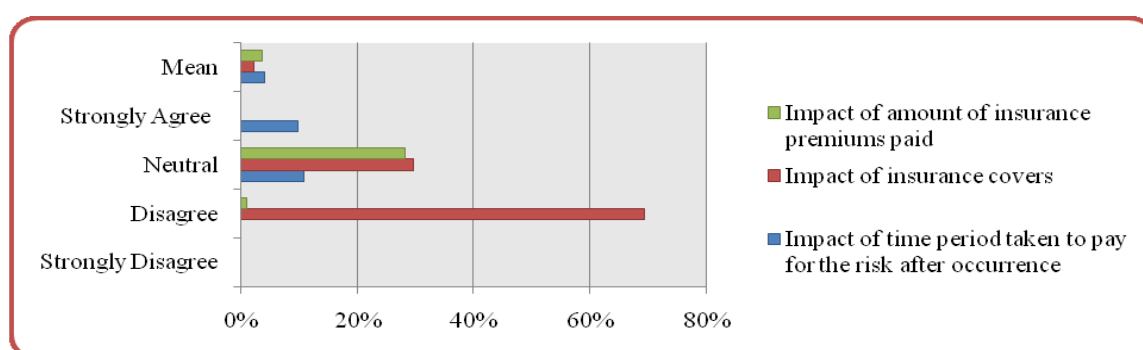
Figure:3 Impact of micro insurance on financial performance of micro financial institution

Discussion

From the analysis the above data it can be observed that mean weight is higher to the statement of time period taken to pay for the risk after occurrence offered by the micro financial institution affect the financial performance of the business leads with 3.99%. Mean weight is higher to the statement of amount of insurance premiums paid offered by the micro financial institution affect the financial performance of the business leads with 3.68%. Mean weight is lower to the statement of insurance covers offered by the micro financial institution affect the financial

performance of the business leads with 2.32%.It concluded that risk after occurrence have impacted higher on the financial performance of the micro financial institution.

The impact of micro finance training on financial performance of micro financial institution

Some questions are related to the micro finance training were asked to the respondent to analysis the performance of micro financial product of their business. The representation of result was done through frequency tables and central tendency are as follows:

Table:4- The impact of micro finance training on financial performance of micro financial institution

| Micro Finance training	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
Impact of training on record keeping	0%	0%	1%	49.7%	49.3%	4.48%
Impact of training on the investment area	1.7%	1.7%	14.5%	59.7%	22.4%	4.0%
Impact of training in management skills	0%	0%	1%	50.5%	48.5%	4.48%
Impact of training on the proper use of the loan	4.3%	5.3%	4.6%	38.6%	47.2%	4.19%
Impact of the frequency of training	0%	0%	1%	59.4%	39.6%	4.39%
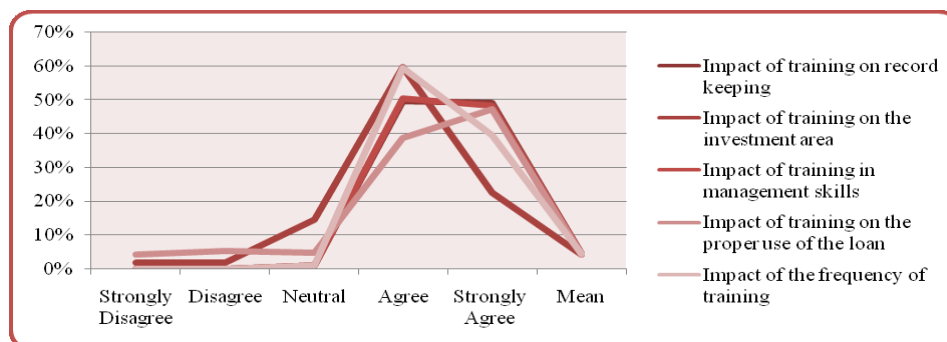
Figure: 4 - The impact of micro finance training on financial performance of micro financial institution

Discussion

From the analysis the above data it can be observed that mean weight is higher to the statement of training of management skills and training of record keeping by the micro financial institution affect the financial performance of the business leads with 4.48%. Mean weight is higher to the statement of frequency of training offered by the micro financial institution affect the financial performance of the business leads with 4.39%. Mean weight is lower to the

Statement of training on the proper use of the loan offered by the micro financial institution affect the financial performance of the business leads with 4.19%. Mean weight is lower to the statement of training on the training on the investment area offered by the micro financial institution affect the financial performance of the business leads with 4.0%. It concluded that training on management skills and records keeping are highly affected on the financial performance of the micro financial institution.

Table:5 Showing Correlation between Product and its performance

		Performance	Micro Credit	Micro Saving	Micro Insurance	Micro Finance training
Performance	Person Correlation	1	.674(**)	.645(**)	.437(**)	.666(**)
	Sig. (2-tailed)	0	0	0	0	0
	N	304	304	304	304	304
Micro Credit	Person Correlation	.674(**)	1	.142(*)	.239(**)	0.06
	Sig. (2-tailed)	0	.	0.013	0	0.302
	N	304	304	304	304	304
Micro Saving	Person Correlation	.645(**)	.142(*)	1	.145(*)	.177(**)
	Sig. (2-tailed)	0	0.013	.	0.011	0.002
	N	304	304	304	304	304
Micro Insurance	Person Correlation	437(**)	.239(**)	.145(*)	1	.147(*)
	Sig. (2-tailed)	0	0	0.011	.	0.01
	N	304	304	304	304	304
Micro Finance training	Person Correlation	.666(**)	0.06	.177(**)	.147(*)	1
	Sig. (2-tailed)	0	0.302	0.002	0.01	.
	N	304	304	304	304	304

** Correlation is significant at the 0.01 level (2- tailed)
* Correlation is significant at the 0.05 level (2- tailed)

Discussion

The above table show the relationship between micro financial product and services and its impact on financial performance. This analysis

shows the positive impact of micro credit on financial performance of the micro finance institution (P<0.01, r=.674**) is follow by

micro finance training (P<0.01, r=.666**)and next micro saving (P<0.01, r=.645**). This analysis also shows the lower impact of micro finance insurance (P<0.01, r=0.347**). All the measure is done on 1% level of significance. It

interpreted that micro finance products and services have plays a positive impact on financial performance of the micro finance institutions. Table:6-Model summery

Model	R	R square	Adjusted R Square	Std. Error of the estimate
1	.929(a)	.872	.870	.206

(a)   = constant symbol of micro credit, insurance, saving, training.

Table: 7- ANOVA (Dependent Variable)

Model		Sum of Squares	Df	Mean square	F	Sig.
1	Regression	88.409	4	23.353	456.558	.000(a)
	Residual	15.278	299	.049		
	Total	102.686	303			

(a)   = constant symbol of micro credit, insurance, saving, training

Table: Coefficients

Model		Unstandardized coefficients		Standardized	T	Sig.
		B	Std. Error	Beta		
1	Micro Credit	.228	.024	.418	18.624	.000
	Micro Saving	.229	.014	.391	18.227	.000
	Micro Insurance	.274	.022	.282	13.997	.000
	Micro Finance training	.285	.016	.437	18.389	.000

Discussion

From above table it is concluded that there is a strong and positive relationship between micro finance product and financial performance of the business. It shows the impactful empowerment between independent variable and optimal linear combination.

From above the table B include unstandarlised coefficients. The predictor variable is show through coefficients of independent variables. The regression equation model is follow.

Financial performance (FP) = -0.071+ 0.249 Micro Credit + 0.228 Micro Saving + 0.284 Micro finance training + 0.273 Micro insurance

It is examining that all the dimension micro credit, insurance, saving and training are major variable in this study. This dimension is needed to measure the financial performance of micro finance institutions.

Summary of finding
The impact of micro credit on financial performance of micro financial institution
The first objective stated to analysis the impact of micro credit on financial performance of

micro financial institution. The data shows a significant impact between micro finance institution and its financial performance. So, this study followed by rejected the null hypothesis of Micro credit has no significant impact on financial performance of micro financial institution.

The impact of micro saving on financial performance of micro financial institution
The second objective stated to analysis the impact of micro saving on financial performance of micro financial institution. The data shows a significant impact between micro finance institution and its financial performance. So, this study followed by rejected the null hypothesis of Micro saving has no significant impact on financial performance of micro financial institution.

The impact of micro insurance on financial performance of micro financial institution
The third objective stated to analysis the impact of micro insurance on financial performance of micro financial institution. The data shows a significant impact between micro finance institution and its financial performance. So, this study followed by rejected the null hypothesis of Micro insurance has no

significant impact on financial performance of micro financial institution.

The impact of Micro finance training on financial performance of micro financial institution

The third objective stated to analysis the impact of micro finance training on financial performance of micro financial institution. The data shows a significant impact between micro finance institution and its financial performance. So, this study followed by rejected the null hypothesis of Micro finance training has no significant impact on financial performance of micro financial institution.

Conclusion

The micro finance institution's financial performance is affected by micro finance product and services. The major factors are of interest rates and loan duration playing an important role to increase financial performance of business. Financial performance are also effected the management skills and keeping systemic records of micro finance. Micro insurance conclude the lower impact on financial performance. The present study suggested that micro finance institutions are focused on micro finance training. It should be provided on daily basis to the needy persons of the micro finance institutions. The researcher also recommends providing the lower interest rate and providing full training to the micro finance beneficiaries.

References

1. Banerjee, Abhijit V., and Esther Duflo. 2011. Poor Economics. New York: Perseus Books.
2. Basu, P., & Srivastava, P. (2005). Exploring Possibilities: Microfinance and Rural Credit Access for the Poor in India. Economic and Political Weekly, 40(17), 1747-1756.
3. Beck, T., Demirgüç-Kunt, A. and Levine, R., 2007. Finance, inequality and the poor. Journal of economic growth, 12(1), pp.27-49.
4. Robin, and RohiniPande. 2005. ―Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment.‖ American Economic Review, Vol. 95, No. 3: 780–95.
5. Dixon, R., Ritchie, J., &Siwale, J. (2006). Microfinance: accountability from the grassroots. Accounting, Auditing & Accountability Journal, 19(3), 405-427. [
6. Dwivedi, A. K., &Dwivedi, N. (2011).Womenempowerment through women entrepreneurship :A study of Faizabad zone of Uttar-Pradesh, Retrieved from http://ssrn.com/abstract=1886250
7. Ferdousi, F. (2013, December).Performance of microfinance institutions in Asia. DEA based efficiency analysis. In International Conference on the Modern Development of the Humanities and Social Sciences, Atlantis Press, Paris (pp. 91-94).
8. Kabeer, N. (2005). Is microfinance a 'magic bullet' for women's empowerment? Analysis of findings from South Asia. Economic and Political weekly, 4709-471.
9. Karlan, D. S. (2001). Microfinance impact assessments: The perils of using new members as a control group. Journal of Microfinance/ESR Review, 3(2), 5
10. Kusum Mukherjee, A. (2014). Microfinance and credit to the ultra poor. International Journal of Social Economics, 41(10), 975-993
11. Leora F. Klapper, Simon C. Parker(2011) Gender and the Business Environment for New Firm Creation, The World Bank Research Observer, Volume 26, Issue 2, 1 August Pp 237–257.
12. Mathew,Jaya and Kurian Reeba (2016) Engendering Women's Access to Credit through Financial Inclusion in India, International Journal of Economics and Finance, Vo. 8, No.6.

COMPARATIVE STUDY OF MECHANICAL PROPERTIES OF UNFILLED AND SIC AND AL$_2$O$_3$ FILLED BANANA FIBER REINFORCED POLYMER COMPOSITES

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ABSTRACT

Banana fiber is a lingo-cellulosic fiber having relatively good mechanical properties as compared to glass fiber. It has a lower density as compared to glass fibers. It has high strength, light weight, smaller elongation, fire resistance, strong moisture absorption, great potentialities, and biodegradability. It helps make products like papers, lamp and pen stands, composite material, etc. Polypropylene reinforced banana fiber-based composites are used in automobile companies to produce under-floor protection panels in luxurious cars like Mercedes. Also, banana fiber-based composite is used for making buildings boards and fire resistance boards. Nowadays, banana fiber reinforced polymer composites are widely used in different industries due to their superior properties. The main objective of the present research is to investigate the effect of %wt of banana fiber % wt of SiC, and %wt of Al$_2$O$_3$ in banana fiber reinforcement composites on tensile property. It has been concluded from the study that the variation in percentage weight of banana fiber affects the tensile strength of unfilled banana reinforcement composites. Also, flexural strength and tensile strength increase with the increase in % wt of filler material from 0 % weight to 20 % weight. Further, an increase in filler particles from 20 % wt to 30 % wt decreases the tensile strength of banana fiber composites

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Keywords: Banana fiber, SiC, Al$_2$O$_3$, tensile strength, flexural strength, hardness, reinforcement.

Introduction

The growing global concern over the environment is now encouraging renewable sources of materials that do not harm nature and come from an alternative source of good economic potential. Natural fiber composites are nowadays being used in various engineering applications to increase strength and optimize the weight and the cost of the product. To manufacture a high-performance and more efficient engineering material, the use of natural fibers as a reinforcement element in composites is increased recently. In India, banana is abundantly cultivated, and banana fiber can easily be obtained from the pseudostem after the fruits and leaves are utilized. Some researchers investigated the effect of various conditions, for example, kinds of Fiber, multiple sorts of filler material, and so on, mechanical and physical properties of fabricated fiber reinforcement composite. A few scientists plan the impact of various boundaries, including creating composites on mechanical and physical properties utilizing factual structure methods and delicate figuring procedures. Pothan et al. (2003) contemplated the viscoelastic properties of polyester and its impact on it because of banana fiber. It is accounted for that the viscoelastic properties significantly affect fiber substance, temperature, and frequency.

% wt of Fiber showed a considerable impact on the Tg values and outcome obtained while considering the elevation of Tg as a proportion of the interfacial interaction. Khalil et al. (2006) investigated the fine structure of banana and pineapple fibers with the help of SEM. As indicated by TAPPI technique, the chemical compositions of fibers were analyzed. This examination is helpful in the decrease of ecological and wellbeing risks related to the removal of plant waste. Nilza G. et al. (2008) investigated the fate of coconut coir, Jamaican banana, and bagasse fiber as composite materials. An examination is introduced for the structure and design of composite material with the elective utilization of different natural Jamaican cellulose fibers. After conducting various tests on the composite like water ingestion, moisture test, carbon content, tensile strength, and chemical analysis, the result shows that the coconut has the highest lignin content present in coconut fiber.

In contrast, the banana fiber has the most increased carbon and cellulose content, tensile strength, and hardness compared to other

natural fibers composites. Idicula et al. (2010) observed the mechanical behavior of the banana, sisal, and hybrid reinforced polyester composites. These fibers were tried based on their tensile properties. These aides deciding the layering examples and fiber piece and focus those are the elements of tensile properties of the composites. Chattopadhyay et al. (2011) examined the composites with polypropylene because of biodegradable characteristics of banana, bamboo, and pineapple leaf Fiber strengthened. Composites' biodegradability comes in the middle of 5-15%. Subsequently decrease in the age of misuse of the non-biodegradable polymers because of the decrease of the measure of polymer content utilized in it. using standard fibers from sustainable assets that strengthen specialists in different engineered polymers can deliver to the administration of waste plastics. Amir et al. (2017) investigated the impact of % weight of banana fiber and another type of banana fiber on the mechanical properties of high-performance polypropylene composites. The maleic anhydride was included for the up-gradation of the bonding between polymer matrix and standard Fiber. Crude banana fiber, banana fiber yarn, and banana fiber mat were used to manufacture PP composites, and mechanical characteristics of the various composites were assessed. Examination done by utilizing SEM pictures and examination deduced that banana fiber yarn composed polypropylene fiber composites was better than the others.

In the present article, we have proposed the comparative study of unfilled and SiC and Al2O3 filled banana fiber reinforced polymer composite under the tensile strength, flexural strength, and hardness.

Material and methodology
Material

To fabricate banana fiber composites, LY556 resin supplied by ASES chemical works, industrial Estate, Jodhpur was used as matrix material. It is the most commonly used thermosetting polymeric epoxy resin. The HY 951 Hardener supplied by ASES chemical works, Industrial Estate, Jodhpur, was used with LY556 in a specific ratio proportion by weight, i.e., 10:100. As corrosion resistance properties, mechanical properties, low shrinkage, and chemical properties are superior in the polymeric epoxy resin during curing, this is widely used in the formation of many composites, and we are also using it for the same reason.

Methodology

Seven wooden blocks were prepared, and a thin plastic sheet was fixed at the bottom of the mold plate to ensure a better surface finish of the product. Then after release, gel silicon spray is sprayed on the surface of thin plastic sheets to avoid the sticking of polymer with the character of thin plastic sheets. After this, banana fiber is being chopped in small size and weighted according to the ratio. These pieces of Fiber are then mixed with the epoxy resin and the hardener in a particular proportion. This procedure is done without silicon carbide and aluminum oxide till now. After adequately mixing banana fiber and hardener in epoxy resin, we poured this mixture on the already made wooden block. Releasing gel is applied to the inner surface of the plastic sheet, and then this sheet is placed on the top of the layer of Fiber and polymer. The roller is moved with a mild pressure on the plastic sheet to remove any trapped air and the presence of excess polymer. Finally applied weight after covering this mixture and leave for 24 hours.

After fabricating the composites, different specimens have been fabricated per the ASTM standard for mechanical testing.

The tensile test has been conducted using the universal testing machine Instron 1195 according to ASTM D3039-76. Flat specimens are often used for the tensile test. The straight side type with end tabs and the dog-bone type are the two most common samples used for the tensile test. The tensile test needs to apply uniaxial load through both ends of the specimen. As per ASTM test standards, the dimension of the sample has been taken as 200 mm x 10 mm at a crosshead speed of 10 mm/min.

Flexural strength classifies the amount of stress and force that can be resisted by an unreinforced concrete slab, beam, or other structure without any bending failures. Flexural strength is also known as bend strength or

modulus of rupture. The Flexural strength test of fabricated composites has been conducted at room temperatures using Instron 1195 testing machine, as shown in figure 3.5. These are the three points bend test in which failure occurs due to inter-laminar shear. The specimens of dimensions 100 mm x 10 mm were fabricated according to standard for the testing at a crosshead speed of 10 mm/min. The thickness of samples has been varied according to types of fabricated composites.

The Rockwell hardness of all specimens has been measured as per the ASTM: E-18 standard using Rockwell cum Brinell hardness tester machine for measuring hardness, minor load, and significant load for all cases is considered as 10 kgf and 150 kgf, respectively

Result and discussion

Unfilled banana fiber-reinforced composites

Tensile strength

Tensile test of fabricated composites has been conducted on the universal testing machine (UTM Instron 1195) at ambient conditions. Shape and size of specimens for tensile test according to the ASTM standard has designation (D3039-76). The tensile load was subjected to the samples at a crosshead speed of 10 mm/min. For all fabricated composites, two identical specimens have been tested. The average of the tensile strength value has been taken as tensile strength for that composite, as shown in table 1. Fig. 1 shows the bar chart for tensile strength of unfilled banana fiber composites.

TABLE 1 TENSILE STRENGTH OF UNFILLED COMPOSITES

Composites	% wt of Fiber	Tensile Strength (MPa)		
		1	2	Mean
BE10	10	6.5	6.1	6.3
BE15	15	10.2	9.6	9.9
BE20	20	7.2	7.8	7.5
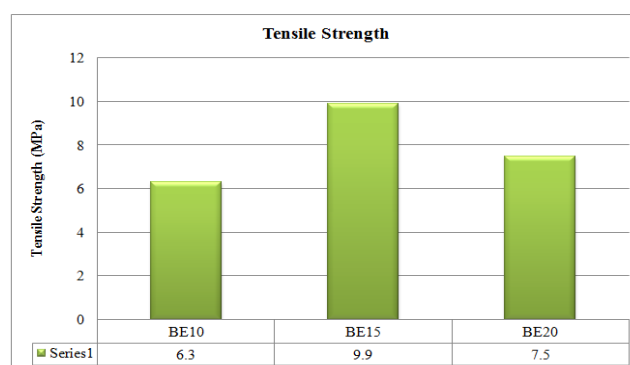
Fig. 1. Comparison of Tensile strength using different wt% of Banana Fiber

From Fig. 1, it has been revealed that the tensile strength of fabricated composites enhances with addition in fiber loading. For low weight % of fiber loading (BE10), tensile strength is low due to the less fiber interface area. Further increase in % weight of Fiber leads to an increase in fiber interface area, therefore increasing tensile strength (BE15). Beyond the specific limit, other addition in fiber loading decreases tensile strength due to incomplete adhesion at the entire surface because of Fiber- fiber interaction

and improper wetting of Fiber (BE 20). The maximum tensile strength has been achieved with the composite having 15 % fiber loading (BE 15) amongst all fabricated banana fiber reinforcement composites with no filler element.

Flexural strength

Flexural test of composite has been conducted using the universal testing machine (UTM Instron 1195). The shape and size of specimens for the flexural test were fabricated per ASTM

standard with designation (D2344-84). The flexural load was subjected to samples at a crosshead speed of 0.5 mm/min. For all fabricated composites, two identical specimens have been tested. The average flexural strength value has been taken as flexural strength for that composite, as shown in table 2. Fig. 2 shows the bar chart for flexural strength of unfilled banana fiber composites.

TABLE 2 FLEXURAL STRENGTH OF UNFILLED COMPOSITES

Composites	% wt of Fiber	Flexural strength (MPa)		
		1	2	Mean
BE10	10	18.3	17.8	18.05
BE15	15	22.8	23.2	23
BE20	20	21.3	20.9	21.1
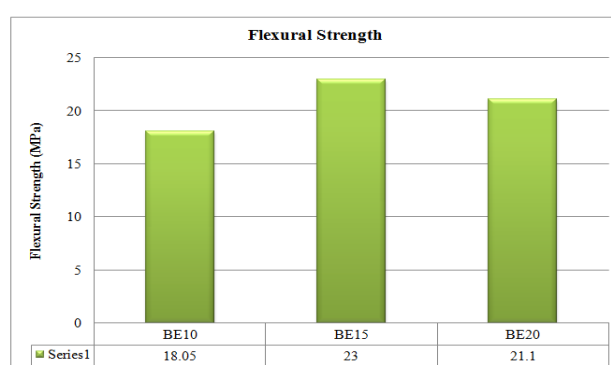
Fig. 2. Comparison of Flexural strength using different wt% of Banana Fiber

It has been observed from the fig. 2 that the value of flexural strength of fabricated composites initially enhances with an increase in fiber loading up to wt % 15, i.e., BE10 to BE15. Uniform distribution of fibers in the composites increases with fiber percentage in the composite that prevents the early sliding of the polymer matrix phase. The stress distribution occurs near the fibers. Therefore, due to the uniform distribution of fibers in the composites, the crack initiation and propagation occurs in several directions instead of unidirectional crack propagation, increasing flexural strength. Beyond the specific limit, a further increase in fiber loading (BE20) decreases flexural strength due to incomplete adhesion at the entire surface because of Fiber- fiber interaction and improper wetting of Fiber. The maximum flexural strength has been achieved with a 15 % weight loading of Fiber.

Hardness

The wear strength of material closely depends on the hardness of the material. Therefore, it is required to improve the hardness of the material to improve the wear strength of the material.

Table 3 indicates the values of hardness along with the average value of hardness for all composites. Fig. 3 shows the bar chart for the hardness of unfilled banana fiber composites.

TABLE 3 HARDNESS OF UNFILLED COMPOSITES

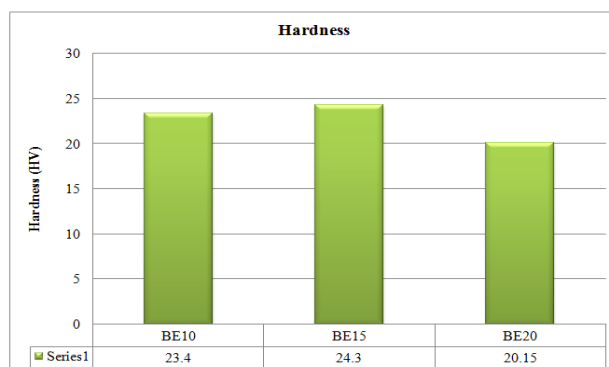| Composites	% wt of Fiber	Hardness (HV)		
		1	2	Mean
BE10	10	23.6	23.2	23.4
BE15	15	24.2	24.4	24.3
BE20	20	20.5	19.8	20.15

Fig. 3. Comparison of Hardness using different wt% of Banana Fiber

It is visible from table 3 and fig. 3 that hardness of the fabricated unfilled composites (BE10, BE15, and BE20) initially enhances with increasing % wt of banana reinforcement from 10 to 15, after that hardness decreases with further addition of banana fiber. This is often a result of the rise in better stress distribution and indentation resistance of the matrix with an increase in banana fiber loading from % weight of banana reinforcement from 10 to 15. Further addition of banana fiber beyond 15% decreased the bonding between matrix and reinforcing materials and observed a decrease in hardness.

B. SiC and Al$_2$O$_3$ Filled Banana fiber-reinforced composites

Tensile strength

For all the fabricated composites, two identical specimens have been tested. The average of the tensile strength value has been taken as tensile strength for that composite, as shown in table 4. The figure indicates the tensile strength of fabricated composites.

TABLE 4 TENSILE STRENGTH OF SiC and Al2O3 FILLED BANANA FIBER REINFORCED COMPOSITES

| Composite Designation	Tensile Strength (MPa)		
	1	2	Mean
Banana Epoxy (BE15)	10.2	9.6	9.9
10% SiC filled Banana Epoxy (10SBE15)	11.89	11.25	11.57
20 % SiC filled Banana Epoxy (20SBE15)	19.64	17.82	18.73
30% SiC filled Banana Epoxy (30SBE15)	12.88	13.54	13.21
10% Al$_2$O$_3$ filled Banana Epoxy (10ABE15)	13.31	12.43	12.87
20 % Al$_2$O$_3$ filled Banana Epoxy (20ABE15)	18.16	19.58	18.87
30% Al$_2$O$_3$ filled Banana Epoxy (30ABE15)	17.36	14.34	15.85
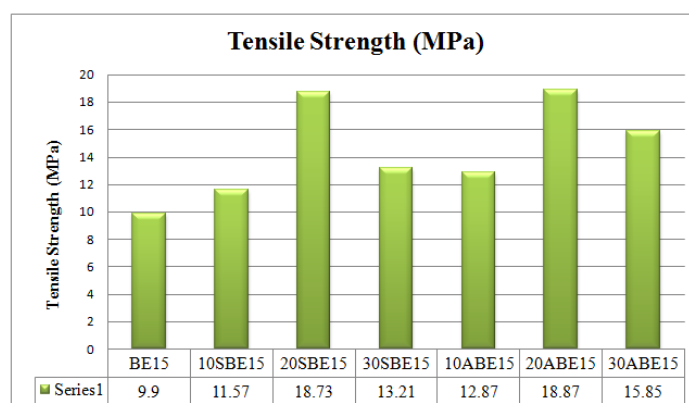
Fig. 4. Comparison of Tensile strength using different wt% of SiC and Al2O3 filled Banana Fiber

Fig. 4 depicts that the value of tensile strength of composites initially increases with an increase in SiC or Al_2O_3 filler up to 20% wt. It is because of Filler particles, which act as a barrier in distributing stress from one point to another. Also, filler particulates increase the area for the bonding among the three different constituents of composites. More increase in filler particulates from 20 wt % in the composites reduces the tensile strength. It is due to the rise in more surface area and less matrix material for bonding. Because of insufficient or improper bonding among three different constituents, the stress may not be distributed effectively from one point to another. Hence, we observed a reduction in the tensile strength of the composite due to poor bonding. The maximum tensile strength has been achieved with 20 % wt loading of filler material (20ABE15).

Flexural strength

For all the fabricated composites, two identical specimens have been tested. The average of the flexural strength value has been taken as flexural strength for that composite, as shown in table 5. Fig. 5 shows the bar chart of flexural strength of fabricated composites.

TABLE 5 FLEXURAL STRENGTH OF SiC and Al2O3 FILLED BANANA FIBER REINFORCED COMPOSITES

Composite Designation	Flexural Strength (MPa)		
	1	2	Mean
Banana Epoxy (BE15)	22.8	23.2	23
10% SiC filled Banana Epoxy (10SBE15)	22.26	21.3	21.78
20 % SiC filled Banana Epoxy (20SBE15)	45.47	46.27	45.87
30% SiC filled Banana Epoxy (30SBE15)	38.65	37.85	38.25
10% Al_2O_3 filled Banana Epoxy (10ABE15)	23.11	25.63	24.37
20 % Al_2O_3 filled Banana Epoxy (20ABE15)	48.2	47.24	47.72
30% Al_2O_3 filled Banana Epoxy (30ABE15)	43.15	40.57	41.86
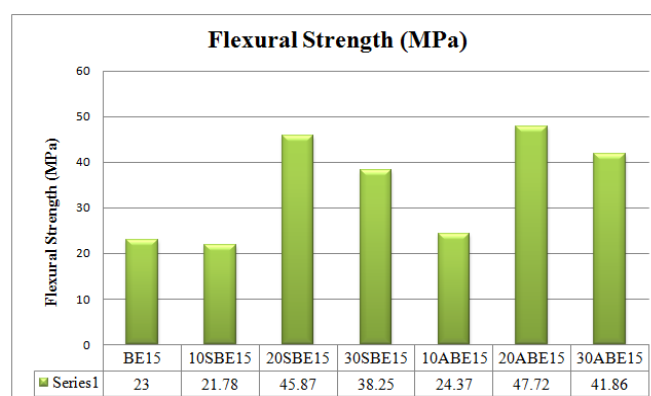
Fig. 5. Comparison of flexural strength using different wt% of SiC and Al2O3 filled Banana Fiber

Fig. 5 depicts that the value of flexural strength of fabricated composites initially increases with an increase either in % wt of SiC or % wt of Al_2O_3 up to 20% wt. It is because of the increase in surface area for bonding among fiber, filler, and epoxy matrix. The figure also revealed that further addition of filler material above 20% wt decreases the flexural strength of fabricated composites. It is a result of incomplete adhesion at the entire surface because of improper wetting of Fiber. Hence there is improper interfacial bonding among the alumina particles, fiber, and epoxy matrix. The maximum flexural strength has been obtained with 20% wt loading of Al_2O_3 particulates.
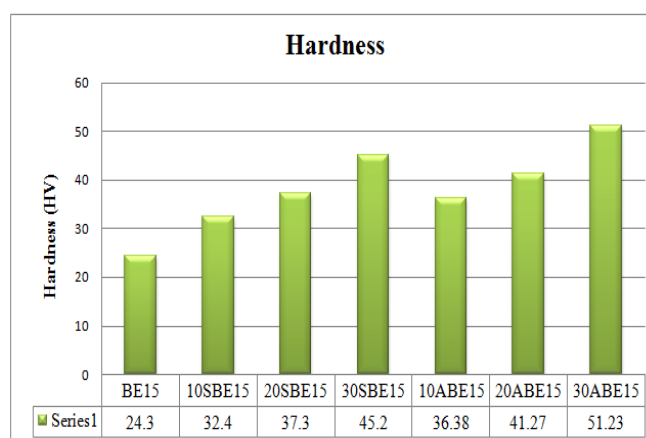
Hardness

Table 6 indicates the hardness of fabricated composites and the average value of hardness

for all banana fiber-reinforced composites. At the same time, the figure shows a bar chart for the average values of hardness.

TABLE 6 HARDNESS OF SiC and Al2O3 FILLED BANANA FIBER REINFORCED COMPOSITES

Composite Designation	Hardness (HV)		
	1	2	Mean
Banana Epoxy (BE15)	24.2	24.4	24.3
10% SiC filled Banana Epoxy (10SBE15)	32	32.8	32.4
20 % SiC filled Banana Epoxy (20SBE15)	38.5	36.1	37.3
30% SiC filled Banana Epoxy (30SBE15)	45.1	45.3	45.2
10% Al_2O_3 filled Banan Epoxy (10ABE15)	36.73	36.03	36.38
20 % Al_2O_3 filled Banana Epoxy (20ABE15)	40.32	42.22	41.27
30% Al_2O_3 filled Banana Epoxy (30ABE15)	52.4	50.06	51.23

Fig. 6. Comparison of hardness using different wt% of SiC and Al2O3 filled Banana Fiber

It is visible from table 6 and fig. 6 that the hardness of fabricated composites increases with an increase either in wt. % of SiC or wt. % of Al_2O_3 particulates in the composites. The maximum hardness is achieved with 30ABE15 composite (30% wt of Al_2O_3). It is because of the increase of density of the composites with increasing wt % of filler particulates. Also, an increase in the hardness of composites indicates better bonding between matrix and reinforcing materials.

