RISK MANAGEMENT IN CONSTRUCTION PROJECTS

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Abstract – This thesis describes the development of a framework for a systematic approach to risk management in construction projects, whose application in construction practice would lead to changes and improvements in the construction industry.

Before showing how the framework was developed, there is a survey of what has been written on the subject and a systematic analysis of risk management, risk in construction and process in construction. This led to the conclusion that realizing a construction project is a process and the risk management process should be subordinated to the construction process.

A new approach was therefore introduced to managing risk, process driven risk management. This approach will give all the participants in the project better understanding of the construction process, enable changes in the construction industry, and contribute to improvement of quality and efficiency in construction.

Risk has a great impact on the performance of project in India in term of cost, time, and quality. It has increase the size and complexity of the projects and has become the ability to manage risk in all phase of the construction process a central element to prevent unwanted consequences. Key risks are identified in the framework, which are independent of the size, type and purpose of the project being realized. Project related risks should be separately identified for each specific project. Depending on available data, quantitative and qualitative analysis is carried out for the identified risks, their risk probability and risk impact determined, and the corresponding risk exposure calculated. Then the adequate risk response is given for each identified risk, depending on its exposure. As the process unfolds new risks appear in each phase and the management process begins new.

Keyword: Project Risk, Risk Management, Risk Allocation, Construction Project

I. INTRODUCTION

Every construction project passes through phases, each of which has a purpose, duration and scope of work. Risk and uncertainty are inherent in all the phases through which the construction project passes, from demonstrating the need do operation and maintenance. Latham said that no construction project is risk free. Risk can be managed, minimized, shared, transferred or accepted. It cannot be ignored. Risks do not appear only in major projects. Although size may be a cause of risk, complexity, construction speed, site and many other factors that affect time, cost and quality to a greater or lesser degree cannot be
overlooked. All the participants in the deciding process should observe risks and their effects on all key points of decision making before and during project realization. Process in construction needs important changes and should be continuously improved. The process itself, and the changes and improvement made to it, are accompanied by risks whose adverse effects may increases planned costs and time necessary for project completion and decrease execution quality. Efficient and quality management of risks should make these changes in the construction industry possible and enhance quality and efficiency. Changes may be brought to the construction industry through improved risk management in several ways. One possibility is to study the causes of risk, their probability and their impact on time, cost and quality for a particular type and size of facility.

Risk management is a continuous process needing an integral risk management system in all the phases that the construction project passes through, which is accomplished by developing a framework for process driven risk management. It is necessary to identify the key risks that appear in all the phases through which the construction project passes, regardless of the type and size of the facility.

II. OBJECTIVE OF THE STUDY

To investigate how to deal with risks and uncertainties in each phase of the project.
To investigate and assess key-risks in each phase of the project.
To suggest risk response for identified key-risks.
To implement and test the proposed framework using a real case which will demonstrate the benefit of the proposed framework.

III. REVIEW OF LITERATURE

There are several examples of research studies involving risk management in construction project in various forms and application which has practically been implemented as well. The projects as such or in parts have been articulated along with their pros and cons by various firms, organizations and authors. Some of such glimpses are highlighted in the following review components.

1. Amita Pawar et.al., (2017): Gaps and inconsistencies in the knowledge and treatment of construction and project risk are identified. The paper describes, on the basis of a questionnaire survey of general contractors and project management practices in Pune, the construction industry's perception of risk associated with its activities and the extent to which the industry uses risk analysis and management techniques. It concludes that risk management is essential to construction activities in minimizing losses and enhancing profitability. Construction risk is generally perceived as events that influence project objectives of cost, time and quality. Risk analysis and management in construction depend mainly on intuition, judgment and experience. Formal risk analysis and management techniques are rarely used due to a lack of knowledge and to doubts on the suitability of these techniques for construction.
2. C. Borysowich (2008): Most organizations are aware that risks do not appear on a linear basis and for this reason risk cannot be identified and measured in this way. Assessing and understanding the interrelation of risk and their associated correlated impact is the real challenge. These complex relationships require a different set of tools. Through the use of tools to simulate multiple risk scenarios and correlating risk interdependencies the organization can begin to build an effective map of their risk landscape. The goal of study was to understand the cumulative impact of risks on performance and value in order to select the appropriate mix between risk retention and risk treatments.

3. Mehdi Ebrat et.al., (2013): Managers require a good understanding about the nature of risks involved in a construction project because the duration, quality, and budget of projects can be affected by these risks. Thus, the identification of risks and the determination of their priorities in every phase of the construction can assist project managers in planning and taking proper actions against those risks. Therefore, prioritizing risks via the risk factors can increase the reliability of success. In this research, first the risks involved in construction projects has been identified and arranged in a systematic hierarchical structure. Next, based on the obtained data an Adaptive Neuro-Fuzzy Inference System (ANFIS) has been designed for the evaluation of project risks. In addition, a stepwise regression model has also been designed and its results are compared with the results of ANFIS. The results show that the ANFIS models are more satisfactory in the assessment of construction projects risks.

IV. METHODOLOGY
Phase I - Identifying and structuring risk within Process Protocol
Each Process Protocol phase is divided into sub-processes, activities that should be performed during the phase. A systematic analysis of the division helped identify and describe the key risks that appear in all construction projects, regardless of size or type.

Phase II - Developing a framework for managing risk in construction projects
The results of Phase I and Phase II served as a foundation for developing a framework for managing risk in the construction project. The framework provides holistic risk assessment from Demonstrating the Need to Operation and Maintenance. After determining risk probability and risk impact, and thus also risk exposure, for each identified key risk or project related risk, a priority risk list is formed and, depending on risk acceptability, a strategy of risk response. If risk response leads to the appearance of new risks, a new cycle of identification, analysis and risk response begins.

Phase III - Application and Verification of the process-driven risk management framework
The last phase shows the application and verification of the proposed process-driven risk management framework using the PP-Risk computer programme developed in the preceding phase.

i) To successfully realise a project it is necessary to identify events that may cause unwanted effects, this means, to identify potential risk sources. Once a risk is identified, it is necessary to assess the probability that it will occur, risk probability, and to estimate the damage that it
may cause to the project, risk impact. The concept of risk exposure as the product of risk probability and risk impact is introduced to enable the relative comparison of several risks within a project. The values of risk exposure are used to make a risk priority list and define the appropriate response to each risk depending on its exposure and position on the risk priority list. Risk response may produce new events that may adversely affect the project and which it is necessary to identify, analyse and anticipate the appropriate response. This is why the risk management process is by its nature cyclical, and why risk management is part of project management and cannot be viewed as a separate whole.

ii) RISKMAN is a risk-driven project methodology. However, even this methodology does not make an allowance for the fact that the construction’s life cycle is a process and that risk management should be adapted to this process. Therefore, what is necessary is process-driven risk management.

iii) the Process in construction needs significant changes and continuous improvement. These changes and improvements are accompanied by risks that may have a detrimental effect on planned costs, project duration and project quality. Efficient risk management must enable changes in construction and contribute to quality improvement and greater efficiency.

The framework for risk management in construction proposed in this work is based on process-driven risk management, which completely subordinates the risk management process to the construction process.

iv) To increase efficiency in the construction industry it is also necessary to develop and to continuously advance the group of activities needed for successful project realisation. Process Protocol I resulted in 10 phases through which the construction project passes in its evolution. High-level processes that have to be performed are identified in each phase. Process Protocol II proclaimed these high-level processes as Level I, and then proceeded to divide the Level I processes into Level II sub-processes, and these, in turn and if necessary, into Level III sub-processes. Thus the realisation of any construction project is broken up into elementary processes. The processes on any level are potential risk sources and may serve as the basis for a risk list in each phase. The risk list in the proposed framework has a total of 49 risks, that is, an average of 5 risks per phase, to which project related risks can be added in each phase. This makes risk management part of a generic process leading to the development of process-driven risk management.

v) The priority list is created using the qualitative approach when there is no database about earlier projects to use for the probability distribution function and for determining risk probability. All the necessary indicators for the direct calculation of the consequences, that is the impact that the risky event would have on time, cost or quality, are also missing. Three techniques are offered for qualitative risk analysis in the proposed framework: Multi-attribute Utility Theory, Fuzzy Analysis and Analytical Hierarchy Process (AHP). All the three are programmable and can be included in the corresponding software for decision-making support. A detailed analysis of all the three techniques shows that AHP is the most complete and most adaptable.
vi) The quantitative approach to forming the risk priority list implies that risk probability and risk impact can be explicitly calculated using one of the known quantitative methods of risk analysis. To do this the relevant database must be available to serve for forming the probability distribution, that is to enable the direct calculation of the impact on time, cost and quality.

**Table 1: Result of risk analysis for Phase 1**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Probability</th>
<th>Impact</th>
<th>Exposure</th>
<th>Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>0.245</td>
<td>0.251</td>
<td>0.061</td>
<td>Acceptable</td>
</tr>
<tr>
<td>102</td>
<td>0.044</td>
<td>0.068</td>
<td>0.003</td>
<td>Negligible</td>
</tr>
<tr>
<td>103</td>
<td>0.043</td>
<td>0.076</td>
<td>0.003</td>
<td>Negligible</td>
</tr>
<tr>
<td>104</td>
<td>0.184</td>
<td>0.189</td>
<td>0.035</td>
<td>Acceptable</td>
</tr>
<tr>
<td>105</td>
<td>0.485</td>
<td>0.416</td>
<td>0.202</td>
<td>Undesirable</td>
</tr>
</tbody>
</table>

**Table 2: Result of risk analysis for Phase 2**

<table>
<thead>
<tr>
<th>Risk</th>
<th>Probability</th>
<th>Impact</th>
<th>Exposure</th>
<th>Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>0.144</td>
<td>0.126</td>
<td>0.018</td>
<td>Acceptable</td>
</tr>
<tr>
<td>202</td>
<td>0.289</td>
<td>0.251</td>
<td>0.073</td>
<td>Acceptable</td>
</tr>
<tr>
<td>203</td>
<td>0.213</td>
<td>0.162</td>
<td>0.034</td>
<td>Acceptable</td>
</tr>
<tr>
<td>204</td>
<td>0.073</td>
<td>0.120</td>
<td>0.009</td>
<td>Negligible</td>
</tr>
<tr>
<td>205</td>
<td>0.092</td>
<td>0.153</td>
<td>0.014</td>
<td>Acceptable</td>
</tr>
<tr>
<td>206</td>
<td>0.189</td>
<td>0.188</td>
<td>0.036</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>
VI. SUMMARY AND CONCLUSION
The author developed and verified a framework for risk management in construction projects, the development of the framework was preceded by systematic analysis of prior studies of risk management and construction process, which resulted in several conclusions that were used for developing the framework for risk management in construction:

Risk management is by nature a cyclical process. Risks must be identified before the beginning of project realisation or the realisation of any phase through which the project passes. The environment in which the project is realised produces new risks during project realisation. The new risks must be analysed together with those identified and analysed earlier, in a continuous attempt to assess the probability and adverse effect of new risks in

### Table 3: Results of risk analysis for Phase 3

<table>
<thead>
<tr>
<th>Risk</th>
<th>Probability</th>
<th>Impact</th>
<th>Exposure</th>
<th>Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>0.204</td>
<td>0.171</td>
<td>0.035</td>
<td>Acceptable</td>
</tr>
<tr>
<td>302</td>
<td>0.384</td>
<td>0.406</td>
<td>0.156</td>
<td>Undesirable</td>
</tr>
<tr>
<td>303</td>
<td>0.224</td>
<td>0.259</td>
<td>0.058</td>
<td>Acceptable</td>
</tr>
<tr>
<td>304</td>
<td>0.069</td>
<td>0.042</td>
<td>0.003</td>
<td>Negligible</td>
</tr>
<tr>
<td>305</td>
<td>0.119</td>
<td>0.122</td>
<td>0.015</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

### Table 4: Result of risk analysis for Phase 4

<table>
<thead>
<tr>
<th>Risk</th>
<th>Probability</th>
<th>Impact</th>
<th>Exposure</th>
<th>Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>0.141</td>
<td>0.134</td>
<td>0.019</td>
<td>Acceptable</td>
</tr>
<tr>
<td>402</td>
<td>0.237</td>
<td>0.172</td>
<td>0.041</td>
<td>Acceptable</td>
</tr>
<tr>
<td>403</td>
<td>0.136</td>
<td>0.145</td>
<td>0.020</td>
<td>Acceptable</td>
</tr>
<tr>
<td>404</td>
<td>0.412</td>
<td>0.342</td>
<td>0.141</td>
<td>Undesirable</td>
</tr>
<tr>
<td>405</td>
<td>0.074</td>
<td>0.207</td>
<td>0.015</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>
relation to existing ones. This creates the need for continuous risk management in all phases of project realisation.

The execution of a construction project is a process. The process in construction contains many special features in comparison with the process of other industries, which are an impediment for changes leading to process improvement. The risk that the project might be unsuccessful is in fact the risk that particular elements in the construction process might be unsuccessful. Risk management should be subordinated to the construction process. This means that the approach to risk management in construction should be changed from risk-driven project management to process-driven risk management. Improving certain elements of risk management lead to better understanding and to changes, in other words, to improvement of the construction process, which is one of the main goals of the construction industry.

The Construction Process Protocol is by nature a generic process and is thus suitable for the construction process within which the framework for process-driven risk management will be situated. As a plan of work, Process Protocol enables managing the project from Demonstrating the Need to Operation and Maintenance regardless of the type, size and purpose of the project that is being realised. According to Process Protocol, every project can be executed through the successful execution of 10 phases grouped in 4 stages. Every phase contains so-called high-level processes as a group of activities that must be realised for the successful conclusion of that phase. High-level processes are broken down into sub-processes in as many levels as the Protocol user deems necessary for the project. The break down of the process in sub-processes provides a good foundation for identifying key risks that are independent of the project being realised. Sub-processes are potential risk sources so risk management in fact means ensuring the success of each sub-process within the entire construction process. Ensuring the successful execution of the construction process leads to process improvement, which gives additional weight to Process Protocol.

VII. REFERENCES
3. Fouzi, hossen, Analyse and manage the risks faced by construction projects, Faculty of Engineering, University of Omar Mukhtar, Libya, (2012).
EMPLOYEES SATISFACTION AFTER MERGER AND ACQUISITION OF FINANCIAL INSTITUTIONS IN NEPAL

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Abstract

Background - Merger and acquisition refer to the aspect of corporate strategy, corporate finance, and management dealing with the buying, selling, and the combination of another company that can help a growing company in a given industry to grow rapidly without having to create another business entity. Merger and acquisition can be threatening for employees and produce anxiety and stress. Patterns of emotional reactions experienced by employees have been identified during merger or acquisition.

Purpose – The purpose of the study is to examine the impact of merger and acquisition on employees’ satisfaction in Nepal.

Methodology – Due to the specific nature of research objectives, descriptive-cum-analytical research design has been used.

Findings – Employees are satisfied after merger and acquisition of the Financial Institutions of Nepal.

Keywords – Merger and Acquisition, Working Condition, Employees Turnover, Job Stress and Employees Satisfaction

Paper Type – Research paper.

Background of the Study

Mergers and acquisitions practice are increasing in the organizations to enhance their competitive advantages and expand their operations. Mergers and acquisitions are undertaken on the assumption that ‘the combined company will have greater value than the two companies alone’ (Cartwright & Cooper, 1993). Merger is the operation by which two companies join together to form a single one. This enables the consolidation and increasing competitive capacity of enterprises. Furthermore, (Buono & Bowditch, 1989) explains a merger transaction is where both parties agree to combine their businesses, and for this purpose form a new company that issues shares which replace the shares of both businesses. Companies do pay considerable attention to human resource issues during merger and acquisitions beside financial and strategic issues. It is argued that problems of human resources and organizational culture should, however, be given a high priority, along with strategic issues, to increase the likelihood of a successful combination. Historically, merger failures were only discussed with financial and strategic explanations. Recently there has been growing acceptance among researchers that the human dynamics or the human resource issues after and following the actual merger or acquisition of two or more organizations are significant determinants of merger success or failure (Buono & Bowditch, 1989 and Cartwright & Cooper, 1993). Two reasons have been cited for the failure of merger & acquisitions with regards to human-resource issues or problems. First, the macro level is the issue of cultural compatibility between the merging organizations (Cartwright & Cooper, 1993). Second, a micro level is the role of individuals or employees in the merger process.
The Nepalese financial sector has witnessed a tremendous growth in the number of financial institutions after the 1980’s by adopting an economic liberalization regulation with a mixed economic model. Today there are 28 commercial banks, 36 development banks, 25 finance companies and 39 insurance companies are there in Nepal (Economic Survey 2018). However, the unnatural increment of the Banking and Financial Institutions has brings several financial challenges and complexities. The financial indicator had indicated that the Nepalese financial sector was weak, vulnerable and at the verge of a collapse.

Merger and acquisition are contemporary in the Banking and Financial Institutions of Nepal and will likely remain so for the next few years since the recent moves of NRB policies seems concerned about the mushrooming financial institutions. Monetary policy 2072/2073 that has increased the paid-up capital of Banking and Financial Institutions- 8 billion for commercial bank, 2.5 billion for development bank, and 800 million for finance companies, is a greater issue in the financial sector of Nepal.

Banking and Financial Institutions employees faced an uncertain future after the merger, as new policies were implemented. This resulted in some employee’s even resisting change. The management of the BFIs should be focused on human side after merger and acquisitions to minimize the risk of the failure rates of merger and acquisitions.

**Objectives of the Study**

The main objectives of the study are

a. To examine the impact of merger and acquisition on employee’s satisfaction.
b. To analyze different human resource issues with respect to merger and acquisition of Banking and Financial Institutions in Nepal.
c. To explore the effects of merger and acquisition to working condition, employees’ turnover and job stress in Banking and Financial Institutions in Nepal.

**Rationale of the Study**

Merger and acquisitions are the emerging issue in Nepal. There are many reasons for doing merger and acquisition.

a. This study emphasizes on human resources management through the process of merger and acquisition.
b. In Nepal human resource issue seems to be neglected after merger and acquisition, so this study supports the improvement of results in the future.
c. Other researchers may also be benefited from this study; it may serve as a basis for more research in this area i.e. banking and financial or other sectors that involve in mergers.
d. The result also gives clear ideas to the different organizations about their employees’ response, to improve their human resource policy and practices for retention of human capital after merger.

**Methodology Used**

This study follows both the descriptive and analytical research design. In this study, employee satisfaction is considered as the dependent variable and employee turnover, job stress and working environment are the independent variables.

Two commercial banks one from merger group i.e. NMB Bank Limited (merger with Pathibhara Bikas Bank, Bhrikuti Bikas Bank, Clean Energy Development Bank and Prudential Finance) and another from acquisition group i.e. Citizen Bank Limited (acquiesced
Premier Finance, Nepal Housing & Merchant Finance and People Finance) have been taken as sample for the study. These organizations were selected on the basis of judgmental and convenient sampling methods.

Altogether 35 employees working in different departments in different levels have been selected judgmentally and in a convenient basis as respondents but priority has been given to include respondents from every financial institution involved in merger and acquisition process.

Primary data has been used in this study for finding the relationship between employee satisfaction and merger of the banking and financing sector. 39 structured questionnaires related to different variables were distributed to all the respondents for the study. Questionnaires were then collected by personal visit to the each and every respondent of sample banks. The five-point Likert scale (with 5= strongly agree to 1 strongly disagree) has been used for each of the statement. Cronbach's alpha test has been done for reliability of data.

All collected data has been tabulated and essential statistical values like mean and standard deviation has been calculated to draw the inferences. Correlation and Regression analysis has been used in order to compare and analyze the relationship of the variables.

The data collected from the respondent are presented, analyzed and interpreted for attaining the objectives stated in the study.

| Profile of respondents | NMB Bank Limited | | | Citizen Bank Limited | | |
|------------------------|------------------|---|------------------|---|---|
|                        | Male | Female | Total | Male | Female | Total |
| Upper Level            | 6    | 4      | 10    | 5    | 4      | 9     |
| Middle Level           | 6    | 6      | 12    | 7    | 5      | 12    |
| Lower Level            | 7    | 6      | 13    | 8    | 6      | 14    |
| Total                  | 19   | 16     | 35    | 20   | 15     | 35    |

Source: Field survey 2018

Table 1, shows that number of male respondents is greater than the number of female respondents, i.e. 19 and 20 male respondents in NMB Bank and Citizen Bank respectively. Higher numbers of male respondents have been seen on Lower Level i.e. 7 in NMB Bank & 8 in Citizen Bank. Lower numbers of female respondents i.e. 4 each from both banks have been in found in Higher Level.

Analysis and Findings

Working Environment after merger and acquisition

In this section altogether 12 questions were asked nine related to the working environment and three for employee satisfaction to the respondents of both banks.
Table 2

<table>
<thead>
<tr>
<th>Working Environment</th>
<th>Gender</th>
<th>Upper Level</th>
<th>Middle Level</th>
<th>Lower Level</th>
<th>Average Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor support and interaction with employees</td>
<td>Male</td>
<td>3.20</td>
<td>3.34</td>
<td>3.33</td>
<td>3.29</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.45</td>
<td>3.40</td>
<td>3.34</td>
<td>3.40</td>
</tr>
<tr>
<td>Satisfied remuneration and other benefits</td>
<td>Male</td>
<td>3.05</td>
<td>3.50</td>
<td>3.36</td>
<td>3.37</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.12</td>
<td>3.45</td>
<td>3.45</td>
<td>3.34</td>
</tr>
<tr>
<td>Enough logistics support for doing work</td>
<td>Male</td>
<td>3.67</td>
<td>3.55</td>
<td>3.22</td>
<td>3.48</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.50</td>
<td>3.25</td>
<td>3.42</td>
<td>3.39</td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>Male</td>
<td>3.32</td>
<td>3.25</td>
<td>3.52</td>
<td>3.36</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.45</td>
<td>3.12</td>
<td>3.35</td>
<td>3.31</td>
</tr>
</tbody>
</table>

Table 2 and Table 3 show that mean value of overall working environment for both banks have been more than 3, i.e. 3.38 for NMB Bank and 3.49 for Citizen Bank. Similarly, mean value of employee satisfaction is also more than 3 in both cases i.e. 3.49 and 3.44 for NMB Bank and Citizen Bank respectively.

Value of Cronbach’s Alpha has been 0.69 and 0.78 for questionnaires of working environment and employee satisfaction which is sufficient to explain the consistency of the questionnaire.

Supervisory support, satisfactory remuneration and enough logistic support indicates that working environment after merger has been satisfactory to the employee of both banks. Hence it is concluded that all levels employee either male or female of both banks have been satisfied after merger.

Employee Turnover after merger and acquisition

In this section altogether 12 questions were asked nine related to employees turnover and three for employee satisfaction to the respondents of both banks.
Table 4

<table>
<thead>
<tr>
<th>Employees Turnover</th>
<th>Gender</th>
<th>Upper Level</th>
<th>Middle Level</th>
<th>Lower Level</th>
<th>Average Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>3.35</td>
<td>3.18</td>
<td>3.25</td>
<td>3.26</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.49</td>
<td>3.15</td>
<td>3.35</td>
<td>3.33</td>
</tr>
<tr>
<td>Opportunities for career growth in the banks</td>
<td>Male</td>
<td>2.30</td>
<td>2.15</td>
<td>2.05</td>
<td>2.17</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.22</td>
<td>1.95</td>
<td>1.95</td>
<td>1.95</td>
</tr>
<tr>
<td>Any humiliation / misbehave from the coworkers</td>
<td>Male</td>
<td>3.25</td>
<td>3.25</td>
<td>3.66</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.15</td>
<td>2.35</td>
<td>2.95</td>
<td>3.43</td>
</tr>
<tr>
<td>Bank’s policy for retention of its employee</td>
<td>Male</td>
<td>3.39</td>
<td>3.35</td>
<td>3.75</td>
<td>3.50</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.48</td>
<td>2.85</td>
<td>2.55</td>
<td>3.53</td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>Average Mean Value</td>
<td>2.92</td>
<td>2.97</td>
<td>2.97</td>
<td></td>
</tr>
<tr>
<td>Value of Cronbach's Alpha</td>
<td>0.65</td>
<td>Average Mean Value</td>
<td>3.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5

<table>
<thead>
<tr>
<th>Employees Turnover</th>
<th>Gender</th>
<th>Upper Level</th>
<th>Middle Level</th>
<th>Lower Level</th>
<th>Average Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>3.15</td>
<td>3.28</td>
<td>3.35</td>
<td>3.26</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.14</td>
<td>3.45</td>
<td>3.35</td>
<td>3.28</td>
</tr>
<tr>
<td>Opportunities for career growth in the banks</td>
<td>Male</td>
<td>2.25</td>
<td>2.25</td>
<td>2.15</td>
<td>2.22</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.12</td>
<td>1.57</td>
<td>1.85</td>
<td>1.85</td>
</tr>
<tr>
<td>Any humiliation / misbehave from the coworkers</td>
<td>Male</td>
<td>3.35</td>
<td>3.26</td>
<td>3.47</td>
<td>3.36</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.45</td>
<td>3.42</td>
<td>2.37</td>
<td>3.38</td>
</tr>
<tr>
<td>Bank’s policy for retention of its employee</td>
<td>Male</td>
<td>3.30</td>
<td>3.37</td>
<td>3.37</td>
<td>3.35</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.42</td>
<td>3.58</td>
<td>3.35</td>
<td>3.45</td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>Average Mean Value</td>
<td>2.89</td>
<td>2.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of Cronbach's Alpha</td>
<td>0.72</td>
<td>Average Mean Value</td>
<td>3.40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 and Table 5 shows that mean value of employee turnover for both banks have been near to 3, i.e. 2.92 and 2.89 for NMB Bank and Citizen Bank respectively. Similarly, mean value of employee satisfaction is also more than 3 in both banks i.e. 3.15 and 3.40 for NMB Bank and Citizen Bank respectively.

Value Cronbach’s Alpha has been 0.65 and 0.72 for questionnaires of employee turnover and employee satisfaction which is sufficient to explain the consistency of the questionnaire.

Positive response on opportunity for career growth and bank’s policy of retention of its employee indicates that employee turnover after merger has been low, which is also supported by below average value of humiliation and misbehave from the coworkers after merger. All levels employee either male or female of both banks have been satisfied after merger.

**Job Stress after merger and acquisition**

In this section altogether 15 questions were asked 12 related to job stress and three for employee satisfaction to the respondents of both banks.
Table 6

NMB Bank Limited

<table>
<thead>
<tr>
<th>Job Stress</th>
<th>Gender</th>
<th>Upper Level</th>
<th>Middle Level</th>
<th>Lower Level</th>
<th>Average Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Fear about losing job</td>
<td>Male</td>
<td>3.05</td>
<td>3.10</td>
<td>3.18</td>
<td>3.15</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.10</td>
<td>3.15</td>
<td>3.35</td>
<td>3.05</td>
</tr>
<tr>
<td>Working condition of banks i.e. problem in</td>
<td>Male</td>
<td>3.20</td>
<td>3.65</td>
<td>3.25</td>
<td>2.75</td>
</tr>
<tr>
<td>working with different groups</td>
<td>Female</td>
<td>3.12</td>
<td>3.29</td>
<td>3.50</td>
<td>2.67</td>
</tr>
<tr>
<td>Adoption of change</td>
<td>Female</td>
<td>3.15</td>
<td>3.155</td>
<td>3.48</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>3.32</td>
<td>3.19</td>
<td>3.35</td>
<td>3.12</td>
</tr>
<tr>
<td>Grievance handling mechanism</td>
<td>Female</td>
<td>3.32</td>
<td>3.27</td>
<td>3.50</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>Male</td>
<td>3.17</td>
<td>3.10</td>
<td>3.25</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.16</td>
<td>2.92</td>
<td>3.25</td>
<td>3.45</td>
</tr>
<tr>
<td>Value of Cronbach's Alpha</td>
<td></td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7

Citizen Bank Limited

<table>
<thead>
<tr>
<th>Job Stress</th>
<th>Gender</th>
<th>Upper Level</th>
<th>Middle Level</th>
<th>Lower Level</th>
<th>Average Mean Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Fear about losing job</td>
<td>Male</td>
<td>3.11</td>
<td>2.90</td>
<td>3.19</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.13</td>
<td>3.10</td>
<td>3.27</td>
<td>2.87</td>
</tr>
<tr>
<td>Working condition of banks i.e. problem in</td>
<td>Male</td>
<td>3.22</td>
<td>3.05</td>
<td>3.26</td>
<td>2.65</td>
</tr>
<tr>
<td>working with different groups</td>
<td>Female</td>
<td>3.22</td>
<td>3.22</td>
<td>3.47</td>
<td>2.66</td>
</tr>
<tr>
<td>Adoption of change</td>
<td>Female</td>
<td>3.25</td>
<td>3.17</td>
<td>3.38</td>
<td>2.99</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>3.22</td>
<td>3.12</td>
<td>3.45</td>
<td>3.07</td>
</tr>
<tr>
<td>Grievance handling mechanism</td>
<td>Female</td>
<td>3.27</td>
<td>3.22</td>
<td>3.60</td>
<td>3.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>Male</td>
<td>3.27</td>
<td>3.16</td>
<td>3.65</td>
<td>3.26</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.26</td>
<td>2.85</td>
<td>3.63</td>
<td>2.89</td>
</tr>
<tr>
<td>Value of Cronbach's Alpha</td>
<td></td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6 and Table 7 show that all employees either male or female of all levels have not felt job stress since the value of all have been more than 3. Value of working with other employees, fear of losing job, adoption of change and grievance handling mechanism have been more than 3 clearly support that employees of both banks have not feel any kind of job stress after merger and acquisition. Value of employees’ satisfaction due to job stress after merger has been more than 3, i.e. 3.46 also indicates the satisfaction level of employees. Value Cronbach’s Alpha has been 0.83 and 0.86 which is sufficient to explain the consistency in the responses of for questionnaires of job stress and employee satisfaction.