Conclusions

The present work is concentrated on investigating the effect of fiber loading and % wt of filler content on the tensile property of banana fiber reinforced epoxy composites. The following conclusions were obtained from the current study:

1. The variation in percentage weight of banana fiber affects the tensile strength, flexural strength, and hardness of unfilled banana reinforcement composites.

2. The hardness, flexural strength, and tensile strength increase with fiber loading from 10 wt % to 15 wt %. Further increase in banana fiber loading beyond 15 wt% leads to a decrease in tensile strength, flexural strength, and impact strength.

3. The BE 15 shows the maximum tensile strength, flexural strength, and hardness among all fabricated unfilled banana reinforcement composites.

4. Initially, tensile strength and flexural strength increase with increasing % wt of filler material from 0 % weight to 20 % weight. Further addition in filler particles from 20 % wt to 30 % wt reduces the tensile strength of banana fiber composites.

5. The maximum flexural strength, tensile strength are achieved with 20% wt of Al_2O_3 filler (20ABE15).

6. Among all the fabricated banana fiber reinforcement composites, the composites with 15 wt % of banana fiber, 30 wt % of Al_2O_3 particles, and remaining epoxy matrix (15ABE30) exhibited Maximum hardness.

References

1. Pothan, L A., Oommen, Z and Thomas, S. (2003) "Dynamic mechanical analysis of banana fiber reinforced polyester composites", Composites Science and Technology, Vol. 63, pp. 283–293. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

2. Khalil, H.P.S.A., Alwani, S.M. and Omar, (2006) A.K.M. "Chemical composition, anatomy, lignin distribution and cell wall structure of Malaysia plant waste fibers, cell wall tropical fibers", Bio Resources, Vol.1(2), pp. 220-232. 161 K. Elissa, "Title of paper if known," unpublished.

3. Pothan, L.A., Thomas, S and Nelakandan,N .R. (1997) "Short banana fiber reinforced polyester composites: mechanical, failure and aging characteristics", Journal of Reinforced Plastics' Vol. 16, pp. 745-765.

4. Nilza G. Jústiz-Smith, G. Junior Virgo, Vernon E. Buchanan, (2008) Potential of Jamaican banana, coconut coir and bagasse fibres as composite materials, Materials Characterization, Volume 59, pp. 1273-1278.

5. Sunil, KM, Sanjay, K. N., Smita, M., and Lakshmi, U. (2010), "Mechanical and fracture behaviour of banana fiber reinforced Polylactic acid biocomposites", International Journal of Plastic Technology, Vol.14, pp. 57–75.

6. Idicula, M., Joseph, K. and Thomas, S. (2010) "Mechanical performance of short banana/sisal hybrid fiber reinforced polyester composites", Journal of Reinforced Plastic and Composite, Vol. 29, pp.12–29.

7. Idicula, M., Malhotra, S.K., Joseph, K and Sabu, T. (2005) "Dynamic mechanical analysis of randomly oriented intimately mixed short banana/sisal hybrid fiber reinforced polyester composites", Composites Science and Technology, Vol. 65, Nos. 7-8, pp. 1077-1087.

8. Merlini, C., Soldi,V., Guilherme and Barra, M.O. (2011) "Influence of fiber surface treatment and length on physico-chemical properties of short random banana fiber reinforced castor oil polyurethane composites", Polymer Testing ,Vol. 30, pp. 833–840.

9. Chattopadhyay, S.K., Singh, S., Pramanik, N., Niyogi, U.K., Khandal, R.K., Uppaluri, R. and Ghoshal, (2011) AK "Biodegradability studies on natural fibers reinforced polypropylene composites", Journal of Applied Polymer Science, Vol. 121, pp. 2226–2232.

10. Singh, V.K., Gope, P.C., "Chauhan Sakshi and Bisht Deepak Singh, (2012) "Mechanical behavior of banana fiber based hybrid bio composites", Journal of Material Environment Science, Vol. 3, No.1, pp. 185-19.

11. N. Amir, Kamal Ariff Zainal Abidin, FaizzatyBintiMd Shiri (2017). "Effects of Fibre Configuration on Mechanical Properties of Banana Fibre/PP/MAPP Natural Fibre Reinforced Polymer Composite". Procedia Engineering 184, 573 – 580.

12. Reddy, N., Yang, Y. and Alister, M. (2006), "Processability and properties of yarns produced from cornhusk fibres and their blends with other fibres, Indian journal of fibre and textile research", Vol. 4 (4), 537-542.

13. S. Biswas and A. Satapathy, "A Study on Tribological Behavior of Alumina-Filled Glass–Epoxy composites Using Taguchi experimental design," Tribology transactions, pp. 520-532, 2010.

14. Sapuan, S.M. and Maleque, M.A. (2005), "Design and fabrication of natural woven fabric woven fabric reinforced epoxy composite for household telephone stand", Materials and Design, Vol. 26, pp. 65-71.

KAMALA DAS AS A SINGER OF ENDLESS SORROW: A SYMBOLIC STUDY OF HER SELECT POEMS

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ABSTRACT

Acclaimed as "the mother of Indian English Poetry" though an anguished and agonized poetic persona, Kamala Surayya (1934-2009), popularly known as Kamala Das, is one of the most anthologized prominent poets, novelists, and story writers of contemporary Indo-Anglian literature. Her poetic universe is replete with utter despair and depression. She underwent a relentless life-and-death struggle throughout her personal and private life to sustain her rightful position in the male-oriented society that made her life a living hell. In many of her poems such as "The sunshine cat", The Old Playhouse", "My Grandmother's House", Substitute, "Suicide", " A Hot Noon in Malabar", "Nani" "The Dance of the Eunuchs" and "The Freaks" Das has symbolically expressed her sorrows and sufferings employing various ingenious and insightful images. She is shocked by her senseless and soulless survival in a convention-ridden society that is obsessed with an authoritarian approach and inflicts upon her endless torture, leaving her as an oppressed and grief-stricken figure. The root cause of her miseries is loveless and futile marital relationships experienced by her living with an "old fat spider", her egotistic and voluptuous husband. The present study meticulously manifests the symbolic representation of sorrows and suffering in the abovementioned poems of Kamala Das.

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Keywords: Despair, Anguish, Imagery, Symbolism, the Patriarchal society, Feminine sensibility.

Introduction

The value of ornaments and symbols has equal importance to the women and the poets respectively. Just as a woman is incomplete without wearing ornaments, a great poet also feels discontented unless he expresses his feelings through symbolic mode. Symbolism, a significant and frequently used literary device, signifies the employment of symbols in literary works. It is something that stands for or implies something else representing something beyond the literal sense. The images and symbols employed by Kamala Das may not be as striking as Elizabethan poets like John Donne and William Shakespeare; though, they are appropriately placed and play a dominant role to portray her despair and depression. Kamala Das has frequently used the symbols of the human body in her poems. Besides, her images and symbols bear the quality of picturesqueness as they represent her personal experiences. The significant and suggestive symbols such as the sea, sun, sleep, sunshine, moon, heat, house, window, etc., play the dominant roles in her poetic corpus. Through these symbols, Das has melancholically expressed her innermost feelings. For instance, The word, 'sunshine' in the poem "The Sunshine cat" is symbolic of the illusion of reality created by the heightened imagination of the observer. The streak of sunlight looked like a yellow cat to the caged female persona. The life of sufferings, physical and mental virtually, reduced the woman to a lifeless Sunshine cat She was forced by her scornful and haughty husband to accept this life of confinement like a pet cat. She lost all her identity and freedom to honor the marital code due to social compulsions. She was dehumanized and reduced to a formless shadow preempting her approaching death. Finally, she became cold and half-dead due to the uncompromising ego of her husband. She was deeply disappointed to realize that she had no identity as a woman. The grief-stricken poetic persona eventually realized that all her so-called lovers were cynics having no emotional attachment to her and-

> "Her husband shut her
> In, every morning; locked
> her in a room of books
> With a streak of sunshine
> lying near the door, like
> A yellow cat, to keep her company, but soon,
> Winter came and one day
> while locking her in, he
> Noticed that the cat of sunshine was only a
> Line, a hair-thin line, and in the evening when
> He returned to take her out, she was a cold and
> half-dead woman, now of no use at all to men."

Commenting on the theme of the poem, A noted scholar, A N. Dwivedi has aptly remarked that "the poem directly highlights the miseries of a forlorn woman."[1] In a highly symbolic poem, "The Old Playhouse", Kamala Das has employed striking and suggestive symbols to highlight the disastrous effects of the mismatched marital relationships. The forceful and fascinating image of 'sparrow' represents the dehumanized image of the speaker, who feels caged by the restrictions imposed on her by her callous husband, who denies her any identity or freedom. The images of 'summer' and 'autumn' are also effective and influential. The images of "summer" and "autumn" respectively represent the happy and gloomy period of her life. Moreover, the mythological image of "Narcissus" is also captivating in the poem. The poetess has aptly compared herself to Narcissus, who, according to Greek mythology, was infatuated or enraptured by his own reflection that he saw in a pool of water. It ultimately overwhelmed him, crushing him with torture and despair as he failed to enjoy the pleasure of sexual intercourse with himself. Other than the symbolic representation of the legendary figure Narcisuss, the evocative images of the "kind night" and "to erase the water" have symbolic significance, signifying that it is only the death that can escape her from depression and loneliness. Finally, the title of the poem, The Old Playhouse, also bears a strong symbolism showing the female persona's joyless and colorless life: She reveals that her life is filled with darkness and-"There is mo more singing, no more a dance, my mind is an old
Playhouse with all its light put out...."

(The old Play House)

In her confessional and emotional poem, My Grandmother's House, the title of which is significant, symbolizing selfless and eternal love, Kamala Das candidly portrays poignant images of her grandmother's house where she spent the brightest and enriching period of her life. According to Z F Molvi,

"she tells us that she was proud of that house
because it gave her genuine
love and true peace and comfort.
Her present unsettled condition is contrasted
with this sense of comfort.
She has lost her right path and she has been reduced
to a beggar seeking love at the stranger's house."[2]

The permanent departure of grandmother tormented Das's soul deeply, leaving her alone in a male-dominated world. She has employed striking literary devices to express her deepest feelings. The anguished poetic persona reveals that "the house withdrew into silence" in the absence of her dear grandmother. The graphic imagery of the moon also represents her plight and predicaments. She acknowledges that the death of her grandmother deeply shocked her soul. She felt as if her blood were as cold as the moon because there was no one to love and look after her; therefore, she yearns to go back in the past and "pick an armful of darkness" which is symbolic of a protective shadow. Her grief that arose due to emotional detachment finds deep expression in the following lines:

"I who have lost
My way and beg now at stranger's door to
Receive love, at least in small change"

(My Grandmother's House)

Kamala Das suffered from a profound sense of failure in her life and finally realized that she cannot cope with it any longer. She gave up all hope of redemption in this hostile world. Moreover, she also lost her peace of mind that was filled with anger and resentment only. It is this realization of meaninglessness that prompts her to end her life. She believes that only death can save her from this earthly plight. In this respect, A.N. Dwivedi has rightly said that

"She is totally lonely and frustrated. Those who claimed to be kind
towards her had only subjected her to humiliation and injury."[3]

There is also a note of pessimism in the poem "Substitute" It vividly dramatizes the poetess's profound sense of sorrow and frustration in life. The quest for love is merely mechanical without any meaning. It reveals her total loss of hope and faith in the male-dominated society. She frankly admits in "substitute that she has miserably failed on all fronts in her life.

"It is hard to believe
that I only lost
lost all, lost even
what I never had"

(Substitute)

The failures, frustration, and loveless marital relationships compelled Kamala Das to ponder over the idea of death or commit suicide. Within this frame of reference, a pessimistic poem, "The Suicide" is an apt instance. In this poem, Kamala Das invites death to end her endless sufferings and frustrations in life. "How long can one resist"?, she frankly admits. There is no final escape "from cages of involvement." The fear of being imprisoned is never fully lifted from a person's conflict-ridden mind. Besides, a person should not expect more than what he possesses. The imagery of the sea is appealing and is directly linked with the soul, having no bearing on the body. It is the exclusive privilege of the souls to merge with the sea:

"I throw the bodies out,

I cannot stand their smell
only the souls may enter
The vortex of the sea
only the souls know how to sing
At the vortex of the." (The Suicide)

For Kamala Das, the 'sea' stands for a constant distraction, an ever-present threat offering her dissolution seductively. In this respect, Devindera Kohli has rightly justified that "the sea - imagery is "part of Kamala Das's elemental symbolism" and that it is "related both to her moods of anguish and release."4 The poem is in the form of a dialogue between the poet and the sea and broadly deals with the themes of death and despair. The sea, a dominating metaphor, denotes a temptation to return to simplicity and innocence through the vision of death. In the series of Kamala Das's sad and sorrowful poems, "A Hot Noon in Malabar" is a significant symbolic poem in which the female persona feels tortured living in the intense heat of the sun in a strange city that is far away from her parental house in Malabar she writes that "To be here, far away, is torture." She suffered from an acute sense of alienation in the city where she had settled after migrating from rural Malabar. She felt suffocated in the hostile urban environment. She also faced relentless psychological tortures due to the unbearable heat of the sun in this strange city. It is torturing for her because it reminds her of the hot noon in Malabar where she lived in her parental house. There she was happy and satisfied, nor did she ever express her displeasure against the heat of the sun. It is the intense heat of city life that tormented her soul, reminding her of the heat of the sun in Malabar that never displeased her. It is this difference in lifestyle that intensified her anguish.

Furthermore, Kamala Das's poem, Nani is also is moving poem, which in a larger sense, emphatically highlights women's oppressions and exploitations in contemporary society. The central theme of the poem revolves around a pregnant housemaid hanging herself, an act to which she was driven by shame and moral austerity of the society in which she lived. Nani's act of committing suicide is indeed distressing, which raises unanswerable questions::

"Nani, the pregnant maid , hanged herself
In the privy one day. For three long hours
until the police came, she was hanging there
A clumsy puppet, and when the wind blew
Turning her gently on the rope." (Nani)

A careful study of Kamala Das's poetry elucidates that most of her poems focus on the themes of emotional dissatisfaction and an unfulfilled quest for love. The poem, "Dance of the Eunuchs" is a candid example of it. The eunuchs in the poem are destined to lead an aimless and meaningless life, and their dance represents the futility of life.

Beneath the fiery gulmohur, with
long braids flying, dark eyes flushing,
They danced, and
they danced, oh, they danced till they bled
There were green
Tattoos on their cheeks, Jasmines in their,
hair some
were dark and some where almost fair."
(The Dance of Eunuchs).

Thus, the constant dance of the eunuchs is not the dance of life but the dance of death. It reveals the pathetic condition of the eunuchs who are involved in the life-and-death struggle of life. Hence they face incessant suffering and hardships throughout their lives. Deep frustration caused by emotional unfulfillment in married life left an adverse effect on her mind and; consequently forced her to seek love outside the marriage. Though she craved to be loved selflessly and emotionally, her husband and lovers objectified her to gratify their sexual desires. She was denied the intellectual and spiritual pleasures of life. In her poem, "The Freaks" she feels no hesitation in admitting that her marriage is an utter failure; it is only a futile and hopeless marital relationship:

"who can
help us who have lived so long
And have failed in love?"
(The Freaks)

The underlying implication of Kamala Das's love poetry makes it evident that she has expressed a heightened vision of marriage and marital relationships, opposing the dehumanized system of traditional arranged marriages in which a girl terribly feels ignored under the influence of male dominance while choosing the prince of her dreams. Keeping in view the women's sufferings and mal-treatment, Das, a fearless feminist, has strongly raised her voice against the futility of the arranged marriages. However, she herself was the victim of a traditional institutional marriage system, as reflected in her poem "The Freaks". The female persona feels caged and suffocated, even though she has to wear a mask of happiness to save this ruined marital relationship. In this context, A distinguished scholar, Mosoumeh M. Moradi's following remarks are very illuminating:

"Women's social unrest in respect of education and career, sexual desire and frustration, suffocation of a caged loveless marriage, numerous affair, the futility of lust, the shame and sorrow of not finding love after repeated attempts, the loneliness and neurosis that stalk women especially and such other things which were not spoken of candidly are

powerfully dealt with for the first time in her poetry. She protests against the marginalisation of women and social injustice and communicates a powerful female sensibility in her poetry."[5]

Conclusion

After an in-depth symbolic study of Kamala Das's select pessimistic poems, it is explored that she is a singer of endless sorrows and sufferings. The elements of failure, frustration, hopelessness, death, and despair find frequent expressions in her poetry. Her vision of life is primarily tragic and pessimistic; however, she was involved in a never-ending struggle of life and death throughout her life. Her marital and extra-marital relationships have a crippling impact on her sensitive psyche. Her loveless married life became more miserable, and as a result, she felt helpless and hopeless as there was no escape from it. The themes of disease, destruction, death, loneliness, rejection, frustration, and helplessness are enormously prevalent in her poetry. In the end, it would suffice to say that love is an indescribable and captivating feeling. Every human being wants to love and be loved, but for Kamala Das, it proved as an unforgettable tragedy of her life. Hence her poetic corpus realistically represents the themes of despair and dejections.

References

1. Dwivedi, A. N. Kamala Das and Her Poetry, Atlantic Publishers & Dist, 2000, P. 100
2. Molvi, M. Z. Kamala Das: Homeless in the City (M. Rajeshwar& P. P. Piciucco, Eds.). In Kamala Das: A Critical Spectrum (p. 86). New Delhi: Atlantic Publisher and Distributer
3. Dwivedi, A. N. Kamala Das and Her Poetry, Atlantic Publishers & Dist, 2000, P. 101
4. Kohli, Devindra. Kamala Das, Arnold-Heinemann Publishers (India), 1975, P. 32
5. Moradi, M. M. Confession of Multilation and Sufferings of Women (A Study of the Selected Poems by Kamala Das) (J. SarangiDr., Ed.). In Kamala Das the Great Indian Trend-setter (p. 54). Authorspress.

OVERCONFIDENCE BIAS, FINANCE RISK TAKING ATTITUDE AND MUTUAL FUND INVESTMENT DECISION

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ABSTRACT

The mutual fund market is developing at an incredible pace. The main benefit of the mutual funds is expansion, professional administration and liquidity. The current study primarily intends to explore the impact of overconfidence bias and finance risk taking attitude on mutual fund investment decision. It also examines if the city in which a person resides moderates this relationship. Data has been collected from 223 respondents from the Indian state of Karnataka. Standard instruments have been used for quantitative primary data collection. Two cities namely Bengaluru and Mysuru have been targeted in this study. This research emphasized the strong relationship between overconfidence bias, financial risk taking attitude and mutual fund investment decision. The decision making patterns also varies depending upon the city in which the respondents are put up..

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Keywords: *Investment, Overconfidence Bias, Attitude, Risk Taking.*

Introduction

Mutual fund companies across the country launch new categories of schemes in a serious attempt to attract investors and increase assets or resources under management. The determination to launch a new category of fund or scheme is influenced by various factors, such as, investors' particular demand for the fund's qualities. Investors agree with and prefer mutual funds for some reasons. Primarily, changes in prospects of mutual fund functioning might encourage investors to transfer capital amongst their savings. Next, as it is possible in mutual funds to be traded on a daily basis (Bollen, 2007) investors might transfer investment in and out of them to tackle their liquidity demands. As emphasized by (Bollen 2007) female depositors are less inclined to an overconfidence bias in investment of mutual funds.

Investment in mutual fund schemes is usually influenced by the investors' attitude. The mutual fund is nothing but a professionally-handled and established cooperative investment scheme that collects money from a large number of investors. The profit expanded from investments is given to depositors corresponding to the total number of units literally hold by them. As a result, a mutual fund investment is the most right and proper investment tool for any individual investor since it provides a prospect to invest in a diversified, proficiently handled security

measures at a relatively minimal cost. Desigan, et al (2006) carried out a out a research on investor's viewpoint with respect to women towards mutual fund investment and emphasized that women investor's fundamentally are faltering in investing as a result of different reasons such as poor knowledge regarding the investment security and their different procedures regarding investment processes, various risks etc. To the extent that the socio-economic factors are considered, age, gender, income and job (Subramanya and Murthy 2013) have been promoting the investors' attitude towards Mutual fund.

A mutual fund is a kind of investment tool which accumulates money from depositors who have a common goal in terms of financial source, and invest income in various resources such as, shares, bonds and so on. By and large, mutual fund is a financial mediator, start with a goal to proficiently handle the money collected from the vast number of investors. Investors could as well benefit from economies of scale and could buy stocks and bonds comparatively at extremely lower trading costs than that of direct investment in capital markets. Economies of scale from mutual funds are highly organized and deliver natural advantage. It is considered comparatively cheaper than investing directly in the large capital markets that entail high-level cost of charges. This as well increases retail investors' access to complex level markets, and

as well there is a better control and management over costs. Research by Karnam and Nandan (2019) has shown that the majority of the family men will earn and largely approaches mutual funds; and the regions like India wherein females are subjugated by male are not allowed to choose mutual funds even if they have a common knowledge regarding the investment schemes.

Financial goals are generally based on number of factors, such as the age, financial independence, lifestyle, income, etc (Mishra and Kumar 2011). Mutual funds are considered a low-risk ways of investment in the complex capital market, but as well entailed a market risk. Risk orientation amongst depositors is extremely significant for choosing mutual fund schemes and their investment behavior. The risks related with finance are generally referred to as the volatility or instability of the proceeds created by the fund. The higher the variation in the fund's profits over a certain period of time, the more the risks linked with the fund's income. Safety and risk diverseness are major concerns for investing in mutual fund schemes. Khurana and Panjwani (2010) emphasized that it is important for investors to understand the risks involved before investing in mutual fund. Research by Supriya (2019) specified that working class people in Bangalore are more attracted towards investments and the author also reported that safety and risk diversification are major concerns for investing in mutual funds.

The financial system gives the investors numerous investment alternative tools with unstable amounts of risks and return. Investment selection method entails finding various investments with some classified benefit characteristics and taking amongst them the one which goes well with the investment goal of the investors' return target and risk tolerance. Risk tolerance is more complicated since it integrates characteristics of risk-taking capability and readiness. Study by (Jain and Rawal 2012; Jain and Mandot 2012) found no relationship between gender and investors' investment decision and on the other hand Murugan (2012) exhibited that there is considerable relationship gender and investors' attitude towards mutual fund. An investor's

capability to take on risk is reliant on different factors such as age, income, financial requirements etc (Kumar, 2016). Though, an investor's readiness to take risk is more psychological process, in which the investor's insight regarding the investment will define his/her investment preference.

An effective economic system must provide its shareholders various investment alternatives to go well with their investment goals. This integrates alternative tools with unstable maturities and risk, i.e. return characteristics. Mutual fund and its related schemes proffer diversification of risks. Das (2011) studied about perception of small investors on mutual funds and reported that various demographic factors of investor, particularly age, gender, and as well level of income have a strong effect on the preference of investment schemes. Kaur, et al (2013) carried out an investigation on investor's perception towards choosing mutual fund schemes and found that investors prefer mutual fund as stock market is considered complicated and risky. Prabhu and Vechalekar (2014) exhibited that age, income and return or profit etc. has effect on the mutual fund selection. Kaur and Arora (2018) reported that awareness and non-awareness level towards mutual fund schemes has greater effect on the investors' decision and as well perception.

The main reason for any individual to invest is to change his consumption design so as to accomplish greater levels of consumption in the near future. Investors' age factor is considered to be the fundamental factor in satisfaction in terms of the self-development relating to return from the investment (Ravi and Mathivanan 2015). The perception of people towards investment differs with their age, academic qualification, income, etc. As stated by Ravi and Mathivanan (2015) the solution to a profitable financial plan is to protect a considerable amount of funds and ultimately invest it effectively, by considering a long duration.

As the future is ambiguous, every investment entails the aspect of risk. This risk is probability of variation in predictable and actual returns. It has the chances of losing some or whole amounts of investment. The motivating force for selecting mutual fund is the security of

invested amount, in addition to the added benefit provided by various schemes. However, perception differs according to the demands and demographic variables of investors (Deo and Jagtap 2017). Geethaa and Vimala (2014) found a positive relationship between demographic variables and investment preference with different risk-taking capability. Dhiraj et.al (2012) reported no relationship among variables such as marital status, gender, age, and career of the investors' and also strong relationship found between place of living, income level and awareness level of the investors in various schemes. Akbar et.al (2013) expressed that the investor's perception is completely based on the demographic profiles and variables such as age factor, marital position and level of education has direct influence on the investors' preference towards investment. Deo and Jagtap (2017) opined that the perception might significantly influence behavioral bias of depositors.

Literature Review

Introduction: In India Behavioral Finance is a new field and various factors that literally impact the decision of investors are explored by researchers for creating awareness among the individuals through research articles. Investors take decisions while investing in mutual funds. If the decision is appropriate the returns will be good, but if the investors take decisions by overlooking the risks associated the investment due to overconfidence or lack of financial knowledge it might result in loss or unpleasant situation. Hence in this study a conceptual model has been developed to find the overall effect of overconfidence bias, financial risk-taking attitude and financial literacy on the mutual fund investment decisions. The demographic variables of the investors like age, gender, income level and city are also chosen to check whether they are influencing the decisions related to mutual fund.

Meaning and Definition of Opportunity bias: Overconfidence bias is one of the most explored factors by the existing studies in the aspect of financial investment decision-making. Basically, the term overconfidence is used to represent deviations from rational behavior. Psychologists had demonstrated that overconfidence bias can influence the decision making of the investors. Pompian (2012) has defined overconfidence as a belief of the individuals that they have the ability, rational reasoning and intellectuality to predict the results accurately.

Taylor and Brown (1988) developed three tools that are commonly associated with positive illusions namely Better than average effect, Illusion of control and unrealistic optimism.

i) Better than average effect: The inclination of the individuals to recognize their knowledge and abilities to more superior when compared to others (Guenther, and Alicke, 2010).

ii) Illusion of control: The overestimation of the people that they can handle undesirable outcomes (Yarritu et al, 2014).

iii) Unrealistic optimism: It refers to the underestimating the occurrence of negative events and overestimating the occurrence of positive events (Weinstein and Klein, 1996) by the individuals during the process of decision making.

Meaning and Definition of financial risk taking attitude: The attitude of investors towards risk taking is considered to be one of the most important factors contributes positively or negatively to financial decision making process. In behavioral finance risk is component of subjective nature, which is determined by evaluating the beliefs, attitudes and feelings towards a particular event (Ricciardi, 2007).

According to Lampenius and Zickar (2005) the following are the two dimensions of financial risk-taking behavior: That is, Risk Control and Speculative Risk. These two dimensions are used as a part of this study to measure the risk-taking attitude of investors.

Risk Control: It refers to the degree to which the individual is inclined towards aversion of risk. The individual weighs the pros and cons before taking risk. They tend to think that higher the risk higher will be its consequences hence this influences their decision making. These individuals are generally termed as risk averse individuals due to their aversion towards risk taking. Due to their risk control behavior they plan well ahead to accomplish their

investment goals in a successful way (Zaleskiewicz, 2001).

Speculative Risk – The term speculative risk denotes the tendency of the individual investors to take more risks during investment decisions. They tend to take risk even if there is no proper information about loss or gain. Basically, it describes the gambling behavior of the individual that is the temptation of the individual to take more risk in order to get more returns. The characteristic of speculative risk is the existence of uncertainty in the event which can either result is profit or loss (Ferrer et al, 2011).

Review on the impact of opportunity bias on investment decision making: Lambert et al (2012) has measured and compared the impact of overconfidence on decision making among students and bankers. Overconfidence is measured based on first two dimensions. Their result showed when compared with students, bankers are influenced by overconfidence and their decision making is as well get influenced and their decision making is also influenced by overconfidence.

Bakar and Yi (2016) explored the role of various biases such as overconfidence conservatism and their overall effect on the decision-making process of investors. They findings reported that all the mentioned biases in this study have an effect on investor's decision-making process except one factor, i.e. herding bias. The authors had also stated that gender difference also have impacts on the investment decision making.

A study conducted by Pikulina et al (2017) explored how the level of confidence of individuals impacts the decision to invest. The authors have mentioned that there is a direct relationship between overconfidence and decision making of investors. Their results show that strong overconfidence will possibly result in excessive level of investment while low self-confidence results in underinvestment. Hence both overconfidence and under-confidence may cause the investor to make suboptimal investment decisions. One of the notable findings of this paper is that moderate level of overconfidence is considered to be an advantage since it results in appropriate investment decision.

Mahalakshmi and Anuradha (2018) analysed the impact of behavioral factors like overconfidence, familiarity level and as well anchoring bias on the investor's decision making. The conceptual model shows that overconfidence has influence over the investor's decisions. The authors suggested that better investment decisions can be achieved by financial advisors by framing strategies by considering the factors that influence the decision of investors.

Nguyen et al (2017) explored the impact of risk can be assessed by measuring both risk tolerance and as well risk perception. From the analysis it is found that risk tolerance is found to influence decision making and this relationship is intervened by risk perception. Risk seekers perceive investment as less risky; they overestimate positive outcomes and allocate more funds when compared to risk avoiders who estimate the risks, they overestimate negative outcomes and allocate lesser funds.

**Table 1 Review on the impact of opportunity bias on investment decision making**

S.No	Author and Year	Description
1	Lambert et al (2012)	Measured and compared the impact of overconfidence on decision making among students and bankers and found that overconfidence of bankers has an impact on decision making.
2	Bakar and Yi (2016)	Examined the impact of various biases and found that all the mentioned biases including overconfidence bias have an effect on investor's decision making.
3	Pikulina et al (2017)	Explored how the level of confidence of individuals impacts the decision to invest. The authors have mentioned that there is a direct relationship between overconfidence and decision making of investors
4	Mahalakshmi, and Anuradha (2018)	Analysed the impact of behavioral factors like overconfidence, and anchoring bias on the investor's decision-making. The conceptual model shows that overconfidence has influence over the investor's decisions.

Table2Review on the impact of financial risk taking attitude on investment decision making

S.No	Author and Year	Description
1	Hyll and Irrek, (2015)	Examined whether decisions are influenced by risk attitudes of the investors and showed that individuals with high risk-taking attitude tend to invest more.
2	Chavali and Mohanraj (2016)	Investigated the impact of risk tolerance level and as well demographic characteristics on investment pattern and financial decision making of individuals and this relationship is confirmed through empirical analysis.
3	Nguyen et al, (2017)	Explored the impact of risk aspects on the decision-making process in terms of investment. From the analysis it is found that risk tolerance is found to influence decision making and this relationship is intervened by risk perception.

Research Gap: The following figure Fig 1 shows the conceptual model formulated for this study. The conceptual model is created after going through previous studies in which the variables under the study are analysed. The definition and the relationship among the chosen variables have been discussed in the previous sections.
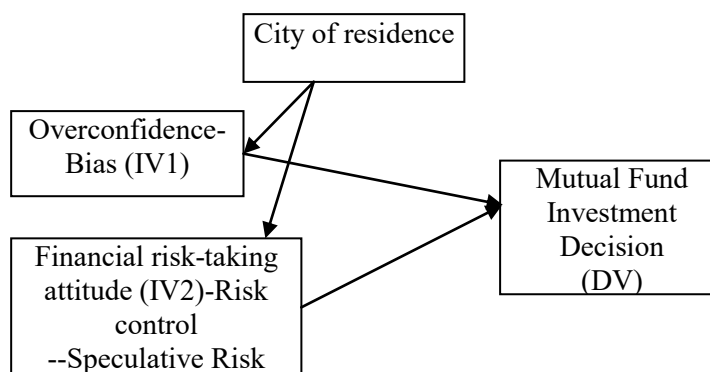
Fig. 1. Conceptual Model

Hypothesis: The following are the hypotheses are to be tested in this study.

H1: The overconfidence bias of the investors has an impact on the decisions made by them in mutual fund investments**.**

H2: The financial risk-taking attitude of the investors has an impact on the decisions made by them in mutual fund investments**.**

H3: The mutual fund investor's behavior of the two groups in Bengaluru and Mysuru City are significantly different.