Relationship between Employee Satisfaction with Working Environment, Employee Turnover and Job Stress

Correlation matrix and regression have been computed to assess the extent of relationship in between the variables of employees’ satisfaction with working environment, employee turnover and job stress.
Table 8

<table>
<thead>
<tr>
<th>Correlation among the study variables</th>
<th>Employees Satisfaction</th>
<th>Working Environment</th>
<th>Employees Turnover</th>
<th>Job Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees’ Satisfaction</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Environment</td>
<td>1</td>
<td>.630**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Employee Turnover</td>
<td>.325**</td>
<td>.352**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Job Stress</td>
<td>.403**</td>
<td>.373**</td>
<td>.531**</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 8 clearly shows that all the variables have been positively correlated to each other at 5% level of significance. Correlation between employee satisfaction and job stress & employee turnover has been low i.e. .403 and .325 indicate that job stress and employee turnover have lower impact on employees’ satisfaction after merger.

Regression among the variables

<table>
<thead>
<tr>
<th>Details</th>
<th>Working Environment</th>
<th>Employee Turnover</th>
<th>Job Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>b (Coefficient)</td>
<td>2.126</td>
<td>1.102</td>
<td>2.253</td>
</tr>
<tr>
<td>R Square (%)</td>
<td>82.2</td>
<td>74.4</td>
<td>68.6</td>
</tr>
<tr>
<td>&quot;t&quot; Value</td>
<td>1.915</td>
<td>2.421</td>
<td>2.189</td>
</tr>
<tr>
<td>Significance</td>
<td>.002</td>
<td>0.025</td>
<td>0.115</td>
</tr>
</tbody>
</table>

On simple observation of table 9, it has been clear that there exists a positive relationship between Employee Satisfaction with Working Environment, Employee Turnover and Job Stress. About 68% to 82% of variance of employee satisfaction has been explained by job stress, employee turnover and working environment.

Conclusion

Merger and acquisitions significantly affect the performance and contribution of the employees. Therefore, banks should focus on providing better working environment, minimizing job stress and turnover rate of the employees to achieve better performance from their employees. Banks should identify the different factors of employee satisfaction after merger and acquisitions which has positive and negative impact on employee satisfaction. All the employees who are working in different banks are satisfied when they are exercising the authority, quality of work life and overall satisfaction with working environment. Employees of both banks i.e. NMB Bank Limited and Citizen Bank Limited are satisfied after merger and acquisition. The correlation among the working condition, employee turnover & job stress show positive relation with employee satisfaction. This shows that all the factors are equally responsible for the employee satisfaction after merger. This is also supported by the regression result giving the significant impact of worker condition, employees turnover and job stress on employee satisfaction after merger.

Bibliography


Monetary Policy of Nepal, (2072/73)


OPTIMIZATION OF PROCESS PARAMETERS OF MILLING OPERATIONS USING VORTEX TUBE COOLING SYSTEM

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Meerut

Mr. Gaurav Bhardwaj
M.Tech Scholar
Dr. A P J Abdul Kalam Technical University
Lucknow

ABSTRACT

The purpose of this work is to study and analyze the effectiveness of Vortex tube as a cooling system for milling operation. The vortex tube, also known as the Ranque-Hilsch vortex tube, is a mechanical device that separates a compressed gas into hot and cold streams. It is a simple and useful device without any moving parts, electrical or chemical power input or special equipments which produces desired cold or hot air economically. Use of vortex tube reduces the need for liquid coolant, which is messy, expensive, and environmentally hazardous. In this work surface finish of mild steel is compared after milling operation when dry machining is done without using any coolant and when cold air from vortex tube is used as a coolant in milling operation. It has been found that the ‘Cutting speed’ and the ‘Feed’ are the two major factors that significantly affect the surface finish and their optimum values were determined. Finally, the production trials were conducted with optimized process parameters value and other suggested countermeasures, it resulted in high surface finish and neat and clean machining environment.

Key words: Milling, Coolant, Vortex tube, Surface Roughness

INTRODUCTION

Metal cutting generates heat which influences the quality of a finished product, the force needed in cutting as well as limiting the life of the cutting tool. There are various attempts by researchers all over the world to understand the mechanism and theory behind the temperature build-up during machining in order to achieve optimized machining procedure and best workpiece results. Higher production rate with required quality and low cost is the basic principle in the competitive manufacturing industry. This is mainly achieved by using high cutting speed and feed rates. Nevertheless, elevated temperatures in the cutting zone under these conditions shorten tool life and adversely affect the dimensional accuracy and surface integrity of component. It is known that cutting fluids, when properly chosen and applied, are used to minimize problems associated with high temperature and high stresses at the cutting edge of the tool during machining because of the lubrication, cooling, and chip flushing functions of the fluids. Also, the effectiveness of fluids depends on their ability to penetrate the chip-tool interface and to form a thin layer in the shortest available time, either by chemical attack or by physical adsorption, with lower shear strength than the strength of the material in the interface.

VORTEX TUBE COOLING SYSTEM

The vortex tube, also known as the Ranque-Hilsch vortex tube, is a mechanical device that separates a compressed gas into hot and cold streams. Fig. 1.1 depicts the basic construction of a Ranque-Hilsch vortex tube in which the air emerging from the "hot" end can reach...
temperatures of 150°C, and the air emerging from the "cold end" can reach -30°C. It has no moving parts. Pressurized gas is injected tangentially into a swirl chamber and accelerated to a high rate of rotation. Due to the conical nozzle at the end of the tube, only the outer shell of the compressed gas is allowed to escape at that end. The remainder of the gas is forced to return in an inner vortex of reduced diameter within the outer vortex.

Fig 1.1 Vortex tube

**SELECTION OF SIGNIFICANT PROCESS PARAMETERS OF MILLING**

Milling is one of the important machining operations. In this operation the workpiece is fed against a rotating cylindrical tool. The rotating tool consists of multiple cutting edges (multipoint cutting tool). There are various process parameters in a milling operation. Some of them are very important which affects the output to a great extent and some are less important. Surface finish is mainly the result of process parameters such as tool geometry and cutting conditions (feed rate, cutting speed, depth of cut), but in addition there is also a great number of factors influencing surface roughness. The significant milling parameters which are primarily responsible for the surface finish was selected by studying the milling process and previous research papers. The non significant process parameters were dropped and the significant parameters are selected for the further analysis and optimization. The four process parameters, cutting speed, depth of cut, feed and type of coolant were found most significant. Table 1.1 displays the significant process parameters and their level.

**TABLE 1.1: PROCESS PARAMETERS FOR MILLING OF MILD STEEL**

<table>
<thead>
<tr>
<th>Process Parameters</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed (RPM)</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>Depth of cut (mm)</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>Feed (mm/rev)</td>
<td>0.5</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Type of coolant</td>
<td>Limited to two levels (i) Dry machining and (ii) Using vortex tube as cooling system</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OPTIMIZATION OF PROCESS PARAMETERS USING TAGUCHI METHOD**

Optimization of significant process parameters was done by using Taguchi method. In present study, an L_{16} orthogonal array was used. This array has fifteen degrees of freedom and it can handle three process parameters. Each milling parameter was assigned to a column
and sixteen milling parameter combinations were tested. The four most significant process parameters, cutting speed, depth of cut, feed and type of coolant were selected and tried with different combination of process parameter level. From the four significant process parameters one process parameter i.e. type of coolant could not be divided into different levels, only two levels were taken. Once the experimentation was performed without any coolant i.e. dry machining and second variation involved was the case of machining with vortex tube cooling system. Hence the combinations of remaining three most significant process parameters were tried for different levels within the permissible range according to workpiece material characteristics and machinability. In this regard, brainstorming was done with the lab technician of the Neelkanth Institute of Technology, Meerut, (U.P) and industry personnel.

The main aim of the study was to reduce the surface roughness for which the ideal value is zero, the analysis was carried out by using MINITAB-17 statistical software in which the S/N ratio was computed by using the smaller the better quality characteristics; \( n = [-10 \log_{10}(\text{mean of sum of squares of measured data})]. \) In the Taguchi method, the signal to noise ratio (S/N) was used as the data transformation method that consolidates the data for each control array row over the various noise levels into one value which computes both the mean and the variation present in the data. The equations for calculating the signals to noise ratios were based on the characteristics of the response variables being evaluated; nominal the best, smaller the better and larger the better. In the present work the main objective was to reduce the surface roughness value. The surface roughness value for each trial was evaluated and the report generated was obtained from MINITAB-17 statistical software.

The S/N ratio was obtained using Taguchi’s methodology. Here, the term ‘signal’ represents the desirable value (Mean) and the ‘noise’ represents the undesirable value (standard deviation). Thus, the S/N ratio represents the amount of variation presents in the performance characteristic. Here the desirable objective was to optimize the response variables Ra. Hence a smaller-the-better type S/N ratio was applied for transforming the raw data for surface roughness as smaller values of Ra was desirable.

Total sixteen experiments were conducted as suggested by \( L_{16} \) orthogonal array. Sixteen samples of mild steel of size 48 x 46 x5 mm were prepared. Each experiment was performed on a different mild steel sample of standard size. Surface roughness of each sample was measured using surface roughness tester. Three values of surface roughness were recorded and average of these three values was taken for further analysis. The average values of surface roughness are tabulated in table 1.2.

**TABLE 1.2: AVERAGE SURFACE ROUGHNESS VALUE OF TRIAL AND S/N RATIO**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Cutting speed in (RPM)</th>
<th>Depth of cut in (mm)</th>
<th>Feed in (mm/rev)</th>
<th>Average surface roughness ( R_a ) in (µin)</th>
<th>S/N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400</td>
<td>1</td>
<td>0.5</td>
<td>16.55</td>
<td>-24.3760</td>
</tr>
<tr>
<td>2</td>
<td>400</td>
<td>1.5</td>
<td>1</td>
<td>8.07</td>
<td>-18.1375</td>
</tr>
<tr>
<td>3</td>
<td>400</td>
<td>2</td>
<td>1.5</td>
<td>15.50</td>
<td>-23.8066</td>
</tr>
<tr>
<td>4</td>
<td>400</td>
<td>2.5</td>
<td>2</td>
<td>15.20</td>
<td>-23.6369</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
<td>1</td>
<td>0.5</td>
<td>3.18</td>
<td>-0.256744</td>
</tr>
</tbody>
</table>
Vortex tube was fabricated by using PVC pipes. Dimensions of each part were selected by studying various research papers related to the design of vortex tube. Fabrication detail of all parts is explained as follows:

I. **Main Body**

Main body of the vortex tube is the middle part of the tube as shown in the fig. 1.2. It is a PVC pipe of diameter 38 mm and length 70 mm. Inlet nozzle was fitted to this part which receives compressed air from the compressor.

II. **Cold Tube**

Cold tube is the short length tube on the right side of the main body. It is also a PVC pipe of diameter 25 mm and length 100 mm. One end of cold tube was fitted into the main body and other end was open and reduced to a size of 10 mm with a reducer as shown in fig. 1.2.

III. **Hot Tube**

Hot tube is the long tube on the left side of the main body. It is also a PVC pipe of diameter 25 mm and length 280 mm. One end of hot tube was fitted into the main body and in other end conical wooden valve was inserted as shown in fig. 1.2.

IV. **Inlet Nozzle**

Inlet nozzle is a very important part of the vortex tube which provides the required kinetic energy to the compressed air. In the given vortex tube inlet nozzle used, was a mild steel nozzle of 10 mm diameter. It was inserted into the main body of the vortex tube and leak sealant was applied on the joint to prevent leakage.

V. **Conical Valve**

Conical valve controls the flow of hot air from the hot tube. It was fabricated from a wooden piece of 30 mm diameter and 100 mm length. It was further machined to conical shape on a lathe machine. Angle of conical valve used at the hot end is 45°. This valve was adjustable at the hot end of the vortex tube.
EXPERIMENTAL VALIDATION

Milling is a widely used manufacturing process in the industry. After deep study of all the factors it was observed that the major factors responsible for surface roughness of the product were cutting speed, depth of cut, feed and type of coolant, amount of coolant used. The process parameters of milling using vortex tube as a cooling system were optimized to get a least value of average surface roughness. Taguchi Method was adopted for this specific purpose which had capabilities to design a set of experiments according to process parameters and their stages under the fixed tolerance limits.

COMPARISON OF SURFACE FINISH ON MILD STEEL SPECIMENS

Main objective of this work was to utilize vortex tube as a cooling system and to use cold air from the cold end of the vortex tube as coolant in milling operation. Milling operation was performed on mild steel specimens of dimensions 48 x 46 x 5 mm. milling machine with a horizontal arbor of 25 mm diameter was used for this work. Eight samples were taken from prepared standard size mild steel specimens and milling operation was carried out with optimized process parameters i.e. speed, depth of cut and feed. These samples were machined without using any coolant and with vortex tube cooling system. Surface roughness was measured using Surftest SJ-210 measuring instrument.

RESULTS AND DISCUSSION
The average value of S/N ratio for each level for each factor obtained is shown in Table 1.3. The table includes ranks based on delta statistics, which compare the relative magnitude of effects. The delta statistic is the highest minus the lowest average for each factor. Minitab assigns ranks based on delta values; rank 1 to the highest delta value, rank 2 to the second highest, and so on. The ranks indicate the relative importance of each factor to the response. The ranks and the delta values show that cutting speed has the maximum and the depth of cut has the minimum effect on surface roughness value.

**TABLE 1.3:** RESPONSE TABLE FOR SIGNAL TO NOISE RATIOS

[Smaller is better \([-10\log_{10}(\text{sum}(Y^2)/n)]\)]

<table>
<thead>
<tr>
<th>Process Parameters</th>
<th>Level-1</th>
<th>Level-2</th>
<th>Level-3</th>
<th>Level-4</th>
<th>Δ (Max-min)</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed</td>
<td>-22.4892</td>
<td>-5.9374</td>
<td>-16.3770</td>
<td>0.0218</td>
<td>22.5111</td>
<td>1</td>
</tr>
<tr>
<td>Feed</td>
<td>-11.9250</td>
<td>-5.6528</td>
<td>-14.6376</td>
<td>-12.5664</td>
<td>8.9848</td>
<td>2</td>
</tr>
</tbody>
</table>

Fig. 1.3 shows the main effect plots for signal to noise ratio. These graphs show the variation of mean of S/N ratio with levels of selected process parameters. Plot of cutting speed shows that at minimum value of cutting speed in selected range i.e. 400 RPM, signal to noise ratio is also minimum. S/N ratio increases when speed increases from 400 to 500 RPM, because surface roughness value decreases when cutting speed increases during milling. S/N ratio decreases when speed increases from 500 to 600 RPM which means surface roughness value increases for this range of cutting speed. This increment in the surface roughness value was either due to the non homogeneous material or due to use of older milling machine. S/N ratio again increases when speed increases from 600 to 700 RPM. Hence for cutting speed, the optimum value is 700 RPM as the S/N ratio is maximum at this speed. Plot of depth of cut shows that S/N ratio is minimum at maximum value of depth of cut in the selected range i.e. 2.5 mm because surface roughness increases when depth of cut increases. The optimum value of depth of cut for which S/N ratio has maximum value is 1.5 mm. Plot of feed shows that S/N ratio increases between 0.5 to 1 mm/rev and decreases afterword because excessive feed decreases the surface finish. For the parameter feed, the optimum value is 1 mm. Maximum value of S/N ratio indicates that particular parameter has maximum desirable effect on objective of the experimentation.
ANALYSIS OF VARIANCE

The analysis of variance (ANOVA) for S/N ratio was computed in order to identify the milling process parameters which significantly affect the surface roughness. The data for each factor was tested for F value to find significance of each factor. The Null hypothesis testing is valid when computed F value is less than standard F value and computed P value is higher than the standard P value, otherwise the factors significantly affect the quality characteristic. For the present experiment the standard F value is 19.00 and the standard P value is 0.05 for F distribution curve with 95% confidence level. It is evident from the Table 1.4 that:

- The computed F values for the cutting speed (F value 56.3) and feed (F value 22.78) were higher than standard F(19.00) value and the computed P value was lower than the standard P value indicating that these were the factors that significantly affect the surface finish.

- The computed F value for depth of cut (F value 1.32) was less than the standard F value thus the effect of this factor was found insignificant.

**TABLE 1.4: ANALYSIS OF VARIANCE FOR S/N RATIOS**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Seq SS</th>
<th>Adj SS</th>
<th>Adj MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting speed</td>
<td>3</td>
<td>1231.49</td>
<td>1231.49</td>
<td>410.497</td>
<td>56.39</td>
<td>0.000</td>
</tr>
<tr>
<td>Depth of cut</td>
<td>3</td>
<td>34.91</td>
<td>34.91</td>
<td>11.636</td>
<td>1.32</td>
<td>0.354</td>
</tr>
<tr>
<td>Feed</td>
<td>3</td>
<td>172.92</td>
<td>172.92</td>
<td>59.975</td>
<td>22.78</td>
<td>0.024</td>
</tr>
<tr>
<td>Error</td>
<td>6</td>
<td>53.09</td>
<td>53.09</td>
<td>8.848</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>1499.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1.5 shows the significant factors and their corresponding values.
TABLE 1.5: SIGNIFICANT FACTORS AND THEIR VALUES

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Factors</th>
<th>Affecting variation</th>
<th>Contribution</th>
<th>Best level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cutting speed,</td>
<td>Significant</td>
<td></td>
<td>700 RPM</td>
</tr>
<tr>
<td>2</td>
<td>Feed,</td>
<td>Significant</td>
<td></td>
<td>1 mm</td>
</tr>
<tr>
<td>3</td>
<td>Depth of cut,</td>
<td>Insignificant</td>
<td></td>
<td>_</td>
</tr>
</tbody>
</table>

CONFIRMATION TRIALS

The final step was to predict and verify the reduction in the average roughness value after implementing the suggested process parameters. The Taguchi method for design of experiment specifies that level of parameters which has the maximum S/N ratio as the optimum parameter. Therefore the level of process parameters which had the maximum S/N ratio was selected as the optimum process parameter for the final trial tests to verify. Table 1.6 and 1.7 shows the values of average surface roughness in case of no coolants and in case of vortex tube cooling system.

TABLE 1.6: CONFIRMATION TRIAL RESULTS FOR USING NO COOLANTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Cutting speed in (RPM)</th>
<th>Depth of cut in (mm)</th>
<th>Feed in (mm/rev)</th>
<th>Average surface roughness $R_a$ in ($\mu$m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>2.54</td>
</tr>
<tr>
<td>2</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>3.30</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.80</td>
</tr>
<tr>
<td>4</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>2.70</td>
</tr>
<tr>
<td>5</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>3.65</td>
</tr>
<tr>
<td>6</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>2.80</td>
</tr>
<tr>
<td>7</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>5.15</td>
</tr>
<tr>
<td>8</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>2.51</td>
</tr>
</tbody>
</table>
TABLE 1.7: CONFIRMATION TRIAL RESULTS FOR VORTEX TUBE COOLING

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Cutting speed in (RPM)</th>
<th>Depth of cut in (mm)</th>
<th>Feed in (mm/rev)</th>
<th>Average surface roughness $R_a$ in ($\mu$m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.23</td>
</tr>
<tr>
<td>2</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.30</td>
</tr>
<tr>
<td>3</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.35</td>
</tr>
<tr>
<td>4</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.70</td>
</tr>
<tr>
<td>5</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.13</td>
</tr>
<tr>
<td>6</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.03</td>
</tr>
<tr>
<td>7</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.05</td>
</tr>
<tr>
<td>8</td>
<td>700</td>
<td>1.5</td>
<td>1</td>
<td>1.41</td>
</tr>
</tbody>
</table>

The Average value of surface roughness obtained in eight trials for the case of without using any coolant during milling operation is 3.056 $\mu$m. Whereas the average value of surface roughness obtained in eight trials for the case in using vortex tube cooling system during milling operation is 1.275 $\mu$m.

The percentage reduction in surface roughness by using vortex tube cooling system is calculated as 58.27%.

CONCLUSIONS

In the present work, experimental investigations of milling operation were carried out to obtain an improved quality surface finish by using vortex tube as a cooling system. The following conclusions are drawn from the present investigation:

- It is concluded that vortex tube can be utilized as a cooling medium in the milling operation. Fabrication of vortex tube was made possible by PVC pipes.
- The temperature difference between hot end and cold end of the vortex tube was recorded as 12.6 °C.
- It is concluded that cutting speed and feed are major factors that significantly affect the surface roughness of the mild steel during the milling operation. The other factor, Depth of cut is found to be insignificant. It is concluded that optimum value for cutting speed is found to be 700 RPM and for feed it is 1mm/rev.
- Percentage reduction in surface roughness by using vortex tube cooling system is calculated as 58.27%.
- Vortex tube cooling serves as a neat and clean coolant for milling operation and gives a pollution free machining operation with a good surface finish.
LIMITATIONS OF THE PRESENT WORK

Although an optimum experimental work has been done to investigate the application of vortex tube as a cooling system for milling operation but still there are some limitations of present work. While carrying out the present work, the following limitations were encountered.

- Temperature of the cold air used as coolant during milling operation can not be decreased much.
- The experiment was conducted on the semi automatic milling machine available in the lab of Neelkanth Institute of Technology, Meerut, (U.P).
- Cold air jet from vortex tube was directed toward tool workpiece interface manually due to which quality of surface finish was reduced in some experiments.
- Conical valve at the hot end side of the vortex tube was also operated manually which caused some disturbance in the value of cold air temperature.

SCOPE FOR FUTURE WORK

The following research areas are recommended to be undertaken for obtaining minimum surface roughness in milling operation.

- Study need to be conducted to obtain the minimum temperature at the cold end of the vortex tube.
- Study need to be conducted for fabrication of the vortex tube from different type of materials.
- Study need to be conducted for more levels of the milling process parameters.
- Study need to be conducted for different angles of conical valve.
- Study need to be conducted for automatic movement of the conical valve during operation.

REFERENCES


STUDY ON THE COMPRESSIVE STRENGTH OF SELF-COMPACTING CONCRETE WITH PERCENTAGE REPLACEMENT OF CEMENT WITH GROUND GRANULATED BLAST FURNACE SLAG

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Scholar at Vivekanand College of Technology & Management, Aligarh

Abstract-
In the last few years, the use of Self Compacting Concrete (SCC) is increasing and there has been a lot of research and amendments to produce self compacting concrete, which have the desired characteristics. In the form of raw materials in concrete, there is a current trend around the world to treat and treat untreated industrial by household wastes etc. Not only do they help reuse waste products, but also create a clean and green environment. The current study focuses on the use of ground granular blast furnace slag (GGBS) as partial replacement of fine aggregate and cement respectively in SCC. In this paper, experimental study is done on fresh and rigorous properties such as the ability to flow, ability to pass, the compressible strength of the M50 grade of the SCC. In this investigation, SCC was partially made with partial change with granite sludge with GGBS and cement. Five mixes with different percentages of Granite Sludge (0%, 5%, 10%, 15% and 20%) as partial replacement for cement (0%, 10%, 20%, 30% and 40%) of GGBS as partial replacement for fine aggregate (M-sand) is considered. Functional and rigid test are conducted for each mixture respectively. Examination results for strict quality are done in 7, 28 days respectively. The purpose of this research is to know the behavior and mechanical properties of self compacting concrete after connecting industrial wastes in different proportions by a test such as compressive strength. The results obtained are discussed and the conclusion is finally concluded accordingly.

Keywords— SCC, GGBS, Granite Sludge, Compressive strength.

Introduction—
The improvement of new innovation in physics is moving forward quickly. In the recent three decades, a great deal of research worldwide has been completed to increase the performance of self compacting concrete, as far as strength and durability are concerned. Consequently concrete is no longer a building material containing cement, composite and water, although the construction industry has changed into a specially adapted material with some new components to meet the special needs. In the SCC, focused on the use of granite mud and GGBS respectively, which is in the form of a fine aggregate (M-sand) and partial replacement of cement. Self-Compacting Concrete (SCC) is a streaming concrete mix that can be consolidated under its special weight. The extremely liquid nature of the SCC makes it suitable for keeping it in difficult conditions and in the section with overcrowded reinforcement. The use of SCC can also help in narrowing the loss related to hearing on the workplace incited by concrete vibrations. Another advantage of SCC is that the time needed to keep the larger section is widely used. Convergent convergence in limited areas, where consolidation can not be appropriate. For example, repairs of the base sides of columns, girders and slabs often require limited and difficult filling to achieve access points. To encourage concrete placement and to ensure stability, the SCC can be used in various categories, including filling complex formwork and casting of tunnel lining sections with
limited access to consolidation. Due to industrialization, there is heavy use of granite waste, GGBS etc. and there are industrial wastes and this creates a threat to the environment, hence the cost of the structure is reduced. Similarly to make the structure more sustainable, the issue of this material is reduced.

**The purpose of this research**

This research has been started so that it can be utilized for subsequent efforts to create the effort made.

a) To study the properties of self compacting concrete.
b) Made by GGBS to replace cement by granite mud and M-sand.
c) Finding new and rigid properties of SCC by different methods.
d) Studying comparisons

**Literature Review**

Now the one-day concrete is around the accepted and most used construction material. Essentially concrete cement, fine aggregate, thick aggregate, water is made and in addition there is some time with the increase of mineral and chemical mixture. Due to the increase in development, the demand for concrete is increasing and at the same time the access to various components of cement and concrete can be ended. It may be less than the use of industrial by products as a replacement material, which will not affect the properties of concrete. Previous research has argued that the use of granite waste and GGBS produces mechanical properties of concrete and apart from this, the expansion of these materials in self-compacting concrete will not change the properties further. In [1,2,3] Dosages of super-plasticizers used for mixing, packing, combing water, and additions are key points affecting SCC properties. Thus, he proposed another mix design method for self-compacting concrete. Finally Nan Su method could be used to produce effectively SCC of high quality. Compared with the other technique created by the Japanese Ready-Mixed Concrete Association (JRMCA), this method is less complex, easier for implementation and less time-consuming, requires a smaller amount of binders and saves cost. From [4, 5, 6, 7, and 8] Maximum 20% partial replacement of cement with granite waste has expanded the quality parameters of self compacting concrete. In [9, 10, 11, 12] The correct aggregate has been changed to 30% with GGBS. It has been found that compressive strength, tensile strength and flexure power increment have been divided with increasing the replacement rate of fine aggregates with GGBS. Concrete is to be kept 0%, 5%, 10%, 15% and 20% for the same, and the fine gross is replaced by GGBS as 0%, 10%, 20%, 30% and 40%.

**Cement**

Cement may be defined as the binding material posses binding property which helps in combining with other inert material to form a dense assembly.

**Corporal properties**

Cement is generally characterized according to its corporal properties for aiming quality control. Corporal properties of cement are accustomed to differentiate and to analogize the various cements. Following are the various corporal properties of cement

- Time of setting
- Soundness
- Fineness
- Strength
Composition of Portland Pozzolona Cement

The major ingredients of PPC are as follows.
- Calcium
- Alumina
- Silica
- Iron

Calcium is generally obtained from limestone, marl or chalk. While silica, alumina and iron come from sand, clays and iron ores.

<table>
<thead>
<tr>
<th>Contents</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>CaO</td>
<td>60 – 67</td>
</tr>
<tr>
<td>SiO₂</td>
<td>17 – 25</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>3 – 8</td>
</tr>
<tr>
<td>SO₃</td>
<td>2 - 3.5</td>
</tr>
<tr>
<td>Alkalis</td>
<td>0.3 – 1.2</td>
</tr>
<tr>
<td>MgO</td>
<td>0.5 - 6</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>0.5 – 6</td>
</tr>
</tbody>
</table>

Table1: Percentage of materials present in cement

The major compound generally form after the addition of water in cement known as Bogus Compounds are as follows
- Tri calcium Aluminate (C3A)
- Tetra Calcium Alumino Ferrate (C4AF)
- Tri Calcium Silicate (C3S)
- Di Calcium Silicate (C2S)

Setting and Hardening-

When water is assorted with Pozzolona Cement, The various ingredient of cement undergoes a chain of chemical reactions which causes it to harden. This process of chemical reaction is known as hydration process and heat generates from these reaction is known as heat of hydration. These chemical reactions give some compounds which are known as BOUGs compound responsible for the properties of cement. These compounds plays an important role in the hardening of cement are described as follows as per their formation
- **Tri calcium Aluminates (C3A)** – This compound form after the addition of water in cement within 24 hours. This compound generates maximum hydration’s heat and accountable for the precociously strength of cement.
- **Tetra calcium Alumino ferrite (C4AF)** – This compound also forms after the addition of water in cement within 24 hours but after the configuration of C3A. This compound contributes very little amount of energy in the cement.
- **Tri calcium silicate (C3S)** - This compound gives major contribution in hydration’s heat also accountable for precociously strength of cement.
• **Di calcium silicate (C2S)** - This compound forms after one year of addition of water in cement. This compound is responsible for the progressive strength of cement. This compound generates least heat of hydration.