Research Methodology

This research adapts quantitative approach and descriptive research design. The sample population are the local public who have invested in mutual funds. 223 people from Bengaluru and Mysuru city of the Indian state of Karnataka have been surveyed using standard instruments. Cluster sampling has been adapted in this research. Overconfidence bias is measured using a 7 item scale proposed by Gill et al (2018). Financial risk taking is measured using two tools, i.e. Speculative risk and Risk control. Risk control is measured using 6 items and speculative risk is measured using 6 items. The research instrument is a modified version of the scale proposed by Lampenius and Zickar (2005). The version modified by Sahi et al (year) in order to suit the Indian context has been adapted in this research. Investment decision making in mutual funds is measured by a 14 item scale proposed by Pacework and Relay (2009). All the instruments used a Five Point Likert scale with options varying from strongly agree to strongly disagree for the respondents to answer. The city was measured using two options Bengaluru and Mysuru which were the target places of study in the Karnataka region of the Indian nation. SPSS has been used to analyse the quantitative data statistically. Multiple Linear Regression and T Test have been applied in this research. The research has been done adhering to ethical guidelines.

Results of the Analysis

Total of 223 respondents have been included in the study. The test of hypothesis results is presented as follows

Hypothesis

H1: The overconfidence bias of the investors has an impact on the decisions made by them in mutual fund investments

Model Summary[b]									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.998[a]	.997	.997	.43859	.997	14106.910	5	217	.000
a. Predictors: (Constant), FBTOT, FLTOT, SRTOT, RRTOT									
b. Dependent Variable: MFTOT									

Hypothesis 2

H2: The financial risk-taking attitude of the investors has an impact on the decisions made by them in mutual fund investments

Model Summary[b]									
Model	R	R Square	Adjs. R Square	Std. Error of the Estimate Value	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.988[a]	.987	.987	.43859	.987	14106.910	5	217	.000
a. Predictors: (Constant), FBTOT, FLTOT, SRTOT, RRTOT									
b. Dependent Variable: MFTOT									

The model summary table gives the R Value R square value and the adjusted R Square value, in this model the obtained R value is .998 and adjusted R square value is .997 respectively and R Square value is found to be. 987.This gives the best fit to the model

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13568.248	5	2713.650	14106.910	.000[b]
	Residual	41.743	217	.192		
	Total	13609.991	222			
a. Dependent Variable: MFTOT						
b. Predictors: (Constant), FBTOT, FLTOT, SRTOT, RRTOT						

Anova is found to be significant

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.025	.220		.113	.000
	RRTOT	.025	.018	.014	1.335	.003
	SRTOT	1.002	.009	.590	117.371	.000
	FLTOT	-.069	.035	-.021	-1.976	.004
	FBTOT	.998	.015	.466	68.098	.000
a. Dependent Variable: MFTOT						

H3: The mutual fund investor's behavior of the two groups in Bengaluru and Mysuru City are significantly different.

Group Statistical Values					
	City	N	Mean	Std. Deviation	Std. Error Mean
MFTOT	Bangalore	92	52.2500	8.73621	.91081
	Mysuru	131	51.9389	7.15730	.62534

Independent Sample Test									
		Levene's Test for Equal Variances		t-test value for Equality of Variances					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower	Upper
MFTOT	Equal variances assumed	1.362	.245	.291	221	.771	.31107	1.06726	-1.79225	2.41439
	Equal variances not assumed			.282	170.493	.779	.31107	1.10482	-1.86982	2.49196

The findings of Levene's Test for Equality of Variances (Homogenisity) reports that significant value, i.e. 0.245 which essentially denotes that both groups are homogeneous group. Here, the mean value obtained for Bangalore is 52.50 and Mysuru is 51.938 respectively. The difference between the two obtained value is .562 which is insignificant. The result of SPSS shows that the significant value is .245, which is is greater than 0.05 hence accept alternate hypothesis. Hence the findings reported that there is significant difference between the two means mutual fund investor's behavior of the two groups in Bengaluru and Mysuru City. The statistical values of the study accepted the hypothesis, i.e.the relationship found between overconfidence and mutual fund investment decision making and the mutual fund investor's behavior of the two groups in Bengaluru and Mysuru City are significantly different.

S.No	Hypothesis	Accepted/Rejected
1	H1: The overconfidence bias of the investors has an impact on the decisions made by them in mutual fund investments.	Accepted
2	H2: The financial risk-taking attitude of the investors has an impact on the decisions made by them in mutual fund investments.	Accepted
3	H3: The mutual fund investor's behaviour of the two groups in Bengaluru and Mysuru City are significantly different.	Accepted

Discussion and Conclusion

The mutual fund industry is found to be one of the fastest growing investment markets. Investors are highly preferring mutual fund industry as comparatively the risk is low than that of other sources of investment. It is more accessible to the individual investors as the funds never get capitalized in one division but gets expanded to many divisions. This financial expansion takes place in a professional way. This research paper paid attention to financial risk taking attitude that highlights investor's risk control behavior towards mutual fund. The study of the research is on overconfidence bias towards mutual funds. These days, how an individual handles his finance has become a matter of great concern. It is no longer about overseeing their temporary financial affairs such as how much to save and spend on a holiday, but, it's about long-standing prospects for example: how to retain the same level of affluence even after their retirement days, how much their investment must return to nullify the impact of inflation, how the eventualities in their life, such as medical emergencies, will be handled, and many more. It was reported that investment decisions of an investor are largely impacted by number of factors such as overconfidence bias, risk-taking and risk control and as well on demographic variables amongst many others (Baruah, et al 2018). 223 respondents have been chosen from the two cities, i.e. Bengaluru and Mysuru City. Investors' behavior of the two groups has been examined in detail. The extent to which risk control and overconfidence bias and interrelated behavioral qualities for example excessive pride might have any effect on financial performance is examined. A mutual fund business is to finance the funds therefore collected in line with the desires of the investors who formed the pool. Investing in financial sector in recent period has become widespread not only amongst organizational but as well individual

investors. But what makes them retain in the market is their risk-taking or risk-control behavior and overconfidence bias. Overconfidence individuals overvalue their abilities, their knowledge towards information which leads them to wrong decision-making. They might become more confident about the optimistic effect of their decision and as well make narrow range future estimations. Overconfidence bias might emerge from optimism, affirmation and delusion of control biases. Many researches have been carried out to investigate the influence of increased pride or overconfidence bias in investment market. Kufepaksi (2007) carried out the research and reported that overconfidence bias results in wrong decision wherein investors make wrong prediction. Eshraghi and Taffler (2012) carried out the research to explore the effect of mutual fund investors' overconfidence bias on their overall investment performance. They emphasized that the previous good performance results in overconfidence and this overconfidence might lead to unnecessary trading together with the lessened future returns. In terms of risk-taking behavior, it was emphasized that women show less risk taking than their opposite counterparts in their most risky investment decisions. The current study reported a positive relationship between financial risk taking attitude and mutual fund investment decision, which is similar to the study done by Baruah, et al (2018) and Sudarmathi, et al (2017). The general assumption is that female investors prefer less risky portfolios compared to male investors which imply that women have a stronger aversion on taking financial risks (Singh and Yadav 2016). Risk is an essential trait of all kinds of financial investments as a result of the difference occur in the real and expected returns from the investment they made. There is a probability for any investor to experience the less return on an investment than the predicted amount in real case. Mutual fund market has been exposed to speculations and ineffectiveness, which are literally bleached to the consistencies of the investors. The study reported that there is a significant difference between the two means mutual fund investor's behavior of the two groups in Bengaluru and Mysuru City.

References

1. Akbar, K.A., and Kotishwar, A. (2013). "Investor Behavior towards Investment in Mutual Funds – A Comparative Study in Telangana region in the State of Andhra Pradesh", Madras University Journal of Business and Finance, 1(1), pp. 23-37.
2. Bakar, S. and Yi, A.N.C., 2016. The impact of psychological factors on investors' decision making in Malaysian stock market: a case of Klang Valley and Pahang. Procedia Economics and Finance, 35, pp.319-328
3. Baruah, M, Parikh, A.K. (2018). Impact of Risk Tolerance and Demographic Factors on Financial Investment Decision. International Journal of Financial Management.
4. Bollen, N.P.B. (2006). Mutual Fund Attributes and Investor Behavior. Journal of Financial and Quantitative Analysis, 42(3), pp. 683-708.
5. Chavali, K. and Mohan Raj, P., 2016. Impact of demographic variables and risk tolerance on investment decisions: An empirical analysis. International journal of economics and financial issues, 6(1), pp.169-175.
6. Deo, R, Jagtap, U.R. (2017). Effect of Demographic Variables on Mutual Fund Investment Decision among Academicians of Indore City. JKIJMS, 1(1), pp. 30-38.
7. Eshraghi, A, Taffler, R. (2012). Fund Manager Overconfidence and Investment Performance: Evidence from Mutual Funds. Retrieved on 26th April 2021 from http://www.cass.city.ac.uk/__data/assets/pdf_file/0019/126730/Eshraghi.pdf
8. Ferrer, R.C. and Mallari, N.C., 2011. SPECULATIVE AND PURE RISKS: THEIR IMPACT ON FIRMS'EARNINGS PER SHARE. Journal of International Business Research, 10(1), p.115.

PRE-CLINICAL STUDY OF LYCOPENE ALONE AND IN COMBINATION WITH OLIVE OIL IN STREPTOZOTOCIN-INDUCED DIABETIC NEPHROPATHY

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ABSTRACT

Male albino rats of Wister strain (200-250g) were used in the study and each group contained six rats. Diabeticinduced nephropathy was produced in rats by administration of STZ (60mg/kg, i. p.). Nephropathy was assessed by evaluating biochemical parameters (Blood glucose, total protein, albumin, uric acid, creatinine, urea, triglycerides and total cholesterol) and antioxidant parameters (NO, LPO, GSH) and membrane-bound ATPases(Na^{2+}/K^{2+}, Ca^{2+}, Mg^{2+}). Lycopene (5mg/kg/p.o.) and olive oil (0.5mg/kg/p.o.) were administered for four weeks after the development of diabetic nephropathy in rats and histopathology of a kidney were carried out. Nephropathyinduced rats showed a significant alteration of behavioural and biochemical parameters. Treatment with lycopene and olive oil significantly attenuated the altered parameters towards normal. Treatment with lycopene (5mg/kg/p.o.) and olive oil (0.5 ml/kg/p.o.) significantly restores the altered parameters towards normal. The above protective effects might be because of the strong antioxidant capacity of the antioxidants. Both the antioxidants will be served as the best nutraceuticals, they showed beneficial effects in STZ-induced diabetic nephropathy.
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Introduction

Diabetes mellitus (DM) is one of the complex metabolic disorders characterized by chronic hyperglycaemia with disturbance of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, their action or both(Kajal Pansare, Chandrashekhar Upasani, Aman Upaganlwar, Ganesh Sonawane, 2021). Chronic hyperglycaemia is related to the long-term damage, dysfunction and failure of various organs mainly the eyes, kidneys, nerves, heart and blood vessels(Revathy & Abdullah, 2017). Long term hyperglycaemia has major chronic complications in that diabetic nephropathy is one of the most common which initially evolves into nephrotic syndrome, finally caused kidney failure and death(Zhang et al., 2016).

In DM a person has high blood sugar, either because the body doesn't produce sufficient insulin. This high blood sugar causes the symptoms such as polyuria, polydipsia and polyphagia. DM is frequently called 'The Silent Killer', as it produces serious complications without serious symptoms and it can also affect the major organs in the body. The management of diabetes includes both the non-pharmacological approaches such as exercise, diet control and surgery and also pharmacological approaches such as the use of anti-diabetic drugs i.e., insulin and oral hypoglycaemic agents(Nagarchi et al., 2015). World Health Organization has estimated that the treatment cost for DM will be 300 million by 2025. Diabetes is related toa higher prevalence of liver and kidney damage due to the formation of free radicals between the glucose oxidation, non-enzymatic glycation of protein, decline in antioxidant defences system, increased activity of polyol pathway, activation of protein kinase-C and cytokine production leading to oxidative stress which plays important role in diabetes complications(Nithiya & Udayakumar, 2018). The currency of diabetes around the world has reached epidemic proportions(Gheith et al., 2016).

Diabetic Nephropathy

Nephropathy is a major complication of DM and is related to oxidative stress(Nasri, 2012). Diabetic nephropathy (DN) is the most common cause of end-stage renal diseases (ESRD). DN will be developed in about 20-40% of type 1 and type 2 patients within 20-30 years of onset of diabetes. It is specified by excessive deposition of extracellular matrix (ECM) in the kidney, leads to glomerular mesangial expansion and tubule-interstitial fibrosis(Rohilla et al., 2011).

It can be detected before the onset of decreased glomerular filtration rate (GFR) in most patients by detecting an abnormal amount of albumin in the urine. Microalbuminuria and albuminuria are two stages that also termed clinical albuminuria, macroalbuminuria, and overt nephropathy(Diagn & He, 2016). DN is characterized by changes in both glomerular and tubular structure and function(Wang et al., 2014). The vascular hypothesis and tubular hypothesis are the two hypotheses that have been proposed to explain the changes in early DN. Both mechanisms show that hyperfiltration occurs in an early stage of DN and causes an increase in glomerular pressure, which further contributes to the sclerotic process of the glomeruli(Mhetre & Patel, 2013).

MATERIALS & METHODS

Experimental Animals

Adult albino male rats of Wistar strain (200-250 gm) were used in the study and each group contains six rats (6 rats). The animals were procured from Wockhardt Aurangabad. Rats were placed separately in polypropylene cages with paddy husk as bedding. The animals were maintained under laboratory condition at a temperature of 23 ± 2 °C, relative humidity of $55\% \pm 10\%$, and 12-h light and 12-h dark cycle throughout all the experiments. Animals had free access to water and standard laboratory feed (Nutrivet Lab, Pune, India) prior to the dietary manipulation. The experimental procedures and protocols used in this study were reviewed and approved by the Institutional Animal Ethics Committee (IAEC).

Preparation of Drug Solutions

Lycopene is dissolved in water while olive oil was used directly and Streptozotocin (STZ) was dissolved in freshly prepared, ice-chilled citrate buffer (pH 4.4). All the drug solution was freshly prepared before administration.

Dose Selection for Lycopene & Olive Oil

Dose of lycopene and olive oil was selected from the previously reported literature. The same dose was also standardized in our laboratory in the STZ diabetes nephropathy model. Based on this the dose of lycopene (5 mg/kg/p.o) and olive oil (0.5 ml/p.o) was selected in the present study(Hassan et al., 2018).

Experimental protocol

A single dose of 60 mg/kg Streptozotocin (STZ) prepared in citrate buffer (pH 4.4 0.1 M) was injected intraperitoneally to induce diabetes. The control rats received an equal volume of citrate buffer and were used along with diabetic animals. Diabetes was confirmed 72 h after STZ injection, the plasma glucose level was checked by Glucometer. The rats having serum glucose level of more than 250 mg/dl were selected and used for further study. The body weight, food and fluid level were measured before and every 24 h after STZ.

administration. This dose of STZ (60 mg/ kg p.o.) was used for a complete study to develop diabetic nephropathy. The biochemical analysis in the urine sample was carried out using an autoanalyzer. **Rats have divided into five groups each group has six animals**

Group-I: control rat treated with vehicle alone.

Group-II: Streptozotocin (STZ) induced diabetic nephropathy, the animals have fasted overnight and diabetes was induced the freshly prepared STZ (60 mg/kg body weight of rats) in 0.1 M citrate buffer (pH 4.5) by a single intraperitoneal (i.p.) injection.

Group-III: Animals were induced diabetic nephropathy as group II treated with lycopene (5mg/kg body weight/day) daily using an intragastric tube for 4 weeks orally.

Group-IV: Animals were induced diabetic nephropathy as group II treated with olive oil (0.5 ml/kg body weight) daily using an intragastric tube for 4 weeks orally.

Group-V: Animals were induced diabetic nephropathy as group II treated within the combination of lycopene(5mg/kg) and olive oil(0.5ml/kg) daily using an intragastric tube for 4 weeks orally.

Tissue homogenization

At the end of the experimental period, the animal has fasted overnight and the animals were euthanasiously sacrificed. The blood was collected and serum was separated by centrifugation at 3,000 rpm and stored at -20ºC and used for the various biochemical and enzyme analysis. The animals were dissected and isolated kidney quickly transferred to ice-cold Tris hydrochloric buffered saline (pH -7.4). It was blotted free of blood and tissue fluid weighed on an electronic balance WENSAR,

(MODEL -PGB200). The kidney was crossed chopped with a surgical scalpel into fine slices, suspended in chilled 0.25M sucrose solution and quickly blotted on a filter paper. The tissues were then minced and homogenized in Tris hydrochloric buffered (10mM, pH -7.4) to a concentration of 10% w/v. The homogenate was centrifuged at 10000 rpm at $0\ ^0C$ for15 minutes using Remi C-24 high-speed cooling centrifuge. The clear supernatant was used for the determination of the assay.

Estimation of biochemical parameters

The rat was kept in a metabolic cage and urine samples were collected over 24 hours. The volume of collected urine and serum samples were used to estimation of different kidney parameters like total protein, albumin, urea, uric acid, creatinine, total cholesterol, triglycerides according to the standard procedures using commercially available diagnostic kits (Bio Lab Diagnostic Pvt.Ltd. Tarapur, Boisar). The homogenised kidney sample was used for the measurement of Lipid Peroxidation, reduced glutathione, nitric oxide, Sodium-Potassium Dependent Adenosine Triphosphatase (Na^{2+},K^{2+} ATPases), Calcium Dependent Adenosine Triphosphatase (Ca^{2+}ATPases), Magnesium Dependent Adenosine Triphosphatase (Mg^{2+} ATPase).

Histopathology

For histological examination, kidney tissues were collected from all groups. After decapitation, the organ-like right kidney was rapidly dissected out and washed immediately with saline and fixed in 10% buffered formalinfor 24 h and processed further. Small sections of tissue were cut and stained with Haematoxylinand Eosin (H&E) for general morphological evaluation. The sections were observed under a Miotic microscope and the photographs were taken.

Statistical Analysis

All data were expressed as mean ± SEM and analysed using one-way analysis of variance followed by Dunnett's Multiple Comparison Test as appropriate to identify the difference between various groups understand. Statistically Significant value defined as $p < 0.05$. All statistical analysis was performed using statistical software (Graph Pad Prism, version 0.5).

Result

Bodyweight, Feed intake and water intake from all the groups were monitored. Body weights were significantly decreased in group II diabetic nephropathy induced animalswhen compared to control group I animals ($p<0.05$), whereas water intake, was found to be significantly increased with compared to normal control rats. Treatment with lycopene (5 mg/kg p.o.), olive oil (0.5 ml/kg p.o.), Combination (lycopene + olive oil) showed a significant recovery in alteration feed intake and water intake, whereas body weight significantly increased as compared to STZ treated rats.

The urine volume, kidney weight and hypertrophy index from all the groups were monitored. It was found that rats treated with STZ showed a significant alteration in kidney weight, whereas urine volume and hypertrophy index was found to be significantly increased as compared to normal control rats, whereas urine volume was found to be significantly increased as compared to normal control rats. Treatment with lycopene (5 mg/kg p.o.), olive oil (0.5 ml/kg p.o.), Combination (lycopene + olive oil) showed a significant recovery in alteration kidney weight and hypertrophy index significantly decreased, whereas urine volume significantly decreased as compared to STZ treated rats. The combination with 50% dose reduction showed better result compared to alone antioxidant.

There are significant changes were observed in the level of serum glucose level. It was found that rats treated with STZ showed a significantly increased serum glucose level as compared to a normal control group. Treatment with lycopene (5 mg/kg p.o.), olive oil (0.5 ml/kg p.o.), Combination (lycopene + olive oil) showed a significant change in levels of serum glucose level at 4th week of treatment, the serum glucose level was decreased significantly as compared to STZ treated rats.

Estimation of Biochemical parameters in urine

Table No.1 represents the levels of total protein, albumin, uric acid, urea and creatinine of control andexperimental animals. Due to diabetic nephropathy in group II animal's total protein, albumin, uric acid, urea and creatinine were increased ($P<0.05$), when compared with group

I control animals.The treatment with lycopene (5 mg/kg/day, p.o.), olive oil (0.5 ml/kg/day, p.o.), and combination (lycopene + olive oil) group significantly reverted back these levels (P<0.05) in alltreatment group as compared with group II animals.

Table 1. Show the level of total protein level, albumin, uric acid, urea, creatininecontrol and experimental animals

GROUPS	Total Protein (g/dl)	Albumin (g/dl)	Uric acid (mg/dl)	Urea (mg/dl)	Creatinine (mg/dl)
I	3.140 ± 0.463	1.100 ± 0.214	1.203 ± 0.138	31.94 ± 2.701	0.857 ± 0.189
II	$7.420 \pm 0.476^{***}$	$3.588 \pm 0.473^{***}$	$6.900 \pm 0.657^{***}$	$58.36 \pm 6.929^{**}$	$2.053 \pm 0.187^{**}$
III	$4.155 \pm 0.458^{\#}$	$2.343 \pm 0.239^{\#}$	$3.638 \pm 0.604^{\#}$	$42.31 \pm 5.466^{\#}$	$1.230 \pm 0.199^{\#}$
IV	$4.605 \pm 0.689^{\#}$	$2.503 \pm 0.262^{\#}$	$3.850 \pm 0.470^{\#\#}$	$42.68 \pm 4.373^{\#}$	$1.235 \pm 0.235^{\#}$
V	$4.530 \pm 0.648^{\#}$	2.150 ± 0.119	$3.765 \pm 0.464^{\#\#}$	$31.75 \pm 4.255^{\#}$	$1.000 \pm 0.0762^{\#}$

(a)

(b)

(c)

(d)

(e)
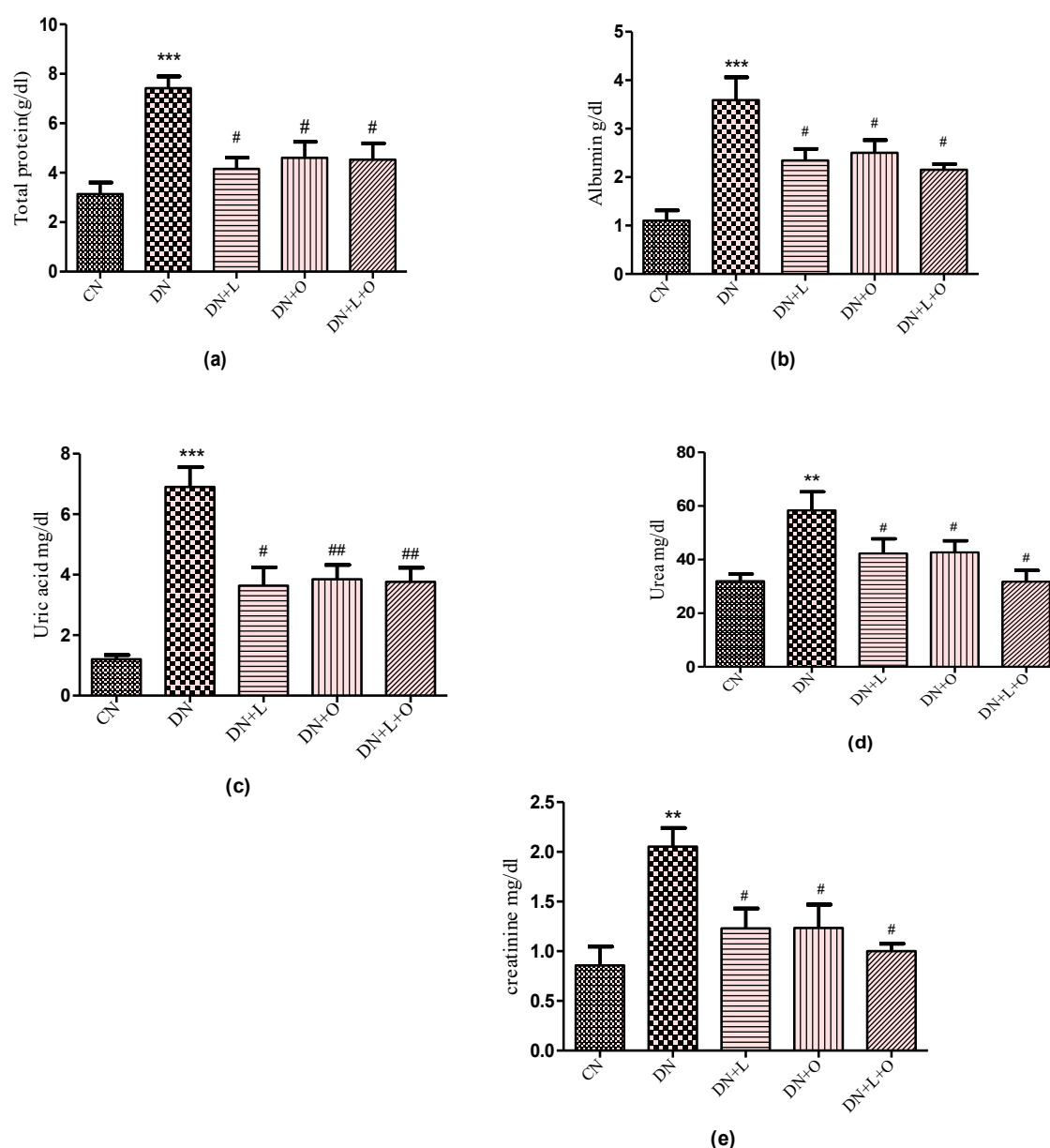
Figure 1. Effect of lycopene alone and in combination with olive oil on a) Total Protein, b) Albumin level, c) Uric Acid, d) Urea, e) Creatinine levels

Values are expressed as mean ±SEMANOVA followed by Dunnett't' test. Values are considered as significant P<0.05. Control compares with diabetic *P<0.05, **P<0.01,

[***]P<0.001, Diabetic compare with treatments [#]P<0.05, [##]P<0.01, [###]P<0.001.

Effect of lycopene alone and in combination with olive oil on total cholesterol level and triglyceride level:

Total cholesterol andtriglyceride level was monitored in all groups. There were significant changes were observed in the levels of total cholesterol andtriglyceride at the 4th week. The level of total cholesterol andtriglyceride was increased significantly in the STZ group as compared to a normal control group. After the treatment with lycopene (5 mg/kg/day, p.o.), olive oil (0.5 ml/kg/day, p.o.), and combination (lycopene + olive oil) group there was a level of total cholesterol andtriglyceride in all treatment groups significantly decreased as compared to STZ group.

Table 2. Show the level of total cholesterol level and triglyceride level control and experimental animals

Groups	Total Cholesterol (mg/dl)	Triglyceride (mg/dl)
I	35.35 ± 2.276	60.84 ± 1.354
II	102.3 ± 22.64[**]	208.4 ± 4.247[***]
III	58.94 ± 3.093[#]	116.3 ± 7.788[###]
IV	61.09± 3.411[#]	120.7 ± 8.674[###]
V	53.94 ± 2.791[#]	94.64 ± 3.887[##]

Figure 2. Effect of lycopene alone and in combination with olive oil on (a) Total Cholesterol and (b) Triglyceride level

Values are expressed as mean ±SEM. ANOVA followed by Dunnett't' test. Values are considered as significant P<0.05. Control compares with diabetic [*]P<0.05, [**]P<0.01, [***]P<0.001, Diabetic compare with treatments [#]P<0.05, [##]P<0.01, [###]P<0.001.

Effect of lycopene alone and in combination with olive oil on Lipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO), Levels in the kidney.

Table No.3 demonstrates the effect ofLipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO), Levels in the kidney of control and experimental animals. There were significant (p<0.05) changes were observed in the levels of LPO, GSH and NO in the STZ group is increased as compared to the normal control group at the 4th-week treatment. After treatment with lycopene (5 mg/kg/day, p.o.) olive oil (0.5ml/kg/day, p.o.), and combination (lycopene + olive oil) groups, there was the LPO, GSH, NO level significantly decreased as compared to STZ group.

Table No.3 Shows the levels of kidney Lipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO)of control and experimental animals

GROUPS	LPO(MDA/g of tissue)	GSH(µg / g of tissue)	NO(nmol/g of tissue)
I	62.49 ± 3.467	183.3 ±13.49	10.55 ± 0.206
II	617.0 ± 32.41[***]	60.64 ± 1.354[***]	24.04 ± 0.840[***]
III	224.8 ±14.75[###]	116.3 ±7.788[###]	12.56 ± 0.360[#]

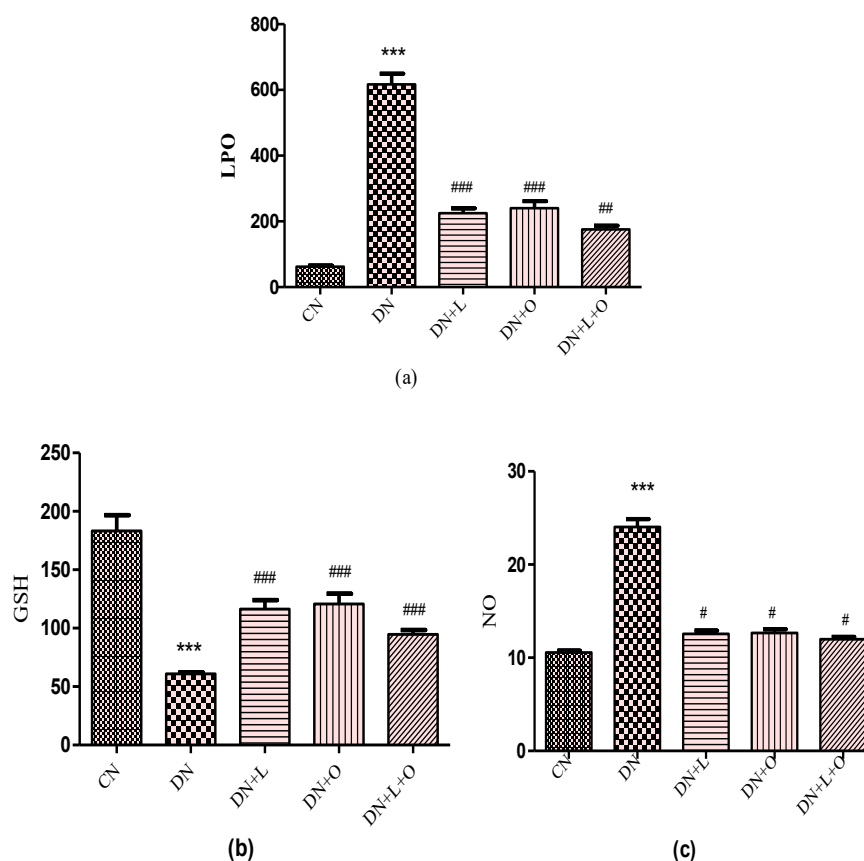| IV | $240.6 \pm 21.25^{###}$ | $120.7 \pm 8.674^{###}$ | $12.60 \pm 0.393^{#}$ |
| V | $175.7 \pm 11.62^{##}$ | $94.64 \pm 3.887^{###}$ | $11.99 \pm 0.248^{#}$ |

Figure 3. Effect of lycopene alone and in combination with olive oil on (a) Lipid Peroxide (LPO), (b) Reduced Glutathione (GSH), (c) Nitric Oxide (NO) levels.

Values are expressed as mean ±SEM. ANOVA followed by Dunnett't' test. Values are considered as significant P<0.05. Control compares with diabetic *P<0.05, **P<0.01, ***P<0.001, Diabetic compare with treatments #P<0.05, ##P<0.01, ###P<0.001

Effect of lycopene and olive oil on membrane-bound phosphatases (Na+/K+, Ca++, Mg++-ATPase's):

There were significant (p<0.05) changes were observed in the levels of Na+/K+, Ca++, Mg++-ATPase's in the STZ group as compared to a normal control group, whereas STZ group (II)animals showed a significant decrease in the activities of enzymic antioxidants (p<0.05) and non-enzymic antioxidants (p<0.05). The levels of these antioxidant's enzymes were increased significantly in animals treated with lycopene (5 mg/kg/day, p.o. p<0.05), olive oil(0.5 ml/kg/day, p.o. p<0.05), and combination group (lycopene + olive oil p<0.05)when compared to that of group II animals (p<0.05).