**Grounded Granulated Blast-furnace Slag**

The grounded granulated blast furnace slag (GGBS) is a by-product produced from iron factory during formation of iron. Iron ore, coke and limestone through in blast furnace and treated at temperature 1400 °C to 1600°C than it flowing on the top of molten iron in the form of fane. When the metallurgical smelting technique is complete, the lime in the flux has been chemically combined with the aluminates and silicates of the ore and coke ash to form a non-metallic product called blast furnace slag.

During the period of cooling and hardening from its molten state, blast furnace slag can be cooled in several ways to form any of several types of Blast furnace slag products. Its chemical composition is nearer to the chemical composition of cement that because it can be used in cement concrete.

**Granulated Slag**

Granulated slag is rapidly cooled by large quantities of water to produce a sand-like granule that is primarily ground into a cement commonly known as GGBS (Ground Granulated Blast Furnace Slag), or Type S slag cement. It is additionally mixed with Portland cement clinker to create a homogenized Type IS cement.

The important element of blast furnace scum are CaO (30-50%), SiO₂ (28-38%), Al₂O₃ (8-24%), and MgO (1-18%). On increasing the CaO content of the slag compressive strength is increased. The MgO and Al₂O₃ content show the similar trend up to respectively 10-12% and 14%, beyond which no further improvement can be obtained. This chemical composition is nearer to the chemical composition of cement that because it can be used as a binder material and also used in concrete by replacing the by weight of cement.

**Tests on GGBS**

**Standard consistency** - The motive of this experiment figure out the water contents demanded to produce a GGBS standard consistency paste.

**Accoutrements** - vicat Accoutrement, “Mixing trowel conforming the requirement of IS: 10086-1982”.

**Procedure:**

- Weight approximately 400mg of GGBS and mix it with a weighed quantity of water, i.e. 10% to 25% weight of GGBS. The time of mixing should vary between 5 to 7 minutes.
- Brim the vicat’s mould with paste and level it with the help of trowel.
- Loser the plunger smoothly till it hold the GGBS surface.
- Uncork the plunger and permit it to penetrate into the paste.
- Note the interpretation on the guage.
- Repeat the above procedure taking fresh samples of GGBS and different quantities of water until the reading on the guage is 5 to 7 mm.

**Observations and calculations:**

Weight of GGBS taken = 400 g
Quantity of water added to cement = 60 ml or g
Standard Consistency = (Quantity of water 5-7 mm penetration / weight of cement) * 100
= (60/400)100 =15%
Initial percentage of water added to GGBS – 15%

“Earliest and final setting time”

Aim: To calculate the earliest and final setting time.

Accoutrements - vicat’s Accoutrements, Mixing trowel meeting the requirement of “IS: 10086-1982”.

Procedure:

- Groom a GGBS paste by mixing the GGBS owing to 0.875 time of water demanded for making a “standard consistent paste”.
- “Threshold a stop-watch at the instance ai which water is added to the GGBS”.
- The properly mixed cement mortar is filled in the mould completely, the mould is resting on a plate which is non porous and smooth plate making a level with the top of the model.

Observations and calculations:

“Weight of GGBS taken = 400 g”

Quantity of water added to GGBS = 0.875*Quantity of water required for standard consistency.

= 0.875*60 = 52.5g

Result:

“Initial setting time: 115 minutes”
“Final setting time: 11.5 hours”

Fineness-

Aim: Determine the fineness of GGBS by dry sieving.

Accoutrements: Ninety µm IS Sieve, Balance capable of deliberation of ten g to the closet ten mg, A pure bristle brush, ideally with 25 to 40 mm.

Procedure:

- GGBS sample of about 100 gm was taken and represented by w1.
- Put the sample on “IS sieve no. 9”
- Air set lump in the sample was remove with the help of fingers.
- Sieving was done by the both the hands and sieves with usually rise without sipping the GGBS and keeping GGBS will spread on the screen carried out circular motion of sieve of the period for 15 min.
- The residual left on the sieve was limpid and weight of residual is represented as w2

Result: “the percentage of residual GGBS sample by dry sieve 3.63 % it has less than 10% by weight.”

Test on Aggregates-

Specific gravity of coarse aggregate

Aim: The motive of this experiment is to figure out the specific gravity of coarse aggregate passing 4.74 mm IS sieve by pycnometer.

Material & equipment:

Pycnometer of about 900ml capacity, with a conical brass cap and screwed at it top, De-aired, distilled water, Glass rod
Procedure:
- Pycnometer is cleaned and dried properly. Figure out the pycnometer mass \(M_1\).
- Oven-dried coarse aggregate of weight 200 to 400 gm and keep it in the pycnometer, calculate the mass of the pycnometer plus soil \(M_2\).
- Fill the pycnometer to half of its height with distilled water and blend it thoroughly with glass rod. Add more water and stir it. Replace the screw top and fill the pycnometer flush with hole in the conical cap. Dry the pycnometer from outside, and find the mass \(M_3\).
- Empty the pycnometer, clean it and fill it distilled water to the hole of the conical cap and find the mass \(M_4\).
- Calculations:
  The specific gravity \((G)\) is calculated by
  \[
  G = \frac{(M_2 - M_1)}{(M_2 - M_1) - (M_3 - M_4)} = \frac{(919 - 652)}{(919 - 652) - (1641 - 1473)}
  \]
  \[G = 2.67\]
- Calculations:
  \[
  G = \frac{(881 - 652)}{(881 - 652) - (1614 - 1474)}
  \]
  \[G = 2.58\]
- Results:
  "Specific gravity of fine aggregate = 2.58"
  "Specific gravity of coarse aggregate = 2.6"

"Sieve analysis"-
- The particle size distribution of coarse aggregate and fine aggregate can be figure out by using the sieve analysis. This can be achieved by sieving the aggregate as per IS: 2386 (PART 1) – 1963. In this experiment we have a tendency to “use different sieves as standardized by the IS code and then pass aggregate through them and so collect different sized particles left over different sieves.”
- A set of IS sieve of size _-_ 80mm, 63mm, 50mm, 40mm, 31.5mm, 25mm, 20mm, 16mm, 12.5mm, 10mm, 6.3mm, 4.75mm, 3.35mm, 2.36mm, 1.18mm, 600µm, 300µm, 150 µm and 75 µm.
- Balance or scale with an accuracy to measure 0.1 present of the weight of the test sample.s

Sieve analysis for coarse aggregate-
Analysis of particle using sieve is done for determining the size of particles in coarse aggregate
- **Aim:** To determine the particle size distribution
- **Apparatus used:**
  A brood of IS sieve of size – 40mm, 20mm, 16mm, 10mm, 4.5mm, 2.36mm.
- **Preceding**
  - “Dried the test sample up to a constant weight at a temperature of 110 +5 degree centigrade and weighted”
  - Sieve the sample.
  - Weight the sample of the material retained on each sieve after completion of sieving.
  - “Cumulative weight passing through each sieve is calculated as a percentage of total sample weight”
- **Observation:**
  Total weight of coarse aggregate = 2000 gm
Sieve analysis for the fine aggregate:
Aggregate gradation (sieve analysis) is the distribution of particle size as a present of the total dry weight. Gradation is determined by passing material through a series of sieves lined up progressively smaller opening from top to bottom and weighting the material retained on each sieve.

**Aim:** “To adjudicate the particle size distribution of fine aggregate”.

**Apparatus used:**
set of “IS sieves” of size – 10 mm, 4.75 mm, 2.36 mm, 600 µm, 300 µm, 150 µm, 75 µm.

**Preceding:**
- “The test sample is dried to a constant weight at a temperature of 110 ± 5 °C and weighted.”
- “The sample is sieved by using a set of IS sieves.”
- “On completion of sieving, the material on each sieve is weighted.”
- “Cumulative weight passing through each sieve is calculated as percentage of total weight.”

**Observation:** Total weight of fine aggregate = 2000 gm

**Preceding to adjudicate the distribution of particle size of aggregate:**
- “The test sample is dried to a constant weight at a temperature of 110 ± 5 degree centigrade and weighted.
- The sample is sieved by using a set of IS sieves.
- On completion of sieving, the material on each sieve is weighted.
- Cumulative weight passing through each sieve is calculated as percentage of total weight.
- Fineness modulus is obtained by adding cumulative % of aggregates retained on each sieve and dividing the sum by 100.”

**Water absorption coarse aggregate:**
This experiment gives aid to adjudicate the absorption of coarse aggregate as per “IS: 2386 (Part 3)-1963”. For this check a sample should not less than 2000g ought to be used. The apparatus used for this test are -
- “Wire basket – perforated, electroplated or plastic coated with wire hangers for suspending it from the balance, Water – tight container for suspending the basket, Dry soft absorbent cloth – 75 cm x 45cm (2 nos), shallow tray of minimum 650 sq.cm area, air-tight container of a capacity similar to the basket and oven.”

**Procedure:**
- The sample should be thoroughly washed to remove finer particle and dust, drained and then placed in the wire and immersed in water at a temperature between 22 to 32 °C.
- After immersion, the entrapped air should be removed by lifting the basket and allowing it to drop 25 time in 20 second .the basket and sample should remain immersed for a amount of more than twenty four hours afterwards.
- The basket and aggregate should than be removed from the water, allow to drain for a few minutes, after which the aggregate should be gently emptied from the basket on to one of the dry cloth when they would remove no further moisture. The should be spread on the second cloths and exposed to the atmosphere away from direct sun light till it appear to be completely surface dry. They should be weighted (weight A).
The aggregate should then place in an oven at a temperature of 100 to 110 °C for 24 hrs. It should than be removed from the oven, cooled and weighted. (Weight B).

Formula used in water absorption = \( \frac{(A - B)}{B} \times 100\% \)

Two such test should be done and mean result should be reported. For performing this experiment the amount of sample should not be less than 2000gm.

**Calculation:**

A=3200gm  
B=3182 gm  
Water absorption = \( \frac{(3200-3182)}{3182} \times 100 \)

=0.53

**Result = 0.53**

**Fineness modulus of coarse aggregate:**

**Procedure:**

“Fineness modulus is obtained by adding cumulative proportion of fine aggregates retained on every sieve and dividing the sum by hundred.”

**Calculation**

Fineness modulus= sum of cumulative % Wt retained (table 7) /100

= 385.3/100

= 3.85

**Result: = 3.85**

**Conclusion**

Based on the results of this study, the following conclusions are drawn-

a) Due to industrialization, large quantities of granite sludge and GGBS are produced and vandalism is produced. To reduce the cost of construction of these wastes which threaten the environment, the structure can be effectively incorporated in the concrete to make the structure more sustainable.

b) Increased percentage of granite sludge and GGBS waste reduces compression strength of concrete.

c) It is seen that the density is directly proportional to the force, as the increase of the density increases, the strength increases, as the density decreases, the strength also decreases.

d) To calculate the earliest and final setting time is- “Initial setting time: 115 minutes” and “Final setting time: 11.5 hours”

e) The fineness of GGBS by dry sieving is “the percentage of residual GGBS sample by dry sieve 3.63 % it has less than 10% by weight.”

f) The motive of this experiment is to figure out the specific gravity of coarse aggregate passing 4.74 mm IS sieve by pycnometer. “Specific gravity of fine aggregate = 2.58” and “Specific gravity of coarse aggregate = 2.6”

g) Water absorption of coarse aggregate is 0.53.

h) Fineness modulus of coarse aggregate is 3.85.

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FINANCIAL INCLUSION AND DEVELOPMENT IN ORDER TO DEVELOP SUITABLE MARKETING STRATEGIES IN INDIA

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Abstract-
According to Global Findx (2014 statistics), two billion people in the world do not use formal financial services. Besides, seventy-five percent are poor people. Bank, out of which forty percent are from the poorest homes in developing countries. Women in developing countries are less than twenty percent of men deposits account and seventeen percent less likely to borrow from formal financial institution. The costs of account, distance travel, infrastructure facilities, and the opening of the account are often seen in some reasons. Government of India has created an ambitious strategy for financial inclusion as part of its development plan with the support of the technology-enabled branchless banking has been successful in expanding the drive about 60 percent of Indian population in terms of banking. However, some evidence suggests that most bank accounts are not being used or not access, especially not by the poor, are the goals of financial inclusion. Like this, the researcher is interested in examining the causes of such low use formal financial services are also willing to measure researcher financial the ability of the persons with the given respondents. Most Indian homes lack access to basic formal financial services. It leaves large part of India's high personal savings have been invested in physical assets and a large part of its borrowing went into the informal credit market. Formal saving generally cheaper and more easily available accounts are expected to be more and more savings accounts utilize more savings. Thus, the researcher is to know whether or not interested in the cost of formal savings transaction costs these costs help explain the less use of financial services. With the identification of the reasons for the use of formal financial services, financial capability and cost of transaction of financial services; Interested by researcher suggest marketing strategies for financial products to increase financial inclusion in India.

Keywords- Financial inclusion in india, overiew, its importance, marketing strategies etc.

Introduction-
As defined by the United Nations, financial inclusion is a financial sector that provides access to savings and payment services to all the bankable people and firms and loans for all. It is not necessary for the inclusive finance that every person is eligible to use every services, but should be able to choose them if desired. 'Money transfer and insurance to poor and low income families and their micro enterprises.' Dr. C. The Committee on Financial Inclusion under the chairmanship of Rangarajan has defined financial inclusion as the process of ensuring access to financial services and timely and adequate credit where weaker sections such as weaker groups and the need for low-income groups at an affordable cost.

However, Dr. Raghuram ji Under the chairmanship of Rajan, the committee on financial reforms, widely defined financial inclusion as a financial universal access to a wide range of financial services at a reasonable price. These include not only banking products, but other financial services like insurance and equity products. Financial inclusion is a basic
requirement of the Government of India. The goal of financial inclusion in India is to draw financial services adequately to open their own growth potential, unless there is no service population. In addition, target efforts towards greater widespread development by accessing funding especially to the poor.

Financial inclusion in India has become a cliche although people are still untouched by unprecedented initiatives. There is apathy towards the implementation of financial inclusion for the sole reason that nobody is aware of the ideal path. It is fundamental to know that the objectives behind the population are adequate to be economically taboo. There are 203 million households in India, out of which 147 million are in rural areas. In this vast piece of population, only three types of financial items, direct credit offices, required sprawling records or a settled store, and entry to safety. Only 48 percent of India's population is enrolled in these basic financial services, 59 percent in Sri Lanka and 63 percent in Korea. The poorer meeting spends the highest level of salary on nutrition for about 60 to 90 percent. Any reduction in earnings or additional expenditure is an immediate result on family welfare.

Poverty is more than the absence of cash only. This includes lack of access to resources and means through which poor can increase their life. To avoid the formal financial structure has been reputed as one of the obstacles in the world without progressively destruction. In many developing countries, the financial institution does not have a large share of family units. This avoidance does not really mean that poor people need dynamic financial life: if told, in reality, the delicacy of their situation has led to the improvement of advanced casual financial instruments.

The use of only contingent means means that the poor are bound by their ability, reimburse the responsibilities, and maintain the trust in the risk of reliably. At macroeconomic level, this financial inevitability on the poor can reduce monetary growth and fuel imbalance. Finding creative models to provide financial services to the poor has now changed into an earnest examination. Therefore, this study is expected to facilitate marketing strategies for financial products to highlight and enhance specific aspects of financial inclusion.

**Importance of Financial Inclusion in India**

In India, policy makers are basically focusing on the financial inclusion of rural and semi-rural areas for the needs of three most important pressures:

a) To build a platform for habit to save money: Emasus of low wages is basically living under a consistent shadow of financial weight in view of non-arrangement of investment funds.

b) To provide formal loan assistance: Generally unaffiliated persons need to rely on casual channels of credit in the form of helplessly as family, companions and moneylenders. Access to sufficient and simple credit to formally manage an account channels can lead to a sense of public entrepreneurship to grow and flourish in India.

c) To prevent interruptions and leaks in public subsidies and welfare programs: A generous measure of schematic cash for the poor people does not actually contact them. Although this property gives the air through adequate arrangements of the government organization, it is widely accepted for release and can not receive the requisite meetings. Accordingly, the government is pushing for the exchange of direct
money for the distribution of its money, but is financing the goods and is paying the money.

**Literature review**

Franklin Allen, Real Demerker-Family, Liora Clapper and Maria Soled Martinez Periya (2016) defined financial inclusion as 'use of formal accounts-can bring many benefits to individuals'. The authors examine individual and nation characteristics related to financial inclusion. Among the systems which are powerful are prohibited: poor, pastoral, women or young people. Manufacturers find that financial inclusion is associated with less account costs, more prominent proximity to financial middle people, more frozen legal rights, and more politically stable situations. As it may be, the creators recommend the achievement of strategies to include advance, it is believed that it depends on the quality of the people.

Regarding measuring financial inclusions around the world from the Global Deluxe Database 2014, the Real Demirigü-Véron, Leora F. Clapper, Dorothea Singer and Peter van Odysse (2015) presented important comments. The database showed that 62 percent of the world's adults account with a bank or some type of financial institution or with mobile money providers. Apart from this, information shows that Colossel Open Doors remain to increase financial inclusion among women and poor people. As indicated by the database, governments and private parties can consider increasing the wages to be an important part and the government goes into accounts with money. There are also large scopes for promoting greater access to accounts, which allow those who already have the most to benefit fully from financial inclusion.

Diego Anzoategui, Asli Demirgüç-Kunt and María Soledad Martínez Pería (2014), examined the effect of the dispatch on financial inclusion. The study examined the effect of the settlement of families on the use of investment funds and credit instruments from the formal financial foundation. The findings of the study have shown that even though remittances have a positive impact on financial inclusion by encouraging the use of deposit accounts, but they do not have a significant and strong impact on demand and utilization of loans from formal institutions.

Asli Demirukk-Kara, Liora Clapper and Douglas Randall (2014) discovered the use and demand of formal financial services among self-identified Muslim adults. The findings of the review revealed that after formalizing the Muslims as a whole more personal and national-level properties than non-Muslims, there is a formal record or extra space in a formal financial organization. However, there is no indication from the investigation that investigation is more inappropriate than Muslim non-Muslims for formal or incidental reports.

Jayati Ghosh (2013), reviewed the literature based on microfinance in Andhra Pradesh in India and examined the microfinance crisis. It has been estimated in the review that microfinance can not be seen as a recession of the silver to improve and microfinance institutions with profit-making systems are risky. Apart from this, the study has suggested the need for regulatory measures and other strategies for the viable financial inclusion of the poor.
Working Paper by Adele Atkinson and Flore-Anne Messi (2013), titled 'Promote Financial Inclusion through Financial Education', showed that low levels of financial inclusion are linked to low levels of financial literacy. Based on the review of the approach, the challenges and solutions faced in the study were highlighted, and the possible ways were discussed.

C. Paramasivan and V. Ganeshkumar (2013) has presented an overview of financial inclusion in India. According to the study, proper mechanisms with resources will promote inclusive growth. Studies have shown that financial inclusion, which is an innovative concept, will promote the banking habits of rural people in India.

Terry Friedline (2012), examined the role of parents in saving financial benefits and opportunities for financial inclusion. The findings of the study showed that savings for parents of their children are important in low-to-middle and high-income household types. It has been suggested in the study that the purpose of inclusion of children in savings can help in reducing the transfer of financial benefits.

Marcus Taylor (2012) studied the problems which underline / exclude and underline the duplication of formal / informal finance. The study had major contradictions within the means of commercial microfinance discourses and practices. Apart from this, its correlated perception of inadequacy of financial inclusion and smooth consumption of smooth in the study was demonstrated.

Mandira Sarma (2012), has attempted to fill the comprehensive measurement literature gap which can be used to measure the extent of financial inclusion in economies by using the index of financial inclusion (IFI). According to the author, the proposed index satisfies the mathematical properties and it is easy to calculate and is comparable to the countries over time.

Michael U. Klein and Colin Mayer (2011) examined mobile banking and financial inclusion from a regulatory perspective. In this letter, the competing policy and inter-subject issues were discussed. The findings of the study showed that mobile banking provides important lessons for the purpose of financial regulation, which usually develops alongside developed economies.

Marketing Strategies to Enhance Financial Inclusion

To succeed in the mission of financial inclusion, a strategy is needed. To face the challenges related to financial inclusion, one needs to engage themselves in planning and implementing strategic orientation and marketing strategies. Today, innovation is the key to creating an opportunity and achieving the goal of financial inclusion. Based on the findings of primary and secondary data analysis and study, the researcher is following marketing strategies to increase financial inclusion in India.

Understanding Market

In fact, changes in demographic and lifestyle in the country are introducing new opportunities for financial inclusion. Strategic perspective of efficient analysis is essential for
understanding socio-economic classification and changes in demographic profile of individuals.

**Finding Niches**

Prices, services, facilities and techniques are some that need to be searched and used in the right direction to meet the target of financial inclusion by banks. Today, these niches are becoming more and more expedient. Today, technology can achieve large-scale adaptation that can benefit the economies of top marketing and scale. Apart from this, banks and other financial service providers have to design products and distribution mechanisms which are more viable and are in line with the financial requirements of the Unbank in rural areas.

**Portable Banking Services**

Banks should think about developing and promoting portable banking services in different areas of India, which can be limited to cash deposits and services on a weekly basis. In such a case, the bank does not need to invest in large infrastructure to meet the needs of such areas. In addition, customers will be able to save transportation and other contingencies because they will be getting services at their doors.

**Product Planning**

Financial inclusion involves the use of important financial services such as bank account, insurance, etc. It is important to understand the perception of these formal financial services and the perceptions of those areas in which the person is dissatisfied with formal financial services and non-formal / traditional financial services. It also involves analyzing the situation in which the person uses financial services and if there is a situation which banks / government does not have information about. It will definitely help experts not only add value to formal financial services but also reinforce the value package for individuals with the aim of financial inclusion.

**Segmentation**

Segmentation is one of the basic elements of marketing strategy. It is advisable for experts that value-added marketing strategy should be used on the basis of segmental analysis and similar information should be used to develop novel formal financial services.

**Mass Customization**

Partition strategies will give experts the option to standardize specific formal financial services and separate them from non-formal / traditional financial services. With the help of technology, researchers are suggesting individuals to design a marketing mix in accordance with the needs of individuals for formal financial services.

**Targeting Strategy**

Banks should see Millennial / Generation Y and Generation Z as their main goals for formal financial services. They are those who are 30 or less and can become long term operators of formal financial services throughout the life.
Value Addition

Banks should be allowed to use their key resources like knowledge and relationship to reconfigure their roles and relationships in the process of creation of value for financial inclusion. In addition, experts should maintain value building in the form of continuous process for knowledge of formal financial services and better fit among new customers involved.

Customer Relationship Management

Financial institutions should make the right mix of technology, people and processes with the aim of customer loyalty for formal financial services. This will help financial institutions to use the services of people repeatedly and encourage their confidence in processes.

Experience Creation

Banks should take initiative to create anesthetic experience by creating the right environment which will encourage individuals to participate in various activities to understand the many formal financial services available to them.

Customer Value Management

Not all people are equal and they do not need the same level of financial services. The development of the management information system can help financial institutions understand the proposals for new proposals and formal financial services proposals.

Ease of Opening an Account and Facility to Hold Ad-hoc Bank Account

In the current study, it has been noted that it takes at least 5 days to open new accounts. This delay can cause any negative impact on the account holder's mind. It has been suggested to accelerate the process and bring it down to one or two days. It will be necessary to collect necessary documents from the potential account holder within the shortest possible time. This is one of the methods to reduce the time limit, opening of new accounts on the basis of ad-hoc in the absence of some documents, and facilitating the account holder to submit remaining documents in extended period. Customers should be allowed to operate their accounts during this time with a specific time limit. They should also be made aware that their account will not be operated after the time limit of compliance.

Incentive Program

Financial institutions should offer incentives for socio-economically backward people when they open a bank account. These incentives should be directly deposited in their bank accounts and they should not be allowed to withdraw this amount till the account holder uses the account for certain transactions.

Bank Account Utility

Providing some benefits like various subsidies, the Government should route them with nationalized or commercial banks with this condition that the beneficiary's bank account should be operated for at least the last 8-10 transactions for other purposes. needed. Such bank accounts should not be operated only to get subsidy and to keep these accounts inactive till the next subsidy. In a way, this strategy will also compel account holders to deal with other reasons.
Debit Cards

Soon after opening the account, the bank should arrange for a debit card to the account holders with a confidential PIN. Account holders will be able to operate accounts without losing time. It is recommended that no fee for such a debit card be charged to the customer. In contrast, these customers should be given some incentives per transaction. This will motivate a large number of new customers to take advantage of such schemes. It will also facilitate cashless transactions and reduce the risk of carrying cash.

Statement of Account

The periodic details of the account should be sent to the account holders without demand from them. Such statements can be sent through the mobile network. This will help the account holder keep the updates of the transaction, and this will result in a God-deal of confidence in the customers about the banks.

E-deposits

Account holders should be encouraged for electronic deposit through mobile banking, bank app or net banking. This will help reduce the bank’s visits to account holders and reduce indirect transaction costs.

E-payments

Electronic payments should be encouraged by financial institutions with proper education among account holders. It will help individuals build trust in formal financial services.

Inexpensive Investment Plans

As the socio-economic backward class income is low and there is a habit of overspending, they fail to save anything bigger. However, financial institutions should come up with the schemes where the person can start investing with a great return (15 to 20 percent per annum) for a short period (15 to 20 years) per month (Rs 100 to 500) Are.

Long Term Loan Facility

Banks can provide long term long-term facilities for eligible candidates without interest. A plan should be developed in such a way that these students can repay their loans in a flexible way to get employment.

No-Fee Program

Banks should be encouraged to open an account with schemes like the skip-in-charge program, courtesy payment, etc. These schemes will definitely help the socioeconomically backward class to open and use bank accounts.

Periodic Campaigns

It has also been suggested that the bank should appoint some personnel to go to different places and arrange campaigns from time to time to open accounts of new members. Whenever more than two persons are found eligible to be account holders in a family, then the bank should allow all the members of the same family to open accounts on a single set of
documents. It will save family members' efforts to compile multiple copies of the same document.

**Counseling Services**

The bank should try to provide free consulting services as a part of the promotion. This will create opportunities for banks to tap potential market. Needy customer

**Personal Selling and Cross Selling**

Banks can promote insurance and other products related to investment within a new customer's network using personal sales skills. Increase the money advice services for all individuals, with a variety of focus on families with different demographic characteristics.

**Financial Education**

With various banking assistance, government institutions should increase the continuity of financial education in all the teaching environments in different rural areas targeting the targets of all age groups and who teach them and teach them.

**Product Literature**

Financial service literature should be simple and well illustrated. In addition to attracting the public, it should be published in the local language.

**Financial Capability Interventions**

Financial capacity intervention in rural areas of India has been evaluated in such a way that we can make a benchmark and compare interference and can identify its functions well. It should be designed to increase opportunities and share the education of interventions, which can help people create financial flexibility.

**Findings of the study**-

Respondents of 20 to 30 age group were up to 16 percent; While about 44 percent of respondents were falling in the age group 41 and above. A group of 20 to 30 years of age is a group of youth who has many aspirations in life and they are capable of saving some amount for future purposes.

87 percent of respondents were male while 13 percent were women. Men in the family are the key elements for earning income in village areas, and women see home and allied activities.

About 94 percent of the respondents were married and the responsibility was after marriage. Only 6 percent were unmarried respondents.

75 percent of the total respondents were employed in some organizations and were earning through this medium. Self-employed up to 7 percent and the same number of respondents were also unemployed. There were no practical income sources of 5 per respondents. About 3 per respondents were only looking after the work of the house, which had no income. Approximately 2.4 percent of respondents were in the category of retired persons.
As with regard to educational qualification of respondents, 56 percent had completed their higher secondary education or below this level. 23 percent did not receive formal education with literacy; While 20 per university degree was achieved.

Researchers wanted to understand the family structure of respondents in relation to the number of male and female members living in families. Statistics show that in most of the houses, there were 4 male / female members. It also means that the houses where the respondents lived in were almost one type of nuclear family.