Histopathological Observations of Kidney in Control and Treated Rats

Histopathological studies on the kidney of control and experimental animals are presented in Figure No.4. The kidney of control rats showed no abnormality. Histological examination of the kidney section showed marked and varying morphological alterations in DN induced animals comprise of vacuolation, tubular atrophy, severe tubular necrosis and interstitial inflammation. Lycopene, olive oil and combination treatment decrease the induced tubular necrosis and most of the changes and kidney displayed an almost normal architecture.

The drug control group kidney showed normal architecture.

A-Group I shows normal kidney architecture with glomerulus. B- Group II STZ treated section of kidney shows necrosis of glomerulus,tubular dilatation and tubular architectural impairment. C-STZ treated with Lycopene and D-olive oil and the kidney tissues of diabetic rats treated with combination-E presenting glomerulus with significant pathology. The section of the kidney shows improvement in tubule structure and minimal cellular swelling compared with the STZ group.

Discussion

The present study was designed to focus on the role of hyperglycaemia and ROS in diabetic complication such as nephropathy. DN is one of the manifestations of secondary complications of diabetes and the kidney is the main target organ affected(Kiran et al., 2012).Diabetic nephropathy is mainly associated with excess urinary albumin, total protein and abnormal renal function as represented by an abnormality in urine creatinine. DN is characterized by an increase in proteinuria and decline in GFR, hypertension, and a

high risk of cardiovascular morbidity and mortality. Increased glomerular capillary pressure occurs early in diabetes and is associated with hyperfiltration at the glomerulus(Singh, 2007). Various agents used to inhibit apoptosis have been tried in the treatment of nephropathy. Antioxidants are frequently used for diabetes and its complications(Kukner et al., 2009).

In the present study, the intraperitoneal administration of STZ effectively induced diabetes mellitus in rats which were confirmed by elevated levels of fasting blood glucose, 72 hours after STZinjection(Eze et al., 2018). DN can develop destruction in pancreatic beta cells and thereupon hyperglycaemia due to the production of free radicals. Long term hyperglycaemia has been proposed as the main contributor to begin and develop the micro-vascular complications of diabetes, including nephropathy by an accumulation of advanced glycation end products (AGE), activation of diacylglycerol (DAC) protein kinase C (PKC) pathway, and overproduction of damaging free radicals(Ashrafi et al., 2017). The STZ induced diabetic rats are associated with a
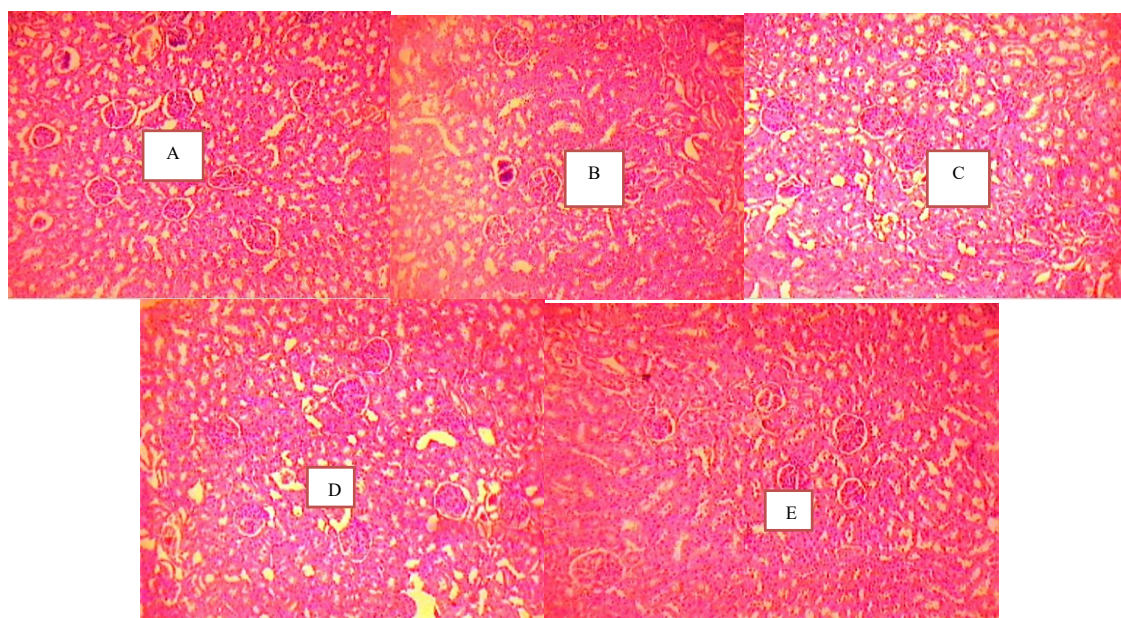

Figure 4. Represents the photomicrograph of hematoxyline-eosin staining of renal tissues of control and treated rats. A-Control group, B-STZ treated, C-Lycopene, D-Olive oil, E-Combination (Lycopene+Olive oil).

significant increase in the levels of urea, uric acid and creatinine are indicating impaired renal function. Increased oxidative stress induces the elevation in the levels of urea, creatinine and uric acid. The level of urea and uric acid was increased in STZ-induced diabetic rats when compared to normal control rats(Nithiya & Udayakumar, 2018).

Lycopene has the most effective anti¬oxidant among carotenoids.It is shown to reduce the risk of some chronic dis¬eases(Taheri et al., 2015).Lycopene significantly de¬crease plasma total cholesterol and triglyceride levels(Li et al., 2014). Treatment of diabetic rats with lycopene, the blood glucose levels was significantly reduced. It may also have acted by stimulating glucose utilization by peripheral tissues or increasing insulin production by the pancreas from regenerated β-cells(Daniel et al., 2015).

The findings in the present study denoted the ability of lycopene to protect the kidney tissue from oxidative damage through the elevation of endogenous antioxidant enzymes(Eze et al., 2018). Lycopene treatment decreased the NO levels.Lycopene significantly improved oxidative stress, inflammation, lipid peroxidation, autophagy, and apoptosis in rats with contrast-induced nephrotoxicity(Oguz et al., 2015).Lycopene possesses strong antioxidant properties as well as a lipid-lowering effect. It can significantly decrease TC and TG level. Moreover, it may prevent mor¬phological destruction of the kidney due to Diabe¬tes Mellitus through its anti-oxidative and reducing fibrosis mechanism(Li et al., 2014).Con-sumption of olive oil with high levels of phenolics lowered blood pressure and LDL (serum oxidative status). Consuming olive oil may help reduce your risk of cancer, stroke, type 2 diabetes, and other chronic diseases(Dahl et al., 2020).The positive effect of olive oil consumption was much more profound in the diabetic group as levels of FBG, TG and TC decreasing by 16-32%(Rahim et al., 2011).Lipid peroxidation appears to be a key element in the production of nephropathy in diabetes. Glutathione is a major intracellular non-protein sulfhydryl compound, it has an important role in the generation of cellular redox state and, consequently, the imbalance in reduced GSH to oxidized glutathione ratio is a putative indicator of cellular oxidative stress. The GSH levels were significantly decreased in the kidney of diabetic control rats(Pharmacol et al., 2014).A significant decreased in the activity of membrane-bound enzymes Na2+/K2+ ATPase, Mg2+ATPase and Ca2+ ATPase in the present study might be due to the generation of oxidative stress. It was observed in the present study that treatment with lycopene and olive oil alone showed improvement in the level of membrane-bound enzymes but combination showed a marked increased level of membrane-bound enzymes(Senthil et al., 2007).Antioxidant enzymes play an important role in the defences system. Reduced levels of GSH enzymes were found in diabetic animals showed the destruction by STZ in animals. After the treatment with lycopene alone and in combination with olive oil improved level of GSH when compared to normal control rat(Morakinyo et al., 2013). A combination of lycopene and olive oil improved the glomerular functions. It was observed that lipid peroxidation was significantly reduced, glutathione peroxidase (GSH-Px) was increased and reduced glutathione (GSH) level was decreased. Administration of lycopene and olive oil would be more effective in preventing the complications of diabetes(Kukner et al., 2009).Lycopene treatment decreased the NO levels but it was not significant. However, the combined treatment decreased the NO levels significantly. Both Lycopene alone and olive oil combined therapy decreased TNF-α, IL-1 β levels of renal tissue. Combination of olive oil and lycopene shows better morphological protection than alone antioxidant(Upaganlawar et al., 2010).The combination of lycopene and olive oil also protected the histological changes. The combined treatment prevents the STZ-induced diabetic nephropathy better than lycopene and olive oil alone(Upaganlawar & Balaraman, 2009).

Conculsion

We conclude that the nephroprotective effect of lycopene and olive oil alone, and incombination might be due to strong antioxidant activity. This study reveals that lycopene, olive oil and combination showed significantly reduced development of oxidative stress by a free radical

scavenger and lowering blood pressure in diabetic nephropathy rats.

Values are expressed as mean ±SEMANOVA followed by Dunnett't' test. Values are considered as significant $P<0.05$. Control compares with diabetic *$P<0.05$, **$P<0.01$, ***$P<0.001$, Diabetic compare with treatments #$P<0.05$, ##$P<0.01$, ###$P<0.001$.

Effect of lycopene alone and in combination with olive oil on total cholesterol level and triglyceride level:

Total cholesterol andtriglyceride level was monitored in all groups. There were significant changes were observed in the levels of total cholesterol andtriglyceride at the 4th week. The level of total cholesterol andtriglyceride was increased significantly in the STZ group as compared to a normal control group. After the treatment with lycopene (5 mg/kg/day, p.o.), olive oil (0.5 ml/kg/day, p.o.), and combination (lycopene + olive oil) group there was a level of total cholesterol andtriglyceride in all treatment groups significantly decreased as compared to STZ group.

Table 2. Show the level of total cholesterol level and triglyceride level control and experimental animals

Groups	Total Cholesterol (mg/dl)	Triglyceride (mg/dl)
I	35.35 ± 2.276	60.84 ± 1.354
II	102.3 ± 22.64**	208.4 ± 4.247***
III	58.94 ± 3.093#	116.3 ± 7.788###
IV	61.09± 3.411#	120.7 ± 8.674###
V	53.94 ± 2.791#	94.64 ± 3.887##

Figure 2. Effect of lycopene alone and in combination with olive oil on (a) Total Cholesterol and (b) Triglyceride level
Values are expressed as mean ±SEM. ANOVA followed by Dunnett't' test. Values are considered as significant $P<0.05$. Control compares with diabetic *$P<0.05$, **$P<0.01$, ***$P<0.001$, Diabetic compare with treatments #$P<0.05$, ##$P<0.01$, ###$P<0.001$.

Effect of lycopene alone and in combination with olive oil on Lipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO), Levels in the kidney.

Table No.3 demonstrates the effect ofLipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO), Levels in the kidney of control and experimental animals. There were significant ($p<0.05$) changes were observed in the levels of LPO, GSH and NO in the STZ group is increased as compared to the normal control group at the 4th-week treatment. After treatment with lycopene (5 mg/kg/day, p.o.) olive oil (0.5ml/kg/day, p.o.), and combination (lycopene + olive oil) groups, there was the LPO, GSH, NO level significantly decreased as compared to STZ group.

Table No.3 Shows the levels of kidney Lipid Peroxide (LPO), Reduced Glutathione (GSH), Nitric Oxide (NO)of control and experimental animals

GROUPS	LPO(MDA/g of tissue)	GSH(μg / g of tissue)	NO(nmol/g of tissue)
I	62.49 ± 3.467	183.3 ±13.49	10.55 ± 0.206
II	617.0 ± 32.41***	60.64 ± 1.354***	24.04 ± 0.840***
III	224.8 ±14.75###	116.3 ±7.788###	12.56 ± 0.360#
IV	240.6 ± 21.25###	120.7 ± 8.674###	12.60 ± 0.393#
V	175.7 ± 11.62##	94.64 ± 3.887###	11.99 ± 0.248#

Figure 3. Effect of lycopene alone and in combination with olive oil on (a) Lipid Peroxide (LPO), (b) Reduced Glutathione (GSH), (c) Nitric Oxide (NO) levels. Values are expressed as mean ±SEM. ANOVA followed by Dunnett't' test. Values are considered as significant $P<0.05$. Control compares with diabetic *$P<0.05$, **$P<0.01$, ***$P<0.001$, Diabetic compare with treatments #$P<0.05$, ##$P<0.01$, ###$P<0.001$

Effect of lycopene and olive oil on membrane-bound phosphatases (Na+/K+, Ca++, Mg++-ATPase's):

There were significant ($p<0.05$) changes were observed in the levels of Na+/K+, Ca++, Mg++-ATPase's in the STZ group as compared to a normal control group, whereas STZ group (II)animals showed a significant decrease in the activities of enzymic antioxidants ($p<0.05$) and non-enzymic antioxidants ($p<0.05$). The levels of these antioxidant's enzymes were increased significantly in animals treated with lycopene (5 mg/kg/day, p.o. $p<0.05$), olive oil(0.5 ml/kg/day, p.o. $p<0.05$), and combination group (lycopene + olive oil $p<0.05$)when compared to that of group II animals ($p<0.05$).

Histopathological Observations of Kidney in Control and Treated Rats

Histopathological studies on the kidney of control and experimental animals are presented in Figure No.4. The kidney of control rats showed no abnormality. Histological examination of the kidney section showed marked and varying morphological alterations in DN induced animals comprise of vacuolation, tubular atrophy, severe tubular necrosis and interstitial inflammation. Lycopene, olive oil and combination treatment decrease the induced tubular necrosis and most of the changes and kidney displayed an almost normal architecture. The drug control group kidney showed normal architecture.

A-Group I shows normal kidney architecture with glomerulus. B- Group II STZ treated section of kidney shows necrosis of glomerulus,tubular dilatation and tubular architectural impairment. C-STZ treated with Lycopene and D-olive oil and the kidney tissues of diabetic rats treated with combination-E presenting glomerulus with significant pathology. The section of the kidney shows improvement in tubule structure and minimal cellular swelling compared with the STZ group.

Disscution

The present study was designed to focus on the role of hyperglycaemia and ROS in diabetic complication such as nephropathy. DN is one of the manifestations of secondary complications of diabetes and the kidney is the main target organ affected(Kiran et al., 2012).Diabetic nephropathy is mainly associated with excess urinary albumin, total protein and abnormal renal function as represented by an abnormality in urine creatinine. DN is characterized by an increase in proteinuria and decline in GFR, hypertension, and a high risk of cardiovascular morbidity and mortality. Increased glomerular capillary pressure occurs early in diabetes and is associated with hyperfiltration at the glomerulus(Singh, 2007). Various agents used to inhibit apoptosis have been tried in the treatment of nephropathy. Antioxidants are frequently used for diabetes and its complications(Kukner et al., 2009).

In the present study, the intraperitoneal administration of STZ effectively induced diabetes mellitus in rats which were confirmed by elevated levels of fasting blood glucose, 72 hours after STZinjection(Eze et al., 2018). DN can develop destruction in pancreatic beta cells and thereupon hyperglycaemia due to the production of free radicals. Long term hyperglycaemia has been proposed as the main contributor to begin and develop the micro-vascular complications of diabetes, including nephropathy by an accumulation of advanced glycation end products (AGE), activation of diacylglycerol (DAC) protein kinase C (PKC) pathway, and overproduction of damaging free radicals(Ashrafi et al., 2017). The STZ induced diabetic rats are associated with a

Figure 4. Represents the photomicrograph of hematoxyline-eosin staining of renal tissues of control and treated rats. A-Control group, B-STZ treated, C-Lycopene, D-Olive oil, E-Combination (Lycopene+Olive oil).

significant increase in the levels of urea, uric acid and creatinine are indicating impaired renal function. Increased oxidative stress induces the elevation in the levels of urea, creatinine and uric acid. The level of urea and uric acid was increased in STZ-induced diabetic rats when compared to normal control rats(Nithiya & Udayakumar, 2018).

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Acknowledgement

References

1. Ashrafi, M., Nazifi, S., Namazi, F., Kazemipour, N., Karimi, B., Goudarzi, T., & Talebanzadeh, S. (2017). Renal Protective Effect of Saffron Aqueous Extract in Streptozotocin Induced Diabetic Rats. International Journal of Medical Research and Health Sciences, 6(9), 151–161.

2. Dahl, W. J., Tandlich, M. A., & England, J. (2020). Health Benefits of Olive Oil and Olive Extracts 1 Health Benefits of Olive Oil Fatty Acid Composition and Shelf Stability of Olive Oil. American Heart Association, 1–5.

3. Daniel, E. E., Mohammed, A., Tanko, Y., & Ahmed, A. (2015). Effects of lycopene on kidney antioxidant enzyme activities and functions in streptozotocin-induced diabetic Wistar rats. Cell Biology, 3(1), 1–13. https://doi.org/10.11648/j.cb.20150301.11

4. Diagn, J. M. B., & He, Z. (2016). Journal of Molecular Biomarkers Diagnosis and Treatment of Diabetic Nephropathy in Type 1 and Type 2 Diabetes Patients. Journal of Molecular Biomarkers & Diagnosis, 7(5), 5–8. https://doi.org/10.4172/2155-9929.1000295

5. Eze, E. D., Afodun, A. M., Sulaiman, S. O., Ponsiano, N., Ezekiel, I., Adams, M. D., Okpanachi, A. O., & Rabiu, M. (2018). Lycopene attenuates diabetes-induced oxidative stress in Wistar rats. Journal of Diabetes and Endocrinology, 9(May), 11–19. https://doi.org/10.5897/JDE2018.0118

6. Gheith, O., Othman, N., Nampoory, N., Halimb, M., & Al-Otaibi, T. (2016). Diabetic kidney disease: difference in the prevalence and risk factors worldwide. Journal of The Egyptian Society of Nephrology and Transplantation, 16(3), 65. https://doi.org/10.4103/1110-9165.197379

7. Hassan, M. F., Hussein, S. A., Senosi, Y. El, Mansour, M. K., & Amin, A. (2018). The Role of Lycopene as Antioxidant and Anti-inflammatory in Protection of Oxidative Stress Induced by Metalaxyl. Journal of Medicinal Chemistry and Toxicology, 3(1), 26–36. https://doi.org/10.15436/2575-808X.18.1890

8. Kajal Pansare, Chandrashekhar Upasani, Aman Upaganlwar, Ganesh Sonawane, C. P. (2021). Streptozotocin and alloxan induced diabetic nephropathy : Protective role of natural products. Journal of the Maharaja Sayajirao University of Baroda, 55(1), 86–102.

9. Kiran, G., Nandini, C. D., Ramesh, H. P., & Salimath, P. V. (2012). Progression of early phase diabetic nephropathy in streptozotocin-induced diabetic rats : Evaluation of various kidney-related parameters. Indian Journal of Experimental Biology, 50(February), 133–140.

10. Kukner, A., Colakoglu, N., Ozogul, C., Naziroglu, M., & Firat, T. (2009). The effects of combined vitamin C and E in streptozotocin-induced diabetic rat kidney. Journal of African Studies and Development, 1(2), 29–36.

11. Li, W., Wang, G., Lu, X., Jiang, Y., Xu, L., & Zhao, X. (2014). Lycopene ameliorates renal function in rats with streptozotocin-induced diabetes. Int J Clin Exp Pathol, 7(8), 5008–5015.

12. Mhetre, N. K., & Patel, A. N. (2013). RENOPROTECTIVE EFFECT OF HYDROALCOHOLIC EXTRACT OF AERIAL PARTS OF CASSIA. International Journal of Pharmacy and Pharmaceutical Sciences, 5(4), 270–279.

13. Morakinyo, A. O., Awobajo, F. O., & Adegoke, O. A. (2013). Effects of alpha lipoic acid on blood lipids, renal indices, antioxidant enzymes, insulin and glucose level in streptozotocin-diabetic rats. Biology and Medicine, 5(1), 26–33.

14. Nagarchi, K., Ahmed, S., Sabus, A., & Saheb, S. H. (2015). Effect of Streptozotocin on Glucose levels in Albino Wister Rats. J. Pharm. Sci. & Res., 7(2), 67–69.

15. Nasri, H. (2012). Silymarin and diabetic nephropathy. Journal of Renal Injury Prevention, 1(January), 3–5. https://doi.org/10.12861/jrip.2012.02

16. Nithiya, T., & Udayakumar, R. (2018). Biomedical and Pharmaceutical Sciences Hepato and Renal Protective Effect of Phloretin on Streptozotocin Induced Diabetic Rats. Journal of Biomedical and Pharmaceutical Sciences, 1(1), 1–6.

17. Oguz, E., Kocarslan, S., Tabur, S., Sezen, H., Yilmaz, Z., & Aksoy, N. (2015). Effects of Lycopene Alone or Combined with Melatonin on Methotrexate-Induced Nephrotoxicity in Rats. Asian Pacific Journal of Cancer Prevention, 16, 6061–6066.

18. Pharmacol, C. E., Balasubramanian, T., Gp, S., Karthikeyan, M., & Chatterjee, T. K. (2014). Therapeutic Effect of Stereospermum suavelolens on Diabetic Nephropathy. Journal of Clinical and Experimental Pharmacology, 4(5). https://doi.org/10.4172/2161-1459.1000162

19. Rahim, A., Jamal, A., Ibrahim, A., & Jamal, A. (2011). Effects of olive oil on lipid profiles and blood glucose in type2 diabetic patients. Int J Diabetes & Metab., 19, 19–22.

20. Revathy, J., & Abdullah, S. S. (2017). The Role of Hesperetin in the Management of Diabetes Mellitus and Its Complications. Journal of Cancer Treatment and Research, 5(1), 1–6. https://doi.org/10.11648/j.jctr.20170501.11

21. Rohilla, A., Tiwari, S. K., Rohilla, S., & Kushnoor, A. (2011). Diabetic Nephropathy : Pathogenesis , Prevention and Treatment. European Journal of Experimental Biology, 1(4), 72–80.

22. Senthil, S., Sridevi, M., & Pugalendi, K. V. (2007). Cardioprotective Effect of Oleanolic Acid on Isoproterenol-Induced Myocardial Ischemia in Rats. Toxicologic Pathology, 35(3), 418–423. https://doi.org/10.1080/01926230701230312

23. Singh, J. (2007). Evaluation of Diabetic Nephropathy: Clinical Recommendations. Medicine Update (Volume 17, 2007), 256–256. https://doi.org/10.5005/jp/books/12086_45

24. Taheri, Z., Ghafari, M., & Amiri, M. (2015). Lycopene and kidney; future potential application. Journal of Nephropharmacology Lycopene, 4(2), 49–51.

25. Upaganlawar, A., & Balaraman, R. (2009). Combined effect of green tea extract and vitamin E on serum and heart tissue lipids, lipid metabolizing enzymes and histopathological alteration in isoproterenol-induced myocardial infarction in rats. Scientia Pharmaceutica, 77(4), 791–803. https://doi.org/10.3797/scipharm.0905-14

26. Upaganlawar, A., Gandhi, H., & Balaraman, R. (2010). Effect of vitamin e alone and in combination with lycopene on biochemical and histopathological alterations in isoproterenol-induced myocardial infarction in rats. Journal of Pharmacology and Pharmacotherapeutics, 1(1), 24–31. https://doi.org/10.4103/0976-500X.64532

27. Wang, J., Liu, H., Li, N., Zhang, Q., & Zhang, H. (2014). The Protective Effect of Fucoidan in Rats with Streptozotocin-Induced Diabetic Nephropathy. Marine Drugs, 12, 3292–3306. https://doi.org/10.3390/md12063292

28. Zhang, H., Fang, B., Zhang, Q., Ji, X., & Chen, L. (2016). Renoprotective effect of lidocaine on streptozotocin-induced diabetic nephropathy. 9(7), 14254–14259.

EXPERIMENTAL PARAMETERS OPTIMIZATION OF DIETHYL ETHER-JATROPHA BIODIESEL BLENDED FUEL WITH DIESEL IN VARIABLE COMPRESSION RATIO S.I. ENGINE USING GRAY RELATIONAL ANALYSIS

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ABSTRACT

Experimental analysis is done for different fuel blends Jatropha-10% Diethyl Ether (DEE)-10%+ Diesel - 80% (A₁), Jatropha-15% +DEE-10% + Diesel -75% (A₂), Jatropha-20% +DEE-10% + Diesel -70% (A₃), and diesel using different compression ratios (CR) (16, 17, and 18) and at various loads (3 kg, 6 kg, 9 kg, and 12 kg) on constant speed VCR diesel engine. The experimental analysis was carried out to study the effects of load and CR on output parameters brake thermal efficiency (BTE), brake specific fuel consumption (BSFC), emission parameters like CO, HC, NOx, and smoke density on all the fuel blends, and diesel fuel (HSD). The present work aims to optimize the combination of fuel blends, CR, load of DEE, Jatropha, and diesel fuelled single-cylinder constant speed diesel engine to improve the performance and to reduce the emission characteristics. An orthogonal array L₂₇ was used to arrange the input factors and their levels in twenty-seven numbers of experiments. Grey based Taguchi method (GTM) has been used to optimize the responses and to identify the best combination of input parameters. The Minitab 17® software was employed for the analysis of experimental results. Further, the method of TOPSIS confirms the optimized results of GTM. This work has used two methods of optimization techniques for accuracy as well as for confirmation about the optimized operating parameters of the unmodified engine. Operation number 27 is the combination of fuel A3 with CR 18, and load 100% (3.4 KW) which gives the best performance and emission characteristics..

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Keywords: *Diethyl Ether, Jatropha, CR, BTE, BSFC, VCR, Grey based Taguchi method, emissions*

Introduction

Diesel engines have been used widely in various engineering applications such as automobile and shipping equipment. The diesel engine has different types of emissions such as CO, HC, NOx, and smoke etc. The alternative fuels have now become a major research area in the engine design due to an increase in fuel economy, and more stringent emission regulations [1, 2].

The required emission regulations are difficult to obtain only with advanced diesel engine technology. It can be achieved by exhaust gas after-treatment, and by using different green fuels for the diesel engines [3]. Generally, alcohol fuels are decreasing engine emissions [3, 4].
Ethanol can be used as substitute fuel for engines [5]. The drawbacks of using ethanol for diesel engines are limited solubility with diesel, low cetane number, and lower viscosity than diesel [6]. To overcome these difficulties, Cetane number enhancers and co-solvent additives have wide scope as a diesel fuel blend for diesel engines [7]. The additives are

employed to improve the properties of fuel blends. Additives are used to compensate for a certain number, improve the viscosity and stabilize the fuel blend mixture [4].

It is also proved that vegetable oil fuels are found best alternatives as their properties are equivalent to diesel fuel and are produced from various crops which are easily available. Also, because of its high cetane number, it can be used in diesel engines without alterations in engine [18].

Biodiesel has several benefits over diesel fuel but difficulties in use due to higher viscosity, higher flash point, lower calorific value, poor oxidative stability, poor cold flow properties, and having greater NOx emissions. The lower percentages of bio-diesel blends increase the BTE, reduced emission, and BSFC [23]. DEE can be used as a better substitute for diesel fuel owing to its good BTE and lower exhaust emissions. DEE has no stability problems in diesel, having a higher Cetane number and good solubility in the diesel fuel [19].

Ethanol blended diesel engines have more emissions of hydrocarbon (HC), and less CO,

NOx, and smoke emissions. The Cetane number improver additives have positive trends to reduce CO and NOx emissions, and have adverse effect on HC emission [1]. Dogan observed the reduction of smoke density, CO, NOx and increase in HC emissions with the increase in percentage of n-butanol. Also, observed an increase of the BTE and BSFC with an increase in percentage of n-butanol [3]. De Caro et al [4] compared blends, with or without additives on two diesel engines using direct and indirect injection. The engine performance was found improved using additives with reduction of diesel engine emissions. Ajav et al. [5] found that no significant reduction in power of engine using ethanol blends (up to 20%) in diesel. By adopting ethanol up to 20% with diesel BSFC increased by 9% compared to diesel alone. The lubricating oil temperatures, exhaust gas temperature, and emissions like CO and NOx were reduced with ethanol. The results of Lu et al. [6] indicate that BTE increases while diesel equivalent BSFC decreases, with CN improvers. Also, the NOx emissions and smoke density reduced using ethanol in diesel fuel and further the NOx and smoke emissions decreases using CN improver. Lapuerta et al. [7] observed prevention of phase separation due to presence of ethanol with specific additives. In their another work [9], they obtained reductions in smoke density with ethanol-biodiesel blend in C.I. engine. Li et al. [10] compares the different blends of ethanol with pure diesel and found that the BTE and BSFC increases while decrease in smoke density with an increase percentage of ethanol. The HC emissions were increased but CO and NOx emissions were reduced with ethanol–diesel blends. Bilgin et al. [12] obtained best efficiency at CR of 21 using ethanol blends with diesel. Muralidharan and Vasudevan [13] obtained lower CO, and HC emissions while increase in NOx emissions with waste cooking oil methyl ester and its blends with a diesel.

Cinar et al. [15] investigated the effects of DEE on HCCI-DI engine. They found that audible knocking recorded with a 40% DEE premixed fuel ratio and decrease in NOx and smoke density while increase in CO and HC emissions. Rakopoulos et al. [19] studied the effect of different DEE blends with diesel and revealed

that DEE blend is a best alternative for diesel engines.

The combustion and emission characteristics of rapeseed plant oil (RSO) and its blends with diesel fuel have been investigated in a multi-cylinder direct injection diesel engine. Results show a significant reduction in NOx and a relatively higher amount of soot for RSO compared to diesel fuel. Under diesel equivalent soot emission levels, it was also possible to achieve a further reduction in NOx emissions by up to 22% for 30% RSO blend, this was achieved at the expense of THC, CO, and BSFC [20]. Jindal et. al [23] found that increase in CR and indicated power (IP) simultaneously resulted in an increase of the BTE and reduction in BSFC with lower emissions.

The design of the experiment's (DoE) Taguchi method was used for the analysis purpose of the experimental results of biodiesel fuelled diesel engines. This method was proposed by Dr. Genichi Taguchi (Taguchi, Genichi and Elsayed, Elsayed A and Hsiang, 1989) for optimization of the parameter, which provides the information about the best control parameters in the least number of experiments. The accuracy and reliability of the Taguchi method solely depend upon the way the factors and their values have been chosen. In Taguchi design, the robustness of any control element is measured by the way it is affected by the independent factors (noise level). The purpose of Taguchi design is to identify the best control element which has less variability due to the uncontrolled factors (noise level) such as ambient temperature, engine vibration, etc. The variability in control factors is measured by Taguchi's signal-to-noise ratio (S/N). The S/N ratio is the log function of the output measured parameter, and these are to be calculated for each output parameter. The higher the S/N ratio means better control factor and less variability due to the noise levels (Rao et al., 2008; Senthilkumar et al., 2014). The S/N ratio is calculated by the three design conditions namely larger the better, smaller the better, and nominal the better. The arrangement of control factors and their levels in a minimum number of experiments called orthogonal array to get the effect of control factors on given responses. However, the Taguchi method is used for

single-objective optimization. For more than one response/multi-objective (output parameters) the grey relational analysis method (GTM) method proposed by Deng (1989) is used. In the GTM method, all the responses are combined and converted into a single response optimization problem. The Taguchi and GTM methods are combined for the optimization of multi-objective responses.

The GTM concept uses two conditions of information. The condition at which not at all any information (black) is available for the system ultimately there is no solution. Another side is full of information (white) which could have a unique solution for the system of information. However, these kinds of extremities never exist in the real world, but somewhere in between. Therefore, GTM uses to solve the problems which have less or partially available information. That converts the multi-objective problem into a single objective and Taguchi is used for optimization. Many authors have used this combined technique of optimization for solving the problems (Tarng et al., 2002; Kuo et al., 2008; Tsao, 2009; Sahu and Pal, 2015; Pervez et al., 2016; Raju, 2016). An orthogonal array L27 was used to arrange the input factors and their levels in twenty-seven numbers of experiments. GTM has been used to optimize the responses and to identify the best combination of input parameters. The Minitab 17® software has been used for the analysis of experimental results. Further, the method of TOPSIS confirms the optimized results of GTM. This work has used two methods of optimization techniques for accuracy as well as for confirmation about the optimized operating parameters of the unmodified engine.

Methods

Fuel preparation

The different blends of Diethyl Ether (DEE) +Biodiesel (BD) +diesel (D) were prepared for the trials on single-cylinder variable compression ratio diesel engine as shown in Table 1. The properties of standard fuels and properties measured from laboratories in Indian BIodiesel Corporation (IBC), Baramati are as shown in the Table 2.

Experimental setup and methodology

The experimental setup is shown in Fig. 1 and its detail is given. The specification of the gas analyzer has tabulated in Table 3.

The rated power rating of the engine is 3.5 kW at 1500 rpm with a water-cooled eddy current dynamometer for loading the engine. The engine has a suitable sensing device for temperature, pressure, flow rate, and crank angle measurements with a data acquisition system. The engine has a compression ratio (CR) that ranges from 12:1 to 18:1. In the present work, the CR selected was 16:1, 17:1, and 18:1. For each CR, the load has been varied from 25 to 100%, in the step of 25%.

The combustion, performance, and emission characteristics were observed for each load and CR. Injection pressure and timing were kept constant at 210 bar and 23□ bTDC for all observations. Rigorous warming experimental work was performed. In each test, the engine was run for 5 minutes to properly up the engine and stabilizing the set of all working parameters. For reliability and accuracy, a set of results were taken six times for ten cycles each, and the best result is taken for analysis purposes.

Taguchi and GTM technique for optimization

As mentioned, these two methods combined to solve the multi-objective related problem. This combined method's steps are shown in Fig 2. The left part of the figure indicates the Taguchi method and the right part is the GTM method.

Selection of factors and their levels

The selection of factors and levels for optimization entirely depends on the designer's level of understanding of the experimental setup and its effects on the output responses. In this study, the three input factors viz. fuel blend, CR, and load and their three levels have been selected as shown in Table 4.

These selected factors and levels are provided in Taguchi's orthogonal array (OA), in such a way that optimization should be in a minimum number of experiments/trials [39–41]. Based on the factors and their levels, these are arranged in a minimum number of trials (OA L27). These combinations along with their experimental results of responses are given the Table 5.

Signal to noise (S/N) ratio calculation

The analyses of results are carried out by calculating the S/N ratio. In this study, for

calculation of S/N ratios following two design conditions are used.

For larger the better characteristics

$$\eta_{ij} = -10 \times \log\left(\frac{1}{r}\sum_{k=1}^{r}\frac{1}{m_{ijk}^2}\right) \qquad (3)$$

For smaller the better characteristics

$$\eta_{ij} = -10 \times \log\left(\frac{1}{r}\sum_{k=1}^{r}m_{ijk}^2\right) \qquad (4)$$

Where η_{ij} is the S/N ratio of experiment number i for response j and mijk is the simulation result for trial i for response j, in kth number of replication and r is the number of replication required. The BTE, taken as 'larger the better' responses and BSFC, CO, HC, NOx, smoke are 'smaller the better' responses. The S/N ratio is calculated by using the equation 3 and 4 and represented in Table 6.

Grey relational generation

The GM optimization was used to solve the multi interdependent responses problem [42], the steps are shown in the right part of the flowchart of Fig. 2. In this part of optimization, the first step is to linear normalization of calculated S/N ratio between 0 and 1, known as grey relation generation.

The grey relation generation sij for trial i and response j has been calculated using Equations 5 and 6. Equation 5 is used for larger the better responses and 6 for smaller the better responses for calculating the grey relational generation

$$s_{ij} = \frac{\eta_{ij} - \min_j \eta_{ij}}{\max_j \eta_{ij} - \min_j \eta_{ij}} \qquad (5)$$

$$s_{ij} = \frac{\max_j \eta_{ij} - \eta_{ij}}{\max_j \eta_{ij} - \min_j \eta_{ij}} \qquad (6)$$

The grey relational generations for normalized S/N ratio. After calculating the grey relational generation, all the performance values are scaled up between 0 and 1. If the performance value s_{ij} for experiment number i of response is 1 or nearer to 1, then this performance value of i is best for response j. But, these kinds of situation never exist; hence a reference sequence X_0 (best/ideal value) = (X_{01}, X_{02}, ….) = (1, 1, …..) is introduced for comparability.

Calculation of grey relational coefficient

The grey relational generation compared with reference sequence and determined how close s_{ij} to X_0. This closeness is represented by the grey relational coefficient ω_{ij} and calculated as given in Equation 7.

$$\omega_{ij} = \frac{\Delta_{min} + \zeta.\Delta_{max}}{\Delta_{ij} + \zeta.\Delta_{max}} \qquad (7)$$

$$\Delta_{min} = Min\left(\Delta_{ij}, i = 1,2,....m; j = 1,2,...n\right)$$

$$\Delta_{max} = Max\left(\Delta_{ij}, i = 1,2,....m; j = 1,2,...n\right)$$

Where $\Delta_{ij} = |x_{0j} - s_{ij}|$ and ζ is the distinguishing coefficient used for compressing or expanding the range of ω_{ij} responses. m and n are the numbers of trials/ experiments and responses.

The value of ζ lies between 0 and 1, and most of the researchers have taken the value of it as 0.5. However, any value of it does not affect the ranking of an optimum experimental alternative.

Calculation of grey relational grade

Calculation of grey relational grade needs the suitable weighting factor for each response. The weighting factor is very crucial because it affects the grading of trials. Hence in this study, the weighting factor has been calculated judiciously and logical manner to avoid any error in the performance calculation. The weights (w_j) are based on decision-makers' judgment, but this must be $\sum w_j$ =1. These weights are decided by the priority matrix as explained in the section 4.1 and values are as follows, BTE=0.25, BSFC=0.16, EGT=0.02, CP=0.11, NHR=0.25, RPR=0.11, CO=0.02, HC=0.02, NOx=0.02, Smoke=0.02. After calculating the weights, the grey relational grades are calculated by using equation 8.

$$\gamma_i = \sum_{j=1}^{n} w_j \omega_{ij} \quad , \qquad i = 1, 2, 3,. . … m. \qquad (8)$$

Where γ_i indicates the grey relational grade for its experiment and w_j is the weighting factor for the jth response. Grey relational grade (GRG) calculation is converting the multi-objective to a single objective in the form of GRG. Using the above equation grey relational grade has been calculated considering the equal weights for all responses as shown in Table 6.

The grey relational grade implies the degree of closeness of the comparability sequence to the reference sequence. If the comparability sequence (GRG) value is higher, indicates mores closer to the reference sequence (best) [43]. Therefore, the particular experiment number will be the best choice whose GRG is the higher value. The values of GRG from Table 6 and Fig. 3, indicate that test number 27 has the highest value as compared to others and ranked 1.Similarly, the ranking of experiment number has been done as per the descending value of GRG as shown in Table 10. The operation number 27 is the combination of fuel A3 with CR 18, and load 100% which gives the best performance characteristics.

The experiment number 27 has following optimized parameters as blend –A3, Load -3.4 kW (100%), and CR-18. As load increases from 25 to 100 % on the diesel engine cylinder temperature also increases which causes more combustion efficiency and hence BTE is highest at full load(100%) which is 3.4KW(12kg). At higher CR 18, pick cylinder temperature is

highest and combustion efficiency is also more, which gives the highest BTE.

At higher load 3.4 KW and higher CR 18; more complete combustion occurs due to higher pick cylinder temperature, which causes a reduction in CO and HC emissions.

A_3 gives optimized results for emission and performance parameters. A_3 contains 10% DEE and 20% Jatropha biodiesel. Due to a higher percentage of biodiesel compared to A_1 and A_2 blends, the A_3 fuel blend having more oxygen contents which results in more complete combustion of the diesel engine, hence BTE is higher than A_1 and A_2 fuel blends. As higher O_2 content in the A_3 fuel blend causes more complete combustion, hence A_3 blend having minimum HC and CO emissions compared to other blends.A_3 gives less smoke density than A_1 and A_2 fuel blend, due to more O_2 contents. Nox emissions are less for more Cetane number fuels. DEE fuel blend having more Cetane number, and higher O_2 contents which cause reduced delay period of diesel.

Table 1 Fuel blends

S.N.	Blend Composition	Name
1	DEE-10% +Jatropha-10% +Diesel -80% -	A1
2	DEE-10% +Jatropha-15% +Diesel -75% -	A2
3	DEE-10% +Jatropha-20% +Diesel -70%	A3
4.	100% Diesel (Reference)	D

Table 2 Fuel properties

Properties	Standard	Diesel	Ethanol	Biodiesel	DEE	A1	A2	A3
Density(Kg/m3 at 20°C)	ASTM D4052	840	789	880	710	865	869	874
Lower heating value (MJ/Kg)	ASTM D5865	42.5	27.0	39.9	34.0	37.50	34	31.50
Liquid viscosity (CP at 20°C)	ASTM D445	3.03	1.20	3-4	0.23	3.10	3.30	3.70
Cetane number	ASTM D613	45-50	5–8	40-50	125	44	49	55
Auto-ignition temperature (°C)	ASTM D93	235	423	-	160	244	249	259

Table 3 INDUS (PEA 205N) Five Gas Analyzer specification

Measurand	Range	Resolution	Accuracy
CO	0 to 15% Vol	0.01% Vol	± 0.02% Vol; ± 3% O.M
CO2	0 to 20% Vol	0.01% Vol	± 0.3% Vol; ± 3% O.M
HC	0 to 30000 ppm	≤2.000: 1 ppm vol.	< 2000 ppm vol.: ±4 ppm vol. ±3 O.M.
O2	0 to 25%	0.01% vol	± 0.02 % vol.

NOx	0 to 5000 ppm	1 ppm vol.	± 5 ppm vol.

Table 4 Factors and their levels

Factors	Level 1	Level 2	Level 3
A: Fuel blend	A1	A2	A3
B: CR	16	17	18
C: Load (%)	25	50	100

Table 5 Arrangement of factors and levels in an orthogonal array (L27) with experimental results

S. No	Jatropha	CR	L	BTE	BSFC	CO	HC	Nox	Smoke opacity
	%		Kg		kg/kWh	%	ppm	ppm	%
1	10	16	3	16.64	0.58	0.285	154	51	3.04
2	10	16	6	24.37	0.39	0.158	109	146	3.49
3	10	16	12	31.23	0.31	0.027	62	752	5.98
4	10	17	3	18.75	0.52	0.121	73	94	4
5	10	17	6	26.81	0.36	0.074	82	280	3.54
6	10	17	12	33.85	0.28	0.015	60	782	4.46
7	10	18	3	18.66	0.51	0.05	53	209	2.21
8	10	18	6	26.27	0.37	0.032	62	419	2.1
9	10	18	12	34.62	0.28	0	79	904	1.54
10	15	16	3	17.91	0.59	0.158	109	45	1.42
11	15	16	6	27.11	0.39	0.082	99	175	0.94
12	15	16	12	35.82	0.3	0.015	67	664	0.35
13	15	17	3	19.1	0.51	0.098	92	115	3.76
14	15	17	6	29.31	0.36	0.041	83	203	1.46
15	15	17	12	37.88	0.28	0.014	82	712	1.58
16	15	18	3	20.27	0.51	0.04	67	223	1.14
17	15	18	6	28.69	0.37	0.025	80	441	2.25
18	15	18	12	37.45	0.28	0	75	858	0.92
19	20	16	3	19.22	0.59	0.127	99	78	0.56
20	20	16	6	30.78	0.37	0.064	89	295	0.79
21	20	16	12	41.24	0.28	0.012	97	710	2.18
22	20	17	3	20.37	0.56	0.069	96	166	1.29
23	20	17	6	30.39	0.38	0.04	103	428	1.29
24	20	17	12	39.37	0.29	0.01	106	789	2.59
25	20	18	3	22.03	0.52	0.038	65	262	0.59
26	20	18	6	31.62	0.36	0.016	88	564	0.82
27	20	18	12	42.54	0.27	0	79	870	1.17

Table 6 Grey relational grade (GRG)

S.No.	GRG	Rank
1	0.4730003	27
2	0.5363789	26
3	0.622416	17
4	0.5554747	24
5	0.5833466	21
6	0.682887	7
7	0.6362812	15
8	0.6458529	13
9	0.70967	6
10	0.5584836	23
11	0.6300285	16

12	0.7663015	2
13	0.5374495	25
14	0.6644683	9
15	0.7183232	4
16	0.636552	14
17	0.6197124	18
18	0.7554769	3
19	0.6002797	20
20	0.6517096	12
21	0.7175191	5
22	0.578004	22
23	0.6116868	19
24	0.6729102	8
25	0.6600889	11
26	0.6636608	10
27	0.7961523	1

The table 1 gives different descriptive statistics of center of gravity and wrist joint. The mean and standard deviation of long service in elbow joint is 144.40 ± 17.54. The mean and standard deviation of flick service elbow joint is 148.20 ± 15.54. The mean and standard deviation of short service in elbow joint is 143.80 + 19.56. The mean and standard deviation of long service in shoulder joint is 45.60 ± 19.95. The mean and standard deviation of flick service in shoulder joint is 42.30 ± 11.49. The mean and standard deviation of long service in shoulder joint is 40.10 ± 18.48.

Figure 1 Single cylinder 4- Stroke VCR Diesel Engine Setup
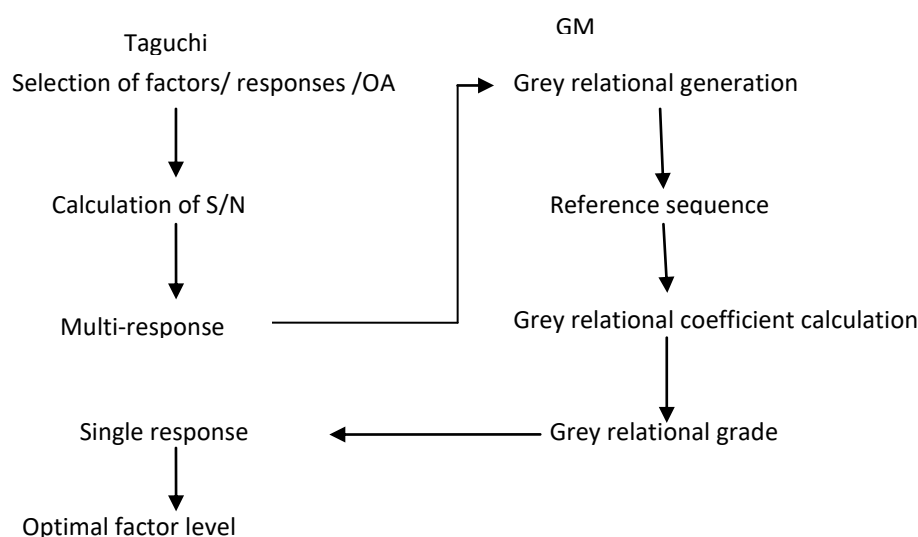
Figure 2 Steps in GTM method
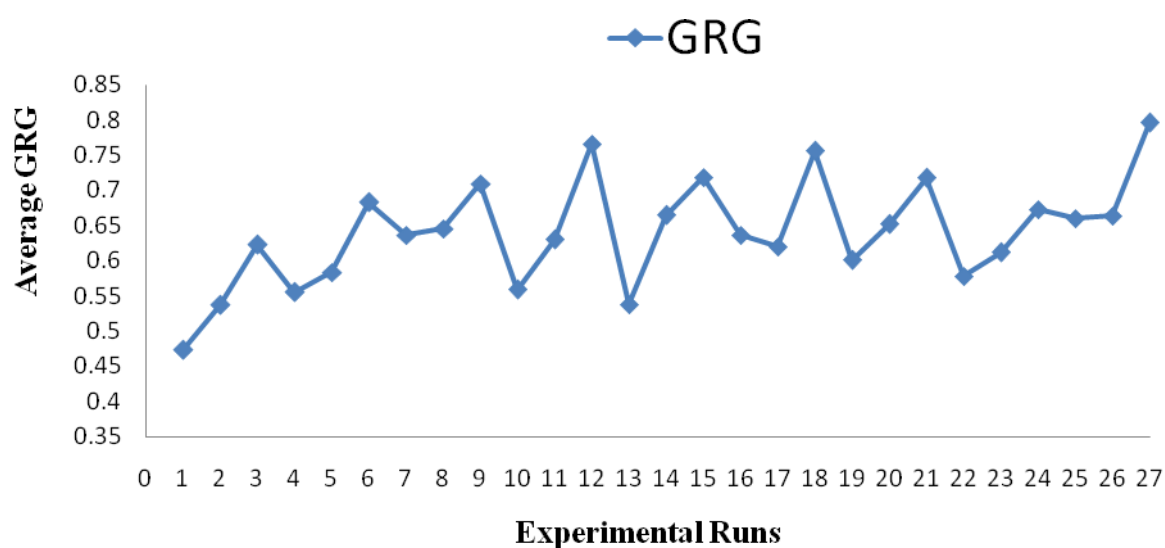
Figure3 Variation of GRG

In the table 2 elbow joint is insignificant as the p-value is 0.834 which is more than 0.05 hence researcher cannot reject the null hypothesis. It can be said that there is no difference among long service, short service, and flick service in elbow joint.

In shoulder table the p-value was found to be insignificance as the p-value is 0.77 which is more than 0.05 hence researcher cannot reject the null hypothesis. It can be said that there is no difference among long service, short service, and flick service in shoulder joint.

Conclusion

Taguchi's Gray Relational Analysis (GTM) is applied to optimize diesel engine input parameters like fuel blend, load, and CR. An orthogonal array L_{27} was used to arrange the input factors and their levels in twenty-seven numbers of experiments. GTM has been used to optimize the responses and to identify the best combination of input parameters and from this following conclusions can be drawn:

- The A_3 with CR 18, and load 100% which gives the best performance characteristics.
- A_3 blend shows the highest value of BTE compared to A_1 and A_2 at higher load 3.4 kW (100%) and highest CR 18.
- A_3 blend shows the lowest value of BSFC
- compared to A1 and A2 at 100% load and CR18.
- (4) A3 gives the lowest CO and HC emissions than A1 and A2 due to higher O2 contents.
- (5) A3 gives lower smoke density than A1 and A2 due to higher O2 contents.
- (6) From the above results, it is seen that the engine gives good performance at higher load and higher CR.

The performance of the A3 blend is better than A1 and A2 blends for the diesel engine.

References

1. Xing-cai Lu, Jian-guang Yang, Wu-gao Zhang, Zhen Huang, 'Effect of cetane number improver on heat release rate and emissions of high speed diesel engine fueled with ethanol-diesel blend fuel', Fuel 2004; 80(14–15):2013–20.

2. E. A. Ajav, Bachchansingh and T. K. Bhattacharya, 'Performance of a stationary diesel engine Using vaporized ethanol as supplementary Fuel', Biomass and Bioenergy, 15 (1998) 493-502,

3. O. Dogan, 'The influence of n-butanol/diesel fuel blends utilization on a small diesel

engine performance and emissions', Fuel 90 (2011) 2467–2472.

4. De Caro PS, Mouloungui Z, Vaitilingom G, et al. 'Interest of combining an additive with diesel–ethanol blends for use in diesel engines', Fuel 2001;80(4):565–74.

5. E.A. Ajav, BachchanSingh, T.K. Bhattacharya ,'Experimental study of some performance parameters of a constant speed stationary diesel engine using ethanol-diesel blends as fuel' ,Biomass and Bioenergy,17 (1999) 357-365

6. Xing-cai Lu, Zhen Huang, Wugao Zhang, Degang LI. 'The influence of ethanol additives on the performance and combustion characteristics of diesel engines', Combust SciTechnoly 2004; 176 (8)1309–29.

7. M. Lapuerta, O. Armas, R. García-Contreras, .Stability of diesel–bioethanol blends for use in diesel engines., Fuel, 86 (2007) 1351–1357.

8. M. Lapuerta, O. Armas, J.M. Herreros, 'Emissions from a diesel–bioethanol blend in an automotive diesel engine', Fuel ,87 ,(2008) 25–31.

9. M. Lapuerta, O. Armas, R. García-Contreras, 'Effect of ethanol on blending stability and diesel engine emissions', Energy and Fuels, 23, (2009) 4343–4354.

10. D.-G. Li, H. Zhen, L. Xingcai, Z. Wu-Gao, Y. Jian-Guang, 'Physico-chemical properties of ethanol–diesel blend fuel and its effect on performance and emissions of diesel engines', Renewable Energy, 30 (2005) 967–976.

11. B.-Q. He, S.-J.Shuai, J.-X.Wang, H. He, 'The effect of ethanol blended diesel fuels on emissions from a diesel engine', Atmospheric Environment, 37 (2003) 4965–4971.

12. Atilla Bilgin ,OrhanDurgun, Zehra ¸Sahin, The Effects of Diesel-Ethanol Blends on Diesel Engine Performance Energy Sources, 24:431–440, 2002

13. K. Muralidharan and D. Vasudevan ,'Performance, emission and combustion characteristics of a variable compression ratio engine using methyl esters of waste cooking oil and diesel blends', Applied Energy, 88 (2011) 3959–3968.

14. H. Sharon , K. Karuppasamy, D.R. Soban Kumar , A. Sundaresan c, 'A test on DI diesel engine fueled with methyl esters of used palm oil', Renewable Energy", 47 (2012) 160-66.

15. Can Cinar, Özer Can, FatihSahin, H. SerdarYucesu,' Effects of premixed diethyl ether (DEE) on combustion and exhaust emissions in a HCCI-DI diesel engine', Applied Thermal Engineering, 30 (2010) 360–365

16. Rakesh Kumar Maurya, Avinash Kumar Agarwal, 'Experimental study of combustion and emission characteristics of ethanol fuelled port injected homogeneous charge compression ignition (HCCI) combustion engine', Applied Energy, 88 (2011) 1169–1180.

17. Octavio Armas , Reyes García-Contreras, Ángel Ramos,' Pollutant emissions from engine starting with ethanol and butanol diesel blends', Fuel Processing Technology, 100 (2012) 63–72

18. K. Muralidharan , D. Vasudevan , K.N. Sheeba ,'Performance, emission and combustion characteristics of biodiesel fuelled variable compression ratio engineEnergy', 36 (2011) 5385-5393,

19. Dimitrios C. Rakopoulos, Constantine D. Rakopoulos, Evangelos G. Giakoumis, Athanasios M. Dimaratos , 'Characteristics of performance and emissions in high-speed direct injection diesel engine fueled with diethyl ether/diesel fuel blends' ,Energy, 43 (2012) 214-224

20. L. Labecki, A. Cairns, J. Xia, A. Megaritis, H. Zhao, L.C. Ganippa, 'Combustion and emission of rapeseed oil blends in diesel engine', Applied Energy ,95 (2012) 139–146.

21. K. Varatharajana,, M. Cheralathan , 'Influence of fuel properties and composition on NOx emissions from biodiesel powered diesel engines': A review, Renewable and Sustainable Energy Reviews, 16 (2012) 3702– 3710.

22. Horng-Wen Wu, Zhan-Yi Wu, 'Investigation on combustion characteristics and emissions of diesel/hydrogen mixtures by using energy-share method in a diesel engine',

Applied Thermal Engineering, 42 (2012) 154e162.

23. S. Jindala' B.P. Nandwanaa, N.S. Rathore , V. Vashistha, 'Experimental investigation of the effect of compression ratio and injection pressure in a direct injection diesel engine running on Jatropha methyl ester', Applied Thermal Engineering, 30 (2010) 442–448.

24. Ismet Sezer, 'Thermodynamic, 'Performance and emission investigation of a diesel engine running on dimethyl ether and diethyl ether', International Journal of Thermal Sciences, 50 (2011) 1594-1603.

25. N.K. Miller Jothi, G. Nagarajan, S. Renganarayanan, 'LPG fueled diesel engine using diethyl ether with exhaust gas recirculation, International Journal of Thermal Sciences', 47 (2008) 450–457.

26. D.H. Qi, H. Chen, L.M. Geng, Y.Z. Bian, 'Effect of diethyl ether and ethanol additives on the combustion and emission characteristics of biodiesel-diesel blended fuel engine', Renewable Energy, 36 (2011) 1252-1258.

27. Saravanan D., Vijayakumar T. and Thamaraikannan M., 'Experimental analysis of Combustion and Emissions characteristics of CI Engine Powered with Diethyl Ether blended Diesel as Fuel', Research Journal of Engineering Sciences,Vol. 1(4), 41-47, October (2012).

29. S.Sudhakar,S.Sivaprakasam,'The Effect of Exhaust Gas Recirculation on Diethyl Ether Fumigation in DI Diesel Engine with Ethanol Blended Diesel', Vol. 3, (2014) ,538-548.

30. J.SureshKumar ,S.V.Maruti Prasad, 'Experimental study on performance Charteristics of C.I. Engine fueled with biodiesel and its blends Diethyl ether', International journal and magazine of engineering, technology, management and

research Volume no: 1(2014), issue no: 8 ,36-40.

31. S. Sudhakar and S. Sivaprakasam, 'Effects of Diethyl Ether Fumigation in DI Diesel Engine Using Bio Ethanol Blended Diesel', International Journal of Innovation and Scientific Research , Vol. 11 No. 1(2014), pp. 65-71.

32. D. D .Nagdeote1, M. M. Deshmukh, 'Experimental Study of Diethyl Ether and Ethanol Additives with Biodiesel-Diesel Blended Fuel Engine International Journal of Emerging Technology and Advanced Engineering' ,Volume 2, Issue 3, (March 2012) 195 -199

33. Say Likhitha S S, B. Durga Prasad, Ch. R. Vikram Kumar, 'Investigation on the Effect of Diethyl Ether Additive on the Performance of Variable Compression Ratio Diesel Engine', International Journal of Engineering Research Volume No.3 Issue No: Special 1, PP: 11-15(March 2014)

34. M. Loganathan, A. Anbarasu and A. Velmurugan, 'Emission Characteristics Of Jatropha - Dimethyl Ether Fuel Blends On A Di Diesel Engine', International Journal Of Scientific and Technology Research , Volume 1, Issue 8, September 2012, 28-32.

35. M. Pugazhvadivu1 and S. Rajagopan, 'Investigations on a diesel engine fuelled with biodiesel blends and diethyl ether as an additive', Indian Journal of Science and Technology Vol.2 No 5 (May 2009), 31-35.

36. S. Sivalakshmi, T. Balusamy, 'Effect of biodiesel and its blends with diethyl ether on the combustion, performance and emissions from a diesel engine', Fuel, Volume 106, April 2013, Pages 106–110.

37. S. Sivalakshmi, T. Balusamy, 'Effect of biodiesel and its blends with diethyl ether on the combustion, performance and emissions from a diesel engine' Fuel, Volume, April 2013, Pages 106–110.

IMPACT OF ARTIFICIAL INTELLIGENCE AND DATA MINING ON PERFORMANCE MANAGEMENT DURING COVID-19 PANDEMIC

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ABSTRACT

*This study discusses artificial intelligence and data mining on performance management. During Covid -19 the whole world has suffered health issues and the pressure of the health organization increased rapidly. In this segment, the artificial intelligence and data mining process play an important role to overcome the problems. For this reason, to increase the effective performance of artificial intelligence and data mining in the health sector this study adopted an effective methodology and data analysis process that can help to find the authentic result of the research. The objective of the study helps to fulfill the aim of this study in a proper manner. The performance management process helps to overcome the challenges with systematic processes. Artificial intelligence mainly helps to implement technology and robots to develop the entire health system. On the other hand, data mining helps to analyze the entire world's health conditions. In this segment, this study has adopted the **Constraint theory** to increase the significance of the study. The methodology is the most significant factor of the research that6 can find the authentic result. For this reason, this teaching study has adopted the **secondary qualitative data collection** process and **descriptive research design**. In the secondary data analysis part, this study has conducted the **thematic analysis** to get realistic results from this study. In this thematic analysis, the teams have made from the previous research paper that was published five years ago. This artificial intelligence and data mining helps to manage the health organizational process and increase efficiency.*

Keywords: *Artificial intelligence, Data mining, Human resource management, Robotic implementation*

Introduction

Artificial intelligence and data mining are the most effective software in management performance. In the year 2020, the whole world has faced a pandemic situation, lockdown, isolation, and others. During this CoronaVirus disease, people are facing health problems and challenges. In this situation, mostly need the proper management perspective for overcome this problem. In this segment, artificial intelligence and data mining helps to overcome the health issue in the entire management process. This artificial intelligence and data mining process can perform more effectivelyin health management process. In this reason, this study adopts different methods and data analysis processes that can increase the efficiency of health sector with implementation of artificial intelligence and data mining to develop performance management.

Objectives

- To analysis the impact of artificial intelligence and data mining in the performance management process during a pandemic situation

- To understand the effects of artificial intelligence and data mining in the management process during Covid-19
- To evaluate the challenges of deploying artificial and data mining in the management process during pandemic situations.

Research question

- How do artificial intelligence and data mining help to increase the efficiency of performance management processes during pandemic situations?
- Which factors of artificial intelligence and data mining influence performance management during pandemic situations?
- How do artificial intelligence and data mining help to overcome the challenges during Covid-19?

Literature review

Concept of performance management

Performance management is the most significant aspects in overcoming the challenges. This management process monitoring the issues and

challenges and also give thye solution to overcome it. This performance management process helps to identify the capabilities and threats of the present situation. This entire process are follows some steps to reach the goals. In this process, four major steps are plan, act, monitoring, and review [1]. This process can mitigate the health related challenges in the proper manner and can get effective results. In 2020, the Covid-19 outbreak creates several health problems in people's lives all over the world. In this situation, the artificial intelligence software process can help to control this situation and overcome the problems.

Factors affecting performance management in health sector during Covid19

During Covid-19 most of the organizations faces many challenges to maintain their management performance. In this segment, many factors affect the performance management of an organization. Among these factors, artificial intelligence and data mining can improve the health condition during Covid-19. Artificial intelligence such as the technical implementation and software mostly helps to manage the performance of an organization. During the Covid-19 most of the organizations has stopped their physical performance and continue their organization with virtual performance with artificial intelligence. In this situation, the technologies and software are helping to continue the performance of an organization [2]. On the other hand, data mining is another significant factor. With data mining, the organization can evaluate the physical performance of the employees. In this data mining process, select some groups to analyze the performance during Covid-19. According to age, gender, and marital status, the organization can create groups and evaluate performance. In India now artificial intelligence uses in different jobs sector for improve performance management.

Effect of artificial intelligence on performance management during Covid19

Artificial intelligence is the most effective role-play for the performance management of an organization. The international company TESCO has used artificial intelligence software in products manufacturing process. This software helps the company to generate more revenue. In this present time, help of this software the company got revenue 55.9 billion. In the pandemic situation, most of the organizations have to stop their physical performance due to lockdown phases for their physical performance due to lockdown phases for the Covid-19 outbreak. For this reason, several organizations adopt virtual techniques that can help to run the performance management process with proper manners. The technological implementations and software help to communicate with each other in this pandemic situation.

Job title	Utilisation of AI in various job roles
Machine learning engineering	75.0 %
Deep learning engineering	60.09 %
Senior data scientist	58.01%
Computer vision engineering	55.2%
Data scientist	51.1%
Algorithm developer	46.9%

Table 1: AI uses in different jobs

The application of artificial intelligence in an organization can keep the records of the employee's performance to evaluate the management process easily this artificial intelligence increases employees' employability and self-efficiency. This technique also helps to run the organization successfully.

Effect of data mining on performance management

Data mining helps to store data to enhance organizational performance. Data mining mostly improves organizational performance and increases the capabilities of employees. In this segment, data mining can analyze huge data with the help of upgradable technologies. From

this data, an organization can identify the major issues within the organization and evaluate the capabilities of the employees [3]. This data mining result, an organization gets the chance to improve their management performance and employees' ability. During the Covid-19 situation, data mining helps the human resource management of an organization. On the other hand, this process can give personalized recommendations for improving the employee's skills and capabilities.

Evaluation of challenges faced during using artificial intelligence and data mining on performance management

In the health sector, artificial intelligence and data mining helps to manage performance but there are some challenges faced by the health

organization. In this segment, proper technology implementation and data mining are required for performance management [4]. Otherwise, the organization could not manage the health system properly.

Constraint theory- Theoretical implementation can reduce the challenges of

artificial intelligence and data mining. In this theory, five stages can help to increase the performance efficiency of the health sector. In the first step identify the issues and evaluate the challenges for reduction [5]. After that find some subordinate solution that can help to overcome the problems and helps to develop the organization. Overcoming one problem finds the next issue that creates problems in the health organization.