It was noted from the collected data that all respondents had savings accounts in different types of banks. 53 percent of respondents had their savings accounts with nationalized banks, while 42.6 percent had their savings accounts in rural / regional rural banks. Only some respondents had their savings bank accounts with private / foreign type banks.

The researcher was interested in knowing the frequency of operating his savings accounts. It is believed that while conducting any account in the bank, a person usually visits banks for the purpose of transactions. Therefore it was decided to ascertain how many times the respondents visited the bank premises in a period of 3 months. Data showed that 40% of the total respondents had visited their respective banks at least 3 times in a 3 month period for some transactions. 18 percent found that visiting their banks four times in a three-month period. 16 percent of respondents had visited their banks six times in the said period. During the 3-month period, approximately 14 percent of respondents visited banks almost twice.

The researcher thought of finding any relation between the types of accounts created by these respondents and the types of banks. On analyzing the data, it was specifically noted that there was no relation to the type of bank and the purpose for which the account was opened by these respondents. In other words, the objective was fulfilled despite the type of bank.

The researcher tried to ascertain that the number of visits of these respondents had some relation with the banks they were choosing to deal with. It was noted that the type of banks has no relation with the number of visits that the respondents had to do to open the account. Whether it is nationalized bank, or rural / rural regional bank or even private one, there was no relation to the number of visits.

Cash withdrawal is one of the most frequent activities while operating a savings bank account in any bank. In rural areas, people like to go to the bank individually and take cash according to their needs. It was found that, despite the type of bank, the respondents used to withdraw cash from the ATM using the card, but the number of respondents doing so was found very little. For this purpose 755 out of 453 respondents were found. 210 respondents were using bank clearance slip to withdraw cash from their accounts. For this activity, the account holder must present himself / herself in the bank with the related passbook. Payment on the withdrawal slip is done only on these basis. 1 were6 respondents were found using cash to withdraw cash from their accounts. In this way, a large number of respondents preferred the mode of payment / withdrawal slip to withdraw money from banks. Again, the type of bank in this regard did not matter too much.
It was attempted to note that the respondents had a habit of lodging their day-to-day expenses on food and other items. Statistics showed that almost 71 percent of respondents did not have such a habit. Of course, 29 per cent of them were not paying attention to these expenses on a regular basis.

During the current study, efforts were made to understand the different types of personality related to the use of financial discipline, learning habits and information received from various sources. Approximately 41 percent of the total respondents firmly agreed that when they come into financial matters, they consider themselves to be the most disciplined person. Approximately 24 percent believe that they were highly disciplined. 24 percent of the total respondents admitted that they were not so disciplined in financial matters and the remaining 8 percent were completely non-disciplined personality.

Conclusion-

The present study has been directed to achieve four key objectives. Given the fact that formal financial services have been outlined in India, the researchers were eager to examine the various reasons for that. It has been specifically noted that the number of people living in rural areas is weak in their socio-economic background. Despite the fact that the latest technology is being used for the wider spread of financial services across the county, urban areas seem to have more privileges of its benefits. In the expansion of financial services across the nation, major players will have to focus primarily on those profit margins which are more than urban background. Most of the rural areas of the country are neglected by these financial institutions relatively profitably because of such areas. As a result of this trend, the deprived part of the socio-economic background in rural areas is either untouched or is being served without any seriousness.

Although India is progressing towards establishing infrastructure since its independence, rural areas still have the benefit of such infrastructure. Building infrastructure is primarily the work of government, local bodies and financial institutions in the country. Unfortunately due to lack of concentration in rural areas, the infrastructure problem is still facing a serious problem. The rural population is not able to construct such infrastructure that will solve their financial problems. These are the major reasons for which a large part of the poor population in rural areas is found to be financially excluded. There is a dire need to bring them to the lowest level of financial inclusion. They also need to help them to understand and understand the importance of financial inclusion in their lives. It is largely possible to bring them in regular steam of financial inclusion and the results will be most encouraging for the national economy.

In this regard, it was found necessary to measure the financial capabilities of the people living in rural areas. The major income source for such areas is from agricultural produce. However, most people like to migrate to the nearest cities to earn their livelihood. This reduces the ability of households to use financial resources. Apart from this, financial products offered by various institutions have their own limitations. Most of them are ready to target the urban population. People living in rural areas do not find such products useful to them because they do not match their needs. The complexity involved in financial products
keeps these individuals away from using them freely. It is necessary to develop suitable financial products that match the needs and desires of the rural population.

It is true that some of the costs have to be raised to take advantage of financial products. If more people are financially involved then they are bound to certain costs. Many times it has been seen that some people open bank accounts for government subsidy and wherever applicable, for subsidies. After obtaining such benefits and crossing the transaction, such accounts are terminated, their purpose ends. In fact, there is every chance for them to use these accounts to plan their financial needs. It is therefore necessary that they should be given the importance of staying in the financial stream which can affect their lives and can teach them to survive in difficult times. The concerned financial institutions and the government can formulate a policy to reduce the cost of availing financial services in the disadvantaged areas. In the end, it should be seen that the mere cost of availing financial services should not be an obstacle to the use of services.

It is true that most people are not aware of the importance of managing their day-to-day finances. Only the low income balance can not be the reason for being financially excluded. A proper training can make wonders if it is taken seriously. However, such training should be provided to the disadvantaged people by local bodies because they know more about the problems of such persons. Other financial institutions can also support their local bodies wherever possible. Persons who have been celebrated to succeed on financial inclusion can be used as role models to motivate local counterparts.

It has been noted through primary and secondary data that the persons who have not yet been brought in financial inclusion have different perspectives. They give more importance to their present existence than their future. This is because their earnings are comparatively very low and they try to find ways and methods to meet their current needs. Circumstances do not allow them to think about their future. They need to reassure that their future can be better if they think about planning their finances properly. To see their future, they need to change their attitude. Their changing attitude can help them think optimistic, which can bring them to the primary stage of financial inclusion.

During the last seventy years of independence, India has made tremendous progress in many areas. Commerce and Industry are making rapid progress in the urban parts of the nation. However, unemployment in rural areas is still a big problem in front of the government. As a result, there are several low-growth socio-economic groups that are still away from financial inclusion. The current study has attempted to ascertain the causes and challenges which are still deprived of financial services. Their inclusion in the national financial stream is particularly important for the equal social justice and economic viability of the nation.

References-


CRITICAL STUDY OF CUSTOMER RELATIONSHIP MANAGEMENT IN RETAIL BANKING

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Abstract

Indian banking industry is currently seeing an increase with innovative banking models like payments and small finance banks. In the year 2016 and 2017, there is hope to be the eleven payment bank launched Independently, about ten small finance banks are in the same way launch is estimated. Recent and new measures of RBI can go a long way. Help in the reconstruction of the domestic banking industry. Market size of Indian banking industry is such that includes 26 public sector banks, 25 private sector banks, 43 foreign banks, 56 regional rural banks, 1,589 Urban Co-operative Bank and 93,550 Rural Co-operative Banks other Financial Institutions. Then, the public sector banks have occupied approximately 80 percent of the market, excluding relatively small shares private player each bank tries to acquire and hold private or public develop your customer base, and extend your profits by expanding them market share. Helps banks in customer relationship management activities making relationships through effective negotiation in each of their stages frequent purchase. The purpose of this paper is to critically analyze the relationship shared among the effectiveness of banks and customers and activities adopted by these banks. This important study of CRM in retail banking in the state of UP, provided an understanding of quality of service and various CRM activities followed by retail banks, and factors whose quality affected service for a satisfied customer and various CRM activities.

Keywords: Public sector banks, private sector banks, customer relationship management, banking, service quality, Indian banking system.

Introduction

Mohandas Karamchand Gandhi said, "In senses or inadvertently, every one of us offers some service. If we add habit deliberately doing this service will increase the desire for our service strong, and this will not only make our own happiness, but also in the world huge ". So the role of customer service and the creation of a permanent customer relationship not only gave importance to the development of business community, but also society as a whole. Understand how customers felt about the organization and competed on the basis of relationship and not alone on binding with a competitive product or fair price actual differential for any business was this study is an attempt to find out how the banks performed in this regard and whether the customer was satisfied or not quality of service and customer relationship provided by these banks construction of practices adopted in the state of UP India's emerging market is facing many challenges. Loosened economic status, Reduction of rupees, various consumer segments and many players are cutting each piece while trying to rebel work in a cost-effective way. Apart from these fall factors, market scenario is also moving forward with the increase in consumer infidelity agility Sharp technical optimization is moving towards the needs of banks skillful in presenting better product solutions despite all of the above challenges, India is still prominently involved in future drivers of the world of the economy India holds an important place and it is only ahead of China. Its share of world's gross domestic product in emerging markets its trend consolidated in later years, in which
India has been given space third largest economy. The banking system has played an important role in the creation of such sound and healthy economy which is prevalent in India. The main reason is to meet the debt needs of all sections of the banks reaching the metropolis and remote corners of the country.

**Evolution of Banking in India**

Banking originated from 2000 B.C. Babylonia, where temples and palaces were considered security of valuables in return, the receipt that was issued was ahead using these items to move to third parties. There were also laws governing such banking activities In these times, these receipts were used as currency notes, facility of transfer of funds from person to person, and for the place. Banking in India grew from the bank of merchants during the 18th century which was mainly engaged in financial activities presidency banks. These days the presidency bank was Bengal / Calcutta in 1809, Bank of Bombay and Bank of Madras in 1840, in 1843 He formed the Imperial Bank of India. Allahabad Bank. The first bank, established in 1865, was fully run by the Indians. Punjab National Bank Limited was established between 1894 and 1906 many banks like 1913, Bank of India, Central Bank of India, Bank of Baroda, Canara Bank, Indian Bank and Bank of Mysore were established. In 1921, all presidency banks were merged to make Imperial Bank of India, which was owned by European shareholders. In the end 1955, State Bank of India (SBI) constituted its ubiquitous Blue Disk to start the business of Imperial Bank under the SBI Act of 1955 of India Later, major conflicts came up during 1969 and 1980 when nationalization changed the face of banking in India with private ownership for public ownership. The next concrete step exposes another development story with the introduction of Indian financial and banking sector reforms. And partial liberation in the period 1990-2004. Liberalization after 2004, became a key base for private attacks and foreign banks are pushing forward and strengthening the competitive scenario. Along with providing financial literacy to millions of Indians in present, there is a diversified structure in the banking sector that comprises a large part. There is a small fraction of scheduled banks and non-scheduled banks.

**The Present Indian Banking Scenario**

An outline of the Indian Banking industry is as follows:

1) Reserve Bank of India
2) Indian Scheduled Commercial Banks  
   a) State Bank of India and its five subsidiaries  
   b) Twenty Nationalized Banks  
   c) Regional Rural Banks  
   d) Other Scheduled Commercial Banks
3) Foreign Banks
4) Non-Scheduled Indian Banks
5) Cooperative Banks

**Literature Review**-

On the contrary, some researchers denied that customer relationship management was an old school marketing idea and current marketing concepts like channels, services and direct were overlayed marketing; Thus, it did not require separate identification.
According to Baker, M. J. (1998) is believed that relationship marketing and direct marketing were synonymous and so seemed to be more relevant to business-to-business marketing and service marketing.

According to Berry, L. L. (1991), there should be an emotional bond between it service providers and service users need to maintain and increase relationship. It made customer relationship management a one the concept is very important for implementing services in their business.

According to Farrell, J. (2001), relationship marketing was more comprehensive than a customer Customer Relationship Management.

According to Richards, K. A. (2008), customer relationship management better pricing strategies, processes involved in customized services, well-integrated supply chain and sales force development.

According to Day, G. (2000), customer relationship management strategy includes essential things there is a need to develop such capabilities that are competitively competitive strategy.

According to Ragins, E. J. & Greco, A. J. (2003), customer relationship management is a business strategy every customer interface is important and tries to assure in spite of the reliable communication channel selected.

According to Lochridge, S. (2001), customer relationship management is also a business strategy that is highly customer-focused and coordination between people, processes, and technologies is needed growth and gain higher profits.

According to Buskirk, B.D. & Lavik, M. (2004), operations involves operations in customer relationship management tech marketers use to identify and analyze customer behavior and processes to motivate and motivate a customer buying the organization's products and services.

According to Goldenberg, B.J. (2002), This is a comprehensive action that provides fully consistent and consistent coordination between all customer contact work.

According to Zeithaml, V. A. (2003), customer relationship management in the banking sector, churning is going on in the way the customers are contacted. Attracting new customers and maintaining existing ones is okay reviewed as banks are now experiencing the challenge of creating and maintaining customer loyalty. Banks are now focusing more on control than ever before quality of the employees' participation with smoothing demand and supply cycle. Attention is drawn to modern marketing, maintaining and developing customer relationships through quality service that happens only when they trust the bank.

According to Reinartz, W. K. (2004), research also revealed the opposite on customer relationships management which failed to do different organizations effectively and manage their client relationship management programs. Specially, organizations spend billions of dollars on customer relationship management, but apparently seventy percent of customer relationship management projects failed to get expected lower-line improvement in job operation.

According to Day, G. (2000), Morgan, N. A., Slotegraaf, R.J. & Vorhies, D. (2004) & Plakoyiannaki, E. & Tzokas, N. (2002), Some subject areas cause these organizations in such a way weaker because they were neglected to implement customer relations management resources they had to build better capabilities to do this, managing customer relationships and achieving competitive advantage.

According to Wang, Y. L. (2004), consumer price and another integrated framework for customer relationship management performance included four major dimensions.
functional value, social value, emotional value and perceived sacrifice. Inspecting the results found, it proved that customer satisfaction, brand loyalty and functional value had a positive effect on customer behavior based on customer relationship management performance, where, brand loyalty was the most important influence on customer behavior.

According to Tokman, M. D. (2007), customer retrieval is referred to as ‘Aadhaar Bank’ in the reg customer retrieval improve service and revenue gains Banks determine the reason behind this customer switching and current relationship they bear with others the provider. After this, shaping social capital, service and value benefits are seen carefully in win-back offers and service value. Due to neglecting the degree of satisfaction with the past the bank receives any crisis or happy customer from the existing bank.

According to Kim, H, and Kim, Y. (2007), relationship termination is called de-marketing, including valuation to maintain profitability and profitability of customers and to eliminate profitless customers However, under the current banking scenario, it can be contribute adversely. The end of these non-profits customers can eventually be expensive due to their strategic network value and such action is not socially acceptable either.

**Evaluation of Perception on Service Quality Dimensions**

I saw in this research that quality of service is a forerunner for the customer satisfaction to assess the effectiveness of customer service quality relationship with banks and finally at the level of their satisfaction is any important point in time. Clients' reactions are analyzed for their detection concepts on the quality of service are provided by their primary bank and the following findings are:

Calculative descriptive results for the quality of service bank type was selected as its primary bank, this indicates between the five dimensions, respondents are considered to be tangible dimensions after the highest sympathy. Reliability and accountability dimensions are at almost the same level and dimension that is least valuable the assurance dimension is by the respondents.

The managerial implication from this search is that even though dimensions of service quality (tangency and sympathy) are positive respondents, credibility, accountability and assurance are considered by dimension the quality of service requires additional attention from the banks. to improve the overall service quality of the banks, they have to be adequately augmented. For this to happen, banks have to empowerly improve the level of knowledge staff. Courtesy of employees and their ability to deliver messages to customers confidence and confidence also have to be developed quite well. Likewise bank there is a need to expand their ability to trust the promised service, a true and persistent look shows a willingness to help them provide clients and prompt service.

Apart from the above, if any one is important, the study examined difference between the customer's demographic characteristics of the bank understanding the quality of service quality in retail banking. Show results between all demographic and financial characteristics, gender, marital the status and age profile of the respondents influences the different assumptions quality of service, while respondents did not have income categories impact the quality of service quality.

The managerial implication of this discovery is that the customers keep their differences assessment on expectations and assumptions in all five service quality dimensions. Age profile of gender, marital status and respondents service Quality
Dimensions Contrast Thus, banks need to be included while drafting of different services, aspects related to gender, marital status and age group. However, no change has been found in different assumptions the level of income means that the respondents fit all the income groups experience the quality of service in the same way without variance.

Through this study, it is also believed that the quality assumptions of service there is a variation in the type of bank selected as their primary bank. Therefore, banks need to work on all five dimensions but emphasize in order of their perceptions If the prohibition is to be observed banks need to engage these dimensions as a guide for re-assignment.

Evaluation of Perception on Dimensions of Customer Relationship Management-

Customer relationship management is the practice of management relationship with segments of diverse clients. Customers differ in their economic value and banks later optimize their offerings and communication strategy accordingly some organizations consider customer relationship management will be an additional investment especially in technology; However, other customer relationships are considered management for comprehensive development is more comprehensive and aggressively and rewarding relationships with customers. This study examined the customer relationship management at customer management level respondents rated different dimensions of customer relationship management in all contact channels of retail banking.

Contributes to the resulting search integrated and well-defined relationship marketing actions through individual banking work cognitive outcomes for customer relationships the formation of study on the type of management bank chosen in their form primary bank indicates respondents between five dimensions the perceived customer feedback and customer knowledge dimension, the highest among other customer relationship management dimensions after customer acquisition and customer information system.

The customer value evaluation dimension is least valuable by the respondents. This search has managerial implications, even if two customer relationship management dimension i.e. customer feedback and customer knowledge is considered positively by respondents. Nonetheless, customer acquisition, customer information system and customer value management client price rating dimensions banks need to pay extra attention. To improve overall perception customer relationship management of banks, these three dimensions are to be executed by mistake. This can be considered extending customer relationship management and adding traditional marketing techniques with relationship management activities which include customer acquisition, customer information system and customer focus value evaluation dimension banks need to emphasize customer acquisition dimensions customer relationship management to complete different measures customer's immediate needs and the ways to attract new ones in this way sections that use the customer's information in getting new customers doing therefore, banks will be able to meet and meet the specific needs of customers service commitment of banks It is in line with the above search it has been said in the study that the assurance dimension of quality of service is needed. Special concerns in banks as customer's dimension again, customer information system relationship management activity involves adopting new techniques communicate with customers.

This study shows that banks must identify customers need to simplify business behavior and implement core banking services. Banks will have to install modern equipment and technologies that allow customers to efficiently meet banking requirements customer value assessment as the dimension of customer relationship management activity includes
features related to trust and taking advantage of the services from banks, the feeling of fulfillment of customers since this factor is least valuable by the respondents in the study, therefore banks need it provide better services that attract customers to bank with them. In this way, the interval is solved by adding the required customer relationship management activities in the traditional marketing framework banks in addition to the above, if any was important, the study examined difference between the customer's demographic characteristics of the bank understanding the dimensions of customer relationship management in retail banking the results show that all demographic and financial characteristics affect only the notions of gender dimensions customer relationship management the managerial implication of this search is that the customer assessment on expectations and assumptions in all five dimensions customer relationship management remains same as gender profile.

Therefore, gender is the key to demographic profiles except gender no effect on how customers experience dimensions customer relationship management is leading this implication that, client concepts on customer relationship management between banks regardless of the status of age, marital and income, they are similar. A search in this context suggests that the assumptions on dimensions customer relationship management depends on the chosen primary bank. This means that the bank which they selected from SBI or its associates, the national banks, private banks of old generation and private banks of new generation one important effect is how they consider the dimensions of the customer relationship management in connection with customers.

Customer’s Satisfaction on the Customer Relationship Management and the Service Quality in Retail Banking-

Customer satisfaction is fundamental in customer creation wishes for future purchases. Enhances customer relationship management customer satisfaction for profitability, ROI, and any organization to customer relationship management, an all-inclusive set of tools, technologies, and processes have to work to support that relationship. The customer satisfaction is a focal component in any successful customer relationship management implementation, leading to customer loyalty organization. The inherent importance of customer satisfaction is produced free advertising that gets installed therefore, it has become indispensable keep the customer in the center of any business with respect to your strategies. In the effect remains more profitable to maintain existing customers than searching it.

Descriptive results calculate for customer satisfaction level dimensions of service quality and customer relationship management the type of bank, which has been selected as its primary bank, indicates the level of satisfaction customer service quality is positive on dimensions and dimensions relationship management. Apart from the above, if any one is important, the study examined the difference between demographic and financial characteristics of bank customer and customer satisfaction level relationship management and service quality of banks. Show results none of the demographic and financial characteristics affect level of customer satisfaction the managerial implication is that if the primary bank is lacking the difference between the needs and requirements of the customers with the products services, it enhanced customer satisfaction.

However, in order keep customers happy, keep them up and protect your existing ones for banks the customer base, the banks have to invest in improving the dimensions of service quality and customer relationship management activity. Otherwise, banks the future of attacking the market can be weak for competition expected service quality and customer
relationship management through this study it is also known that the customer satisfaction was there is no difference in the type of bank selected as their primary bank.

The managerial implication is that the main products offered by all banks remained the same and the difference is in the way of obtaining products only through these different customers through and through different banking channels measures of various activities, meeting customer's expectations.

**Integrated Service Quality-Customer Relationship-Satisfaction Model**

An integrated model finally developed has been tested in the study. The initial model was developed based on the review of various literature customer relationship management and service quality dimensions different organizations when the model is tested using the SEM tool, it is found it eventually took place as a customer after a three-stage process satisfaction plateform service begins with affecting quality dimensions customer relationship management dimension, which is in two stages customer feedback, customer knowledge, and customer value evaluation the dimension of customer relationship management, for progress second acquisition of customer acquisition and customer information system customer relationship management dimensions finally, the model ends with a satisfied customer who found its effect from the customer feedback, customer value evaluation, customer acquisition and customer information system dimensions of customer relationship management this the model is tested using the structural equation modeling tool and the resultant removing modals such as links with modifications which are not important it emerges as follows:

![Figure 1: Integrated Service Quality-Customer Relationship-Satisfaction Model](image)

The managerial implication of the model is such that it will help bank to regain customer relationship management and quality of service to achieve your business objectives. As it is believed in the model, the quality of service dimensions are placed at the top of the organizational perspective, as a result getting customer satisfaction All other dimensions of service quality customers influence three specific dimensions of management i.e. customer feedback, customer knowledge and customer value evaluation. Thus, banks should be aware of the fact that the quality of service dimensions directly influence the way customers experience customer feedback, customer knowledge and customer value evaluation, customer
relationship management dimensions. Table 1 shows that the effectiveness of service is on quality dimensions customer feedback, customer knowledge, and customer value evaluation the dimension of customer relationship management activity.

Table 9.2: Service Quality Dimension influencing the CRM

<table>
<thead>
<tr>
<th>Service Quality dimension</th>
<th>Dimension of CRM activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tangibility</strong> - The bank has enough space sit and wait, the bank is clean and clean, bank employees are clean attendance, bank statements are clearly printed, and the bank has appropriate signals inside their branches provide direction service location.</td>
<td><strong>Customer Knowledge</strong> - Hours of operation of the bank convenient for the customer, in clarity understanding the features of the products and services. <strong>Customer Value Evaluation</strong> – easy to understand the systems and processes.</td>
</tr>
<tr>
<td><strong>Reliability</strong> – The bank adheres to its promises service quality and delivery, performs services are correct at first demanded by the customer, provides time of service promises to do this and the bank has accessible communication network and means.</td>
<td><strong>Customer Response</strong> – Bank provides a variety of service items and information, bank fulfils its promises on time. <strong>Customer Knowledge</strong> - Offers a comprehensive range of investment products, offers innovative loan services. <strong>Customer Value Evaluation</strong> - Always delivers superior services, offers high quality services.</td>
</tr>
<tr>
<td><strong>Responsiveness</strong> - Bank employee gives quick service, the behavior of bank employees increase confidence in the customer, there are employees of the bank regularly courteous with customers, bank employees pay personal attention the customer</td>
<td><strong>Customer Response</strong> – Bank uses different measures to meet customers' urgent/specific requirements. <strong>Customer Knowledge</strong> - understands individual needs and circumstances of the customer, always meets expectations of the customer. <strong>Customer Value Evaluation</strong> - enjoy banking with the bank, services available at bank motivate the customer to use it more.</td>
</tr>
<tr>
<td><strong>Assurance</strong> - Bank has amicable rankings staff, customers feel safe bank, Transaction with employees bank has knowledge of answering Customer's requests.</td>
<td><strong>Customer Response</strong> - Bank employees are knowledgeable and the information required on request services, banks actively give total financial advice the solution for the customer, and the bank is capable of a wareness about your products and services to meet customer’s needs. <strong>Customer Knowledge</strong> – Encourages introduction new customers for the purchase of products and bank services, better terms and conditions compared to other banks.</td>
</tr>
<tr>
<td><strong>Empathy</strong> - Bank shows sincere interest employees of solving problems of customers banks are always ready to help, bank employees respond to customers' employees without requests for no delay the best interests of the customer in the bank the heart represents the front line staff of the bank proper guidance signal which indicates what services are the counters offering, bank employees feel special need.</td>
<td><strong>Customer Response</strong> - Bank staff shows sincere interest in solving customer’s problems. <strong>Customer Knowledge</strong> - encourages using bank’s services and products. <strong>Customer Value Evaluation</strong> - relaxed using banking services, services at bank would help me to give a good reference to other people.</td>
</tr>
</tbody>
</table>

Moving forward, the second stage of the model demonstrates the effect three dimension of customer relationship management i.e. customer feedback, customer knowledge and customer value evaluation the remaining two dimensions i.e. customer acquisition and customer notification system it can be explained through the table below.
Table 2: Dimensions of CRM

<table>
<thead>
<tr>
<th>Dimensions of CRM - Customer Response, Customer Knowledge and Customer Value Evaluation</th>
<th>Dimensions of CRM – Customer Acquisition, Customer Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Response</strong> - Bank uses different remedies to meet customers' needs requirements, bank offers a variety of services items and information, the bank fulfills its promises at times, is able to provide awareness about the bank customer's products and services to meet requirements, banks actively give total financial advice customer solution, bank employee knowledgeable and necessary information officers on requested services, bank employees show honesty interest in solving customer's problems.</td>
<td><strong>Customer Acquisition</strong> - The bank system that makes it easy to do business with the customer bank, system followed by bank to fulfill customer banking needs. <strong>Customer Information System</strong> - The bank uses phone calls, e-mails and personal touring to communicate with the customer, the bank continually understands the service requirements and expectations the customer provides a series of bank credits features to the customer requirements, bank products that provides reflect the earnings and wealth of the customer, the bank provides enough information to allow while the customer has to be well informed to choose.</td>
</tr>
<tr>
<td><strong>Customer Knowledge</strong> - Hours of operation of the bank convenient for the customer, the bank offers one investment products, broad range of bank provides new loan services, the bank understands of personal needs and circumstances customers, banks often encourage to introduce new customers for the purchase of products and bank services, banks often encourage you to use bank services and products, bank offers better terms and conditions compared to other banks, banks always meets customer’s expectations.</td>
<td><strong>Customer Acquisition</strong> - Bank has implemented core banking solutions, bank maintains record of purchases and services of each customer. <strong>Customer Information System</strong> - Fast bank answers to problems, tips and customer’s complaints, bank continuously understands the service requirements and customer expectations, and bank offers convenient services.</td>
</tr>
<tr>
<td><strong>Customer Value Evaluation</strong> – Always bank provides better services, offers high quality enjoy banking with services, banks, services customers available in the bank inspire to use it plus, feel comfortable using banking services, help in providing good services to the bank references for others.</td>
<td><strong>Customer Acquisition</strong> - The bank has modern equipment and technology, bank provides tele banking and Internet banking facilities, ATM machines are available in most places. <strong>Customer information services</strong> – Bank offers useful online products and services.</td>
</tr>
</tbody>
</table>

Finally the model shows the satisfaction of affected customers relationship management dimension i.e. customer feedback, customer value evaluation, customer acquisition and customer notification system the managerial implication is that the banks will have to recognize that customers are satisfied if they are responded with the necessary requirements and services (customer feedback), better services (customer value evaluation) using modern technologies, new needs of customers or new ones customers are acquired with specific requirements (customer acquisition) and finally, with active measures, the service requirements customer (Customer Information System).

**Conclusion**

This important study of customer relationship management in retail provides an understanding of the quality of banking in the state of UP service and various customer relationship management activities adopted by retail banks factors that affect quality of service and various client relationship management activities lead to a satisfied customer this study is analyzed. One integrated service quality-customer relationship model 'has also been developed to provide directions to banks such efforts should be done to improve relationships streamline customers and their marketing efforts.
Service quality dimensions affect customer's dimensions relationship management partly responds to customer, with customer knowledge and customer value evaluation which in turn affect customer relationship management activity has two dimensions (customer acquisition and customer information system). It emerges the major findings of the study. Has been developed on the basis of model the services available to customers and the type of bank they choose primary bank this study provides actionable information to banks which they can design and implement marketing programs different requirements of customers significant differences about the service dimensions of quality and customer relationship management among the different demographic and financial characteristics of the bank customers, beneficial insights where banks should focus and what kind of needs to be an activity should be developed to connect with customers so that they be satisfied with the banks.

References-


A NOVEL SCORE FUNCTION ON INTUITIONISTIC FUZZY SETS AND ITS APPLICATION TO MULTI CRITERIA GROUP DECISION MAKING PROBLEM

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Abstract

In this paper, a new score function on intuitionistic fuzzy sets (IFs) was proposed which can overcome the drawbacks of the existing score functions. Also multi criteria group decision making method was discussed based on the proposed new score function.

Keywords: Intuitionistic Fuzzy Sets (IFS), Multi criteria group decision making (MCDM), Score function.

1. Introduction

Zadeh [13] in 1965 introduced the concept of fuzzy sets. Later it was extended to intuitionistic fuzzy set by Atanassov [1] in which the membership was characterized by degree of membership and degree of non-membership. Atanassov and Gargov [2] introduced the concept of internal valued intuitionistic fuzzy sets (IVIFs). In recent years, MCDM has been used in various fields. In [11] Wu and Chen presented an MCDM method which was based on intuitionistic fuzzy sets (IFS). Many scoring functions are existing to rank the alternatives. Some of them are proposed by, Chen & Tan [4], Kharal [5], Lin et al [6][7], Liu & Wang [8], Wang et al. [9]. In this paper, we have proposed a new score function which can overcome the drawbacks of the existing score functions [4, 5, 6, 7, 8, 9], also a MCGDM approach was explained using the new proposed score function. A comparative analysis of the existing score information & the proposed score function was also made to analyze the drawback of the existing method.

This paper is organized as follows: Section 2 explains the basic concepts of IFVs. In section 3, we discussed briefly the existing score functions. In Section 4, we propose a new score function of IFVs and with the example, we analyze the drawback of the existing score function with the proposed one. Finally, an MCDM approach was explained using proposed score functions.

2. Preliminaries

Definition 2.1: Intuitionistic fuzzy set

Let X be a non-empty set, then \( A = \{ < x, \mu_A(x), \nu_A(x) > , x \in X \} \) is an intuitionistic fuzzy set, where \( \mu_A(x) \) is the membership degree of \( x \) belongs to \( X \) and \( \nu_A(x) \) is the non-membership degree of \( x \) belongs to \( X \), such that \( \mu_A: X \rightarrow [0,1], \nu_A: X \rightarrow [0,1] \) and \( 0 \leq \mu_A(x) + \nu_A(x) \leq 1 \), for all \( x \in X \).

For convenience, we write Intuitionistic fuzzy value as \( A=\langle a,b \rangle \) where \( a \) is the degree of membership and \( b \) is the degree of non-membership.
Definition 2.2: Score Function of an Intuitionistic Value (IFV)

Let \( A = \{ < x, \mu_A(x), \nu_A(x) >, x \in X \} \) be an intuitionistic fuzzy number, then the score function \( S(A) \) is defined as
\[
S(A) = \bar{\mu}_A(x) - \bar{\nu}_A(x), \text{ for all } x \in X.
\]

Definition 2.3: Accuracy Function of an Intuitionistic Fuzzy Value (IFV)

Let \( A = \{ < x, \mu_A(x), \nu_A(x) >, x \in X \} \) be an intuitionistic fuzzy number, then the accuracy function \( E(A) \) is defined as
\[
E(A) = \bar{\mu}_A(x) + \bar{\nu}_A(x), \text{ for all } x \in X.
\]

Definition 2.4: Hesitancy degree of an Intuitionistic Fuzzy Value (IFV)

Let \( A = \{ < x, \mu_A(x), \nu_A(x) >, x \in X \} \) be an intuitionistic fuzzy number, then the hesitancy degree of \( A \) denoted by \( \pi_A \) is defined as
\[
\pi_A = 1 - \bar{\mu}_A(x) - \bar{\nu}_A(x), \text{ for all } x \in X.
\]

Definition 2.5: Comparison of an Intuitionistic Fuzzy Numbers (IFNs)

Let \( A_1 = \{ < x, \mu_{A_1}(x), \nu_{A_1}(x) >, x \in X \} \) and \( A_2 = \{ < x, \mu_{A_2}(x), \nu_{A_2}(x) >, x \in X \} \) be any two intuitionistic fuzzy numbers. Let \( S(A_1), S(A_2) \) and \( E(A_1), E(A_2) \) be the score functions and accuracy functions of \( A_1 \) and \( A_2 \) respectively. Then

i) If \( S(A_1) < S(A_2) \) then \( A_1 < A_2 \)

ii) If \( S(A_1) > S(A_2) \) then \( A_1 > A_2 \)

iii) If \( S(A_1) = S(A_2) \) and \( E(A_1) < E(A_2) \) then \( A_1 < A_2 \)

iv) If \( S(A_1) = S(A_2) \) and \( E(A_1) > E(A_2) \) then \( A_1 > A_2 \)

v) If \( S(A_1) = S(A_2) \) and \( E(A_1) = E(A_2) \) then \( A_1 = A_2 \)

Definition 2.5: Ranking of IFV

In [14], Zhang and Xu proposed a new ranking method for IFV which is given as follows:

Let \( A_1 = \langle a_1, b_1 \rangle, A_2 = \langle a_2, b_2 \rangle \) be two IFVs, where \( a_1 \in [0,1], b_1 \in [0,1], 0 \leq a_1 + b_1 \leq 1, a_2 \in [0,1], b_2 \in [0,1] \) and \( 0 \leq a_2 + b_2 \leq 1 \). Then

i) If \( a_1 \geq a_2 \) and \( b_1 < b_2 \), then \( A_1 > A_2 \).

ii) If \( a_1 < a_2 \) and \( b_1 \geq b_2 \), then \( A_1 < A_2 \).

iii) If \( a_1 = a_2 \) and \( b_1 = b_2 \), then \( A_1 = A_2 \).

3. Existing Score Functions of IFV

Let \( A = \langle a, b \rangle \) be an IFV, Where \( a \in [0,1], b \in [0,1], \pi_A = 1-a-b, \pi_A \in [0,1] \) and \( 0 \leq a+b \leq 1 \)

1) Chen and Tan’s score functions \( S_1 [4] \)

\[
S_1(A) = a - b, S_1(A) \in [-1,1]
\]

The larger the value of \( S_1(A) \), The larger the IFV \( A \)

2) Kharal’s Score function \( S_2 [5] \)
The existing score functions for ranking the IFVs have the drawbacks that they get invalid ranking results or they can’t distinguish the difference between the IFVs. In order to overcome the drawbacks, the new score function was proposed.

4. The Proposed New score function of IFVs

Let A=<a,b> be an IFV, where a ∈ [0,1], b ∈ [0,1] and 0 ≤ a+b ≤ 1
Let $\pi_A$ be the hesitancy degree of the IFV. The score value $S_N(A)$ of the IFV $A$ is defined as follows:

$$S_N(A) = \frac{a-b}{2} - (1-a-b) \log (1+1-a-b)$$

$$= \frac{a-b}{2} - (1-a-b) \log (2-a-b)$$

$$S_N(A) = \frac{a-b}{2} - \pi_A \log (1+\pi_A)$$

Where $S_N(A) \in [-1,1]$. The larger the value of $S_N(A)$, the larger the IFV $A$.

**Property 1:** If IFV $A = \langle a, b \rangle$, where $a \in [0,1]$ and $b \in [0,1]$ and $0 \leq a+b \leq 1$, then $S_N(A) \in [1,1]$.

**Proof:** If IFV $A = \langle 1,0 \rangle$, then $S_N(A) = \frac{1-0}{2} - (1-1-0) \log (2-1-0) = 0.5$

If IFV $A = \langle 0,1 \rangle$, then $S_N(A) = \frac{0-1}{2} - (1-0-1) \log (2-0-1) = -0.5$

Therefore $S_N(A) \in [-1,1]$.

**Property 2:** Let $A_1 = \langle a_1, b_1 \rangle, A_2 = \langle a_2, b_2 \rangle$ be two IFVs, if $A_1 \neq A_2$ then $S_N(A_1) \neq S_N(A_2)$.

**Proof:** Let $A_1 = \langle a_1, b_1 \rangle, A_2 = \langle a_2, b_2 \rangle$

Then $\pi_{A_1} = 1-a_1-b_1, \pi_{A_2} = 1-a_2-b_2$

**Case i)** Let us assume $A_1 \succ A_2$, then $a_1 \geq a_2$ and $b_1 < b_2$.

Consider, $S_N(A_1) - S_N(A_2)$

$$= \frac{a_1-a_2}{2} - (1-a_1-b_1) \log (2-a_1-b_1) - \left( \frac{a_2-b_2}{2} - (1-a_2-b_2) \log (2-a_2-b_2) \right)$$

$$= \frac{1}{2} \left[ (a_1-a_2) + (b_2-b_1) \right] + \left[ (1-a_2-b_2) \log (2-a_2-b_2) - (1-a_1-b_1) \log (2-a_1-b_1) \right]$$

Since $a_1 \geq a_2 \Rightarrow a_1 - a_2 \geq 0$ and $b_1 < b_2 \Rightarrow b_2 - b_1 \geq 0$

Hence $(a_1-a_2) + (b_2-b_1) \geq 0$

So, $\frac{1}{2} \left[ (a_1-a_2) + (b_2-b_1) \right] \geq 0$

Also $(1-a_2-b_2) \log (2-a_2-b_2) - (1-a_1-b_1) \log (2-a_1-b_1) \neq 0$, Hence

$$\frac{1}{2} \left[ (a_1-a_2) + (b_2-b_1) \right] + \left[ (1-a_2-b_2) \log (2-a_2-b_2) - (1-a_1-b_1) \log (2-a_1-b_1) \right] \neq 0$$

$$S_N(A_1) - S_N(A_2) \neq 0$$

$$S_N(A_1) \neq S_N(A_2).$$

Hence proved.

**Case ii)** Let us assume $A_1 \prec A_2$, then $a_1 \leq a_2$ and $b_1 > b_2$.

Since $a_1 \leq a_2 \Rightarrow a_2 - a_1 \geq 0$
Consider, Case (ii) if \( A_1 \leq A_2 \), then \( S_N(A_1) \leq S_N(A_2) \).

Consider, \( S_N(A_1) - S_N(A_2) = \frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1) ] + [ (1 - a_2 - b_1) \log (2 - a_2 - b_1) - (1 - a_1 - b_1) \log (2 - a_1 - b_1) ] \)

Since \( a_1 \geq a_2 \Rightarrow a_1 - a_2 \geq 0 \) and \( b_1 \leq b_2 \Rightarrow b_2 - b_1 \leq 0 \)

\( (1 - a_2 - b_1) \leq (1 - a_1 - b_1) \)

So \( \log (2 - a_1 - b_1) \leq \log (2 - a_2 - b_1) \)

Therefore, \( S_N(A_1) - S_N(A_2) \geq 0 \)

Hence the proof

**Property 3:** Let \( A_1 = \langle a_1, b_1 \rangle \), \( A_2 = \langle a_2, b_2 \rangle \) are two IFVs.

i) If \( A_1 > A_2 \) then \( S_N(A_1) > S_N(A_2) \)

ii) If \( A_1 < A_2 \) then \( S_N(A_1) < S_N(A_2) \)

**Proof:**

**Case (i)** If \( A_1 > A_2 \), then \( a_1 \geq a_2 \) and \( b_1 < b_2 \)

Consider,

\( S_N(A_1) - S_N(A_2) = \frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1) ] + [ (1 - a_2 - b_1) \log (2 - a_2 - b_1) - (1 - a_1 - b_1) \log (2 - a_1 - b_1) ] \)

Since \( a_1 \geq a_2 \Rightarrow a_1 - a_2 \geq 0 \) and \( b_1 < b_2 \Rightarrow b_2 - b_1 \leq 0 \)

\( (1 - a_2 - b_1) \leq (2 - a_2 - b_2) \)

\( \log (2 - a_1 - b_1) \leq \log (2 - a_2 - b_2) \)

Thus \( (1 - a_2 - b_2) \log (2 - a_2 - b_2) - (1 - a_1 - b_1) \log (2 - a_1 - b_1) \geq 0 \)

Also \( \frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1) ] \) \( \geq 0 \)

Therefore, \( \frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1) ] + (1 - a_2 - b_2) \log (2 - a_2 - b_2) - (1 - a_1 - b_1) \log (2 - a_1 - b_1) \geq 0 \)

This implies \( S_N(A_1) - S_N(A_2) \geq 0 \)

\( S_N(A_1) \geq S_N(A_2) \)

Hence the proof

**Case (ii)** if \( A_1 < A_2 \), then \( S_N(A_1) < S_N(A_2) \).

Consider, \( S_N(A_1) - S_N(A_2) = \frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1) ] + [(1 - a_2 - b_2) \log (2 - a_2 - b_2) - (1 - a_1 - b_1) \log (2 - a_1 - b_1)] \)
Since $A_1 < A_2$, then $a_1 < a_2$ and $b_1 \geq b_2$

Which implies $a_2 - a_1 > 0$ and $b_2 - b_1 \leq 0$

That is $a_1 - a_2 < 0$ and $b_2 - b_1 \geq 0$

$2-a_1-b_1 > 2-a_2-b_2$

$\log (2-a_1-b_1) > \log (2-a_2-b_2)$

$\log (2-a_2-b_2) - \log (2-a_1-b_1) < 0$

$(1-a_2-b_2) \log (2-a_2-b_2) - (1-a_1-b_1) \log (2-a_1-b_1) < 0$

Also $\frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1 ) ] < 0$

Hence $\frac{1}{2} [ (a_1 - a_2) + (b_2 - b_1 ) ] + [(1-a_2-b_2) \log (2-a_2-b_2) - (1-a_1-b_1) \log (2-a_1-b_1)] < 0$

This implies $S_N(A_1) - S_N(A_2) < 0$

$S_N(A_1) < S_N(A_2)$

Hence the proof

**Example 1:**

Let $A_1 = \langle 0.20, 0 \rangle$ $A_2 = \langle 0.20, 0.20 \rangle$ be two IFVs

$\pi_{A_1} = 1-0.20-0 = 0.80$, $\pi_{A_2} = 1-0.20-0.20 = 0.60$

The ranking order between the IFVs value $A_1 = \langle 0.20, 0 \rangle$ $A_2 = \langle 0.20, 0.20 \rangle$ should be $A_1 > A_2$ by definition 2.5 since $a_1 \geq a_2$, $b_1 < b_2$, then $A_1 > A_2$.

But from table 1 we see that the score functions $S_3, S_4, S_5, S_6$ gives the unreasonable ranking orders between the IFVs.

**Table 1:** Ranking orders of IFVs of different score functions.

<table>
<thead>
<tr>
<th>Score Functions / IFVs</th>
<th>Example 1 $A_1 = \langle 0.20, 0 \rangle$ $A_2 = \langle 0.20, 0.20 \rangle$</th>
<th>Example 2 $A_1 = \langle 0, 0.4 \rangle$ $A_2 = \langle 0.3, 0 \rangle$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_1$</td>
<td>$A_1 &gt; A_2$</td>
<td>$A_1 &lt; A_2$</td>
</tr>
<tr>
<td>$S_2$</td>
<td>$A_1 &gt; A_2$</td>
<td>$A_1 &lt; A_2$</td>
</tr>
<tr>
<td>$S_3$</td>
<td>$A_1 = A_2$</td>
<td>$A_1 &lt; A_2$</td>
</tr>
<tr>
<td>$S_4$</td>
<td>$A_1 &lt; A_2$</td>
<td>$A_1 &gt; A_2$</td>
</tr>
<tr>
<td>$S_5$</td>
<td>$A_1 &lt; A_2$</td>
<td>$A_1 = A_2$</td>
</tr>
<tr>
<td>$S_6$</td>
<td>$A_1 &lt; A_2$</td>
<td>$A_1 &lt; A_2$</td>
</tr>
<tr>
<td>$S_7$</td>
<td>$A_1 &gt; A_2$</td>
<td>$A_1 &lt; A_2$</td>
</tr>
</tbody>
</table>
Example 2:
Let $A_1 = <0, 0.4>$ and $A_2 = <0.3, 0>$ be two IFVs. $\pi_{A_1} = 1 - 0.4 = 0.6$, $\pi_{A_2} = 1 - 0.3 = 0.7$.

The ranking order between the IFVs value $A_1 = <0, 0.4>$ and $A_2 = <0.3, 0>$ should be $A_1 < A_2$ by definition 2.5 since $a_1 < a_2$, $b_1 > b_2$, then $A_1 < A_2$.

But from the Table 1, we see that the score functions $S_4$ and $S_5$ gives the unreasonable ranking orders between the IFVs.

Example 3:
Let $A_1 = <0.5, 0.5>$, $A_2 = <0.4, 0.4>$, $A_3 = <0.3, 0.3>$, $A_4 = <0.2, 0.2>$ and $A_5 = <0.1, 0.1>$.

Then from Table 2, we see that the score functions $S_1$ and $S_2$ were not able to distinguish the IFVs $A_1$, $A_2$, $A_3$, $A_4$, and $A_5$.

Therefore, in summary, from Table 1 and Table 2, we see that the new proposed score function can overcome the drawbacks of the existing score functions [4,5,6,7,8,9].

### Table 2: Ranking orders of IFVs for different score functions.

<table>
<thead>
<tr>
<th>Score Functions / IFVs</th>
<th>$A_1$</th>
<th>$A_2$</th>
<th>$A_3$</th>
<th>$A_4$</th>
<th>$A_5$</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_1$</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>$A_1 = A_2 = A_3 = A_4 = A_5$</td>
</tr>
<tr>
<td>$S_2$</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>$A_1 = A_2 = A_3 = A_4 = A_5$</td>
</tr>
<tr>
<td>$S_3$</td>
<td>0.25</td>
<td>0.1</td>
<td>-0.05</td>
<td>-0.2</td>
<td>-0.35</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_4$</td>
<td>0.5</td>
<td>2</td>
<td>-0.1</td>
<td>-0.4</td>
<td>-0.7</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_5$</td>
<td>0.75</td>
<td>0.4</td>
<td>0.05</td>
<td>-0.3</td>
<td>-0.65</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_6$</td>
<td>0.5</td>
<td>0.2</td>
<td>-0.1</td>
<td>-0.3</td>
<td>-0.65</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_7$</td>
<td>0.5</td>
<td>0.48</td>
<td>0.42</td>
<td>0.32</td>
<td>0.18</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_8$</td>
<td>0</td>
<td>-0.1</td>
<td>-0.2</td>
<td>-0.3</td>
<td>-0.4</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
<tr>
<td>$S_N$</td>
<td>0</td>
<td>-0.0158</td>
<td>-0.0584</td>
<td>-0.1224</td>
<td>-0.2042</td>
<td>$A_1 &gt; A_2 &gt; A_3 &gt; A_4 &gt; A_5$</td>
</tr>
</tbody>
</table>

5. MCGDM – Method based on the proposed new score function of IFVs
Let \( A_1 = \{ A_1, A_2, \ldots, A_m \} \) be as set of alternatives and \( G = \{ G_1, G_2, \ldots, G_n \} \) be a set of attributes let \( w = (w_1, w_2, \ldots, w_n) \) be the weight vector of attributes provided by the decision makers, \( w_j \in [0,1], j=1,2,\ldots,n, \sum_{j=1}^{n} w_j = 1. \)

Let \( D = \{ D_1, D_2, \ldots, D_t \} \) be the set of decision makers, \( V = (V_1, V_2, \ldots, V_n) \) be the weighting vector of decision makers with \( V_k \in [0,1], \sum_{k=1}^{t} v_k = 1. \)

Suppose \( \tilde{R}_{ij}^{(k)} \) is the intuitionistic fuzzy decision matrix \( \mu_{ij}^{(k)} \in [0,1] \), \( \nu_{ij}^{(k)} \in [0,1] \mu_{ij}^{(k)} + \nu_{ij}^{(k)} \leq 1 \), \( i=1,2,\ldots,m \), \( j=1,2,\ldots,n \), \( k=1,2,\ldots,t \).

**Step 1:** Utilize the decision matrix \( \tilde{R}_k \) and the IFWA

\[
\tilde{R}_k^{(k)} = \mu^{(k)} \times \nu^{(k)} = IFWA_w(\tilde{R}_{i_1}^{(k)}, \tilde{R}_{i_2}^{(k)}, \ldots, \tilde{R}_{i_m}^{(k)}) \text{ for } i=1,2,\ldots,m, j=1,2,\ldots,n, k=1,2,\ldots,t.
\]

To derive the individual overall preference intuitionistic fuzzy values \( \tilde{r}_i^{(k)} \) of the alternatives \( A_i \).

**Step 2:** Calculate the new proposed score function of the overall intuitionistic fuzzy values.

**Step 3:** Rank the alternatives \( A_i \) in accordance with the score value.

**Numerical example:**

A company needs to identify the best supplier from a set of four suppliers, namely \( S_1, S_2, S_3, S_4 \). Three criteria must be evaluated. They are Quantity \( (C_1) \), Reliability \( (C_2) \), and Price \( (C_3) \). The four alternatives are to be evaluated using Intuitionistic fuzzy numbers by three decision makers (whose weighting vector \( w = (0.3,0.5,0.2)^T \) under the above three criteria (whose weighting vector \( w = (0.4,0.3,0.3)^T \) and construct respectively the decision matrices as listed in the following matrices.

\[
\begin{align*}
R^{(1)} &= \begin{bmatrix}
S_1 & [0.3,0.4] & [0.2,0.3] & [0.1,0.4] \\
S_2 & [0.1,0.3] & [0.5,0.2] & [0.4,0.2] \\
S_3 & [0.1,0.5] & [0.4,0.2] & [0.6,0.1] \\
S_4 & [0.2,0.5] & [0.1,0.3] & [0.6,0.3]
\end{bmatrix} \\
R^{(2)} &= \begin{bmatrix}
S_1 & [0.3,0.5] & [0.4,0.1] & [0.3,0.2] \\
S_2 & [0.2,0.4] & [0.3,0.5] & [0.3,0.4] \\
S_3 & [0.2,0.4] & [0.2,0.4] & [0.5,0.1] \\
S_4 & [0.3,0.5] & [0.4,0.3] & [0.4,0.2]
\end{bmatrix}
\end{align*}
\]
In this paper, we proposed a new score function of intuitionistic fuzzy values (IFVs). From Table 1 and Table 2, we can see that the proposed new score function $S_N$ of IFVs can overcome the drawbacks of the existing score functions [4,5,6,7,8,9]. Also an MCGDM method was discussed based on the proposed score function. Further, this can be extended to Interval Valued Intuitionistic Fuzzy Sets and etc.

**Conclusion**

In this paper, we proposed a new score function of intuitionistic fuzzy values (IFVs). From Table 1 and Table 2, we can see that the proposed new score function $S_N$ of IFVs can overcome the drawbacks of the existing score functions [4,5,6,7,8,9]. Also an MCGDM method was discussed based on the proposed score function. Further, this can be extended to Interval Valued Intuitionistic Fuzzy Sets and etc.

**References**

OPTIMAL TRANSFER POLICY OF AN INVENTORY MODEL FOR IMPERFECT ITEMS WITH STOCK DEPENDENT DEMAND AND UNCERTAIN HOLDING COST: A FUZZY APPROACH

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Abstract:

The present study investigates a fuzzy inventory model for imperfect items, in which demand is stock dependent and holding stock is uncertain. Since holding cost is uncertain, it is taken as a triangular fuzzy number. In this model, retailers optimal order quantity and optimal number of transfers per order from the warehouse to the retailers display area are determined. The objective is to maximize the retailer’s average profit. Numerical examples are presented to illustrate the model developed.

1.1 Introduction

Inventory control is an important field for both real world applications and research purpose. In an inventory control system, the assumption of perfect quality in certain products is unrealistic and if adopted, may lead to errors in determining the order size and related inventory cycle time.

In recent years, the topic of transfer batching, the integration of production and inventory model, as well as the procurement and shipment of inventory items have been considered by some researchers.


This paper considers an inventory model for imperfect items with stock dependent demand and uncertain holding cost. In certain situation, uncertainties are due to fuzziness, primarily introduced by Zadeh[13] is applicable.

The holding cost is taken as a triangular fuzzy number. When the retailer receives the delivered items only some of the items are displayed in the shop and the remaining items are kept in the warehouse. The display space is limited and the holding cost inside the shop is higher than the holding cost in the warehouse. The objective of the model is to determine the ordering and transfer schedule which maximizes the average profit per unit time yielded by the retailer. Hence, in this paper, we have developed an ordering-transfer inventory model with stock dependent demand. For defuzzification Graded Mean Integration Representation Method is used.

The rest of the paper is organized as follows: In section 2, the preliminaries are given. In section 3, notations and assumptions are given. A mathematical model is presented in section 4. An example is given in section 5. Sensitivity Analysis is derived in section 6. Concluded in section 7. Reference is given in section 8.

2. Preliminaries

2.1 Fuzzy Number

A fuzzy set $\tilde{A}$ on $R$ must possess at least the following three properties to qualify as a fuzzy number.

i) $\tilde{A}$ must be normal fuzzy set.

ii) $\alpha \tilde{A}$ must be closed interval for every $\alpha \in [0, 1]$.

iii) the support of $\tilde{A}$ and $^\delta \tilde{A}$ must be bounded.

2.2 Triangular fuzzy number

It is a fuzzy number represented with three points as follows:

$\tilde{A} = (a_1, a_2, a_3)$.

This representation is interpreted as membership functions and holds the following conditions.

i) $\mu_a(x)$ is strictly increasing when $x \in [a_1, a_2]$
ii) $\mu_A(x)$ is strictly decreasing when $x \in [a_2, a_3] \mu_A$

iii) $\mu_A(x) = \begin{cases} 0 & \text{if } x < a_1 \\ \frac{x-a_1}{a_2-a_1} & \text{if } a_1 \leq x < a_2 \\ 1 & \text{if } a_2 \leq x < a_3 \\ \frac{a_3-x}{a_3-a_2} & \text{if } a_3 \leq x \leq a_4 \\ 0 & \text{if } x > a_4 \end{cases}$

2.3 Operations on Fuzzy Number

The Function Principle:

The function principle is used for the operation of addition, subtraction, multiplication and division of fuzzy numbers.

Suppose $\tilde{A} = (a_1, a_2, a_3)$ and $\tilde{B} = (b_1, b_2, b_3)$ are two triangular fuzzy numbers. Then

(i) The addition of $\tilde{A}$ and $\tilde{B}$ is

$\tilde{A} + \tilde{B} = (a_1 + b_1, a_2 + b_2, a_3 + b_3)$ where $a_1, a_2, a_3, b_1, b_2, b_3$ are any real numbers.

(ii) The subtraction of $\tilde{B}$ from $\tilde{A}$ is

$\tilde{A} - \tilde{B} = (a_1 - b_3, a_2 - b_2, a_3 - b_1)$ where $a_1, a_2, a_3, b_1, b_2, b_3$ are any real numbers.

(iii) The multiplication of $\tilde{A}$ and $\tilde{B}$ is

$\tilde{A} \times \tilde{B} = (c_1, c_2, c_3)$ where $T = (a_1 b_1, a_1 b_3, a_3 b_1, a_3 b_3)$, $c_1 = \min T$, $c_2 = a_2 b_2$, $c_3 = \max T$

if $a_1, a_2, a_3$, $b_1, b_2, b_3$ are all non-zero positive real numbers.

(iv) $\frac{1}{\tilde{B}} = \tilde{B}^{-1} = \left( \frac{1}{b_3}, \frac{1}{b_2}, \frac{1}{b_1} \right)$ where $b_1, b_2, b_3$ are all non-zero positive real numbers, then the division of $\tilde{A}$ and $\tilde{B}$ is

$\frac{\tilde{A}}{\tilde{B}} = \left( \frac{a_1}{b_3}, \frac{a_2}{b_2}, \frac{a_3}{b_1} \right)$. 


(v) For any real number K, \( K\tilde{A} = (Ka_1, Ka_2, Ka_3) \), if \( K > 0 \), \( K\tilde{A} = (Ka_3, Ka_2, Ka_1) \), if \( K < 0 \)

2.4 Defuzzification

**Graded Mean Integration Representation Method**

If \( \tilde{A} = (a_1, a_2, a_3) \) is a triangular fuzzy number then by the graded mean integration representation method, the defuzzified value of \( \tilde{A} \) is,

\[
p(\tilde{A}) = \frac{a_1 + 4a_2 + a_3}{6}
\]

3. Assumptions and Notations

3.1 Assumptions

The following assumptions are adopted.

1. Shortages are not allowed
2. Maximum allowable number of displayed stocks in the display area is M.
3. The lead time is zero.
4. The time into transfer items from the warehouse into the display area is very small.

3.2 Notations

The following notations are used in this model.

\( \tilde{h}_1 \) - holding cost per unit item per unit time in the warehouse=(\( h_{11}, h_{12}, h_{13} \))
\( \tilde{h}_2 \) - holding cost per unit item per unit time in the display area=(\( h_{21}, h_{22}, h_{23} \))

\( M \) – Maximum allowable number of displayed stock in the display area.