Figure 1: Constraint theory

Methods

Description of context and setting of study- Methodology is the most important element that helps to find the authentic result of the study. Methodology mainly has two types one is the data collection and another is the data analysis. This data collection process also can be divided into two parts one is a quantitative data collection tools and another is a qualitative data collection process. Due to the Covid-19 situation, this study has adopted the secondary qualitative data collection method because in this lockdown period the primary data collection method is impossible for the researcher [6]. The researcher will collect secondary data from online sources. In this segment, mostly the researcher follows the previous research articles

which were published five years ago. Moreover authentic books, journals, online pdf, and authentic websites help the researcher to collect the secondary data during and complete this study during this pandemic situation.

Specification of design of the study- Secondary qualitative data mostly helps to find real results. This qualitative data can compare the present situation with the previous situation in research study. This study follows thepositivism philosophy to find the significant result of this research. On the other hand, the deductive research approach helps to complete this study and a descriptive research design can help to find the authentic result of this study [7]. This secondary data, this study has conducted the thematic analysis to get the effective result of this study. In this thematic analysis, some

themes have been made from the previous research articles and journals. This qualitative analysis, this research helps to understand the evaluation of the present situation.

Result and discussion

Thematic analysis

Utilization of artificial intelligence and data mining in performance management during pandemic situations- In the performance management process, artificial intelligence is the most significant part of this study. In the present era, most probably every sector has adopted technological implementation and data analysis systems to develop their organizational performance. With the help of this technological implementation, the organizational management process can perform more effectively and through this system, an organization can get development. During the Covid-19 outbreak, this artificial intelligence and data mining process help to maintain the performance management process of an organization [8]. This artificial intelligence follows some steps

that can evaluate the management performance effectively.

Detection- In the artificial intelligence process detection is the first step that helps to find the issues and gives early warning. Through this detection can make imagery of the organizational performance and helps to collect the data for evaluating the organizational performance. In this process, the organization can set the goals and try to overcome the challenges that can help to improve the **performance management process.**

Prevention- In these steps, it helps to predict the health condition of the people. With the help of this process, the health organization can calculate the patient's probability of disease. On the other hand, with this technology health organizations can monitor the patient's health condition frequently and monitor properly. This process also helps to collect personal information about the health condition of the patient.
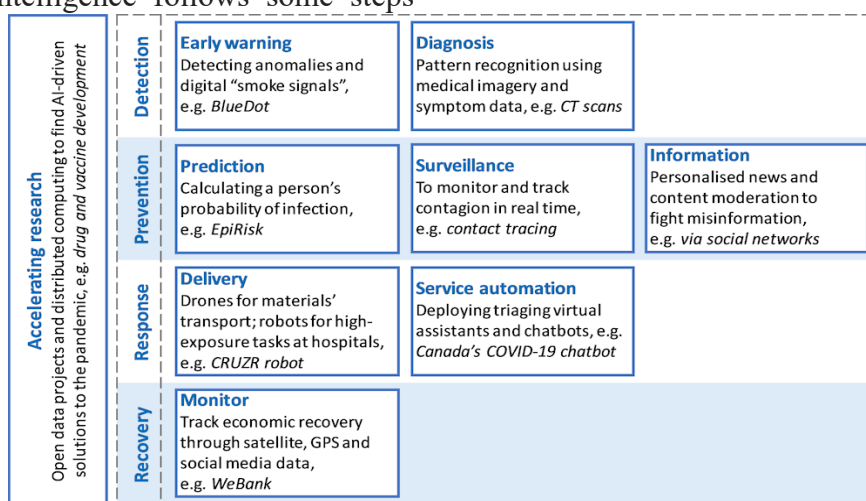

Figure 2: Utilisation of artificial intelligence

Response- Artificial intelligence helps to deliver health care products faster and helps to develop medical treatment. During Covid-19 the number of patients increases in the health sector. At that point, robotic implementation can help to maintain the entire medical process [9]. This technological implementation helps to performance management of the help sector. This technological implementation of the health sector also deployed assistance to mitigate the patient's demand such as the Covid-19 catboat.

Recovery- This technology also helps to recover the economic losses for Covid-19. This process using GPS, Online platforms, and websites for develop the heath organizational performance. During Covid-19 the pressure has increased rapidly in this situation the artificial intelligence helps to recover this condition by using artificial intelligence.

Data mining also helps to evaluate the entire health condition of the world. On the other hand, through this data mining process, the health organization can understand the right way

of Covid-19 treatment. From this analysis, employees can increase their efficiency and the health sector can manage their performance.

The evolution of artificial intelligence and data mining helps to reduce the challenges in performance management

Table 2: Productivity of AI in different countries

Identification countries	Market share of AI productivity in the Information technology sector
Sweden	37%
Japan	34%
UK	25%
France	20%

During Covid-19 the health sector mostly suffered from several challenges. In this situation, the health sector needs to proper management process only that away can reduce the challenges and helps to build effective performance management. In this performance management of the health sector, artificial intelligence and data mining plays a significant role in this segment. The whole world, has adopt the artificial intelligence software in their health sector, in Sweden 37%, Japan 34%, UK 25% and France 20%. The traditional process of health organizations faces many problems to handle huge numbers of patients together. For this reason, the artificial intelligence implementation in the medical sector develops the performance and manages the entire system [10]. In the Covid-19 outbreak, the whole world has suffered from huge medical issues. In this segment, the technological implementation that helps to find the symptoms of Covid-19 and robotic implementation in the health sector helps to handle the huge number of patients. On the other hand, data mining increases the efficiency of the employees that can increase performance management during Covid-19.

Impact of artificial intelligence and data mining for developing the performance management during Covid-19- Artificial intelligence and data mining helps to deal with Covid-19. This technological implementation and data mining not only helps to handle the patients also helps to manage the performance management of health organizations. During Covid-19 the entire world faces many health issues. Artificial intelligence helps to overcome problems and increase the efficiency of the health sector [11]. Artificial intelligence and data mining helps to analyze the entire process and make effective decisions for the health sector. The employees can increase their reflective thinking, self-management with this effective process. On the other hand, this data mining system can help to solve the problems and increase the efficiency of the employees. This technology-based process increases human resource management in the health sector and organizational efficiency.

Conclusion

After all these discussions it can conclude that artificial intelligence and data mining helps to manage the performance of the health organization effectively. During the Covid-19 situation, the whole world suffered health issues and the medical sector has gone through difficult challenges. In this segment, technological implementation and data mining helps to handle a huge number of people and provide the patients effective treatment. This artificial intelligence and data mining develop health organizational performance effectively.

References

1. I. Agbehadji, B. Awuzie, A. Ngowi and R. Millham, "Review of Big Data Analytics, Artificial Intelligence and Nature-Inspired Computing Models towards Accurate Detection of COVID-19 Pandemic Cases and Contact Tracing", International Journal of Environmental Research and Public Health, vol. 17, no. 15, p. 5330, 2020. Available: 10.3390/ijerph17155330.

2. C. Pramono, A. Manurung, P. Heriyati and W. Kosasih, "Analysis of The Influence of Entrepreneurship Capability, Agility, Business Transformation, Opportunity on Start-Up Behavior In E-Commerce Companies In Indonesia During The Covid 19 Pandemic", WSEAS TRANSACTIONS ON BUSINESS AND ECONOMICS, vol. 18, pp. 1103-1112, 2021. Available: 10.37394/23207.2021.18.104.

3. A. Zhang, "Influence of data mining technology in information analysis of human resource management on macroscopic economic management", PLOS ONE, vol. 16, no. 5, p. e0251483, 2021. Available: 10.1371/journal.pone.0251483.

4. G. S and K. S, "Review of Data Mining Classification Techniques", Bonfring International Journal of Software Engineering and Soft Computing, vol. 9, no. 2, pp. 8-11, 2019. Available: 10.9756/bijsesc.9013.

5. K. Yang, B. Yang, X. Xu, C. Hoover, M. Smedskjaer and M. Bauchy, "Prediction of the Young's modulus of silicate glasses by topological constraint theory", Journal of Non-Crystalline Solids, vol. 514, pp. 15-19, 2019. Available: 10.1016/j.jnoncrysol.2019.03.033.

6. H. Chu and Q. Ke, "Research methods: What's in the name?", Library & Information Science Research, vol. 39, no. 4, pp. 284-294, 2017. Available: 10.1016/j.lisr.2017.11.001.

7. B. Cypress, "Qualitative Research Methods", Dimensions of Critical Care Nursing, vol. 37, no. 6, pp. 302-309, 2018. Available: 10.1097/dcc.0000000000000322.

8. X. Cheng, A. Alimadadi, I. Manandhar, S. Aryal, P. Munroe and B. Joe, "Abstract P051: Application Of Artificial Intelligence In Transcriptome-based Diagnosis Of Cardiomyopathies", Hypertension, vol. 76, no. 1, 2020. Available: 10.1161/hyp.76.suppl_1.p051.

9. M. Naseem, R. Akhund, H. Arshad and M. Ibrahim, "Exploring the Potential of Artificial Intelligence and Machine Learning to Combat COVID-19 and Existing Opportunities for LMIC: A Scoping Review", Journal of Primary Care & Community Health, vol. 11, p. 215013272096363, 2020. Available: 10.1177/2150132720963634.

10. Y. Duan, J. Edwards and Y. Dwivedi, "Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda", International Journal of Information Management, vol. 48, pp. 63-71, 2019. Available: 10.1016/j.ijinfomgt.2019.01.021.

11. A. Sharifi, M. Ahmadi and A. Ala, "The impact of artificial intelligence and digital style on industry and energy post-COVID-19 pandemic", Environmental Science and Pollution Research, 2021. Available: 10.1007/s11356-021-15292-5.

IMPACT OF CLOUD COMPUTING AND MACHINE LEARNING TECHNIQUES IN CLINICAL DIAGNOSIS: A SYSTEMATIC REVIEW

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ABSTRACT

Cloud computing and machine learning (ML) has recently gained prominence in the healthcare industry.Machine learning and cloud computing play a dynamic role in illness detection, but mainly among those living in rural locations with few medical resources. Machine-learning-based diagnosis systems function as secondary readers, assisting radiologists in accurately identifying illnesses, while cloud-based systems can enable telehealth and remote diagnostics.Artificial neural networks techniques have piqued many academics who want to investigate their potential for illness detection. An extreme learning machine (ELM) is a type of artificial neural network (ANN) with a lot of potential for handling classification issues.

Cloud computing platforms provide a more precise and real-time forecast of the disease's growing tendency. Patients with life-threatening illnesses such as cancer, diabetes, neurological disorders, coronary heart disease, and HIV/AIDS are more susceptible to severe complications. This necessitates creating a solid mathematical foundation for tracking its spread and the automation of monitoring tools for dynamic online decision-making.Innovative solutions are needed to create, manage, and analyse massive data on the growing network of infected patients, patient information, and community movements and combine clinical trials, pharmaceutical, genetic, and public health data.

Hence, ML can be used to manage enormous amounts of data and intelligently forecast disease spread. Cloud computing is utilised to improve the prediction process quickly by using high-speed computations.Cloud computing is gaining traction to solve the problem of delivering sophisticated services and data via the Internet.In addition, the current paper is conducted to understand the impact of cloud computing and machine learning Techniques in clinical diagnosis. The research design has been used in the present study is descriptive. Secondary data is analysed for literature review and purpose of analysis to get a precise conclusion.

Keywords: *Artificial intelligence, Data mining, Human resource management, Robotic implementation.*

Introduction

Technology has played a critical role in defining, reinventing processes, equipment, and medications in healthcare services. Cloud computing is already helping doctors and health care providers in many terms. In addition, many practitioners are drawn to the availability of large, quickly available and reconfigurable resources such as virtual systems, platforms, and applications [1]. This is because they require substantial resources to handle, store, share and use the vast amounts of medical data. Hence, health researchers are shifting their activities to cloud computing.

The adoption of cloud technology can substantially improve information technologies and information-rich services such as medical imaging.Cloud computing provides flexible and scalable computer resources from remote places [2]. Sharing medical data and photos requires collaboration between medical institutions and hospitals, and cloud computing makes it easy.Patient data may be readily kept in virtual archives accessible by multiple healthcare providers, allowing for easier data exchange and a reduction in local storage needs.Cloud computing makes it modest to integrate data on the cloud, making it easier to maintain medical records up to date. Moreover, cloud computing provides many resources that can handle large quantities of biological pictures or voice data.

Another field that can benefit from cloud computing in clinical diagnose is medical image processing. Over the last decade, research in many fields of medical image processing has resulted in ongoing algorithmic advancements. If a novel image processing method enhances

picture quality and clinical yield, it should be compared to existing algorithms.Most importantly, physicians, nurses, and other healthcare practitioners have quick access to comprehensive patient data from various sources, obviating the need for large networks and strict security measures. As a result, patients receive the information, medicines, and therapies they require more promptly and precisely. In addition, if diseases can be detected early and accurate, the chances of early treatment and survival are increased.

Apart from this, Machine learning techniques are being utilised in healthcare for computational decision making in instances where a critical data analysis on medical data is required to discover hidden correlations or anomalies that are not obvious to humans [3].Processing vast amounts of medical data was a significant problem in the early days, which led to the adaptation of machine learning in the biological domain. Machine learning algorithms are being modified and tested regularly to increase their effectiveness in analysing and delivering more accurate data.Moreover, Machine learning methods are being used to help doctors make quick and precise choices by predicting or diagnosing diseases, detecting hidden disorders, giving clinical decision support, and even determining if a medication is acceptable as a therapy for a certain condition.In this systematic review, the main concern will be given towards machine learning and cloud computing since it is the method used in many healthcare activities utilising various approaches and algorithms.
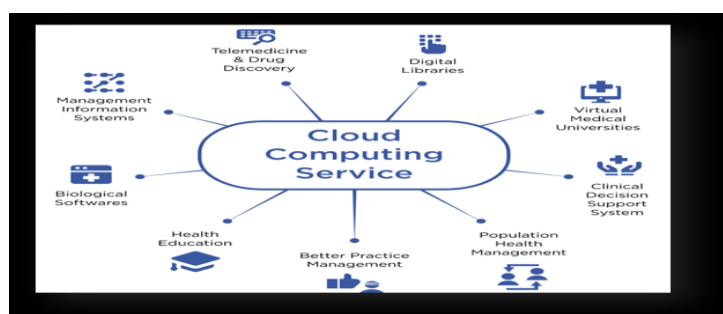
(Figure 1: Cloud computing's uses in the healthcare industry)
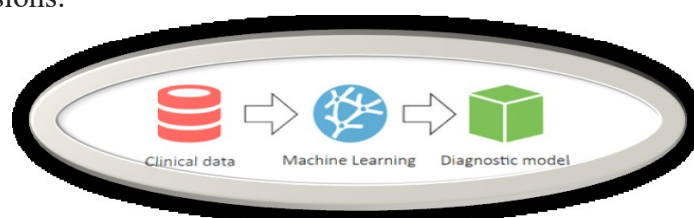(Source:

Literature Reviews

A. Jain, et al., [4] states that, In the healthcare business, cloud computing improves efficiency while lowering expenses. Cloud computing simplifies and secures the exchange of medical records, automates back-end processes, and even makes the design and maintenance of telehealth apps easier. Amid the army of life-saving devices, the hospital's operations are aided by a strong force: cloud computing. The natural language processing tool of machine learning is used to drive critical applications, filter, analyse, and extract essential information from piles of unstructured data, including physician and lab notes (typed and handwritten).Huh. Data analysis in the cloud comes in helpful in extracting information.

LeewayHertz - Software Development Company. 2021 [5] suggest that Machinelearning focuses on how computers learn from data and improve over time.It is typically based on statistics and probability. The quality of the characteristics given to the algorithm determines the accuracy of the model's predictions.Hence, numerous machine learning approaches have been used to predict or diagnose an illness early on, making therapy less difficult and increasing the patient's chances of being cured. Different sorts of diseases have been interpreted as a consequence of ML techniques, although with varying levels of accuracy depending on parameters such as the algorithm employed, feature set, training dataset, and so on. For example, the presence of cancer cells may be identified from thermographic pictures using feature extraction techniques and machine learning techniques. In addition, for cancer diagnosis and classification, various machine learning approaches have been developed.

As per the views of Crespo-Perez G, Ojeda-Castro A[6], With the advancement of technology, medical picture analysis is becoming more sophisticated. Medical imaging is a fast-expanding study field since it is necessary to identify illnesses in many cases. When examining creating predictions from a picture using machine learning, several phases may be recognised. Once an image is provided as input, it will be split into segments to zoom in on the desired region.This imaging is utilised to plan, track progress, and evaluate outcomes.Hence, Machine learning is used with these medical imaging tools to create better surgical planning decisions.

Accordance with Das A, et al., [7] In today's medical world, it's critical to make an accurate diagnosis of a condition by analysing vast volumes of medical data. There are various activities in the fields of medicine and biology are being carried out utilising cloud computing. For example, medical data evaluation, data collection and inspection, imaging, extracting information and more. Data themselves are not helpful; they must be analysed, understood, and acted upon to be beneficial. As a result, cloud computing helps healthcare providers do this more effectively.

(Figure 2: Cloud computing and ML assist in clinical diagnosis)(Source: Self-made)

Research Methodology

The methodology is essential for the creation of analysis work.A descriptive research design has been used in the research.The report uses secondary data to research all the factors and aspects of the current paper to obtain a precise conclusion. It has been collected from articles, essays, books, journals, and literature on the topic. Numerous diseases must be recognised in their early stages to begin appropriate therapy. Otherwise, they may be incurable and fatal. As a result, complex medical data, medical reports, and medical pictures must be analysed less quickly but with better accuracy.Technology has changed the way a sector operates, whether it is retail, automobile, manufacturing, and many other industries. Technologies such as cloud computing and machinelearningare now significantly affecting the health care sector—the emerging continuously and affecting its operations [8]. Health care providers need to access and store a vast amount of data. In such a situation, cloud computing helps them a lot. Cloud computing refers to the delivery of different services by using the Internet. It involves databases, networking, server, storage, and software. Some of the key characteristics of cloud computing are broad network access, rapid elasticity, scalability, and measured service.

Machine learning is the process of data analysis that automates analytical model building. Data preparation capabilities, algorithms, and scalability are required to develop good machine learning systems. Machine learning technology is helping healthcare organisations to meet the growing medical demands, reducing costs and improving operations. This technological innovation proves advantageous for healthcare practitioners to detect and treat diseases more efficiently with personalised care. Further, Machine learning technology is the most common form of artificial intelligence that enables better decision making [9]. It consists of algorithms, defined as the collection of instructions used to perform a particular set of tasks. Machine learning techniques develop various foundational models to resolve the challenges. In addition, Clinical diagnosis can be based on the study of symptoms and signs of disease, which ML quickly does.Machine learning in clinical diagnosis streamlines Record-Keeping with eliminate operational costs and optimise operations [10]. For example, Natural Language Processing or NLP

allows physicians to capture and record the clinical notes, eliminating manual processes. In addition, algorithms of machine learning make it easier to provide clinical decision support and image analysis. Another impact is on data integrity.

The impact of machine learning technologies on clinical diagnosis can be demonstrated by identifying the benefits. For example, this technique is helpful in effectively finding the risk factors. It discovers which variable is more associated with the risk of having any disease. Apart from this, the ML technique helps diagnose the disease quite earlier and on a factual basis. Thus, it has the potential to increase diagnosis efficiency. Besides this, the ML technique is effective in reducing the necessary Hospital visits. This advanced tool schedules the hospital visits of the patient only when it is needed. The primary use of the ML technique in clinical diagnosis can be seen as computerised axial tomography (CAT), Magnetic resonance imaging (MRI), and ultrasound imaging [11]. Machine learning techniques are consistently using, finding and predicting images that indicate any severe issue or disease. Machine learning technologies can be efficiently used in various

medical applications such as drug development [12]. By learning the symptoms, this technology is crucial in designing and manufacturing drugs. Other than this, it helps improve radiotherapy. Cancer treatment is still one of the critical problems in the modern medical world. This practice can be used in radiotherapy to treat the issue of cancer more effectively. Moreover, the implementation of ML in a clinical trial can lower down the cost of conducting any research. This learning system helps find appropriate solutions and organise and analyse the data in the healthcare industry and medical diagnosis area. This advanced tool reduces the time taken for making any crucial decision as artificial intelligence is the technique that stores and analyses the given data. Moreover, it can connect various explanations and clues, which leads to ready to use solutions and quick responses. In a nutshell, it can be said that cloud computing is impacting the clinical diagnosis and centralising medical record access, improving scalability, and offering cost-effective solutions with custom payment models. elow is given some essential factors of how cloud computing assisting in clinical diagnosis-

Table 1: The application of cloud computing

Electronic record-keeping	The application of cloud computing in the clinical diagnosis process describes applying remote services to function, manage, and store healthcare-related data. Cloud computing and storage provides a flexible and reliable solution to health care professionals and hospitals to access server and hold the large volume of data [13]. This data can be kept in a safe and secure environment that is maintained by competent IT professionals. Applying cloud computing techniques has created a significant impact on clinical diagnosis. This can be said that cloud storage is beneficial for maintaining efficient electronic medical record keeping. The goal of this application is to improve the efficiency, safety, and quality of medical services. Further, it also engages the patients and family, improving coordination of care, and maintaining the privacy and security of the patient.
Reduction of data storage costs	Cloud-based health care professionals and solutions manage the administration and maintenance of cloud data storage services. Therefore, it facilitates the organisation to eliminate the initial costs, and concentration can be put on taking care of the patients.
Data security	Traditional data storage has the risk of damage and theft. Cloud computing has brought ease to this task as the individual can establish their own on-site data storage. The sensitive information can be kept confidential and proper security can be ensured.
Enhances the safety of patients	Cloud-based EMR's plays a lead role in improving the safety of patients. For example, this can be illustrated that if a mentally ill patient has visited numerous hospitals in a year with a hope to get appropriate medication, then with the application of EMR solution, the health care provider at every facility can get to know about the interaction that happened between the patient and other doctors.
Drive medical research	With the help of cloud computing techniques, health care providers have the opportunity to leverage analytics and big data [14]. In addition, these advanced techniques have positively impacted medical researchers.
Flexibility	Another significant impact of this tool on clinical diagnosis is that it offers scalability and flexibility. The cloud service providers offer the pay as you go cost structure. The data

	storage capacity can be decided as per the investment and cost. Further, if needed, it can be expanded to any level.

Table 2: Machine Learning Library in Languages

Language	Traditional machine learning libraries	Deep neural network machine learning libraries
Python	Scikit-learn, PyBrain, Nilearn, Pattern, MILK, Mixtend	Keras, Tensorflow (written in both C++ and Python), Nolearn, DeePy, Pylearn2
R	Caret, Boruta, GMMBoost, H2O, KlaR, rminer	Darch, DeepNet
C++	Shogun	Caffe, EBLearn, Intel Deep learning Framework, Tensorflow (written in both C++ and Python)
Java	Encog, Spark, Mahout, MALLET, Weka	Deeplearning4j
JavaScript	Cluster, LDA, Node-SVM	ConvnetJS

Findings/ Results

The researcher carefully examines secondary data for literature review and the purpose of examination and conclusion. Several publications from reliable sources were scanned and analysed to acknowledge the impact of cloud computing and machine learning in clinical diagnosis. The study's findings show that healthcare providers widely use machine Learning and Cloud Computing to track the disease, anticipate epidemic growth, and devise tactics and regulations to stop it from spreading. In addition, an improved model based on machine learning has been used to estimate disease risk.

Further, Machine learning has been used in the healthcare industry, from extracting medical papers to predicting or diagnosing diseases. The incorporation of machine learning techniques into the field of computational biology has considerably enhanced medical imaging. Many clinical diagnoses are being made utilising medical image processing techniques and machine learning algorithms. Additionally, machine learning-based computational decision making is used in patient care, resource allocation, and research on therapies for various diseases.

Hence, it is clear from the findings with the help of cloud computing and ML that all the above points should be addressed in healthcare, and those duties should be accomplished quickly.

Conclusion

This study has been discussed how Machine Learning and cloud computing can help predict the growth of severe diseases. Machine learning has been used in many areas of the examined topic in the current environment. Machine learning is used in illness diagnosis and prediction, medical imaging, medication repurposing, biological event extraction, and a variety of other applications in healthcare.For example, the dataset could be analysed by processing the medical image data using unsupervised machine learning techniques like clustering. The surgeon could then state to determine if any crucial information was misplaced while planning the surgery or confirm that the chosen surgical approach is appropriate for the patient.This is why machine learning techniques have made it feasible to forecast sickness in the healthcare field.Machine learning will enhance diagnostic accuracy by plummeting diagnostic mistakes.

In addition, Cloud computing gives enormous potential to improve various healthcare-related functions, such as telehealth and virtual care, medication adherence, resource inefficiency, personal data privacy, and medical record uniformity. In addition, cloud computing may increase its efficiency and efficacy by utilising an open platform. It also allows health care

providers to communicate with patients directly, delivering better treatment and early clinical diagnosis.

Future work:- Machine learning is also utilised in medical applications to analyse real-time, high-resolution physiological data. There are numerous that should be addressed in future research. The use of machine learning in biomedicine is something that may be discussedfor future research. To execute the activities above with datasets, algorithms are necessary. As a result, new machine learning-based statistical approaches are critical in today's medical practice.The journey began with integrating machine learning into computational biology and has since progressed through many milestones, culminating with the advent of precision medicine.

References

1. Abdelaziz A, Salama AS, Riad AM, Mahmoud AN. A machine learning model for predicting of chronic kidney disease based Internet of things and cloud computing in smart cities. InSecurity in smart cities: models, applications, and challenges 2019 (pp. 93-114). Springer, Cham.

2. A. Jain, A. K. Pandey, (2019), "Modeling and Optimising of Different Quality Characteristics in Electrical Discharge Drilling Of Titanium Alloy (Grade-5) Sheet" Material Today Proceedings, 18, 182-191

3. A. Jain, A. K. Pandey, (2019), "Multiple Quality Optimisations in Electrical Discharge Drilling of Mild Steel Sheet" Material Today Proceedings, 8, 7252-7261

4. A. Jain, A.K.Yadav & Y. Shrivastava (2019), "Modelling and optimisation of different quality characteristics in electric discharge drilling of titanium alloy sheet" Material Today Proceedings, 21, 1680-1684

5. Cloud Computing in Healthcare | Cloud-based Healthcare Software [Internet]. LeewayHertz - Software Development Company. 2021 [cited 5 August 2021]. Available from: https://www.leewayhertz.com/cloud-computing-in-healthcare/

6. Crespo-Perez G, Ojeda-Castro A. Convergence of cloud computing, Internet of things, and machine learning: The future of decision support systems. Int. J. Sci. Technol. Res. 2017;6(07):131-6.

7. Das A, Rad P, Choo KK, Nouhi B, Lish J, Martel J. Distributed machine learning cloud teleophthalmology IoT for predicting AMD disease progression. Future Generation Computer Systems. 2019 Apr 1;93:486-98.

8. Jayatilake S, Ganegoda G. Involvement of Machine Learning Tools in Healthcare Decision Making. Journal of Healthcare Engineering. 2021;2021:1-20.

9. Kumar SA, Kumar H, Dutt V, Dixit P. The Role of Machine Learning in COVID-19 in Medical Domain: A Survey. Journal on Recent Innovation in Cloud Computing, Virtualization & Web Applications [ISSN: 2581-544X (online)]. 2020;4(1).

10. Lahoura V, Singh H, Aggarwal A, Sharma B, Mohammed MA, Damaševičius R, Kadry S, Cengiz K. Cloud computing-based framework for breast cancer diagnosis using extreme learning machine. Diagnostics. 2021 Feb;11(2):241.

12. Shameer K, Johnson KW, Glicksberg BS, Dudley JT, Sengupta PP. Machine learning in cardiovascular medicine: are we there yet?. Heart. 2018 Jul 1;104(14):1156-64.

13. Six Ways Cloud Computing is Improving Healthcare [Internet]. Built In. 2021 [cited 5 August 2021]. Available from: https://builtin.com/cloud-computing/cloud-computing-in-healthcare

14. V. Panwar, D.K. Sharma, K.V.P.Kumar, A. Jain & C. Thakar, (2021), "Experimental investigations and optimisation of surface roughness in turning of EN 36 alloy steel using response surface methodology and genetic algorithm" Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.03.642

15. Wong KK, Fong S, Wang D. Impact of advanced parallel or cloud computing technologies for image guided diagnosis and therapy. Journal of X-ray science and technology. 2017 Jan 1;25(2):187-92.

IMPACT OF TOTAL QUALITY MANAGEMENT APPROACHES IN RETAINING AND INCREASING CUSTOMER SATISFACTION

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ABSTRACT

A comprehensive study of total quality management has been made in this research, alongside discussions being presented based on a number of related procedures and principles. Alongside providing a definite knowledge gap that has been identified, a definite research aim and a number of related objectives have been presented. The concept of total quality management has been discussed in detail, while mentioning key factors of TQM that affect customer retention and satisfaction aspects. A conclusive research design has been followed, alongside a secondary qualitative data collection method being conducted. As per data analysis, thematic analysis approach has been undertaken in accordance with the provided research objectives, alongside relevant secondary data to support such. Finally, a thorough discussion has been made that highlights the key findings as per the analysis, followed by a conclusive report

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Introduction

Research problems

The aspect of total quality management (TQM) is defined as a certain form of business management strategy that involves providing maximum value to respective customer bases. In this regard, every employee, primarily involved in direct interactions with the customers, are encouraged to make constant improvements with regards to a wide variety of customer service skills [15]. As per this research study, key issues related to customer retention and satisfaction have been discussed, with such being largely affected across every business owing to the recent COVID situation. Owing to these identified problems, application of relevant TQM aspects has been discussed in this study.

Knowledge gap

Information with regards to workforce status within a certain company, involving employee satisfaction can be readily obtained from respective company reports. However, various negative aspects related to both customer satisfaction and retention is difficult to gather, owing to the biased nature of such information. Additionally, such bias is observed within various company research and interview articles as well, thereby implicating the accuracy of the data obtained for this research purpose.

Aims and objectives

Aim: The aim of this study is to analyze and present the overall positive impact of total quality management on customer retention and satisfaction

Objectives

- To identify the key factors that impact customer retention and satisfaction aspects within a certain company
- To understand the impact of Covid-19 upon customer retention and satisfaction on a global scale
- To analyze the applicability of key TQM principles into mitigating the causes to low customer retention and satisfaction metrics

Literature Review

Concept of total quality management

The concept of total quality management defines a certain model of business

management that places focus on maximizing customer satisfaction in order to achieve long-term business success[9]. Total quality management sets out an array of principles for the purpose of creating an exact understanding regarding the key activities that needs to be undertaken and implemented in order to maximize the value provided to the customer base. In this regard, around 3 key principles of TQM can be defined and has been presented as follows:

- Customer focus: This principle entails the requirement to understand the exact customer needs and preferences within a particular market, based on which products and services can be designed accordingly.
- Leadership: In accordance with the leadership approach, following a transformative style that involves an inspirational form of leadership strategy

would serve to maximize employee engagement, thus allowing for increased cooperation and performance with respect to customer value production [14].

- People involvement: On par with transformational leadership approach, involving respective employees across every key decision-making process within the company ensures a highly innovative workflow to be maintained, serving to significantly improve value production.

Factors affecting total quality management approaches

Implementation of a certain form of total quality management approach is dependent upon a wide range of factors, primarily pertaining to various internal functionalities of a particular business and is provided as such:
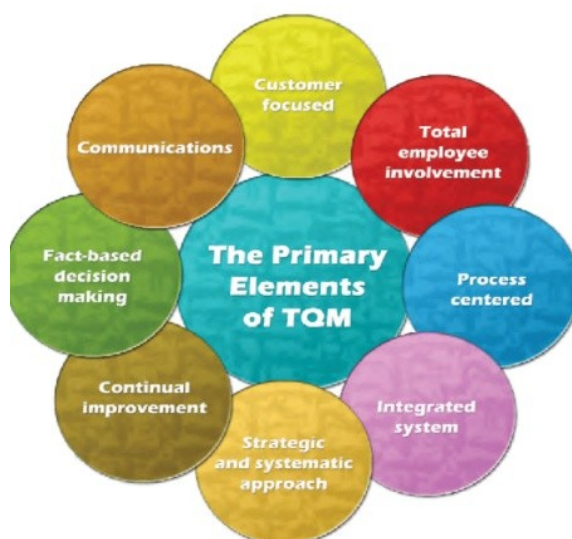

Figure 1: Main Elements of Total Quality Management
(Source: Influenced by [1])

Employee involvement and fast decision-making

Increasing employee involvement across every key business decision would enable a highly innovative approach to be undertaken across respective operations. Additionally, this would enable a gradual improvement within individual employee skills, leading to increased performance and faster decision making, primarily while facing potential risky situations. This enables a streamline value chain

management system ensuring increased customer retention and satisfaction levels [1].