\( p \) – Selling price per unit
\( c \) – Purchasing cost per order
\( s \) – Ordering cost per order
\( a \) – fixed cost per transfer from the warehouse to the display area

\( T \) – Replenishment cycle time in the warehouse
\( n \) – Number of transfers from the warehouse to the display area per order.

4. Mathematical Formulation and Solution of the Model.

Inventory of this model is of two types.

(i) Stock in the warehouse.
(ii) Stock in the display area.

The retailer receives the delivered products and only some of the items are kept in the warehouse, because of the limited display space in the shop. The retailer orders Q items per order from the supplier; q items are transferred to display area and stocks Q - q in the warehouse. The quantity q per transfer is transferred from the warehouse to display area, until
the inventory level in the warehouse reaches to zero. If the retailer transfers the items from warehouse to display area in n times, then \( q = \theta Q/n \).

We consider the inventory model of items in which some of them are imperfect, with stock dependent demand and uncertain holding costs. Since holding cost is uncertain, we consider these parameters as fuzzy numbers. The objective of this model is to determine the ordering and transfer schedule which maximizes the average profit of the retailer. Here percentage of imperfect item is \( \theta \).

The retailer received \( Q \) items per order from a supplier and \((1 - \theta)Q \) items are perfect items and imperfect items are identified and removed before keeping the products in the display area, the time and cost for screening the items is negligible. Imperfectness might occur during the shipment from supplier to retailer.

Now total cost in the warehouse = ordering cost + holding in the inventory.

\[
\text{Total cost in the warehouse} = s + h_1 q t_1 + 2q t_1 + 3q t_1 + \cdots + (n-1)q t_1
\]

\[
= s + h_1 q t_1 \frac{(n-1)(n-2)}{2}
\]
Inventory level $I(t)$ of the display area at any time $t$ is given by
\[ \frac{dI(t)}{dt} + \theta I(t) = -D(I(t)), \quad 0 \leq t \leq t_1, \]
\[ \frac{dI(t)}{dt} + \theta I(t) = -a - bI(t). \]

Boundary conditions are $I(t_1) = R$, $I(0) = R + q (= M)$

**Inventory level in the display area:**

\[ I(t)e^{(\theta + b)t} = (-a)e^{(\theta + b)t} + c \quad \text{.............(1)} \]

Using the boundary condition $I(t_1) = R$,
\[ I(t) = \frac{-a}{\theta + b} + e^{(\theta + b)(t_1 - t)}[R + \frac{a}{\theta + b}] \quad \text{.............(2)} \]

**Holding cost in the display area:**

\[ \ddot{HC}_2 = \ddot{h}_2 \int_0^{t_1} I(t) dt \]
\[ = \ddot{h}_2 \int_0^{t_1} \left\{ \frac{-a}{\theta + b} + e^{(\theta + b)(t_1 - t)}[R + \frac{a}{\theta + b}] \right\} dt \]
\[ = \ddot{h}_2 \left\{ \frac{-at_1}{\theta + b} + \frac{1}{\theta + b} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \right\} \]

**Total Holding cost in the display area:**

Total holding cost in the display area is
\[ \ddot{T}\dot{H}C_2 = n \ddot{h}_2 \left\{ \frac{-at_1}{\theta + b} + \frac{1}{\theta + b} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \right\} \quad \text{.............(3)} \]

Using the boundary condition $I(0) = R + q$ in (2), we get
\[ q = \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \quad \text{.............(4)} \]

**Total cost in the warehouse:**

Total cost in the warehouse is
\[ \ddot{T}\dot{C}_1 = s + \ddot{h}_1 t_1 \frac{(n-1)(n-2)}{2} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \quad \text{....(5)} \]

**Total cost = Total cost in the warehouse + Total holding cost in the display area + n(cost of transfer)**

\[ \ddot{T}\dot{C} = s + \ddot{h}_1 t_1 \frac{(n-1)(n-2)}{2} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 + n\ddot{h}_2 \left\{ \frac{-at_1}{\theta + b} + \frac{1}{\theta + b} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \right\} + nf \quad \text{....(6)} \]

**Revenue per cycle:**

Revenue per cycle $= (p-c)\int_0^{t_1} D(I(t)) dt$

\[ = (p-c) \left\{ at_1 - \frac{abt_1}{\theta + b} + \frac{b}{\theta + b} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \right\} \]

Total revenue over the period $[0,T]$ is
\[ \ddot{T}R = n(p-c) \left\{ at_1 - \frac{abt_1}{\theta + b} + \frac{b}{\theta + b} \left[ R + \frac{a}{\theta + b} \right] e^{(\theta + b)t_1} - 1 \right\} \quad \text{....(7)} \]
Total profit over the period [0,T]:
\[ \tilde{TP} = \text{Total Revenue} - \text{Total cost} - \text{cost of deterioration} \]
\[ = n(p-c) \left( at_1 - \frac{ab}{\theta+b} + \frac{b}{\theta+b} \left( R + \frac{a}{\theta+b} \right) \right) - s \tilde{h}_1 t_1 \frac{(n-1)(n-2)}{2} \left( R + \frac{a}{\theta+b} \right) \left( e^{(\theta+b)t_1} - 1 \right) - \]
\[ n\tilde{h}_2 \left( \frac{a}{\theta+b} + \frac{1}{\theta+b} \right) \left( R + \frac{a}{\theta+b} \right) \left( e^{(\theta+b)t_1} - 1 \right) - nf \theta \left( R + \frac{a}{\theta+b} \right) \left( e^{(\theta+b)t_1} - 1 \right) \quad \ldots \ldots \quad (8) \]

Average profit per unit time:
\[ \bar{AP} = \frac{TP}{T} = \frac{\tilde{TP}}{nT} \]
\[ = \left( p-c \right) \left( a - \frac{ab}{\theta+b} + \frac{b}{\theta+b} \left( R + \frac{a}{\theta+b} \right) \right) - \frac{s}{n} \tilde{h}_1 \left( n^2 - 3n + 2 \right) + \frac{\tilde{h}_2}{(\theta+b)t_1} - \frac{\theta}{t_1} \quad \ldots \ldots \quad (9) \]
\[ \frac{\partial \bar{AP}}{\partial n} = 0 \Rightarrow n^2 = \frac{2s}{\tilde{h}_1 t_1 \left( R + \frac{a}{\theta+b} \right) \left( e^{(\theta+b)t_1} - 1 \right)} + 2 \quad \ldots \ldots \quad (10) \]
\[ \frac{\partial^2 \bar{AP}}{\partial n^2} = \frac{-2s}{n} \tilde{h}_1 t_1 \left( R + \frac{a}{\theta+b} \right) \left( e^{(\theta+b)t_1} - 1 \right) \frac{2h_1}{n} < 0. \quad \ldots \ldots \quad (12) \]
\[ \Rightarrow \bar{AP}(n, R, t_1) \text{ is a concave function of } n \text{ for fixed } t_1 \text{ and } R. \]

Now we have to determine the optimal replenishment cycle time and optimal replenishment level in the display area. Taking the first partial derivative of \( \bar{AP}(n, R, t_1) \) with respect to \( R \), we get
\[ \frac{\partial \bar{AP}}{\partial R} = \left( p-c \right) \frac{b}{(\theta+b)t_1} \left( e^{(\theta+b)t_1} - 1 \right) - \frac{h_1}{2} \left( n - 3 + \frac{2}{n} \right) \left( e^{(\theta+b)t_1} - 1 \right) - \frac{h_2}{(\theta+b)t_1} \left( e^{(\theta+b)t_1} - 1 \right) - \frac{\theta}{t_1} \left( e^{(\theta+b)t_1} - 1 \right) \]
\[ = \left( e^{(\theta+b)t_1} - 1 \right) \left[ \frac{1}{(\theta+b)t_1} \left( b(p-c) - \tilde{h}_2 \right) - \frac{h_1}{2} \left( n - 3 + \frac{2}{n} \right) - \frac{\theta}{t_1} \right] \quad \ldots \ldots \quad (13) \]

Based on the values of \( b(p-c) - \tilde{h}_2 \), the following cases are discussed as follows.

Case: 1 \( b(p-c) - \tilde{h}_2 < 0 \)

If \( b(p-c) - \tilde{h}_2 < 0 \) then \( \frac{\partial \bar{AP}(nR,t_1)}{\partial R} < 0 \Rightarrow \bar{AP} \) is a decreasing function of \( R \) for fixed \( n \).

\[ \Rightarrow \text{Optimal retransfer level of the item in the display area } R^* \text{ is zero.} \]
\[ \Rightarrow \text{profit per unit of inventory is less than holding cost in the display area.} \]
\[ \Rightarrow \text{It is not profitable to buildup inventory.} \]

By substituting \( R^* = 0 \) in \( \bar{AP}(n, R, t_1) \), we have
The first order condition for finding the optimal transfer quantity \( t_1^* \) can be determined for fixed \( n \).

Substituting \( t_1^* \) and \( R^* = 0 \) in equation (4), we get the transfer quantity \( q_0^* \) can be determined for fixed \( n \).

**Case: 2** \( b(p-c) - \widetilde{h}_2 = 0 \)

If \( b(p-c) - \widetilde{h}_2 = 0 \). Then \( \frac{\partial AP(n,R,t_1)}{\partial R} < 0 \)

Equation (9) becomes,

\[
AP(n,R,t_1) = (p-c) \left\{ \left( a - \frac{ab}{\theta+b} \right) - \frac{s}{t_1} + \frac{a\widetilde{h}_2}{(\theta+b)} - \left( R + \frac{a}{\theta+b} \right) (e^{(\theta+b)t_1} - 1) \right\} \left( \frac{\widetilde{h}_1}{2n} (n^2 - 3n + 2) + \frac{\widetilde{h}_2}{(\theta+b)t_1} + \frac{\theta}{t_1} \right) - \frac{f}{t_1} \]

Since, \( \frac{\partial AP(n,R,t_1)}{\partial R} < 0 \), AP is a decreasing function of \( R \) for fixed \( n \). It is the same as case 1. Therefore, the optimal retransfer level of the item in the display area \( R^* \) should be zero.

Substitute \( R^* = 0 \) in equation (17), we get AP is a function of \( n \) and \( t_1 \).

The first order condition for finding the optimal \( t_1^* \) is \( \frac{\partial AP(n,t_1)}{\partial t_1} = 0 \).
\[ \overline{AP}(n, t_1) = (p - c) \left\{ \left( a - \frac{ab}{\theta + b} \right) - \frac{s + \frac{ah_2}{\theta + b}}{t_1} - \left( \frac{a}{\theta + b} \right) \left( e^{(\theta + b)t_1} - 1 \right) \left( \frac{n^2 - 3n + 2}{t_1^2} \right) \right\} - \frac{f}{t_1} \]  

\[ \frac{\partial \overline{AP}(n, t_1)}{\partial t_1} = \frac{s}{t_1^2} - \left( \frac{a}{(\theta + b)^2} \right) \left( e^{(\theta + b)t_1} \right) \left( \frac{n^2 - 3n + 2}{t_1^2} \right) + \frac{a\theta}{(\theta + b)^2} \left( e^{(\theta + b)t_1} - 1 \right) + \frac{f}{t_1} \]  

\[ \frac{\partial^2 \overline{AP}(n, t_1)}{\partial t_1^2} = \frac{a\theta}{(\theta + b)^2} \left( e^{(\theta + b)t_1} - \frac{2at_1}{(\theta + b)^2} \left( e^{(\theta + b)t_1} \right) \left( \frac{n^2 - 3n + 2}{t_1^2} \right) \right) - \left( \frac{at_1^2}{(\theta + b)^3} \right) \left( e^{(\theta + b)t_1} \right) \left( \frac{n^2 - 3n + 2}{t_1^2} \right) < 0. \]  

From equation (21), we know \( \frac{\partial^2 \overline{AP}(n, t_1)}{\partial t_1^2} < 0. \)

Hence \( \overline{AP}(n, t_1) \) is a concave function in \( t \), for fixed \( n \).

There exists a unique value of \( t \), such that \( \overline{AP}(n, t_1^*) \) is the maximum value \( t_1^* \) can be determined by solving equation (20).

Substitute \( t_1^* \) and \( R^* = 0 \) in equation (4), the transfer quantity \( q_n^* \) can be determined for fixed \( n \).

**Case 3** \( b(p - c) - \overline{h}_2 > 0 \).

There are three sub-cases in case 3.

**Case 3.1** \( b(p - c) - \overline{h}_2 > 0 \)

If \( b(p - c) - \overline{h}_2 > 0 \), then \( \overline{AP}(n, R, t_1) < 0 \). It is the same as case 1. The optimal retransfer level of the item in the display area \( R^* = 0 \) and there exists a unique value of \( t_1^* \) such that \( \overline{AP}(n, t_1^*) \) is the maximum value \( t_1^* \) can be determined by solving equation (15).

Substitute \( t_1^* \) and \( R^* = 0 \) in equation (4) and the transfer quantity \( q_n^* = R \). The number of transfers from the warehouse to the display area per order \( n \) must be larger than or equal to 2.

**Case 3.2** \( b(p - c) - \overline{h}_2 > 0 \)
If \( b(p - c) - \frac{h_2}{\theta + b} > \frac{h_1}{2n} (n^2 - 3n + 2) + \frac{\theta}{t_1} \), then \( \frac{\partial^2 \bar{AP}(n, R, t_1)}{\partial R} > 0 \). That is, the benefit received from the unit of inventory \((p - c)/(\theta + b)\) is larger than the unit carrying cost \( h \) and \( AP \) is an increasing function of \( R \) for fixed \( n \).

Therefore, we should pile up inventory to the maximum allowable number \( M \).

So, \( I(0) = M \). From \( I(0) = M = q + R \) and equation (4), we know

\[
q = [R + \frac{a}{(\theta + b)}](e^{(\theta+b)t_1} - 1)
\]

\[
\Rightarrow R = \left( M + \frac{a}{\theta + b} \right) e^{-(\theta + b)t_1} - \frac{a}{\theta + b} \quad \text{........... (22)}
\]

which indicates that \( R \) is a function of \( t_1^* \). Substituting equation (22) in equation (9), we get

\[
\bar{AP}(n, t_1) = (p-c)\left[ a - \frac{ab}{\theta + b} + \frac{b}{\theta + b} \left( M + \frac{a}{\theta + b} \right) (1 - e^{(\theta+b)t_1}) \right] - s \frac{nt_1}{\theta + b} - \left( M + \frac{a}{\theta + b} \right) (1 - e^{\theta + bt_1})
\]

\[
\left( \frac{h_1}{2n} (n^2 - 3n + 2) + \frac{h_2}{(\theta + b)t_1} + \frac{\theta}{t_1} \right) - \frac{f}{t_1} \quad \text{........... (23)}
\]

\[
\frac{\partial \bar{AP}(n, t_1)}{\partial t_1} = (p-c)\left\{ - \frac{b}{(\theta + b)t_1} \left( M + \frac{a}{\theta + b} \right) (1 - e^{(\theta+b)t_1}) + \frac{b}{(\theta + b)^2 t_1} \left( M + \frac{a}{\theta + b} \right) (e^{(\theta+b)t_1}) \right\} - 
\]

\[
\frac{s}{nt_1} - \left( M + \frac{a}{\theta + b} \right) (1 - e^{(\theta+b)t_1}) \left[ - \frac{h_2}{(\theta + b)t_1} - \frac{\theta}{t_1} + \frac{f}{t_1^2} \right]
\]

\[
\text{.......(24)}
\]

The second order condition is,

\[
\frac{\partial^2 \bar{AP}(n, t_1)}{\partial t_1^2} < 0. \text{Hence} \bar{AP}(n, t_1) \text{ is a concave function in } t, \text{ for fixed } n. \text{ There exists a unique value of } t_1^* \text{ such that } \bar{AP}(n, t_1^*) \text{ is the maximum value } t_1^* \text{ can be determined by solving equation (24).}
\]

**Case: 3.** \[ b(p - c) - \frac{h_2}{\theta + bt_1} = \frac{h_1}{2n} (n^2 - 3n + 2) + \frac{\theta}{t_1} \]

If \[ b(p - c) - \frac{h_2}{\theta + bt_1} = \frac{h_1}{2n} (n^2 - 3n + 2) + \frac{\theta}{t_1} \], then we obtain

\[
\bar{t}_1 = \frac{2b(p - c) - h_2}{(\theta + b)h_1(n - 3 + \frac{2}{n})} \quad \text{........... (25)}
\]
From \( \frac{\partial \tilde{AP}(n,R,t_1)}{\partial R} = 0 \) and equation (25), the retransfer level of the item in the displayed area \( R^* = R_n^* \), can be determined. However,

\[
\left( \frac{\partial^2 \tilde{AP}(n,R,t_1)}{\partial t \partial R} \right)^2 - \left( \frac{\partial^2 \tilde{AP}(n,R,t_1)}{\partial t^2} \right) \left( \frac{\partial^2 \tilde{AP}(n,R,t_1)}{\partial R^2} \right) > 0 \text{ at } (t_1^*, R^*) = (t_n^*, R_n^*). \text{ Hence } \tilde{AP}(n, R, t_1) \text{ has a saddle point at } (t_1^*, R^*) = (t_n^*, R_n^*) \text{ for fixed } n.
\]

5. Numerical Example

Given \( a = 550 \text{ units/unit time}, b = 0.9, n = 4 \text{ days}, \quad \tilde{h}_1 = (0.7, 0.8, 0.9), \quad \tilde{h}_2 = (0.5, 0.6, 0.7), c = \text{ Rs. 4 per unit}, p = \text{ Rs. 5 per unit}, M = 450 \text{ units}, s = \text{ Rs. 50 per unit}, f = \text{ Rs. } 10 \text{ per transfer and } \theta = 10\% \). Find the optimum replenishment cycle time in the display area, optimum replenishment cycle time in the warehouse area, optimal replenishment level, quantity per transfer from the warehouse to the display area, order quantity, and average profit are determined.

Sol:

5.1 Optimum replenishment cycle time in the display area:

\[
\bar{t}_1 = \frac{2\left[b(p - c) - \tilde{h}_2\right]}{(\theta + b)\tilde{h}_1 \left(n - 3 + \frac{2}{n}\right)}
\]

\( \bar{t}_1 = (0.2963, 0.5, 0.7619) \)

By graded mean integration method,

\( p(t_1) = 0.5097 \)

5.2 Optimum replenishment cycle time in the warehouse area:

\[
T = n\bar{t}_1
\]

\( T = 2.0388 \)

5.3 Optimal replenishment level:

\[
R = \left(M + \frac{a}{\theta + b}\right)e^{-(\theta + b)\bar{t}_1} - \frac{a}{\theta + b}
\]
5.4 Quantity per transfer from the warehouse to the display area:

\[ q = R + \frac{a}{b + b} \left( e^{b+b} - 1 \right) \]

\[ q = 399.3243 \]

5.5 Order quantity:

\[ Q = \frac{nq}{\theta} \]

\[ Q = 15972.972 \]

5.6 Average profit:

\[ \bar{AP} = (p-c) \left\{ a - \frac{ab}{\theta + b} + \frac{bq}{(\theta + b)\tau_1} + \frac{ah_2}{n\tau_1} - q \left\{ \frac{h_1}{2n} (n^2 - 3n + 2) + \frac{h_2}{(\theta + b)\tau_1} - \frac{b}{\tau_1} \right\} \right\} \frac{f}{\tau_1} \]

\[ \bar{AP} = (14.2572, 177.5539, 340.8507) = \]

By graded mean integration method,

\[ p(\text{AP}) = 257.9345 \]

6. Sensitivity Analysis

Table 1:

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7. Conclusion

In this paper, we develop an optimum replenishment cycle time in the display area, optimum replenishment cycle time in the warehouse area, optimal replenishment level, quantity per transfer from the warehouse to the display area, order quantity, and average profit in the fuzzy sense. Holding cost in the display area and holding cost in the warehouse area is taken as triangular fuzzy numbers. Here we acquire the defective items in terms of percentage. This model is solved analytically to calculate the average profit. Finally, the proposed model has been verified by the numerical example along with the sensitivity analysis. By the above table, if the number of transfers is increased then the order quantity is decreased. From this we conclude that, minimize the number of transfer more the order quantity. In the future study, we apply the fuzzy concept for all provisions in this predictable model.

8. References


AN ANALYTICAL STUDY ON JOB SATISFACTION OF EMPLOYEES RECRUITED IN MUNICIPAL CORPORATION OF MAHARASHTRA

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Abstract:
The study would also elaborate on job satisfaction conducted by municipal corporations and the purpose behind this is to put down a frame work that will actually enable us to find the drawbacks in the existing job satisfaction methods. The result of the study would be better quality intake of employees. This would also help the HR manager to improve the job satisfaction. This will also boost the employees and will motivate them. The employees will also be capable to face future difficulties and competitions.
The core of management functions lies in the actual guiding, directing and even controlling of the efforts made of the employees in an organization. Without the effort of human being, even resources like material, machine and money would also remain meaningless. To achieve the basic objective of an organization, effective and efficient use of human resource is essential. Otherwise raw material will remain unused, machine will stand idle and money will not serve any purpose. Human resource management is a function of management with the primary objective of ensuring that every employee makes his fullest contribution to the achievement of the objectives of business. It is that part of general management which is especially concerned with the people employed in an organization.

Key words: Efficiency, Satisfaction, Effectiveness, Motivation.

Introduction:
As a general concept, satisfaction may be explained in a behavioral perspective. Individual or organizational behavior is believed to be goal directed. Each human action has a primary motivation and most actions are attempts to maximize satisfaction by fulfilling multiple motivations, some of which are identified by Maslow (Maslow, 1943). Accordingly the meaning of satisfaction in common usage, satisfaction happens when one gets what he needs, desires, wants, expects, deserves or deems to be his entitlement.
According to Hoppock (1935), “Job satisfaction is any mixture of psychological, physiological and environmental circumstances that cause a person truthfully say I am satisfied with my Job”. Such an explanation indicates the variety of variables that persuade Job satisfaction. Blum (1968) defined Job satisfaction as “an attitude which results from a balancing and summation of many specific likes and dislikes experienced in connection with the Job”. Vrom (1964) finds that Job satisfaction is, “the positive orientation of an individual towards all aspect of the work situation”.

Locke (1969) explained Job satisfaction as a “pleasurable or positive emotional state resulting from the appraisal of one’s or Job experiences”.

**Job Satisfaction and Attitude towards Job**

Attitude represents an unrelenting tendency to feel and behave in a particular way towards various objects. Attitudes are not learned. They are acquired from various sources, the more important of them being direct experience with the object, associating one object with another about which an attitude had already been formed from Family and peer groups, from the neighborhood, economic status and occupations and mass communications. Job satisfaction refers to a person’s feelings towards his Job.

**Job Satisfaction and Attraction towards Job**

The concept of Job satisfaction applies only to the outcome already gained by an individual whereas Job attraction is concerned with hedonism of the future”.

There are 3 important dimensions to Job satisfaction.

1. Job satisfaction refers to one’s feelings towards one’s Job. It can only be surmised but not seen.
2. Job satisfaction is often determined by how well outcomes meet or exceed expectations. Satisfaction in one’s Job means increased commitment in the fulfillment of formal requirements. There is greater willingness to invest personal energy and time in Job performance.
3. The terms Job satisfaction and Job attitudes are typically used interchangeably. Both refers to effective orientation on the part of individuals towards their work roles which they are presently occupying. Positive attitudes towards the Job are conceptually equivalent to Job satisfaction and negative attitudes towards the Job indicate Job dissatisfaction.

**How To Measure Job Satisfaction**

There are a number of ways to measure Job satisfaction. The most ordinary ways of measurement include rating scales, critical incidents, interviews and action tendencies.

**Various Rating Scales**

The most common approach for measuring Job satisfaction is the use of various rating scales. These scales fall into two different categories. One is called factor made scales, which are constructed for a particular setting or a project. The second set comprises standardized scales which, before their use, have been developed to establish group norms on the scales and to ensure reliability and validity of the measuring instruments. It is the tailor made scale which is frequently used in practice.

1. Job Descriptive Index
2. Minnesota Satisfaction Questionnaire (MSQ)
3. Critical Incidence
4. Interview
5. Action Tendencies

The various theories of Job satisfaction are subsumed under two categories namely content theories and process theories. The former category emphasizes the specific factors which motivate the individual towards Job, while the latter category deals with dynamics of this motivational process. Even though doubts were raised against these theories they represent foundation for the development of later theories. So any discussion of Job satisfaction will be incomplete and inadequate if a glance at the contributions of the important theorists is not made.

1. Abraham Maslow’s Need Hierarchy Theory (1943)
3. Frederick Herzberg’s Two Factor Theory (1959)
4. Douglas McGregor’s Theory X and Theory Y
5. David McClelland’s Needs Theory.

Review Literature:

As per in the year 1991, Balgir tried to understand hygiene-motivational factors as postulated by Hergeberg based on their need priorities that control the minds of Indian Managers while doing service in their respective Organizations. The results explained that Job Satisfaction, Salary, Job Security, Better Chances of Promotion, Happy Personal Life, High Position And Friendly Social Circle are few of the motivating factors in that order which robustly influence Indian Managers.

According to in the year 1992, Dhar and Jain underwent an investigation amongst academicians. The investigation discovered the nature of relationship between Job Satisfaction, Job Involvement, Age and Length of service. An important finding of this study was such that Job Involvement and Job Satisfaction are positive correlates with each other which shows that involvement in Job increases the level of Job Satisfaction and vice-versa.

As per in 2004, Sarri and Judges, provided greater understanding of the research on employee’s attitudes and Job Satisfaction. Their article identified three gaps between Human resource practice and the scientific research in the area of employee attitudes in general and the most crucial employee attitude in particular –Job satisfaction: the causes of employee attitudes, the result of positive or negative Job satisfaction and how to measure and influence employee attitudes. Suggestions for practitioners were provided on how to close the gaps in knowledge and for evaluating implemented practices.

According to Santhapparaj, et.al., in the year 2005, evaluated the Job satisfaction of the women managers working in automobile industry in Malaysia based on primary survey of 200 woman managers. The result demonstrated that female managers were generally satisfied with their Job. Highest level of satisfaction happens in the areas of supervision, Job in general, and presents Job and present pay. However, relatively large numbers of women managers were unhappy with their co-workers, pay and present Job. The correlation analysis demonstrated that there was a significant negative correlation between age, education and various Job factors that determine the Job satisfaction.
Objectives of the study:
1. To assess the relationship between the Place of the Job and Job Satisfaction of the employees of Municipal Corporations of Maharashtra
2. To know the employee satisfaction level towards the organization and the relationship within.
3. Employee satisfaction is considered as a key issue by the organization where efforts are need to be taken.
4. To assess the relationship between the Annual Income and Job Satisfaction of the employees of Municipal Corporations of Maharashtra
5. The study will help to improve the efficiency and working skills of the employees of the Municipal Corporations.

Hypothesis
- There is no significant difference in the Job Satisfaction among the employees, having different Length of Services, of various Municipal Corporations

Research methodology:
Research Methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by researcher in studying his research problem along with the logic behind them.

This study primarily deals with Job satisfaction among Employees of Municipal Corporations in Maharashtra. The study focuses on identifying various factors affecting satisfaction of Employees of Municipal Corporations in Maharashtra.

Research Design:
A research design is a master plan specifying the methods and procedures for collecting and analyzing the needed information. It is a framework or blueprint that plans the action for the research work.

“A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.”

Data Collection Methods:
The data is the raw material with which the foundation of subsequent analysis and statistical interpretation is firmly laid.
The data is of two types:-
- Primary Data, and
- Secondary Data

Primary Data collection:
There are several methods of collecting primary data. Important methods are
1. Observation method
2. Interview Method
3. Through Questionnaires
4. Through Schedules.
Secondary Data:
Secondary data is data collected by someone other than the user. Common sources of second ary data for social science include censuses, surveys, organizational records and data collected through qualitative methodologies or qualitative research. Primary data, by contrast, are collected by the investigator conducting the research. Secondary data analysis saves time that would otherwise be spent collecting data and, particularly in the case of quantitative data, provides larger and higher-quality databases than would be unfeasible for any individual researcher to collect on their own. During this research, the researcher used the various research papers, articles & relevant websites, earlier theses etc. Data from various sources were analyzed & used in this study.

Data Analysis & Interpretation:
Analysis and interpretation are giving meaning to the collected information by comparing them with the existing information.
The statistical tools used in this study are

1. Tabulation: The table for the demographic distribution for collecting the samples as per the criteria under the Objectives of this study.
2. Reliability Test Analysis: Cronbach’s alpha reliability test is used to check the internal consistency of items under consideration of a subject.
3. Validity Test Analysis: Data preprocessing is performed to check any outliers falling beyond 1-5 rating against each factor response and to fill the missing values of the responses by using KNN technique.
4. Co-linearity test: As to identify the relationship between the various parameters and their total effect by using bi-variate correlation.
5. Descriptive Analysis: Graphical tools of bar charts are used to identify the trend on each item under consideration.
6. Inferential Analysis: Hypothesis testing is conducted using Independent T test for given six different scenarios viz. Gender, Marital status, Caste, Home town effect, Age and Service length.

Statistical Analysis
Step 1:
Tabulation: The tables for the demographic distribution reflect the sample to be collected as per the criteria under the Objectives of this study. This fair distribution helps in performing the hypothesis testing considered under this study.

Step 2:
Reliability Test Analysis: The 5 point Likert’s scale is used to collect the responses where every Likert’s item is given the weights: 1-Strongly agree, 2-Agree, 3-Neither agree nor disagree, 4- Disagree and 5-Strongly disagree.
To test the reliability of the format design a pre survey test is necessary before executing the overall study. For this, Cronbach’s Alpha Reliability test is performed on the designed 5 different parameters i.e. Working environment, Seniors/Superiors reporting authorities, Co-worker co-operation, Promotion and Pay. 20 samples of Municipal Corporations employees each form both Eastern Maharashtra region as well as Western Maharashtra region were tested. Cronbach’s Alpha reliability co-efficient normally ranges between 0 and 1, however there are actually no lower limit to the co-efficient. The closer Cronbach’s Alpha co-efficient is to 1.00, the greater the internal consistency of the items in the scale. Cronbach’s Alpha is calculated by following formula:

$$\alpha = \frac{k}{k - 1} \left( 1 - \frac{\sum_{i=1}^{k} \sigma_{Yi}^2}{\sigma_X^2} \right)$$

Where:
- \(k\) = number of different items administered to each subject.
- \(\sigma_{Yi}^2\) = Variance of different items administered to each subject.
- \(\sigma_X^2\) = Variance of total raw scores of each sample respondent.

George & Mallory (2003) provides the following techniques: If \(\alpha\) is
- a. \(> 0.90\) = Excellent
- b. \(0.80 - 0.89\) = Good
- c. \(0.70 - 0.79\) = Acceptable
- d. \(0.60 - 0.69\) = Questionable
- e. \(0.50 - 0.59\) = Poor
- f. \(< 0.50\) = Unacceptable

**Step 3:**
Validity Test Analysis : After passing the above test the overall study can be conducted where the data is then compiled in the required format. Data preprocessing is performed to check any outliers falling beyond 1-5 rating against each factor response and to fill the missing values of the responses by using KNN technique. After the completion of data preprocessing an equal justice can be examined for each factor under consideration for the two samples sets i.e. employees’ of Eastern Maharashtra region containing set of 120 samples. Similar set of 120 samples of employees’ of Western Maharashtra region working under the respective Municipal Corporations offices.

**Step 4:**
Co-linearity test : As to identify the relationship between the various parameters and their total effect by using bi-variate correlation is used. The Bivariate Co-linearity test identify any duplicity among the 5 parameters which reveal their dependency. The Karl Pearson’s correlation coefficient \(r\) is used to determine this test. The following figure reflects the inference of the coefficient values.
Step 5:
Descriptive Analysis: Based on the percentage of the 5 point Likert’s scale a graphical representation can provide a clear amount of percentage which agrees the fact under consideration. The comparative results under the two regions of Maharashtra state i.e. Eastern Maharashtra and the Western Maharashtra; can also be tabulated to determine the facts numerically.

Step 6:
Inferential Analysis: The responses under each of the 5 parameters were added. A new parameter named as Total Job satisfaction is the grand total of all the total 28 variables under consideration. To study the support of the 6 facts under consideration viz Working environment, Seniors/Superiors reporting authorities, Co-worker co-operation, Promotions, Pay and the Total Job Satisfaction, Independent Two sample t-test is carried out for both the regions under Maharashtra state.

Statistically we test null hypothesis H0 : \( \mu_1 = \mu_2 \) (There is no significant difference between the means of the demographic variable for the two regions under the Maharashtra state).

vs the alternative hypothesis H1: \( \mu_1 \neq \mu_2 \) (There is some significant difference between the means of the demographic variable for the two regions under the Maharashtra state). The demographic variable under the testing are sub-divided. For example under gender males of Eastern Maharashtra region are tested against males of West Maharashtra region. Similarly testing is performed for females too.

SPSS Table:
The Independent sample T test using SPSS tool provides Two table. First table provide group statistics in which sample size, mean, std deviation and std error are provided. The sample size clearly indicates the test size as per the demographic distribution table.

Using the second table, the 5th column of Sig (2 tail test) provides the p. value which depends on the sig p value of the second column. If their p value is >0.05 (no difference) consider the first sig value otherwise consider the 2nd sig value of the 5th column. We can set the following rules at 5% level of significance:

If p value >0.05, then the model is non-significant model and supports the statement of the null hypothesis. This means, there is no significant difference between the means of the demographic variable for the two regions under the Maharashtra state. Hence, they support the fact under null hypothesis.

If p value ≤0.05, then the model is significant model to determine the statement of alternative hypothesis. This means, there is some significant difference between the means of the demographic variable for the two regions under the Maharashtra state. Hence they support the fact under alternative hypothesis.
Step 7:
Using the interpretations determined in inferential analysis an overall conclusion is drawn as to support the hypothetical statement under consideration.

**Length of service**

<table>
<thead>
<tr>
<th>Length of service</th>
<th>East Maharashtra</th>
<th>West Maharashtra</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Below 10 years</td>
<td>14</td>
<td>07</td>
</tr>
<tr>
<td>10 years to 20 years</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>20 years to 30 years</td>
<td>37</td>
<td>09</td>
</tr>
<tr>
<td>30 years &amp; above</td>
<td>17</td>
<td>06</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>37</td>
</tr>
</tbody>
</table>

**Conclusion:**
There is significant difference in the Job Satisfaction of the employees having their length of service below 20 years working in various Municipal Corporations of Eastern Maharashtra and Western Maharashtra. There is no significant difference in the Job Satisfaction of the employees having their length of service above 20 years working in various Municipal Corporations of Eastern Maharashtra and Western Maharashtra. There is significant difference in the Job Satisfaction of the employees having their length of service below 20 years working in various Municipal Corporations of Eastern Maharashtra and Western Maharashtra. On the other hand, Employees having their service length above 20 years reflect reverse response as compared to their junior Employees. We can conclude that there is no significant difference in the Job Satisfaction of the employees having their length of service above 20 years working in various Municipal Corporations of Eastern Maharashtra and Western Maharashtra.

**Recommendations**
On the basis of the present study, following recommendations are made

- It was observed during this study that, there is a lot of political pressure on Corporations employees which leads to Job dissatisfaction among them. It is suggested that the political pressure/disturbance may be minimized in order to improve the performance of employees.
- There is biased environment for the women employees in the Corporations. Such things affect the work environment & Job satisfaction. Equal treatment should be given to both the genders of employees.
- Most of the employees perform well in their home town. Although there are service conditions under which they are transferred to other parts of Maharashtra. However, Job satisfaction & work performance improve when the person is working in his/her hometown.
References:

IMPACT OF PARENTING STYLES ON THE ACADEMIC ACHIEVEMENT OF THE CHILD

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ABSTRACT
Parenting style alludes to the path in which guardians bring up their children. The way that individual parent is an imperative consider their children socio-enthusiastic development and advancement. Various studies observed there are mainly two essential components that assistance shape effective Parenting: parental responsiveness and parental demands. Parenting styles distinguished in three ways: legitimate Parenting, dictator parenting, and tolerant Parenting.

Various studies developed three unique Parenting styles by including the uninolved or careless style, which has the most inescapable negative outcomes over all areas. While not each parent falls perfectly into one classification, these Parenting styles for the most part relate with the sort of teach a parent utilizes with his or her tyke or children.

Guardians are the fundamental column and the first of child's identity improvement. The nature of the connection amongst guardians and youngsters is considered as the deciding variable of alteration and their cooperation to each different and in addition mental and passionate airs overwhelming on the family frame the behavioral and identity qualities of children. The current paper highlights the role of parenting styles in the academic achievement of the child.

KEYWORDS:
Parenting style, Academic, Achievement, Children

INTRODUCTION
The issue of socialization has been drilled on individuals by different sources and everyone makes up the social and social identity of the mingled one. Family assumed the fundamental part in many social orders, including Iran among this and it has the most impact during the time spent human's socialization and cultural assimilation.

Different studies have been performed demonstrating that a standout amongst the best components on the improvement and arrangement of pre-adult's identity is their parent's parenting practices. Parenting styles are designs for children preparation that is framed by the regularizing connection of guardians and how they reaction to children' academic achievement. Moreover, different investigations demonstrated the connection between five identity qualities including learning styles, scholarly accomplishment and emotional wellness which show the significance of tending to this territory.
Clinicians are unique in relation to each other regarding the significance of identity. The majority of them concur that the term identity is a moderately stable attribute, propensities or elements that propagate person's conduct to some degree; or more particular, identity is comprised of characteristics and inclinations which are directed to singular contrasts in conduct, conduct security after some time and conduct congruity in different circumstances. Many investigations have reported that Parenting has a capable impact in academic achievement of the children and is frequently connected with tyke results including school-significant results. Parenting styles can be portrayed as examples of conduct that essential guardians use to connect with their children. These examples of childrearing make an enthusiastic atmosphere in which the parent's practices are communicated. In line with this, the studies research about influence of parenting styles on the academic achievement of the children.

Today, many parents gripe about the identity and the conduct of their children without understanding that their children rearing style is the principle purpose for the children's undesired conduct which can influence their academic results. In opposition to regular convictions 'qualities has nothing to do with conduct' yet it's the way parents bring up children that influence their identity. Child rearing is a perplexing undertaking that incorporates numerous particular practices that work independently and together to impact child’s academic achievement. Family is the principle column and the first of children's progress. The nature of the connection amongst parents and youngsters is considered as the deciding component of change and their association to each different and additionally mental and enthusiastic climate predominant on the family shape the academic achievement attributes of children.

IMPACT OF PARENTING STYLES ON THE ACADEMIC ACHIEVEMENT OF THE CHILD

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Different investigations have been performed showing that a standout amongst the best factors on the advancement and arrangement of juvenile's identity is their parent's children rearing practices.

Thusly, the present examination inspects the connection between children rearing styles and identity measurements. Parental demandingness is the degree to which parents set rules for their youngsters, and how their academic practices is based.

Parental responsiveness is the enthusiastic normal for children’s academic achievement. Responsiveness passes on to how much parents bolster their youngsters and go to their children' needs. Both children rearing responsive and requesting has been connected to secure connection in children.
One essential assignment of children’s academic achievement is the socialization of children. This errand requires parental desires and direction that change with the improvement of the children to support positive academic results. The socially capable youngster can be depicted as having freedom, social obligation, force, and accomplishment introduction, which is the drive to look for scholarly difficulties and take care of issues productively and with diligence. Development of emotional and behavioral self-regulation of a child is highly influenced by parental attitude. The capacity to control emotional responses depends on the level of response and involvement of parents in a child’s life. For example, parents act as a resource for their child in social referencing. When a child is placed in a fear-inducing situation, if a parent is present, the child will look toward the parent and examine facial expressions. If the parent does not show emotional distress, then the child will display less distress and more engagement in the situation.

Not only the emotional and behavioral progress throughout each form of psychosocial development, have parents played a vital role in the positive growth of their child. Parents who influence the development of their child in a positive manner tend to have particular qualities and characteristics. These parents tend to be responsive, demanding, accepting and emphasize discussion and interaction. These parents have the characteristics of an authoritative parent.

Past studies showed that authoritarian parenting is related low academic achievement. This means that parents with too high or too low demand and responsiveness have children with low academic achievement. Past studies have established a positive correlation between authoritative parenting style and academic achievement.

The current study intends to investigate the relation of parenting style on children’s academic performance. Specifically, this research would like to know if these different parenting styles have any effect on children’s academic performance. It is expected that present study would be helpful to all of the students because every student belongs in a family. So, parenting style has an important role in student’s academic activities. If we can identify the relation of parenting style with students’ academic performance and which parenting style is effective in high academic performance, it will be possible to inspire parents in that kind of parenting style.

It is especially important that parents give children a good start, but it’s also important for parents to recognize that kids come into the world with their own temperaments, and it is the parents’ job to provide an interface with the world that eventually prepares a child for complete independence. In a rapidly changing world parenting seems subject to fads and changing styles, but the needs of child.

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DISCUSSION

In a rapidly changing world parenting seems subject to fads and changing styles, but the needs of child Family as well as parents are considered as an indispensable support system available to any child and seem to play a significant role in the development of the child. Although, the significance of home environment in the developmental of the child cannot be ignored, yet the strongest factor influencing the development of the child is, the style used by parents for their child’s rearing.

“Academic performance of school students depends on parenting styles along with other conditions i.e. parents being responsive (supportive and warm), demanding (controlling and supervising) and guidance given to the students towards their academic performance.” Moreover, it is the duty of parents to provide proper nutrition, safe environment and guidance to their child to prepare them to fulfill the demands of lifelong learning.

Family as well as parents are considered as an indispensable support system available to any child and seem to play a significant role in the development of the child. Although the significance of home environment in the developmental of the child cannot be ignored, yet the strongest factor influencing the development of the child is, the style used by parents for their child’s rearing.

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In the present competitive era, when every parent wants their child to perform well in each and every field of life, it is very much important to understand the effect of different parenting styles on the child’s development including his academic achievement.

CONCLUSION

Parenting style has substantial effect on children’s development. It was found that parenting style had a significant effect on academic achievement of senior secondary school students. So, parents must be made aware of their contribution in children’s life domain. It was further found that students who perceived their parents’ parenting style as democratic demonstrated high academic achievement.

Hence, parents must adopt democratic parenting style and must use it practically while dealing with their children. They must encourage their children to participate in activities that match their talents and also to work hard by being genuinely interested in their activities. Understanding the importance of parenting style in the life of children, schools and administrators should organize workshops and trainings for parents to guide the parents about the various strategies which they should use for their child’s development.

REFERENCES
CHILDHOOD, A FUNDAMENTAL RIGHT: LAW AND IRONY

Prem Kumar

1. Introduction

No one knows who created mankind on this planet but “Mankind” as we know, begins with childhood. There is life as blooms from each pinnacle of Mother Nature, seen or unseen, tangible or intangible but it manifests in different nascent forms giving pleasant surprises. A child is born as a gift from nature to Mankind. Great Poet William Wordsworth said “Child is the father of man.....” It sounds paradoxical; however it might mean that if childhood is nurtured in heart, our inner child dictates all the great and wonderful things that we find in life. But, if that ‘inner child’ is killed in childhood itself, the grown up will become unsocial and may be a dent on Mankind. An adult is the product of the habits, manners and behavior that he inculcated during his childhood. Then, who is responsible of killing ‘inner child’ in our children and if that can be prevented, it will provide a wholesome solution of many of present problems the Nations are facing today. Then questions arise, how and by what means. It that process, every effort would rest either on social participation or on legal intervention.

Though, much has been written on the issue being an issue needs prime consideration to secure an idle and disciplined society, however, I have concentrated with my best of ability to identify the root causes of the problem and aspect of effectiveness of present laws of the land on the issue and legal intervention. Basic issue is, whether ‘childhood’ is a fundamental right of children or it is at the disposal of common law and the will of society.

Present laws in India deal only the crimes against children, which turns out ultimately to be the matter of statutory rights. Hon’ble Apex Court in Maneka Gandhi’s case has expressed thus;

“The theory that a peripheral or concomitant right which facilitates the exercise of a named fundamental rights or gives its meaning and substance or makes its exercise effective, is itself a guaranteed right included within the named fundamental right cannot be accepted...... Where a statutory provision empowering an authority to take action is constitutionally valid, action taken under it may offend a fundamental right and in that event, though the statutory provision is valid, the action may be void. Therefore, even though section 10(3)(c) is valid, the question would always remain whether an order made under it invalid as contravening a fundamental right...... It is true that in a proceeding under Article 32 of the Constitution, we are only concerned with the enforcement of fundamental constitutional rights and not with any statutory rights apart from fundamental rights.”

Thus, a statutory right empowers an authority to take action only if violation of any statutory provision is found in a particular case but such protection is insufficient to ensure certain basic rights at large, related to children. Apart, doors of Article 32 are open only for enforcement of rights conferred by Part-III of the Constitution and not statutory rights.

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2. Shocking Data - Present Scenario

India with 1.21 billion people constitutes as the second most populous country in the world, while children represents 39% of total population of the country. The figures show that the larger number of about 29 per cent. constitutes children in the age between 0-5 years. Uttar Pradesh (19.27%) is the State with highest children’s population in the country, followed Bihar, Maharashtra, West Bengal and Madhya Pradesh constitutes 52% of children’s population in the country.2

In our country, crime against children starts even before birth. The strong preference for sons under patriarchal traditions and the availability of inexpensive prenatal diagnostic techniques have resulted in an increased use of prenatal gender tests in India, even among the rural poor. The Government of India has also enacted Pre natal Diagnostic Techniques Act of 1994 and the Medical Termination of Pregnancy Act of 1971 was enacted by the Government of India with the object of reduction in the incidence of illegal abortion and consequence maternal mortality and morbidity.

The Indian Penal Code (Act No. 45 of 1860) provides an exception and permits abortion only when it is justified for the good faith purpose of saving the life of the woman.

In many parts of India, daughters are not preferred and hence sex-selective abortion is commonly practiced, though being illegal in India. To address the same, some statutes provide certain benefits to unborn child, resulting in an unnatural male to female population sex ratio due to millions of developing girls selectively being targeted for termination before birth.

Sections 312 to 316 of the Penal Code provided that any person performing an illegal abortion was subject to imprisonment for three years and/or payment of a fine; if the woman was “quick with child”, the punishment was imprisonment for up to seven years and payment of a fine.

Girl child neglect was assessed comparing to her brothers on factors like attention, food, recreation time, household work, taking care of siblings, etc. 70.57% of girls reported having been neglected by family members. 48.4% of girls wished they were boys.3

In 2007, the Ministry of Women and Child Development (MWCD) released a study report on child abuse. The report discusses incidence of child abuse nationwide. Children between the ages of 5-12 are at the highest risk for abuse and exploitation. It is estimated that 150 million girls and 73 million boys under 18 have been subjected to forced sexual intercourse or other forms of sexual violence. In 2002 there were 53,000 reported cases of child homicide. ILO estimates show there were 218 million child laborers in 2004, out of which 126 million were engaged in hazardous work.

Every two out of three school children reported facing corporal punishment.

Child abuse in India is often a hidden phenomenon especially when it happens in the home or by family members. Focus with regards to abuse has generally been in the more public domain such as child labour, prostitution, marriage, etc. Intra-family abuse or abuse that takes place in institutions such as schools or Government homes has received minimal attention. This may be due to the structure of family in India and the role children have in this structure. Children in India are often highly dependent on their parents and elders; they
continue to have submissive and obedient roles towards their parents even after they have moved out of their parental home. This belief that parents and family are the sole caretaker of the child has proved to have negative effects on child protection laws and strategies. Numbers of cases of child abuse in the home are hard to attain because most of these crimes go unreported. Societal abuses that are a result of poverty such as malnutrition, lack of education, poor health, neglect, etc. are recognized in various forms by the Indian legal system. But India does not have effective law that protects children against abuse in the home. Mal-treatment of care givers has the potential to emotionally and mentally harm children to a very different degree. Studies in intra-familial child abuse in the US have shown correlation to delinquency, crime, teenage pregnancy, and other psycho-social problems.

The study of the MWCD found a wide spread incidence of child abuse in juvenile justice institutions, 70.21% of children in conflict with law and 52.86% of children in need of care and protection reported having been physically abused. The study found that 69% of children reported to have been physically abused. Out of these 54.68% were boys. 52.91% of boys and 47.09% of girls reported having been abused in their family environment. Of the children who were abused in family situations 88.6% were abused by their parents.

With regard to child labour, 50.2% of children work all seven days of the week. 81.16% of the girl child labourers work in domestic households, while 84% of the boy child labourers worked in tea stalls or kiosks. 65.99% of boys and 67.92% of girls living on the street reported being physically abused by their family members and other people.

The study examined emotional abuse and girl child neglect. The study examined two forms of emotional abuse: humiliation and comparison. Half the children reported facing emotional abuse with 83% of that abuse being conducted by parents.

In 2002 there were 53,000 reported cases of child homicide.

3. Rights of a Child

The history of children’s rights dates from the 19th century. Prior to that, there were no particular mechanisms in place to protect children. In ancient times and up to the middle Ages, in some parts of the world, parents even had the power of life or death over their children.

(a) 19th century:

The 19th century marked the start of children’s rights. The child began to be considered as a being in need of protection. For the first time in Europe, laws were passed governing child labour. Different legal texts progressively encouraged or made education obligatory for young children, and society recognized the fact that the child could not be dealt with in the same way as an adult.

(b) 20th century: children become subjects of rights

The history of children’s rights accelerated in the 20th century. In 1919, the League of Nations created a committee for the protection of children. Five years later, it adopted the Geneva Declaration, first international treaty on children’s rights, inspired by the work of Jonasz Korczak, who is considered to be the father of children’s rights.

After the Second World War, the history of children’s rights underwent several key stages following the creation of the United Nations:
1948: Universal Declaration of Human Rights, which stipulates that motherhood and childhood are entitled to special care and assistance.

1959: The UN adopted the Declaration of the Rights of the Child, which recognized the child as subject of rights.

1989: On November 20, the Convention on the Rights of the Child (CRC) was unanimously adopted by the United Nations General Assembly.

21st century: towards an effective application of children’s rights?

2000: Strengthening of the CRC with the adoption of two optional protocols on the sale of children, child prostitution and child pornography, and child involvement in armed conflicts.

2011: Adoption of a third optional protocol, introducing a mechanism by which children may submit complaints to the Committee on the Rights of the Child.

2014: The 25th anniversary of the Convention. It has now been ratified by 193 member States of the United Nations. Only the United States and Somalia, who have both signed the treaty, have not ratified it.

The four guiding principles of the Convention on the Rights of the Child are: Non-discrimination priority given to the best interests of the child, Right to life, survival and development, Respect for the views of the child. Beyond these principles, UNCRC recognizes following rights of children:

The right to an identity (Articles 7 and 8) -

All children have the right to a name and nationality from birth, ensuring his protection and support by his own country. If the birth is not registered, the child will not be recognized by the State and will not receive care or education.

The right to health (Articles 23 and 24) -

All children should be cared for if sick, be well-fed, protected from drugs, and enjoy living conditions which are not dangerous to their health.

The right to education, (Article 28) -

All children have the right to an education and access to skills which will help them prepare for their future.

The right to a family life (Articles 8, 9, 10, 16, 20, 22 and 40) -

All children have the right to live with people who love and care for them, preferably their families, or by careers if their own families cannot look after them.

Right to be protected from violence (Articles 19 and 34) -

Each child must be protected from violence, from his own family or any person who wishes to harm him. He should never be obliged to suffer or inflict ill-treatment or any act of sexual or physical violence.

The right to an opinion (Articles 12 and 13) -

All children have the right to express their views. They also have the right to be informed and give their opinion about the world around them.
The right to be protected from armed conflict (Articles 38 and 39)-

All children must be protected from was and its consequences, such as being a refugee, injured, prisoner, or forced into armed conflict.

The right to be protected from exploitation (Articles 19, 32, 34, 36 and 39) - A child should not be obliged to work in difficult or dangerous conditions, in order to survive or support his family.

The right to equality and respect for differences. Each child has the same rights, regardless of his race, colour, religion, language or culture, gender, or abilities.

4. Indian Scenario

In India, unfortunately, there are no fundamental rights specific to children framed in our Constitution but are presumed to be covered by the fundamental rights otherwise available in Part III to citizens in general. They are abandoned. They do not get a chance to step in a school. They are left to fend for themselves on the streets. They suffer from many forms of violence. They do not have access to even primary healthcare. They are subjected to cruel and inhumane treatments every day. They are children - innocent, young and beautiful - who are deprived of their rights.

In 2014 Nobel Peace Prize awardees—Ms. Malala Yousafzai and Mr. Kailsh Satyarthi have reminded us all of the need to keep on advancing in providing opportunities that has an important effect on all children. The opportunities are meant to be meaningful enough to allow them to learn and gain the mindsets and skills that would empower them to be free, develop themselves, their communities and the world.

5. When a Human ceases to be a ‘Child’

Infect, defining what age a person is or ceases to be a child is a constant debate in the India. The Census of India considers children to be any person below the age of 14. Biologically ‘childhood’ is the stage between infancy and adulthood. According to the UNCRC, ‘a child means every human being below the age of eighteen years unless, under the law applicable to the child, majority is attained earlier’. This definition of child allows for individual countries to determine according to the own discretion the age limits of a child in their own laws. But in India various laws related to children define children in different age limits.

The Indian Penal Code, 1860 finds that no child below the age of seven may be held criminally responsible for an action (Section 82, IPC). In case of mental disability or inability to understand the consequences of one’s actions the criminal responsibility age is raised to twelve years (Section 83, IPC). A girl must be of at least sixteen years in order to give sexual consent, unless she is married, in which case the prescribed age is no less that fifteen. With regard to protection against kidnapping, abduction and related offences the given age is sixteen for boys and eighteen for girls.

According to Article 21-A of the Constitution, all children between the ages of six to fourteen should be provided with free and compulsory education. Article 45 states that the State should provide early childhood care and education to all children below the age of six. Lastly Article 51 (k) states the parents/guardians of the children between the ages of six and fourteen should provide them with opportunities for education.
The Child Labour (Prohibition and Regulation) Act, 1986 defines a child as a person who has not completed fourteen years of age. The Factories Act, 1948 and Plantation Labour Act, 1951 states that a child is one that has not completed fifteen years of age and an adolescent is one who has completed fifteen years of age but has not completed eighteen years of age. According to the Factories Act adolescents are allowed to work in factories as long as they are deemed medically fit but may not for more than four and half hours a day. The Motor Transport Workers Act, 1961, and The Beedi and Cigar Workers (Conditions of Employment) Act, 1966, both define a child as a person who has not completed fourteen years of age. The Merchant Shipping Act, 1958 and Apprentices Act, 1961 don’t define a child, but in provisions of the act state that a child below fourteen is not permitted to work in occupations of the act. The Mines Act, 1952 is the only labour related Act that defines adult as person who has completed eighteen years of age (hence a child is a person who has not completed eighteen years of age).

The Prohibition of Child Marriage Act, 2006 states that a male has not reached majority until he is twenty-one years of age and a female has not reached majority until she is eighteen years of age. The Indian Majority Act, 1875 was enacted to create a blanket definition of a minor for such acts as the Guardians and Wards Act of 1890. Under the Indian Majority Act, 1875 a person has not attained majority until he or she is of eighteen years of age. This definition of a minor also stands for both the Hindu Minority and Guardianship Act, 1956. Muslim, Christian and Zoroastrian personal law also upholds eighteen as the age of majority. The first Juvenile Justice Act, 1986 defined a boy child as below sixteen years of age and a girl child as below eighteen years of age. The Juvenile Justice (Care and Protection of Children) Act, 2000 has changed the definition of child to any person who has not completed eighteen years of age.

Because of its umbrella clauses and because it is the latest law to be enacted regarding child rights and protection, many are of the opinion that the definition of child found in the Juvenile Justice Act, 2000 should be considered the legal definition for a child in all matters.

6. Identifying Rights: of Children

In our country, rights of children are recognized to be essential rights by way of judicial pronouncement, as our Courts take the task to determine it, when occasion so arises. In fact, our legislators are expected to realize need to recognize fundamental rights of children in following areas:

(a) Right to Survival:
* Right to be born,
* Right to minimum standards of food, shelter and clothing,
* Right to live with dignity,
  * Right to health care, to safe drinking water, nutritious food, a clean and safe environment, and information to help they stay healthy.

(b) Right to Protection:
* Right to be protected from all sorts of violence,
* Right to be protected from neglect,
* Right to be protected from physical and sexual abuse,
* Right to be protected from dangerous drugs.

(c) Right to Participation:
* Right to freedom of opinion,
* Right to freedom of expression,
* Right to freedom of association,
* Right to information,
* Right to participate in any decision making that involves him/her directly or indirectly.

(d) Right to Development:
* Right to education,
* Right to learn,
* Right to relax and play,
* Right to all forms of development - emotional, mental and physical.

Out of above, only the ‘right to education’ has been specifically identified to be the basic right of children only after intervention of Supreme Court. The addition of the Right to Education (RTE) in the Universal Declaration of Human Rights in 1948 was the beginning of a remarkable expansion of educational opportunities around the world. The Apex Court led a great importance on various aspects of the issues related to children qua the ideals of social and economic justice. It was observed in Unni Krishnan’s case that Article 21 is the heart of Fundamental Rights and it has extended the scope of Article 21 by observing that the right to life includes the education as well as, as the right to education flows from the right to life.

As a result of expansion of the scope of Article 21, the Public Interest Litigations in respect of children in jail being entitled to special protection, health hazards due to pollution and harmful drugs, housing for beggars, immediate medical aid to injured persons, starvation deaths, the right to know, the right to open trial, inhuman conditions in aftercare home have found place under it.