Continuous improvement through communication

Undertaking an improved communication protocol across every workforce level allows greater clarity and understandability with respect to each specific allocated tasks and operations. This significantly improves the overall workflow and hence, allows greater performance to be obtained. Additionally, this helps every employee to stay engaged and

provide appropriate cooperation with regards to every value production strategy.

Inclusion of integrated system

Implementation of an integrated system allows individual business departments to work with a high level of synchronization, thus allowing a more efficient information flow. Additionally, this also allows the adoption of effective technological implementation as well. For instance, implementation of AI and Big data analytics across marketing and logistics respectively would allow exact customer needs and preferences to be determined, allowing product specifications to be set accordingly while maintaining appropriate value standards [6].

Effect of total management approaches in customer retention
Table 1: Increase of market share of television of Samsung

Year	Market share of television
2018	29.0%
2019	30.9%
2020	31.9%

(Source: [18])

Customer retention aspect is primarily dependent upon the exact individual requirements being met by a certain product or service provided by a certain company. In this regard, taking a customer centric approach through implementation of effective TQM procedures entails effective marketing and research operations to be undertaken [10]. This serves to significantly improve the value production within a certain market while ensuring brand value and brand image to be considerably increased. For instance, Samsung has implemented various strict procedures with regards to product quality assurance, focused upon significantly improving customer safety.

This involves an enhanced 8-point battery check system that checks the durability of mobile batteries from component level to the shipment level of the supply chain.

On the other hand, Samsung has improved quality of television to attract more customers and it has been witnessed that the company has increased market share from 30.9% in 2019 to 31.9% in 2020 [18]. Thus, Covid19 has not affected market shares of the product because of maintaining quality in the competitive market. The company's multi-layer safety protocol checks for implementation of appropriate safety standards with regards to the overall design and component materials [8].

Effect of total quality management approaches in increasing customer satisfaction
Table 2: Increase of net profit of Colgate Palmotive (India) Limited

Year	Increase of net profit after tax (Lakhs)
2015	558,98
2016	581,17
2017	577,43
2018	673,37
2019	775,57

(Source: [19])

Customer satisfaction, being a primary influencing factor to that of customer retention, is mostly dependent on various aspects as per the provided products and services. Hence, this primarily entails an increased level of customer satisfaction upon acquisition of higher product quality as per the market standards. Additionally, pricing strategies also play a vital role and a lower price, while maintaining appropriate quality standards, allows for more customer satisfaction to be obtained. Besides accurately meeting all respective product preferences and standards, providing various other additional benefits through effective customer services protocols also forms a prime component of a TQM management infrastructure. Furthermore, implementation and utilization of sustainable business practices

also generates significant appeal from respective customer bases, thereby allowing further customer satisfaction levels to be attained [13]. The table above proves the point that sustainable business generates net profit as Colgate Palmolive (India) Limited has witnessed an increase in net profit from 673,37 lakhs in 2018 to 775,57 lakhs in 2019 [19].

Theoretical framework

Deming Model of Quality Management

This model presents a number of management protocols and practices that serve to provide a definite understanding among various businesses to increase respective quality production procedures and standards, thereby allowing increased productivity and profitability within respective markets [2]. In this respect, fourteen specific practices have been identified and defined within this model and has been provided as follows:

- Creating a definite purpose for enhancing improvement criteria for every product and service provided
- Adopting a sustainable business philosophy
- Avoid sole dependance upon inspections to ensure appropriate quality standards
- Minimizing supply chain costs via working with a single supplier
- Make constant improvements on a regular basis within product, planning and service
- Adopt effective employee training and developmental programs
- Adopt an effective leadership style
- Avoid fear while taking key business decisions
- Eliminating key barriers within workplace management
- Avoiding workforce slogans and exhortations
- Avoiding quota specific workforce goals
- Avoiding the annual rating and merit system
- Encourage education and self-improvement within the entire workforce
- Involve every individual employee within every key business decision with regards to transformative processes [4]

Methods

Context of the study

In regards to appropriate implementation of various TQM procedures, employee retention and satisfaction rates with regards to a global scale across every key global industry have been considered as the primary context. As has been mentioned before, owing to high levels of information bias within individual company information, a specific company context has been avoided and focus is placed more upon a demographic aspect with regards to the global working populace across respective industries. Accordingly, the key variables for this research project involve various customer retention and customer satisfaction metrics, with such being applied upon the backdrop of appropriate TQM implementation while comparing those metrics prior to such implementation.

Research Design

Research design refers to the actual form of data collection being applied within the research, in tandem with a particular analytical structure. There are mainly two forms of research design that can be implemented, being exploratory and conclusive. Exploratory design provides a generalized overview upon the provided research topic, while a conclusive design involves a highly detailed research structure that presents a certain conclusion as per research findings [7]. In this study, a conclusive report is required to be provided as per research requirements and hence, a conclusive design has been undertaken.

Sampling strategy

Undertaking a certain form of sampling strategy involves the actual populations to be interacted with based on which the most suitable candidates are to be selected in order to carry out a primary form of data collection. As per this research study, an entirely secondary form of data collection is to be undertaken and hence, no such sampling strategy is necessary.

Data collection methods

As has been mentioned above, a secondary data collection method is to be undertaken for this research purpose. In this regard, the main source of such secondary data would be various online journals, newspapers and reports, with such being collected mainly from Google Scholar. Additionally, a number of statistical

and related websites are also to be referenced in order to provide relevant visual data and tables as per research requirements.

Data analysis method

Since a secondary qualitative data collection method is to be conducted, data analysis method has been performed in a theme-based procedure. These themes have been generated in accordance with research objectives that have been mentioned earlier, alongside various supporting evidence and relevant data being provided as well. Hence, around three themes will be provided based on the main variable as discussed, involving customer satisfaction and customer retention, and applicability of TQM strategies with regards to these aspects.

Results

Theme 1: Key factors impacting customer retention and satisfaction within a certain business background

Customer retention and satisfaction within a certain company is driven by certain key aspects, involving customer loyalty, prevention of customer loss and reduced commodity costs while maintaining appropriate quality standards. In this regard, customer loyalty forms the prime defining factor of both customer retention and customer satisfaction and can be readily measured via various customer loyalty metrics, with most commonly used being the customer churn rate [5]. Being defined as the percentage of customers discontinuing subscriptions of a particular product or service, reduction of customer churn

rate can be attributed to certain key improvement aspects. According to various reports, around 36 elements can be defined in that respect, with product quality being the most preferred element. As compared to other elements, the impact of product quality on customer loyalty is about 7.6%, followed by 6.1% for expertise and 5.5% for responsiveness. Moreover, churn rate reduction of only 5% by improvements made with respect to these elements can increase overall profitability by around 25% [17].

Theme 2: Impact of Covid-19 upon customer retention and satisfaction on a global scale

On account of this pandemic situation, availability and production of proper customer services across almost every business firm has been severely impacted. Owing to the huge number of restrictions across every sector, meeting customer demands have become increasingly difficult, thereby adversely affecting the customer retention capabilities of respective firms. In response to this, such firms have been concentrating upon improving customer demand recovery through application of various effective strategies, primarily involving the Go-to-market sales model. According to reports, online support and e-commerce aspects have been largely focused upon by various companies. For instance, the percentage at which online support is being provided by respective businesses during this COVID situation has increased up to 62%, as compared to being 52% before COVID [16].
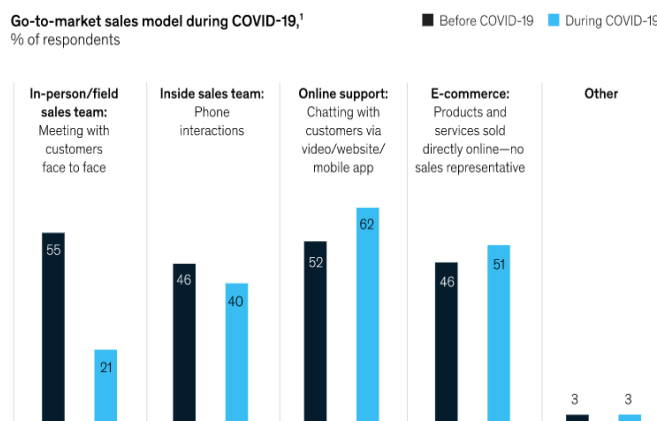

Figure 2: Go-to-market sales model
(Source: Yu et al. 2021)

Theme 3: Role of TQM procedures in mitigating key issues impacting customer retention and satisfaction within a company

The key procedures in TQM to maintain customer retention and customer satisfaction aspects involve providing an effective customer feedback survey, engaging in customer education, and indulging in good communicative practices with every individual customer. In this respect, improving overall customer experience serves as the primary driving factor for maintaining sufficient levels with respect to both customer retention and customer satisfaction. For instance, an improved customer education strategy allows respective customers to understand the true value of every product and service being provided while increasing awareness regarding various other related product information. This ultimately helps a customer to decide upon the most suitable product, thereby improving customer experience and in turn, custom retention and satisfaction [3].

Discussion

As per the results provided, customer retention and satisfaction aspects can be primarily attributed to increased value production aspects, primarily via effective product quality management while maintaining a highly affordable price range [11]. Such can be readily justified via utilizing the customer churn rate metric that provides insight regarding the key aspects that cause decline in customer loyalty, primarily being low product quality and poor service responsiveness. Additionally, indulging

in effective interpersonal communication with customers has also been determined to impact customer satisfaction metrics. In response to retention impacts being significantly bolstered due to COVID 19, companies have been undertaking digital service procedures to maintain customer interaction and service production on nominal levels. This also allows every TQM procedure to be conducted more effectively, including improved customer feedback surveys across respective digital platforms and an improved communication process facilitated via increased customer activities across various social media platforms [12].

Conclusion

As has been discussed, implementation of effective TQM procedures within a company mostly entails improved business processes that involve adoption of effective tools and technologies in order to attain a high level of customer retention and satisfaction rates. In this regard, practices like improved training and skills developmental procedures, alongside maintaining a highly integrated business environment have been deemed to be highly effective. However, implementation of such tools requires significant investments to be made and hence, may not be a viable option for startups and small companies across respective industries.

Reference

1. Abbas, J., 2020. Impact of total quality management on corporate green performance through the mediating role of corporate social responsibility. Journal of Cleaner Production, 242, p.118458.
2. Alauddin, N. and Yamada, S., 2019. Overview of Deming criteria for total quality management conceptual framework design in education services. Journal of Engineering and Science Research, 3(5), p.2019.
3. Anees, R.T., Nordin, N.A., Anjum, T., Cavaliere, L.P.L. and Heidler, P., 2020. Evaluating the Impact of Customer Relationship Management (CRM) Strategies on Customer Retention (A Study of Fast Food Chains in Pakistan). Business Management and Strategy, 11(2), pp.117-133.
4. Aryanny, E., 2020, July. Analysis of Quality Management by Implementing Total Quality Management Based on Deming Prize. In Journal of Physics: Conference Series (Vol. 1569, No. 3, p. 032015). IOP Publishing.m
5. Ascarza, E., Neslin, S.A., Netzer, O., Anderson, Z., Fader, P.S., Gupta, S., Hardie, B.G., Lemmens, A., Libai, B., Neal, D. and Provost, F., 2018. In pursuit of enhanced customer retention management:

Review, key issues, and future directions. Customer Needs and Solutions, 5(1), pp.65-81.

6. Bolatan, G.I.S., Gozlu, S., Alpkan, L. and Zaim, S., 2016. The impact of technology transfer performance on total quality management and quality performance. Procedia-Social and Behavioral Sciences, 235, pp.746-755.

7. Changiz, T., Yousefy, A. and Fakhari, M., 2020. Research utilization process model: A cyclical, spiral, and developmental process to provide conclusive research knowledge in health professions education. Medical Journal of the Islamic Republic of Iran, 34, p.79.

8. Dahlgaard-Park, S.M., Reyes, L. and Chen, C.K., 2018. The evolution and convergence of total quality management and management theories. Total Quality Management & Business Excellence, 29(9-10), pp.1108-1128.

9. Khanam, S., Siddiqui, J. and Talib, F., 2016. Role of information technology in total quality management: a literature review. Khanam, S, Siddiqui, J. and Talib, F.(2013),"Role of Information Technology in Total Quality Management: A Literature Review", International Journal of Advanced Research in Computer Engineering and Technology, 2(8), pp.2433-2445.

10. Mohammed, K., Alotibie, B.A. and Abdulaziz, A., 2016. Total quality management in Saudi higher education. International Journal of Computer Applications, 135(4), pp.6-12.

11. Obeidat, B.Y., Hashem, L., Alansari, I., Tarhini, A. and Al-Salti, Z., 2016. The effect of knowledge management uses on total quality management practices: A

theoretical perspective. Journal of Management and strategy, 7(4), pp.18-29.

12. Saffar, N. and Obeidat, A., 2020. The effect of total quality management practices on employee performance: The moderating role of knowledge sharing. Management Science Letters, 10(1), pp.77-90.

13. Sahoo, S. and Yadav, S., 2018. Total quality management in Indian manufacturing SMEs. Procedia Manufacturing, 21, pp.541-548.

14. Sohel-Uz-Zaman, A.S.M., 2016. Implementing total quality management in education: compatibility and challenges. Open Journal of Social Sciences, 4(11), p.207.

15. Y. Pambreni, A. Khatibi, S. M. Azam, and J. Tham, "The influence of total quality management toward organization performance," Management Science Letters, pp. 1397–1406, 2019.

16. Yu, J., Seo, J. and Hyun, S.S., 2021. Perceived hygiene attributes in the hotel industry: customer retention amid the COVID-19 crisis. International Journal of Hospitality Management, 93, p.102768.

17. Yu, R., An, X., Jin, B., Shi, J., Move, O.A. and Liu, Y., 2018. Particle classification optimization-based BP network for telecommunication customer churn prediction. Neural Computing and Applications, 29(3), pp.707-720.

18. 2020 Business Report. Samsung. August 2nd 2021. [Online]. Available: https://images.samsung.com/is/content/samsung/assets/global/ir/docs/2020_Business_Report.pdf

19. 2020. Annual Report. Colgate-Palmotive (India) Limited. Available: https://www.colgateinvestors.co.in/media/2449/colgate-ar-2019-20-full.pdf

MEASURING THE SUCCESS OF MARKETING STRATEGY EMPLOYED BY NEW E-BUSINESS

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ABSTRACT

Marketing is one of the most significant and costly investments that any company will undertake.Customers are easily distracted, therefore grabbing their attention has become critical. Consequently, Marketing comes in to help E-commerce firms overcome these problems. E-commerce plays a vital role in the marketplace. It is becoming a fast-growing field of business as more consumers make purchases online rather than in traditional retail locations. Hence, the company needs to promote their product effectively in the marketplace. E- Businesses are increasingly turning to a virus form of marketing to raise brand awareness, expand their client base, and enhance their return on investment (ROI). As an e-commerce business owner, marketing platforms are an ideal method to reach out to many clients at once. The type of marketing strategy has a significant impact on a customer's purchasing decision. Customers will be engaged and loyal to the brand if e-business uses the appropriate digital marketing approach.For eCommerce businesses, marketing has become a lifeline since it provides the best of both: REACH and ROI.It has been seen that every e-business has implemented different strategies of marketing. It's critical to do everything right when it comes to promoting products and services to the public.As the owner of an e-commerce firm, you must design such a plan and begin implementing it immediately.The current paper is conducted for measuring the success of the marketing strategies employed by new e-business. The ability to accurately measure the success of advertising and digital marketing efforts is critical. In this paper, the research sets out various metrics to measure the success of the marketing strategy implement by numerous new e-business.

Keywords: Digital marketing; E-business; Measurement metrics; Marketing strategy

Introduction

The paper aims to measure the success of the marketing strategy employed by new e-business. Measurement is the key to optimising the success of marketing campaigns. Marketing strategy is concerned with overall planning that has been done for reaching towards consumers and developing them into customers of their product or services [1]. It also involves value proposition, target customer demographics for achieving success in the long run. It is identified that there are mainly four types of marketing strategies such as diversification, product development, market development and market penetration. In the present market scenario, most e-business emphasises developing effective marketing strategies with the help of that they can able to enhance their market share and profits. With respect to this, success can be measured easily by emphasising

adopting measures that are feasible for running the operation in the future.

There are different perspectives involved through which success can be measured by e-businesses with regard to the deployment of marketing strategy. It is evaluated that monitoring results in real-time are also considered an essential perspective with the help of that effectiveness of marketing strategy can be analysed easily. In this case, different tools can be used by e-businesses for measuring success in real-time and customised options for creating a daily dashboard. Here, collecting data and monitoring results by focusing on real-time supports in achieving success for the long term. This helps in determining problems and, along with this, optimising the experience of the customer.

Apart from this, different metrics can also be used by e-businesses for measuring success. It is evaluated that return on investment is one of

the metrics that can be adopted by e-businesses for considering success in the future terms. Return on investment is also a factor that constitutes building out various aspects that are suitable for running operations effectively [2]. It is an excellent way for measuring impact on marketing strategy with the help of that sales can be improved. With respect to this, cost per engagement is another metric that emphasises building brand image by analysing performance. E-businesses also focus on attracting customers and, along with this, cater in indulging into practices through which success can be achieved efficiently.

It is analysed that email engagement is another perspective that is taken into account by e-businesses with the aim of measuring success. In this case, different aspects are considered related to the involvement of monitoring the marketing environment. It is found that metrics are the most efficient concepts that are taking into consideration by e-businesses for measuring success related to marketing strategy. In addition to this, pay per click is also a metric with the help of that success can be determined by e-businesses with regards to marketing strategy. It is essential for e-businesses to analyse success; otherwise, it has a more significant impact on business activities as well as on the brand image of the firm.

(Figure 1: Digital marketing strategy)
(Source: Marketing Insider Group. 2021)

Literature Reviews

As per viewA. Jain, [3] website traffic is a critical metric through which e-businesses are able to measure the success of their marketing strategy. It is mainly concerned with new visitors or either returning old visitors to the website of the business. It is essential to emphasise building unique aspects that are feasible for running activities and, along with this, constitute in meeting change that is suitable for measuring success in the extended period. With the help of these metrics, e-businesses gain an idea about their operations and based on that, they can analyse their performance in a better way. Therefore, it is necessary to consider and emphasise bringing aspects that are feasible for building brand image in the market.

A. Jain, A. K. Pandey, [4] stated that new e-businesses have to understand certain reasons before starting their business as understanding customer journey is one of them. Apart from this, learning about site content is also important and also constitute in performing efficiently. It is essential to develop and gather information about customers through which a better understanding of marketing strategy success can be evaluated. With respect to this, if the company aims to consider success factors, it constitutes meeting objectives and goals. Therefore, it is crucial for a company to inculcate and emphasise on development of business activities through which success can be delivered significantly.

According to A. Jain, et al., [5] website behaviour is another tactic with the help of that presence of customers can be evaluated quickly

and along with this emphasise on running the operation for the long term. It is related to SEO efforts that are working and supports in providing an understanding of the behaviour of customers with new e-business. In this case, different elements are considered, such as page views per visit, bounce rates and time spent on a website. So, this caters to gaining knowledge about success that has been indulging and focusing on determining suitable change for running business activities. It is vital to decide on success with the help of that operation can be evaluated and cater to achieve success.

Brenner M, Brenner A[6] stated that intangible benefits could be gathered, emphasising meeting perspective that is important and indulging into practices. E-businesses developed marketing strategies to gain methodologies and measure performance that is beneficial for achieving goals and objectives.

Marketing performance metrics are only used by professionals with the help of that success of employing strategy in the business can be measured. It is necessary to emphasise on determine success and along with this progress is catered through which further development can be done. The marketing strategy can be formulated, and based on that; success can be catered through which better understanding can be achieved to a more significant extent.

As per the study of GrayCell Technologies. 2021 [7] consistency is also an important aspect suitable for the development of activities that are essential in meeting a success. Here, a measurement system can also be developed with the help that success is achieved for an extended period. It is vital to building aspects that are suitable for running operations for the future.

(Figure 2: Different marketing strategy)
(Source: GrayCell Technologies. 2021)

Research Methodology

Qualitative method design has been used to conduct the research. This research examines various literature to provide a detailed analysis of marketing and its measurement metrics. Secondary data is used in the study to obtain precise conclusions. All data collected from multiple sources was examined and evaluated to get consistent and reliable information. Further,

the entire research strictly follows the methods and procedure to conduct this investigation. It is necessary to implement the process correctly to get an accurate result.

A well-considered, well-informed marketing plan is the foundation of effective marketing. An effective marketing plan will assist businesses in defining clear, attainable, and quantifiable marketing goals for the brand [8]. Every successful product or service on the

market today is the result of an effective marketing strategy. It is one of the most critical components in providing businesses with all of the necessary information and assisting them in making sound business choices.In addition, with the fast-evolving technologies that are emerging in modern industry, a business must In this context, one of the most challenging elements of establishing a successful e-commerce business is competing against internet behemoths like Amazon and eBay.It has been found that numerous new e-business is employing various types of the marketing strategy to grow its business in the industry.Unfortunately, the e-commerce sector is full of companies who are just interested in increasing their sales and have no regard for their consumers or their interests [9]. While this is one method to manage an internet business, it does little to develop client loyalty or distinguish the brand from the competition.

Taking the example of Modcloth, they decided to make its e-commerce site a social experience for their consumers, including them every step of the way. They achieve this through active social media profiles and outstanding customer service, focusing their whole business on finding the appropriate product and fit for each and every client.In addition, their high-quality pictures, behind-the-scenes blog articles, and detailed product lists make shopping at their site a pleasant and exciting experience.Hence, it has been seen that Modcloth created a robust online community out of their consumers, guaranteeing that they'll keep coming back to their eCommerce site. Moreover, As Seen On Screen, or ASOS, is a fashion company that highlights the most recent celebrity fashion trends. Since becoming a multibillion-dollar corporation, the eCommerce giant has undoubtedly figured out which marketing strategies work best. Like many of the top e-commerce firms, ASOS depends extensively on content marketing, influencer marketing, and social advocacy. In some aspects, their arc of growth is so high and significant as to be likened to Amazon as an online firm.

Consequently, it has been found that newe-business can promote in a variety of ways as such social media is fast becoming a critical component of a successful e-business strategy

be ready and prepared to adapt to its ever-changing environment. In order to remain competitive, and e-business must develop a robust marketing strategy. It aids in the discovery of areas affected by business growth and, as a result, aids in the development of an organisational plan to meet consumer demands. [10]. Setting up a Twitter account and a corporate blog are two examples of a solid social media e-business strategy model. The blog is designed to provide visitors with helpful information about the company's goods and services. The primary focus should be on connection development and delivering valuable information, not on hard-selling when using social media as a passive source of sales.Furthermore, Pay-per-click advertising is an example of an e-business advertising approach [11]. The business needs to create a list of keywords relating to their product or service, evaluate their popularity, and then utilise the best in pay-per-click ad campaigns. This is an excellent approach to contact a specific audience that is already interested in what the business has to offer. Apart from this, numerous metrics can be used to measure the marketing strategy's success, such as Return on investment (ROI), Cost per Sale, Cost per lead,pay per click, email- engagement, overall site traffic, number of downloads, and more.

Return on Investment (ROI) is a metric that evaluates how much money a campaign generates for every dollar spent [12]. For example, if smith spent $1,000 on a campaign that resulted in $5,000 in sales, his return on investment (ROI) is $2,000, or 200%. This is the best KPI for determining the performance of any marketing initiative since it considers the quality of leads generated. Further, the cost-effectiveness of marketing initiatives is measured by the cost per lead. However, this measure is solely concerned with the campaign's lead generation [13]. It does not assess the quality of leads since it excludes the sales process.Moreover, the contribution of marketing activities to sales statistics is measured by incremental sales. Incremental sales are a fantastic method to compare e-business marketing efforts since they indicate how effective the marketing initiatives are at producing sales [14].

Measuring e-business marketing campaign success comes down to three components. Create specific calls-to-action and landing pages based on these inputs to produce trackable outcomes. They are as follow-

Table 1: Measurement to measure the marketing strategy

Measure	Reach	Act	Convert	Engage
Brand Measures	• Unique visitors • New visitors • Brand/direct visits • Audience share (vs competitors	• Led Volume • Pages per visit	• Sales volume • Led Volumes Follower or fan volumes	• Email list quality • Repeat transactions • Repeat visits • Exit surveys
Content performance Measures	• Share of audience • Key sites with content visible in search • Share of search/ search presence (Findability) • Inbound links • Referring domains	• Page per engagement rate (Bounce, pages per visit, duration) • Shares by users (shareability) • PostRank score • Comments and site interactions	• Lead sign-up and conversion rate by engagement tool • Subscription to email or RSS	• Active customers % (site and email active) • Conversion to fan or followers • % social interactions with content such as Fan page comments • Repeat conversion rate • Email open and CTR
Commercial Measures	• Cost per click and cost per sale • Brand awareness	• Goal value per visit • Online lead contribution (% of total) • Cost per lead • Customer satisfaction	• Conversion rate to sale • Channel conversion rate • Online-originated-sales, revenue and production • Avg order value or cost per sale	• Retained sales growth and volume • Revenue per visit • Revenue per channel and category • The lifetime value of customer and loyalty

(Source: Self-made)

Findings/ Results

The findings of the study suggest that It's crucial to track the performance of marketing campaigns.There are a variety of techniques to calculate ROI, including cost per campaign, cost per sale, and cost per click. Each of them will provide a unique perspective on how the audience interacts with the brand. Whatever sort of campaign an e-business runs or what goals it sets, monitoring current activity is critical to ensuring its success.

Table 2: Different metrics used to measure the marketing strategy

S.no.	Metrics used for measuring success	Its effectiveness
1.	Pay per click	50%
2.	Email engagement	30%
3.	Number of downloads	40%
4.	Overall site traffic	70%

5.	ROI	60 %
6.	Cost per engagement	30%
7.	Conversion rate	50%
8.	Incremental sales	55%

(Source: Self-made)

Conclusion

The report concludes that they defend types of metrics that can measure the success of the marketing strategy employed by new e-business. Essential indicators such as conversion rate, click-through rates, average time on site, page views, and a number of visits provide valuable insight on ecommerce features, customer behaviour and also demonstrates what's working and what's not. Measuring marketing strategy provides insight into how an e-business operates – and may help discover opportunities for improvement. Companies use a variety of marketing techniques to fulfil their definite performance goals. Further, Marketing performance metrics assess the degree to which marketing spending adds to earnings as marketers face increasing demand to produce a return on investment (ROI) on their efforts. It also emphasises how marketing supports and complements activities in other parts of the company, such as sales and customer service. Marketing metrics are numerical data that marketers may use to assess their performance in relation to corporate objectives. Further, Marketing strategies were developed to present products and services in a positive light and influence purchase decisions. Marketing efforts are generally integrated across all channels (e.g., print, email, and social media), and the real influence on target audiences is assessed across all channels.

Future work

When it comes to determining the effectiveness of marketing, there are apparently infinite marketing indicators to consider. This paper has attempted to cover the significant metrics to measure the success of marketing strategy. However, this does not mean that the study does not need future research. Future research is required in order to look at how marketing strategies will evolve to achieve goals and objectives. This study helps marketers decide how to scale up marketing campaigns that help promote products and services to maximise impact on consumers.

References

1. Angeles L. Marketing Effectiveness - How to Measure Your Marketing Success [Internet]. Intechnic. 2021 [cited 6 August 2021]. Available from: https://www.intechnic.com/blog/marketing-effectiveness-how-to-measure-your-marketing-success/

2. Auty L. How to measure marketing campaign success | Beacon [Internet]. Beacon. 2021 [cited 6 August 2021]. Available from: https://www.thisisbeacon.com/digital-marketing/measure-marketing-campaign-success/

3. A. Jain, A. K. Pandey, (2019), "Modeling and Optimising of Different Quality Characteristics in Electrical Discharge Drilling Of Titanium Alloy (Grade-5) Sheet" Material Today Proceedings, 18, 182-191

4. A. Jain, A. K. Pandey, (2019), "Multiple Quality Optimisations in Electrical Discharge Drilling of Mild Steel Sheet" Material Today Proceedings, 8, 7252-7261

5. A. Jain, A.K.Yadav & Y. Shrivastava (2019), "Modelling and optimisation of different quality characteristics in electric discharge drilling of titanium alloy sheet" Material Today Proceedings, 21, 1680-1684

6. Brenner M, Brenner A. What Is Marketing? [Internet]. Marketing Insider Group. 2021 [cited 6 August 2021]. Available from: https://marketinginsidergroup.com/strategy/what-is-marketing/

7. Digital Marketing Services - PPC, SEO, Social Media, Content Writing [Internet]. GrayCell Technologies. 2021 [cited 6 August 2021]. Available from: https://www.graycelltech.com/digital-marketing/

8. Gökşen Y, Karabacak S. Marketing Expansion Strategies in Multinational Marketing: The Role of e-Business. InEconomy, Finance and Business in Southeastern and Central Europe 2018 (pp. 675-688). Springer, Cham.

9. Kabrilyants R, Obeidat B, Alshurideh M, Masadeh R. The role of organisational capabilities on e-business successful implementation. International Journal of Data and Network Science. 2021;5(3):417-32.

10. Sanaei MR, Sobhani FM. Information technology and e-business marketing strategy. Information Technology and Management. 2018 Sep;19(3):185-96.

11. Saura JR, Palos-Sanchez PR, Correia MB. Digital marketing strategies based on the e-business model: Literature review and future directions. Organisational transformation and managing innovation in the fourth industrial revolution. 2019:86-103.

12. Sihare SR. Roles of E–content for E–business: Analysis. International Journal of Information Engineering and Electronic Business. 2018;10(1):24.

13. V. Panwar, D.K. Sharma, K.V.P.Kumar, A. Jain & C. Thakar, (2021), "Experimental investigations and optimisation of surface roughness in turning of EN 36 alloy steel using response surface methodology and genetic algorithm" Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.03.642

14. Wu M, Gide E, Jewell R, Zhang L. CSFs for SMEs in Measuring e-Commerce Success. InE-Business-State of the Art of ICT Based Challenges and Solutions 2017 Jan 18. IntechOpen.

ROLE OF MACHINE LEARNING AND THEIR EFFECT ON BUSINESS MANAGEMENT IN THE WORLD TODAY

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ABSTRACT

In this study, a brief detailed description of the significance of Artificial intelligence (AI) and machine learning (ML) in businesses are described. AI is the emerging trend and technology of the modern world and provides various benefits to firms. AI and ML reduce the overall cost of the business operations and save the money of the organization. It also helps the businesses to make smarter decisions in the business processes and also able to provide solutions to the business problems effectively. The chat bots developed on the basis of AI can communicate with the customers anytime 24/7 and solve the queries of the customers regarding any product or business.

ML creates opportunities for businesses based on business operations and also makes the process fully automated. In addition to this, the ML also improves the cognitive engagement between customers and employees effectively and provides solutions to problems of customers like password issues and many others. Along with that, the study also contains the methods and techniques used for the completion of the study. The researcher has used the secondary qualitative and quantitative data collection methods in this study. In order to implement AI and ML in business operations, companies need to understand the augmentation and automation process. Additionally, the market size of the AI in percentage and $ million is described according to the type of company

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Introduction

In the modern world, everything or business is going online and for the development and growth of the business, digital technology is vital. Artificial intelligence (AI) is an effective and compact technique that can be used for the building of business operations and systems which can mimic or identify the behaviour of humans and the power of decision making. **Machine Learning (ML)** is a part or segment of AI which includes the data for the development of solutions for the tasks. Moreover, the solvers are professionally trained models to effectively solve the problems linked with the tasks of the business. Huge amounts of data and information are provided to the ML models and that and information is derived from linear algebra and probability theory. As the models do not understand the common human language, they only understand the computer language and theory-derived concepts.

In addition to this, there are several advantages of machine learning and AI in various businesses for its growth and development. The goal of ML is to identify the structure of information and data and transfer out to models which may be used by people. The main aim of the study is to find out the significant role of ML and its impacts on business management in the present digital world. Along with that, the study also includes the requirement or demand of AI and ML in the modern world of businesses. The concept of ML provides the users with the facilities like face lock on their phone, share pictures with their friends by fingerprint lock and many other technologies convert the texts of the images into movable texts. In the modern world, the demand for ML and AI installed and developed devices are boosting which will help the customers to operate the devices remotely.

Importance of Artificial Intelligence and Machine Learning in Business performance

There is great importance of AI and ML in businesses and it also helps to improve the production rate and economic growth of the

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companies. Some of the major importance of Ai in businesses is mentioned below:

Saves money and time

In the case of working, machines are more effective and efficient than human beings. The machines developed with AI technology operate 24/7 and they cannot get bored with working [1]. In addition to this, they do not take breaks, sleep and other types of rest which humans take, these qualities make the machines more reliable in the place of working anytime and they are also able to notify about the other works. The machines can analyze huge quantities of data in a few seconds and also take less time to make decisions according to the data and information.

Helps in Smart decision making

In the digital modern world, if the data does not have many uses and make sense then the data is an invaluable resource for businesses. AI-based machines can analyze the data and process the data quickly to generate solutions to business problems. These machines offer more accurate

and predictable answers as per the needs and expectations of the customers.

Enhances Customer experience

If a customer has any query at any time they can chat with the chatbots which helps the businesses to provide customer services 24/7.

Improves productivity and growth

With AI technology the business does not need to put the burden of the large tasks on the employees as the AI machines can do large tasks effectively within a short period of time [2]. Along with that, it improves productivity and growth of the business and it gives more accurate results rather than human beings.

On the other hand, the ML helps the business to identify the opportunities that can profit the organizations and potential risks quickly. The practical implications of ML drive results of the businesses to dramatically improve the bottom line of the businesses. The training of machine learning and the implication of AI in the business takes more time and professional techniques are needed.
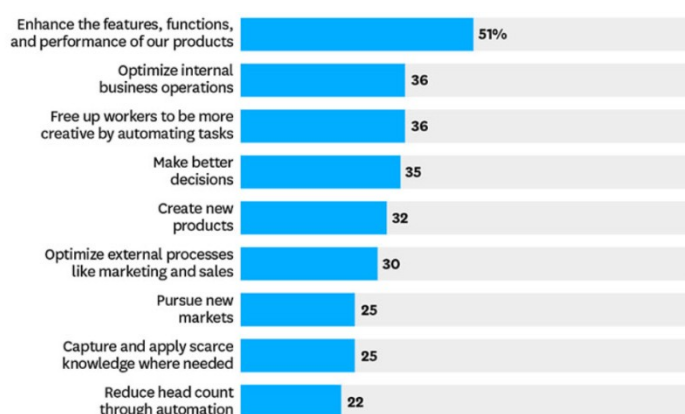

Figure 1: Benefits of AI in business

(Source: [3])

Machine Learning and AI for the modern world

AI and ML are becoming the most important needs of every business in the entire world. AI has three main types and the companies must look and understand these types of AI for its implication. Moreover, the AI can manage the three vital requirements of the business such as

automation of processes, cognitive engagement and cognitive insight of the business.

Automation of process

Most of the tasks of the business have been changed by the implication of AI that is the physical tasks are converted to digital tasks and the back-office operations and financial actions are completed by robotics technologies [4]. The physical tasks such as form filling, data transfer

form email, the record of customer data in the call center, replacement of lost ATM or credit cards, and so on. Therefore, AI helps both customers and businesses to share information, complaints, queries and many others through digital technologies and they can get the answers instantly.

Cognitive Engagement

AI improves the engagement of the customers and employees to become simple and convenient with the help of natural language, chatbots and many others. Intelligent robots or chatbots provide services to the consumers 24/7 and solve the issues or problems with which the customer is facing like password issues and various technical issues in the natural language of the customers [5]. It also makes internal sites for the answering of employee's questions involving employee benefits, HR policies and

information technology (IT). Along with that, ML and AI also make systems for the recommendation of products and services and health treatment to make customized diet and care plans.

Cognitive Insight

It helps to detect the insights of the businesses using the algorithms and vast volumes of data and information. The applications of ML are used for the prediction of the expectations of the customers that what they want to buy and detect the frauds like, insurance claims and credit fraud with real-time data. In addition to this, it also analyzes the data of warranty in order to ensure the quality or safety issues in the automobile and other devices and provides automated personalized targeting of the digital ads.
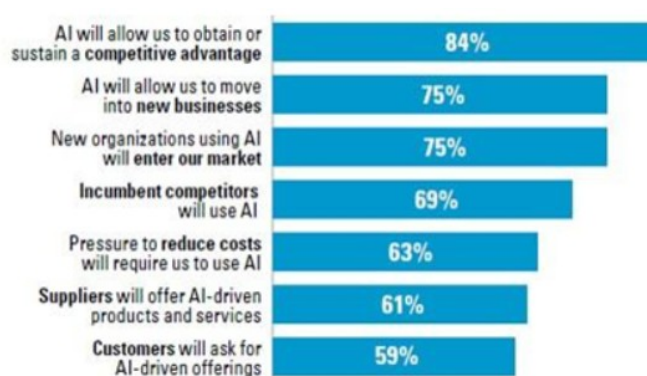

Figure 2: Reasons provided by Global firms for the implementation of AI in business
(Source: [6])

The above-given figure shows the reasons for the AI and ML implementation in business according to the responses of the global based companies. 84% of the companies have acknowledged that AI allows them to obtain competitive advantages in the present world [7]. On the other hand, 75% of the organizations have reported that AI allows them to start a new business and enter the existing market with effective technology. 69% of the companies have reported that most of the competitors use AI-based technology in their business operations [8]. Along with that, 59% of the firms reported that customer demand for the offerings driven by AI and the implication of AI reduces the costs effectively.

Methods and Techniques

For the collection of data and the analysis of data, there are two types of methods available such as primary and secondary methods. In addition to this, both the methods further include quantitative and qualitative data. The primary data can be defined as the data which are collected by the researcher from the main sources directly [9]. On the other hand, the secondary data can be illustrated as the data which are already collected from primary sources and made available for the researchers to use for their research. In this research, the secondary qualitative and quantitative data collection method has been used by the researcher for the completion of the study.

The researcher has collected quantitative data from reliable websites and sources such as **Cellstrat, towards data science** and many

others published after the year 2017. Along with that, the qualitative data has been collected by the researcher from scholarly published journals, articles, research papers and newspapers [10]. For the collection of data from Google scholar, those journals, articles, newspapers and research papers are collected which are published after the year 2017 and contain authors name, year of publication, journal title, topic title and page number.

Result and Discussion

AI and ML can improve any business activity through augmentation or automation.

Augmentation is the process of empowering humans in an operation or activity and automation is the process of human removal from the activity. In this study, here the business needs to understand which process they want to implement in the business activities. Augmentation and automation are of opposite extremes and offer solutions in fully augmented or fully automated ways. These two processes include four strategies such as effectiveness strategy, efficiency strategy, innovation strategy and expert strategy.
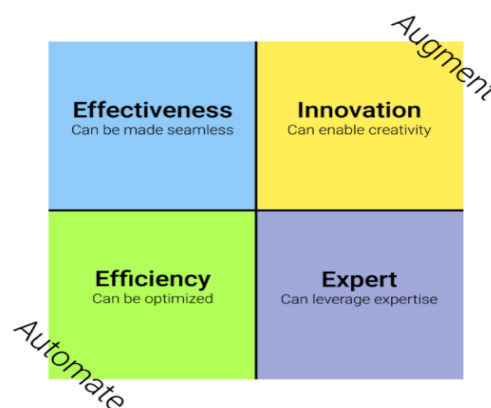

Figure 3: Four strategies for AI implementation in business
(Source: [11])
Table 1: Systematic review of secondary qualitative data

Authors	Findings	Importance
Ayoubi	AI improves the personalized experience of the customers and provides them with effective shopping experiences and helps the businesses to generate sales and enhance the loyalty of the customers. This is the main reason due to which global companies are making an effort for the implementation of AI and ML in their business operations [12].	AI understands the purchasing behavior of the customer and stores the data of the customers about the product and second shows the recommended results for the customers.
Ma	This technology helps the business to communicate and interact with the customers anytime through chats, emails, phone calls and social media. The technique requires humans to interact with it. In addition to this, AI analyzes the data collected from the communication with customers and stores the data in its space [13].	Chatbots developed based on AI can communicate with unlimited consumers at a time and deliver equal service to all of them at the same time.
Mendling	AI is effective in businesses that require continuous communications with huge amounts of consumers per day. On the other hand, the applications of AI and ML instantly discover the data in the business processes.	For example, AI and ML can be used in trains, buses, airlines and many others that can have thousands of passengers every day. The AI also provides advantages to the businesses related to the insights [14].
Gudivada	ML and AI can be utilized to control the robots working in the factories and maintaining the ideal temperatures by intelligent heating [15].	AI can operate or implement technologies that can increase automation in the business.
Attaran	In the modern world, AI can recruit people for business operations and reject those who do not meet the required	It reduces not only the cost of the company but also helps to

	criteria of the company [16].		hire professional and experienced employees who can improve the production and economic growth of organizations.

(Source: Self-developed)

Table 2: Market size of AI and ML in percentage and $ million by organization type

Sl. No.	Company Type	Market size (%)	Market size ($ millions)
1.	MNC IT [17]	36.2%	2314.3
2.	Domestic IT	25.4%	1619.3
3.	Captive	8.8%	564.1
4.	MNC Engineering	5.8%	371.6
5.	Ecommerce	4.8%	305.1
6.	Boutique AI and analytics	3.4%	215.3
7.	Public Research	3.4%	371.6

(Source: Self-developed)

Conclusion

This study includes the various advantages of AI and ML in business operations. Moreover, AI and ML have vital significance in the business growth and product development of organizations. In addition to this, AI provides cognitive engagement, process automation and cognitive insights to the business and also helps the firms to make smarter decisions, reduces cost and improves the customer experience. Most of the companies in the global market are implementing and demanding AI and ML technologies in their business to improve the overall operations and business process. The market size of the AI and ML in the different companies is also discussed with its percentage and company type.

References

1. B. Ponte, D. De la Fuente, R. Pino, R. Rosillo and I. Fernández, "Supply Chain Management by Means of Simulation", Polibits, vol. 48, pp. 55-60, 2013. Available: 10.17562/pb-48-7.
2. E. Brynjolfsson and T. Mitchell, "What can machine learning do? Workforce implications", Science, vol. 358, no. 6370, pp. 1530-1534, 2017. Available: 10.1126/science.aap8062.
3. Y. Duan, J. Edwards and Y. Dwivedi, "Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda", International Journal of Information Management, vol. 48, pp. 63-71, 2019. Available: 10.1016/j.ijinfomgt.2019.0
4. R. Cioffi, M. Travaglioni, G. Piscitelli, A. Petrillo and F. De Felice, "Artificial Intelligence and Machine Learning Applications in Smart Production: Progress, Trends, and Directions", Sustainability, vol. 12, no. 2, p. 492, 2020. Available: 10.3390/su12020492.
5. C. Laurell, C. Sandström, A. Berthold and D. Larsson, "Exploring barriers to adoption of Virtual Reality through Social Media Analytics and Machine Learning – An assessment of technology, network, price and trialability", Journal of Business Research, vol. 100, pp. 469-474, 2019. Available: 10.1016/j.jbusres.2019.01.017.
6. P. Priore, B. Ponte, R. Rosillo and D. de la Fuente, "Applying machine learning to the dynamic selection of replenishment policies

in fast-changing supply chain environments", International Journal of Production Research, vol. 57, no. 11, pp. 3663-3677, 2018. Available: 10.1080/00207543.2018.1552369.

7. A. Sun and B. Scanlon, "How can Big Data and machine learning benefit environment and water management: a survey of methods, applications, and future directions", Environmental Research Letters, vol. 14, no. 7, p. 073001, 2019. Available: 10.1088/1748-9326/ab1b7d.

8. Reasons given by Global Companies for Adoption of Artificial Intelligence – CellStrat, Cellstrat.com, 2021. [Online]. Available: https://www.cellstrat.com/2018/01/25/reasons-given-by-global-companies-for-adoption-of-artificial-intelligence/. [Accessed: 02- Aug- 2021].

9. A. Porokhovsky, "Artificial intelligence today and tomorrow: political and economic approach", Economic Revival of Russia, no. 365, pp. 4-11, 2020. Available: 10.37930/1990-9780-2020-3-65-4-11.

10. S. Bhatore, L. Mohan and Y. Reddy, "Machine learning techniques for credit risk evaluation: a systematic literature review", Journal of Banking and Financial Technology, vol. 4, no. 1, pp. 111-138, 2020. Available: 10.1007/s42786-020-00020-3.

11. J. Hama Kareem, "The impact of intelligent manufacturing elements on product design towards reducing production waste", International Journal of Engineering Business Management, vol. 11, p. 184797901986395, 2019. Available: 10.1177/1847979019863955.

12. S. Ayoubi et al., "Machine Learning for Cognitive Network Management", IEEE Communications Magazine, vol. 56, no. 1, pp. 158-165, 2018. Available: 10.1109/mcom.2018.1700560.

13. L. Ma and B. Sun, "Machine learning and AI in marketing – Connecting computing power to human insights", International Journal of Research in Marketing, vol. 37, no. 3, pp. 481-504, 2020. Available: 10.1016/j.ijresmar.2020.04.005.

14. J. Mendling, G. Decker, R. Hull, H. Reijers and I. Weber, "How do Machine Learning, Robotic Process Automation, and Blockchains Affect the Human Factor in Business Process Management?", Communications of the Association for Information Systems, pp. 297-320, 2018. Available: 10.17705/1cais.04319.

15. J. Ding, X. Hu and V. Gudivada, "A Machine Learning Based Framework for Verification and Validation of Massive Scale Image Data", IEEE Transactions on Big Data, vol. 7, no. 2, pp. 451-467, 2021. Available: 10.1109/tbdata.2017.2680460.

16. M. Attaran and P. Deb, "Machine learning: the new 'big thing' for competitive advantage", International Journal of Knowledge Engineering and Data Mining, vol. 5, no. 4, p. 277, 2018. Available: 10.1504/ijkedm.2018.095523.

17. Report: State of Artificial Intelligence in India - 2020", Analytics India Magazine, 2021. [Online]. Available: https://analyticsindiamag.com/report-state-of-artificial-intelligence-in-india-2020/. [Accessed: 02- Aug- 2021].

ANALYSIS OF THE CUSTOMER-CENTRIC MARKETING STRATEGIES IN ATTAINING COMPETITIVE ADVANTAGE FOR THE FIRM AND SUSTAINING BUSINESS SUCCESS

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ABSTRACT

This research provides ideas for putting the consumer at the heart of a business. It explains why a company should consider customers as assets that must be obtained, developed, and nurtured in order to produce lucrative connections, and it promotes customer profitability as a criterion for assessing corporate performance. Furthermore, it promotes the necessity to supply consumers with solutions in the form of bundles of products and services. It expands the concept of consumer value above tangible advantages and price to encompass both tangible and intangible benefits, as well as ownership rights expenses, while accommodating a wide range of distinct client demands. The review discusses the importance of company planning, marketing and sales processes, and altering staff behavior in order to establish lifetime, high-value profitable customer relationships that meet the demands of the customer. Competitive Advantage of Customer Centricity provides a new path for entire companies to pursue in accomplishing these profitable aims. In this study, we examine existing studies with the goal of demonstrating the importance of marketing skills and further rebuilding the path from market segmentation to organizational outcomes, thereby describing how a firm achieves favorable business performance. We built the road from marketing skills to favorable performance of the organization in the first phase. In order to have a better understanding of the idea of capabilities, we investigated specific determinants of market segmentation.

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Keywords: Customer Centricity, Business, Marketing, Firm, Success, Sustainable

Introduction

Because businesses cannot prosper unless they are concerned with their customers' actual requirements, they have evolved into customer-centric companies. All through this century, the marketing literature has placed a specific emphasis on giving extensive evidence of the organizational financial advantages of concentrating on the customer, as it has more recently been described to, customer centricity. Customer centricity is a business approach that stresses putting customers at the center of all organizational operations and understanding and meeting their requirements. Simultaneously, particularly during the last 30 years, corporations have been under mounting demands to be totally sustainable. That is, they should pay more attention to the environmental and societal implications of the actions they engage in. The aim is that organizations become sustainable firms, which implies that all of the

company's partners have the mindset to constantly operate in a sustainable manner. At the same time, corporate social responsibility must incorporate measures that assess environmental, social, and financial sustainability. In this environment, it appears logical to combine customer centricity with sustainability in order to ensure the lengthy viability of companies. Firms should care about climate change, society, and money using various tactics such as product customization, productivity increases, conscious consumption, and contemplating longer product life cycles. However, in order to effectively implement these approaches, businesses must acquire and evaluate the correct information at the right time while remaining consistent with the corporate mission.

WHAT IS THE DEFINITION OF CUSTOMER-CENTRIC MARKETING?

Customer-centric marketing is a marketing strategy that priorities the demands and objectives of consumers in all promotional choices such as advertising, selling, and marketing products and services [1]. Successful customer-centric marketing necessitates a thorough grasp of why your consumers demand what your firm offers. The aim isn't just business expansion; its development driven by demonstrating to clients how your product/service will enhance some area of their job or life. It also works: Businesses who use a customer-centric, information marketing and sales platform increase their marketing ROI by 15-20% more than.

THE THREE PRIMARY GOALS OF THE CUSTOMER-CENTRIC MARKETER

In Table 1. when developing strategies and initiatives, customer-centric marketers keep three primary goals in mind [2].

Fig 1. Customer Centric Marketing

Table 1 customer-centric marketers

Customer orientation	Customer orientation is essential for customer-centric marketing firms. They work hard to make sure what their consumers truly need from their connection, and they advocate for them both inside and outside. This might imply producing more useful tools to assist them in getting better at their professions, or it could imply promoting a customer's accomplishment on social networking sites to help raise awareness.
Long-term strategy or planning	Several marketing companies are only judged by the quantity of generating prospects they generate and flow into the sales pipeline. This can result in certain quick-fix solutions meant to get clients in the doorway, but these strategies are frequently relatively brief. They may link your sales staff with a customer, but they do not establish a long-term connection. Customer-centric marketers eschew these quick gains in favour of building long-term engagement.
Customer success	Customer-centric marketing is mostly about giving your consumers power and assisting them in becoming their best versions – even if they don't wind up utilizing your products. Gainsight is an example of a firm that excels at this. They have built a network for customer success experts to enhance their skills and expertise. Gainsight has been regarded as the go-to business for customer satisfaction information as a result of this ecosystem, making them a leader in the industry. Rather of focusing all of their time and attention on evangelizing the benefits of Gainsight, their marketing department strives to promote the customer success sector as a whole.

DEVELOPING A CUSTOMER-CENTRIC MARKETING STRATEGY

Customer-centric marketing necessitates deliberate action; the transition does not occur by chance. Here are some strategies for refocusing you're marketing on your consumers [3].

Begin with top leadership.

A change in corporate direction is always more successful if people at the top embrace it. Teams that are motivated by their leaders will thrive in an atmosphere where everyone feels acknowledged and encouraged [4]. They will, in turn, oversee the client experience with the same degree of care and understanding. The

essential talent necessary for this inspiring leadership is centeredness, which Bain describes as a state of mind that allows leaders to maintain cool under pressure, empathize, listen profoundly, and be present.

All of these characteristics are also necessary for customer centricity. While leaders model these traits domestically, staff are more likely to emulate them when dealing with consumers [5]. Even if your senior staff isn't totally on board at first, get them closer to the consumer by providing chances to talk directly with users and sharing customer quotations. You may get them closer to the final objective of complete endorsement by establishing relationships and demonstrating the effectiveness of customer-centric marketing.

Learn about your customers.

To be successful with customer-centric marketing, it should go without mentioning that you must spend time getting to know your consumers thoroughly [6]. There are several ways to accomplish this:

• Interview existing or past customers one-on-one.

• Distribute surveys to consumers to gather input on a specified series of questions.

• Use social media management services and Google Alerts to find out what people are saying regarding your company on the internet.

• Make use of the data that is accessible to you in any analytics solutions that your firm subscribes to.

• Volunteer your time to your customer service team by reading and replying to consumer queries.

• Participate in calls with your sales staff or listening to recordings of their conversations with prospects.

Basically, relates to your consumers necessitates getting closer to the people that interact with them on a daily basis. Front-line employees, such as customer service and sales, have a plethora of knowledge about what consumers want and what they ask for.

Build infrastructure around the customer

The greatest return will be obtained by investing in customer-centric infrastructures. Systems and processes are the most effective

means of scaling personalized experiences [7]. Connecting clients to the materials that are most relevant to them, for example, necessitates tailored messaging depending on the customer categorization. Flows for any sort of client demand or job-to-be-done may be created using optimized design.

To be effective, customer-centric marketing must be hyper-personalized. Understanding your user profiles is a good place to start, but in order to successfully communicate with each person, consumers must be divided in your systems. You may divide your user base in an endless number of ways. The more detailed you can be with your marketing approach, the more granular you can be about your client base, from the services they use to how engaged they are. Instead of creating tools to achieve company objectives (e.g., persuading customers to sign up), create tools to achieve customer goals, and the firm's success will follow [8].

BUILD YOUR CUSTOMER-CENTRIC MARKETING STRATEGY

Changing one's focus to one's customers might seem strange at first. It will take time to shift your emphasis from filling a funnel with quality leads to addressing the requirements of your target consumers, but the result will be a more gratifying manner of conducting business [9]. Meeting your clients' requirements and being really useful leads to better connections, which leads to a more profitable business in the long run.

CAPABILITIES FOR MARKETING ARE BEING DEVELOPED.

Understanding specific circumstances might help you better understand the idea of marketing capabilities [3]. Through the mediating impact of marketing skills, link various strategic orientations to company performance. According to the findings, competition orientation and innovation orientation both make a significant contribution to the growth of marketing capabilities, and marketing capabilities have a favorable impact on total firm performance. Implementation of marketing techniques in worldwide new businesses through the application of the entrepreneurial marketing idea to these internationalizing firms [9]. The result was that

the evolution of good businessman marketing strategies seems to reflect the environment's instability and worldwide variety, as well as the organizational innovation of international new enterprises.

In other case, the environment was an indication of the emergence of specific marketing talents. Culture has an influence on the international marketing of health care services. The research authors revealed that the sociocultural factors of performance orientation, individualism/collectivism, and uncertainty avoidance had an impact on trust, network development, and standardization/adaptation. Operations and marketing departments have an influence on their abilities and, as a result, on total company success [10][11]. The importance placed on marketing and operations departments has an influence on their capacities during times of economic development. As a result, future research should take into account both the capabilities – procedures and the capabilities – operations relationships. Managers (i.e., firms) that perceive their industrial environment to be volatile will develop stronger market learning and marketing skills. Market understanding will help in the development of outstanding marketing talents. The findings substantially supported the assumption that industry competitive intensity influences market learning

process and marketing competence development.

CUSTOMER CENTRICITY AND SUSTAINABILITY RELATIONSHIP

Given consumers' growing awareness about the environment and the breadth of the sustainability research, which includes economic, environmental, and social views, the link between customer centricity and sustainability is desirable. Along these lines of thought [12]. Custom-Centric Sustainability is a notion that urges executives to constantly keep in mind the strategy of being focused on customers while still having a long-term vision. It is vital to emphasize that the users' opinions should be reflected so that all of the organizations' operations have sustainability as the main indicator [13].

The preceding research gives useful information on the state of the art, as well as some advantages on customer centricity and sustainability integration. To the best of knowledge, no descriptive study has been conducted that comprehensively analyses and maps the extant literature on customer - centric and sustainability. Because the use of scient metric research has been significantly expanded in the academia with the goal of classifying and identifying trends and on the huge quantity of scientific production, the purpose of this study is to fill this vacuum in the research.

Steps to get a sustainable competitive advantage
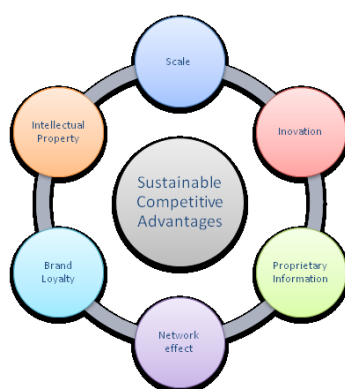

Fig 2. Sustainable Competitive advantages

The business climate nowadays is extremely competitive. It is now easier and less expensive to establish a business, especially with technology allowing business to be performed online and globally in order to get clients in

other marketplaces [14]. The rise of internet commerce is one example, and all of this rivalry and activities makes it tough to distinguish apart. The goal is to avoid becoming another "me too" company. To avoid this, create a

lasting competitive edge that sets you apart from your competition. The key to corporate success is maintaining a sustainable competitive edge. It is the driving factor that enables a company to have more focus, more sales, larger profitability, and more customer and employee engagement than rivals.

It is the primary generator of long-term value proposition and what purchasers will prioritize when looking to acquire a firm. Without a lasting comparative advantage, you risk becoming another "me too" firm that complicates along with subpar outcomes. In Table 2. We show the most fundamentals of three forms of long-term economic advantage.

Table 2 long-term economic advantage.

1	Cost advantage:	The business competes on price.
2	Value advantage:	The company offers a distinct proposition that is regarded to be of higher value.
3	Focus advantage:	The company concentrates on a certain market segment and has a customized solution created exclusively for that market group.

Smaller businesses lack the share of the market and purchasing power to successfully compete on pricing, and they are too tiny to be everything to all clients in a market. As a result, in order to compete successfully, small firms must create a lasting competitive advantage based on offering greater value to a specialized segment. Other benefit that is frequently mentioned is firsthand experience [15]. The first mover advantage occurs when the initial entry in a new market gains an edge over later entrants. Unfortunately, while being the first to market may give an early advantage, it is not sustainable in my judgment unless it is reinforced by one of the three sorts of benefits described above. Google and Facebook are two good examples. Despite the fact that none of these firms were the first to market, they today command their particular sectors [16].

FIVE STAGES TO GAINING A LONG-TERM COMPETITIVE ADVANTAGE

- Create a business structure that will complement and execute on the value offer.
- Recognize the market and its divisions. Look for segments that are underserved by rivals and may be successfully targeted and marketed to.
- Consider your skills and key abilities, and how you can leverage them in novel ways to add value to your target marketplace.

- Acquire a knowledge of what clients truly desire and create a value offer that piques their interest.
- Determine the essential things you must perform exceptionally effectively in order to support & execute the business model. Levels of service, quality, advertising, and price are just a few instances.

Once you've identified your sustainable competitive advantage, you should put it to work for your company in a variety of ways. Utilizing your sustainable competitive advantage in sales and marketing helps your consumers understanding why they should part with their money and give it to you instead of your rivals [17]. This, in turn, makes it much easier for your employees to offer your services or products and ensure that their commitments are kept. They understand that the entire organization is focused on ensuring that the sustainable competitive advantage is preserved and profited on. Your long-term competitive advantage may drive your decision-making and give you with purpose and concentration. If a new business opportunity does not enhance your long-term competitive advantage, you should reconsider whether to embrace it [18]. Even in the face of intense competition, this longer-term perspective and efficient consumption of a durable competitive advantage may enable a greater return on

capital invested in the firm. This status adds value to a company and can increase the sale price. That is a benefit that every business owner desires.

Conclusion

In this paper we show what customer-centric marketing is and we write the three main priorities of the customer-centric marketer. We analyzed the developing a customer-centric marketing strategy and build a customer-centric marketing strategy. In this study we review about the development of marketing capabilities in this research paper we study about customer centricity and sustainability relationship. We also review about the steps to get a sustainable competitive advantage and we also write five steps to developing a sustainable competitive advantage.

Reference

1. J. Sheth, R. Sisodia and A. Sharma, "The Antecedents and Consequences of Customer-Centric Marketing", Journal of the Academy of Marketing Science, vol. 28, no. 1, pp. 55-66, 2000. Available: 10.1177/0092070300281006.

2. R. Chavez, W. Yu, M. Feng and F. Wiengarten, "The Effect of Customer-Centric Green Supply Chain Management on Operational Performance and Customer Satisfaction", Business Strategy and the Environment, vol. 25, no. 3, pp. 205-220, 2014. Available: 10.1002/bse.1868.

3. Sheth, N. Sethia and S. Srinivas, "Mindful consumption: a customer-centric approach to sustainability", Journal of the Academy of Marketing Science, vol. 39, no. 1, pp. 21-39, 2010. Available: 10.1007/s11747-010-0216-3.

4. F. Girard, "Symbioses strategies for sustainable company management", International Journal of Sustainable Development, vol. 12, no. 234, p. 248, 2009. Available: 10.1504/ijsd.2009.032780.

5. [5] Jain, A. Yadav and Y. Shrivastava, "Modelling and optimization of different quality characteristics in electric discharge drilling of titanium alloy sheet", Materials Today: Proceedings, vol. 21, pp. 1680-1684, 2020. Available: 10.1016/j.matpr.2019.12.010.

6. G. Özcüre, H. Demirkaya and N. Eryiğit, "The sustainable company and employee participation as a part of the solution to triple crisis in the European Union And Turkey: Example of OMV Samsun Elektrik", Procedia - Social and Behavioral Sciences, vol. 24, pp. 1274-1287, 2011. Available: 10.1016/j.sbspro.2011.09.096.

7. L. Valikangas and M. Gibbert, "Boundary-setting strategies for escaping innovation traps", IEEE Engineering Management Review, vol. 33, no. 3, pp. 101-101, 2005. Available: 10.1109/emr.2005.26770.

8. L. Jeppesen and K. Lakhani, "Marginality and Problem-Solving Effectiveness in Broadcast Search", Organization Science, vol. 21, no. 5, pp. 1016-1033, 2010. Available: 10.1287/orsc.1090.0491.

9. V. Panwar, D. Kumar Sharma, K. Pradeep Kumar, A. Jain and C. Thakar, "Experimental investigations and optimization of surface roughness in turning of en 36 alloy steel using response surface methodology and genetic algorithm", Materials Today: Proceedings, 2021. Available: 10.1016/j.matpr.2021.03.642 [Accessed 27 July 2021].

10. J. Merigó, C. Muller, N. Modak and S. Laengle, "Research in Production and Operations Management: A University-Based Bibliometric Analysis", Global Journal of Flexible Systems Management, vol. 20, no. 1, pp. 1-29, 2018. Available: 10.1007/s40171-018-0201-0.

11. P. Jeffers, "Embracing sustainability", International Journal of Operations & Production Management, vol. 30, no. 3, pp. 260-287, 2010. Available: 10.1108/01443571011024629.

12. Y. Lee, "Corporate Sustainable Development and Marketing Communications on Social Media: Fortune 500 Enterprises", Business Strategy and the Environment, vol. 26, no. 5, pp. 569-583, 2016. Available: 10.1002/bse.1936.

13. A. Jain and A. Kumar Pandey, "Modeling And Optimizing of Different Quality Characteristics In Electrical Discharge

Drilling Of Titanium Alloy (Grade-5) Sheet", Materials Today: Proceedings, vol. 18, pp. 182-191, 2019. Available: 10.1016/j.matpr.2019.06.292.

14. J. Santos, A. Muñoz-Villamizar, M. Ormazábal and E. Viles, "Using problem-oriented monitoring to simultaneously improve productivity and environmental performance in manufacturing companies", International Journal of Computer Integrated Manufacturing, vol. 32, no. 2, pp. 183-193, 2018. Available: 10.1080/0951192x.2018.1552796.

15. S. Nikou, H. Selamat, R. Yusoff and M. Khiabani, "Electronic Customer Relationship Management, Customer Satisfaction, and Customer Loyalty: A Comprehensive Review Study", International Journal Of Management And Economics Invention, 2016. Available: 10.18535/ijmei/v2i12.02.

16. E. Hollensbe, C. Wookey, L. Hickey, G. George and C. Nichols, "Organizations with Purpose", Academy of Management Journal, vol. 57, no. 5, pp. 1227-1234, 2014. Available: 10.5465/amj.2014.4005.

17. A. Jain and A. Pandey, "Multiple Quality Optimizations in Electrical Discharge Drilling of Mild Steel Sheet", Materials Today: Proceedings, vol. 4, no. 8, pp. 7252-7261, 2017. Available: 10.1016/j.matpr.2017.07.054.

18. J. Jiao and M. Tseng, "Understanding product family for mass customization by developing commonality indices", Journal of Engineering Design, vol. 11, no. 3, pp. 225-243, 2000. Available: 10.1080/095448200750021003030