Through various judgments the Apex Court also included many of the non-justifiable Directive Principles embodied under Part IV of the Constitution and some of the examples are as under:

(a) Right to pollution free water and air.
(b) Protection of under-trial.
(c) Right of every child to a full development.
(d) Protection of cultural heritage.

The Government of India by Constitutional (86th Amendment Act) Act, 2002 had added a new Article 21-A, which provides that -

“The State shall provide free and compulsory education to all children of the age of 6 to 14 years in such manner as the State may, by law determine”.

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Further, they strengthened this Article 21-A by adding a clause (k) to Article 51-A, which provides for those who are a parent or guardian to provide opportunities for education to his/her child or ward between the age of 6 and 14 years. On the basis of the Constitutional mandate provided under Articles 41, 45 46, 21-A, 51-A(k) and various judgments of Apex Court, both the Government of India, has taken several steps to eradicate illiteracy, improve the quality of education and simultaneously ensure that the dropouts are brought to nil.

The Parliament of India enacted the Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) on August 2009. The same got enforced on April 1st, 2010.

7. **Awakening: By commissions**

**The Commissions for Protection of Child Rights Act, 2005** has ultimately been enacted with following statement, objects and reasons:

“An Act to provide for the constitution of a National Commission and State Commissions for Protection of Child Rights and Children’s Courts for providing speedy trial of offenses against children or of violation of child rights and for matters connected therewith or incidental thereto. WHEREAS India participated in the United Nations (UN) General Assembly Summit in 1990, which adopted a Declaration on Survival, Protection and Development of Children; AND WHEREAS India has also acceded to the Convention on the Rights of the Child (CRC) on the 11th December, 1992; AND WHEREAS CRC is an international treaty that makes it incumbent upon the signatory States to take all necessary steps to protect children’s rights enumerated in the Convention; AND WHEREAS in order to ensure protection of rights of children one of the recent initiatives that the Government have taken for children is the adoption of National Charter for Children, 2003; AND WHEREAS the UN General Assembly Special Session on Children held in May, 2002 adopted an Outcome Document titled “A World Fit for Children” containing the goals, objectives, strategies and activities to be undertaken by the member countries for the current decade; AND WHEREAS it is expedient to enact a law relating to children to give effect to the policies adopted by the Government in this regard, standards prescribed in the CRC, and all other relevant international instruments.”

**The National Commission for Protection of Child Rights (NCPCR) was established in March 2007** as a statutory body under the Commissions for Protection of Child Rights Act, 2005. It was set up to protect, promote and defend child rights in the country. The Commission consists of a chairperson and six members who are well versed in child welfare.

**Function of the Commission:**

- Examine any law or constitutional provisions to ensure that the safeguards of the law protect child rights,
- Provide the Central Government with recommendations to improve correct the safeguards,
- Inquire into child rights violations,
- Examine the risk factors for children affected by terrorism, communal violence, riots, natural disasters, domestic violence, HIV/AIDS, trafficking, maltreatment, torture and exploitation, pornography, and prostitution and recommend appropriate remedial measures.
Look into the special care and protection of children from distress, marginalized and disadvantaged back grounds.

Study and ensure implementation of child rights treaties

Conduct research in the field of child rights.

Create awareness through various mediums

Inspect any children’s home or observations homes where children have been detained

Inspect any juvenile’s custodial home, or place of residence or institution for children, under the control of the Central Government or any other authority, and take up with authorities for remedial action.

Inquire into complaints and take Suo motu notice of matter relating to deprivation and violation of child rights or non implementation of laws providing for protection and development of children or non compliance of policy decisions, guidelines or instructions to ensure welfare of the children.

India has also launched an Integrated Child Protection Scheme which aims at shielding children from violence and abuse.

8. Conclusions

Although, our Parliament has enacted Commissions for Protection of Child Rights Act, 2005 ane Right of Children of Free and Compulsory Education Act or Right to Education Act (RTE) after inserting certain provisions by Constitutional (86th Amendment Act) Act, 2002, but declaring certain rights of our children to be ‘fundamental rights’ has still seems to go a long way. The Fundamental Rights are defined as basic human freedoms that every Indian citizen has the right to enjoy for a proper and harmonious development of personality. These rights universally apply to all citizens, irrespective of race, place of birth, religion, case or gender. Law protects physical harm and exploitation of children but still the childhood itself has not been recognized to be the fundamental right of each child. Just like sense of freedom or life has been recognized to be the fundamental rights in our Constitution, childhood needs to be recognized as a guaranteed right under Part III of our Constitution. In A.K. Gopalan’s case, Apex Court has way back expressed;

“The material points substantially altering the edifice are first in the Preamble which declares India a Sovereign Democratic Republic to secure to all its citizens justice, liberty and equality and to promote among them all, fraternity. Part III of the Constitution is an important innovation. It is headed “Fundamental Rights.”

The words, ‘all its citizens’ though include children but still Part-III needs to take care of citizens of special category who are innocent and unaware of their rights. An adult citizen can claim his or her fundamental right but a child, who is even not aware about him/herself while subjected to injustice, torture, inequality, poverty, illiteracy, malnutrition etc. is dependent on elders or sometimes, ruthless system for justice through others. Though all the relevant rules and policies are in place, there is a lack in enforcement initiatives.

The law enforcement agencies and even our Courts need to be sensitive, polite and vigilant while dealing with the matters related to children.
As barriers, there are several factors that forbid effective implementation of the laws. Due to relatively low success in achieving concrete child development outcomes in India, the condition of underprivileged kids and underprivileged youth is harsh and needs urgent attention. There is a need to intensify efforts for children welfare at all levels to implement the rules and provisions of the Convention and contribute to create a world suitable for children. This is may be because innocence of a child or childhood has not been recognized to be a guaranteed right.

Reference

2. Data Source: Census of India 2010-11.
ECONOMICAL IMPACT OF TOURISM MANAGEMENT - A STUDY ON AMDAMAN ISLANDS

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Shri Venkateshwara University, Gajraula, India

ABSTRACT
Tourism is a multi-fragmented industry that entails many industries under its broad umbrella. The major constituents of modern day tourism include attraction, transportation, accommodation, food services, entertainment and recreation. The study was conducted at various tourist destinations of the Andaman Islands. These locations basically included the areas that were visited or resided (hotel) by the tourist in the process of undertaking the phenomenon of tourism. The study tries to put forward a way to showcase the tourism impact on the economy of the destination. The study was conducted using quantitative approach that included those of exploratory data analysis and correlation among the variables. Results clearly showed that the expense undertaken by the tourist on their visit helped in developing the economic status of the destination. This research mainly focused on the tourism development in Andaman Island and its impact on Indian Economy not to beyond this context.

Keywords: Accommodation, Transportation, Attraction, Food and Beverages, Andaman Islands.

1. INTRODUCTION
India is growing rapidly in terms of tourism and entails a crucial role in the country’s economy. According to the World Travel and Tourism Council (2017) — “tourism generated 15.24 lakh crore (US$210 billion) which in turn contributed to 9.4% of India’s GDP (Gross Domestic Product). To add more, the tourism industry provided 41.622 million jobs that are around 8% of the total employment. Further it is predicted to grow at an annual rate of 6.9% that is 32.05 lakh crore (US$450 billion) by 2028 (9.9% of GDP).” In a developing country like India, tourism has resulted up being one of the imperative parts of the economy, adding to GDP and generating employment opportunities. Tourism is one of the developing organizations in the country with unprecedented potential for expansion and enhancement. The tourism industries play an eminent role in any countries economic development. It essentially enables the country to make openings of jobs for the unemployed citizens. Besides, it is additionally a standout amongst the most vital engines that attracts additional trades potential. It is also critical to extend the activity of the legislature to impact India to prevail in tourism and set up itself in the overall market. India has a rich wellspring of tourism for the establishment of the brand. India has moved the brand Incredible India to improve tourism.
The current study coins how tourism segment is significant for the development economically. In other words the research tries to analyse tourism and its economic effect in
context to mother land India, with a special case study on an exclusive group of islands. The study was undertaken at a remote place that is home to a vivid variety of living organisms along with the marvellous beauty of Mother Nature that attracts tourists from around the world. A group of land territories scattered in the Bay of Bengal forms the mesmerizing beauty of Mother Nature represents the whole of Andaman and Nicobar Islands.

2. OBJECTIVES
In order to analyze the impact of tourism on the economical aspects of a region following objectives where taken into account:

i. To determine the relationship between the money spent on accommodation, transportation, attraction, and food and beverages.

ii. To analyze the economical impact of tourism in Andaman Islands.

3. RESEARCH METHODOLOGY
Following a review of literature and the characterization of the study area; the methodology used in this research was based on both primary and secondary source data. The primary data’s were obtained by conducting fieldwork in Andaman Islands. The surveys were conducted in places that were visited by tourist—this included various hotels, restaurants, local food stalls, market areas and places that provided various activities to the visiting tourists from all walks of life. The questionnaires were supplied to the tourists once they were free from all activities and where either simple relaxing or where doing nothing. During the survey comfort and respect to the views of the tourist were kept in mind.

Surveys were conducted between the months of November 2017 to April 2018. The questionnaire was distributed in only English language. Complete freedom of independence was given to the participants while filling the questionnaire; although the interviewer was present in case they had some difficulty in filling the form. The survey was completely anonymous. A total of 500 valid questionnaires were received by the interviewer. The interviewer made sure that the questions were not left blank by the respondents. The measurement instrument included those of the questions related to the money spent by the tourists in accommodation, transportation, attraction and food and beverages.

The data collected were organized, tabulated and analyzed by using the SPSS 24.0 program (IBM Corporation, Armonk, NY, USA).

4. REVIEW OF LITERATURE
The British Empire once had conquered almost the entire world. They established their rule and supremacy in almost every part of the globe. The colonization of various pieces of land by the Britishers resulted in a lot of changes culturally, traditionally and politically. They explored whole of the world and colonised the territories discovered by them. It was in the year 1789, when Lieutenant Archibald Blair came to the archipelago as a Governor General of India, and Lord Cornwallis had ordered him to survey the land, raise the British flag and set up harbours where ships could refit themselves in time of war or distress. Besides this historical account, the accounts mentioned in the previous section may be categorised as travelogues, some of them even the products of mere imaginations that are interesting to read but worth less to a serious historian. The hydrographer appointed by Lord Cornwallis explored the entire Andaman and found Chatham Island, a small island about 12 acres in area apt for the construction of harbour that is well connected to the main island by a causeway at low tide, and easy to defend against the hostile tribes. People were brought more in numbers for the gradual settlement of colony in these islands but the monsoon of 1795 brought sickness and misery afresh taking fifty lives. The British officials started feeling the disadvantages of this place against the unrivalled advantages as a naval port. However in
1796, the council of directors finally took a decision to shut down the settlement and on 8th February 1796, issued instructions to abandon the islands. As the people left the islands along with the British officials, the Andamanese went back to their state of isolation to remain undisturbed and unapproached for the next sixty years.

The outbreak of violence in 1857, where Indians started protesting against the Britishers, forced the government to set up penal settlement in a place quite distant from the mainland. This led to the formation of the Andaman committee that undertook its expedition in November and December 1857, and submitted its report in January 1858 which favoured Andaman as the best site for penal settlement. The old harbour of Andaman was renamed as Port Blair and on 22 January 1858 Captain Man raised the Union Jack at Port Blair. At first the prisoners who came to these islands along with the officials had quite a good time during the times of exploration and settlement. By the end of the terms of the prisoners, they were sent back to their home state but the better treatment and the availability of money in working at these groups of islands brought them back. As a result of this, crimes started increasing in the country with more and more people wanting to be deported to Andaman Islands. This made the Britishers take some stringent action and make the rules of the islands more strict and inhuman. From here the Andaman history entered into a phase of struggle, development and misery. This phase lasted till the end of British Rule that is 1947. During this period the prisoners, better known as the freedom fighters of Mother India were brought here and tortured. The construction of Cellular Jail started in 1896 and was ready by 1910. This immorial structure had 668 cells constructed on the pattern of Madras close prison, so that no prisoners could see another during their confinement. It was here the great Veer Savarkar stayed for almost two years without knowing the fact that his brother too was imprisoned in the same jail. The British officials set up their base camp in the Ross Island and made it the capital city of the islands. The prisoners who did not listen to the Britishers were taken to the Viper Islands and hanged to death. The Cellular Jail also had the provision of hanging prisoners but mass execution of prisoners took place in Viper Island.

By May 1912 Indian newspapers had got the wind of the state affairs and begun running stories of the atrocities being perpetrated in these islands. The place started getting attention by the name of “Hell on Earth” and subsequently the prisoners started revolting against the officials of the British rule. The hunger strike of 1937 which almost lasted for fifty six days was finally ended by the intervention of Mahatma Gandhi and the political prisoners were shipped back. The pathetic era of Cellular Jail came to an end and the penal colony went back to normal. But this peace was short lived as the outbreak of Second World War in 1939 brought the dramatic entry of the Japanese in December 1941. The British moved back to Calcutta, evacuating the islands by 13th March 1942. The Japanese were ruthless and more brutal. They killed people and made the place more unstable for the settlers to reside. However all these brutalities came to an end when Imam-ul-Majid in February 1947, was made the first Chief Commissioner of Andaman of an independent India.

Today the Andaman bunch comprises of 550 islands—-islets that covers a land territory of 6,408 km of which only 28 islands are inhabited. This gathering incorporates extensive islands, for example—North Andaman, Middle Andaman, South Andaman and Little Andaman; while islands in Ritchie’s Archipelago comprises of the world famous Swaraj Dweep Island (Havelock Island) and Shaheed Dweep Island (Neil Island) among others. The Islands have one of a kind history—-geopolitical area and statistic profile which makes it unique from others.
5. EXPLORATORY DATA ANALYSIS

Analyzing the Money Spent by the Tourist on their Visit to the Andaman Islands

In order to analyze the economical condition of a tourist destination, it is necessary to analyze the basic amount of money spent by the tourist on their visit to the location. So with the help of the distributed questionnaire, it was tried to analyze the amount of money spent by the tourist on the basic elements of tourism i.e. accommodation, transportation, attraction and last but not the least, food & beverages.

5.1 Spent on Accommodation (Per Person)

The table 1 shows the frequency distribution of the money spent by a tourist on a per day basis in accommodation. It is interesting to see that out of 500 tourists, 18.0% of tourists spent under 1000 for Accommodation which is highly appreciable while 38.0% of tourists spent 1000 – 2000 which is an economical spent, however 12.0% of tourists spent 2000 – 4000 which is a moderate expenditure of residence. It was noted that 20% of the respondent spent Rs 8000 and more, which show that the high level guest looking for luxury accommodation also visited the islands.

Table 1: The Expenditure in Andaman’s per person per day for Accommodation

<table>
<thead>
<tr>
<th>Variable (Per day)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1000</td>
<td>90 (18.0%)</td>
</tr>
<tr>
<td>1000-2000</td>
<td>190 (38.0%)</td>
</tr>
<tr>
<td>2000-4000</td>
<td>60 (12.0%)</td>
</tr>
<tr>
<td>4000-8000</td>
<td>60 (12.0%)</td>
</tr>
<tr>
<td>8000-10000</td>
<td>55 (11.0%)</td>
</tr>
<tr>
<td>Above 10000</td>
<td>45 (9.0%)</td>
</tr>
</tbody>
</table>

5.2 Spent on Transportation (Per Person)

In spite of the respondents complaining regarding the high price of transportation in the islands, it was interesting to analyze the money spent by them on their movement in the islands.

Table 2 shows that almost 25% of respondents have spent at least Rs 2,000 on a daily basis. However 50% of them have accepted to have spent money ranging from Rs 2,000-8,000. It was astonishing to find that out of 500 respondents; 50 of them had spent more than Rs 10,000 on a daily basis. The figures shown here display that the transportation in the Andaman Islands was indeed costly, yet the hike in price was quite obvious due to the remoteness of the landmass.

Table 2: The Expenditure in Andaman’s per person per day for Transportation

<table>
<thead>
<tr>
<th>Variable (Per day)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1000</td>
<td>25 (5.0%)</td>
</tr>
<tr>
<td>1000-2000</td>
<td>100 (20.0%)</td>
</tr>
<tr>
<td>2000-4000</td>
<td>125 (25.0%)</td>
</tr>
</tbody>
</table>
5.3 Spent on Attractions (Per Person)
Any destination receives the maximum number of tourist only if the destinations have some mesmerizing attractions. These attractions include those of both the natural and manmade, here natural attraction refers to those of beaches, mountains, historical sites etc.; whereas manmade attractions are those sites which are built particularly for the tourist’s relaxation, enjoyment, refreshment etc.

Table 3 shows that almost 45% of the visiting tourist had spent upto Rs 2,000 daily for attraction purposes while 10% of the respondents stated that they had spent more than Rs 8,000 on availing the attractions available in Andaman Islands.

<table>
<thead>
<tr>
<th>Variable (Per day)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1000</td>
<td>50 (10.0%)</td>
</tr>
<tr>
<td>1000-2000</td>
<td>225 (45.0%)</td>
</tr>
<tr>
<td>2000-4000</td>
<td>125 (25.0%)</td>
</tr>
<tr>
<td>4000-8000</td>
<td>50 (10.0%)</td>
</tr>
<tr>
<td>8000-10000</td>
<td>25 (5.0%)</td>
</tr>
<tr>
<td>Above 10000</td>
<td>25 (5.0%)</td>
</tr>
</tbody>
</table>

5.4 Spent on Food and Beverages (Per Person)
Food is considered to be the basic requirement for the existence of mankind. Similarly the food consumed by the tourist on their visit to a destination helps in advancing the economical status of the local residents. It was important to analyze the money spent by the tourist on food and beverages while they visited the Andaman Islands.

Table 4 shows the expenditure in Andaman’s per person per day for food and beverages were as follows; out of 500 tourists, 45% of the respondents had spent Rs 2,000-4,000 on food and beverages while 7% tourist claimed to have spent Rs 8,000 and more on a daily basis.

<table>
<thead>
<tr>
<th>Variable (Per day)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1000</td>
<td>10 (2.0%)</td>
</tr>
<tr>
<td>1000-2000</td>
<td>140 (28.0%)</td>
</tr>
<tr>
<td>2000-4000</td>
<td>225 (45.0%)</td>
</tr>
<tr>
<td>4000-8000</td>
<td>90 (18.0%)</td>
</tr>
<tr>
<td>8000-10000</td>
<td>25 (5.0%)</td>
</tr>
<tr>
<td>Above 10000</td>
<td>10 (2.0%)</td>
</tr>
</tbody>
</table>

6. HYPOTHESIS TESTING
H₀: There is no relation between the money spent in Accommodation, Transportation Attraction (natural and manmade) and food-beverages by the visiting tourist.
Hₐ: There is significant relation between the money spent in Accommodation, Transportation, Attraction (natural and manmade) and food-beverages by the visiting tourist.
Table 5 describes the mean, standard deviation and numbers of following variables— money spent on Accommodation, Transportation, Attractions (natural and manmade) and food-beverages by the visiting tourists.

### Table 5: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>‘N’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation</td>
<td>3.9000</td>
<td>1.60473</td>
<td>500</td>
</tr>
<tr>
<td>Transportation</td>
<td>4.0400</td>
<td>1.51095</td>
<td>500</td>
</tr>
<tr>
<td>Attractions</td>
<td>4.1800</td>
<td>1.49401</td>
<td>500</td>
</tr>
<tr>
<td>Food and Beverages</td>
<td>4.2200</td>
<td>1.39121</td>
<td>500</td>
</tr>
</tbody>
</table>

The value of correlation between the money spent in accommodation, transportation, attraction (natural and manmade) and food-beverages by the tourists were 0.398, 0.243, 0.134, 0.145 and 0.120 to each other’s; which showed strong relation between them “with p value less than 0.05 level of significance”.

Thus the alternate hypothesis stands accepted, i.e., there is significant relation between the money spent in Accommodation, Transportation, Attraction (natural and manmade) and food-beverages by the visiting tourist.

### Table 6: Correlations

<table>
<thead>
<tr>
<th></th>
<th>Accommodation</th>
<th>Transportation</th>
<th>Attractions</th>
<th>Food and Beverages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>1</td>
<td>.398**</td>
<td>.243**</td>
<td>.134**</td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.000</td>
<td>.000</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed)**
7. DISCUSSION

7.1 Impact of Tourism on Indian economy

Tourism has turned into the biggest industry in the world, creating riches and employment, opening the psyches of visitors to visitors for various lifestyles. The most critical components for the achievement of tourism development incorporate item improvement, showcasing, guidelines and human resource development. India’s tourism is one of the prospering divisions as far as scope. Tourism in India is continually developing to create employment and gain a lot of foreign money to settle the economic and social development of the nation. It additionally protects and keeps up the diversity of India’s characteristic and social situations. We must build up the tourism industry with government support, new inceptions, activities and plans to impact foreigners to hold our position solidly. This research clarifies the effect of tourism on the Indian economy. Tourism in India is a key factor for development and a critical wellspring of foreign exchange earnings. The tourism division in India is thriving because of an expansion in foreign tourist entries (FTA) and a more prominent number of Indians making a trip to national goals. India has staggering development in tourism and is a standout amongst the most essential economic changes. Tourist movement has enduring financial effects on the economy and the host network. Even though the industry has incredible opportunities, it is important to make it positive regarding what's to come.

Tourism is viewed as one of the biggest economic activities in the world and maybe the biggest in the administration part. It is likewise one of the quickest developing areas of the worldwide economy. Tourism is indispensable for some nations, because of the income produced by the utilization of products and enterprises by tourists, the charges forced by organizations in the tourism area and employment opportunities in the parts of services related with tourism. Tourism has an immediate and aberrant impact on society, which is viewed as a powerful instrument for the economic development of the country. These effects are economic, social and social, natural, congestion and blockage, network frames of mind, services and expenses. Kreag likewise dissected that every one of these effects has positive and negative viewpoints. A portion of the highlights that depict the effect of tourism on the economy are shown in the figure 6.1.
Tourism has turned into a key segment of the world economy and has turned into an essential workforce in world exchange. It has had a progressive and huge effect on the worldwide economic situation. Tourism has been distinguished as the principle export segment in the world. The multifaceted idea of this segment makes it an impetus for economic development and helps adjusted provincial development. It is a low-capital industry and serious work with economic multiplier and offers the chance to acquire foreign currency at low social cost. The tourism industry goes about as an incredible operator of both economic and social changes. It invigorates employment and investment, modifies the structure of an economy, contributes altogether to foreign currency gains and keeps up a good parity of installments. The cash spent by tourists in a country is conveyed a few times simultaneously; the absolute income got from tourism is commonly more noteworthy than the real use. It is completely perceived that the multiplier impact of tourism income stretches out to the optional and tertiary areas of an economy. Tourism has an economic, social, instructive and political importance. Advertising and advancement are of imperative significance in the tourism segment on account of the intensity of the tourism industry both inside and among the countries that create tourism. The tourism division makes immediate, aberrant and prompted employment. It creates a wide scope of occupations, from exceedingly qualified and prepared chiefs, from star lodgings to flat mates, merchants and craftsmen. With its quickest development, new word related skylines open for youngsters in creating nations.

Tourism in India has extraordinary relevance for economic development, social development and national incorporation. India is a tremendous country of incredible magnificence and diversity and its tourism potential is similarly immense. With its rich social legacy that shows itself gloriously in a considerable lot of the royal residences, sanctuaries, mosques, posts, caverns and ancient engineering wonder divider depictions, its shifted geology ranges from the repetitive plain to the most elevated mountains in the world.

India's tourism and hospitality industry has turned out to be one of the primary drivers of development in the administration division in India. In developing nations like India, tourism has turned out to be one of the primary divisions of the economy, adding to a vast piece of national income and producing colossal openings for work. It has turned into the industry's quickest developing services in the country with extraordinary potential for further extension and broadening, it has an immediate and backhanded chain of association with different areas of the economy. Along these lines, tourism has an expansive positive and negative effect on the economic, social and environmental parts of India.

7.2 Tourism and Economic development of Andaman Islands

Silver sand beaches surrounded by purplish blue waters are home to a rich flora and fauna. The Andaman Islands are a group of 572 islands and islets situated on the territory of India in the Bay of Bengal. Until the start of the twentieth century, the lovely Andaman Islands were covered in haziness. Prior to India's autonomy, they were known as kalapani, a colonial jail to which the general population of continental India had been removed. It was just during the 1950s that saw a few tourists from India or abroad. Over the years tourists who began arriving have expanded step by step, attracted by the pleasant excellence of the islands.

The economic development of any country depends on an expansive degree on the growth and development of exchange, trade and industry. The island of Andaman is wealthy in resources for tourism, which are in bounty. The common magnificence of the Andaman Islands is extremely alluring. Both domestic and foreign tourists think of it as the green heaven under the perceived Marigold sun. Tourism in the Andaman Islands is still in its infancy. The resources in charge of the growth of tourism have not yet been completely used to the level of
exploration. Be that as it may, right now, tourism is developing crisscross, both positive and negative, and expanding and diminishing. The tourism industry in these islands can be created in an extremely vast manner. In this way, the growth of the tourism area in these islands, both as far as the quantity of domestic tourists, foreign tourists and the all-out income got from this administration, has been discovered, investigated, deciphered and introduced. The issues of tourism on these islands are additionally recommended and proper measures are taken.

Tourism is the main region of these islands, as different divisions don't enlist much growth and development because of various reasons. In any case, tourism has encountered extensive growth, although it requires productive administration with arranging, association, work force, control, correspondence, spending plan, coordination and with the fitting tourism arrangement. Tourism has incredible inclusion in these islands if legitimately overseen. When the deterrents headed for tourism development in the Andaman Islands have been evacuated, and if a technique, tourism arranging and tourism approach are figured in the light of the recommendations below and executed with incredible consideration, it is immovably trusted that tourism Andaman Islands will be improved, tourism incomes will increment, managerial and regulatory costs will be diminished and surplus will be noticeable. Tourism will draw in more tourists to these islands and could likewise contribute more to the economic development of the Andaman Islands.

7.3 Growth of Tourism

Tourism in the Andaman Islands is still in its infancy. The resources in charge of the growth of tourism have not yet been utilized to its limits by the tourism industry players. Be that as it may, right now, tourism is developing crisscross, both positive and negative, and expanding and diminishing. On analyzing the income collected by the tourism industry players, retrieved from the questionnaire and the interviews done with the organization heads and the visiting tourist proves that tourism is on a roll of development. Further the available data on the inflow of tourist reported by the Andaman and Nicobar administration shows that the incoming of tourist to these groups of islands is steadily growing for the last years. Figure 2 shows the inflow of tourist to Andaman Islands, it is interesting to find that the incoming of tourist is showing positive rise and the number of tourist visiting the islands is meant to increase in the coming years. It must be noted that the maximum number of tourist visiting these islands are more of domestic than foreign tourist. However it is expected that the incoming of foreign visitors will increase with the development of Veer Savarkar International Airport that is expected to be completed by 2020 and can carry each of six hundred foreign and domestic tourists.
Domestic Tourist
The Andaman Islands are considered to be a small or mini India due to the incredible racial and social mix, all individuals being equal in terms of religions with utmost respect for each other living in this region. The mix culture found on these islands acts as a source of attraction to the entire Indian citizens across the mother country. The visitation of tourist from various parts of the country results in the formation of domestic tourism and these tourists are considered to be domestic tourists. Domestic tourism helps in building the likelihood of harmony through comprehension between various parts of the population. There is no denying the fact that the development of foreign tourism is conceivable only if national tourism has a fast and strong growth in the Island tourism. At present Andaman receives comfortable number of domestic tourist yet increase in the same would result in development of tourism more firmly.

Foreign Tourist
The incoming of persons from their home country to another country for the purpose of leisure, recreation, adventure etc results in the development of the term foreign tourist. A foreign tourist plays a crucial role in the development of the local economy of the destination visited by them which further helps in developing the country’s economy. Foreign tourism brings foreign currency to the destination in advancement to the international exchange which helps in developing the financial conditions of the location. When it comes to Andaman Islands it is seen that less number of foreign tourist visit the destination, however the right focus given in marketing the destination will help in establishing the islands as grand product in the global market.

7.4 Economical Impact of Tourism in Andaman Islands
Tourism conveys money to the destinations economy that further helps in improving the infrastructure of the location and develops enough business opportunities at ground level. The positive economical effect on the destination helps in building the entire nation itself. However the positives effects are always followed by negative aspects that could adversely influence the economy of the destination by adding hike in the price of basic goods, creating
an impermanent deficiency of land, employment and the very Mother Nature. So it is necessary to embrace a logical and a practical way to deal with breakdown by the negative effects of tourism. As discussed in the previous chapter, a sustainable tourism approach must be used to undertake the amazing phenomenon of tourism in Andaman Islands. The unavailability of proper data in respect to analyze the economical effect of tourism in Andaman Islands resulted in undertaking a field survey that accessed and analyzed the money spent by the tourist on their visit to the islands.

Figure 3: Money spent by tourist in Accommodation, Transportation, Attractions, Food and Beverages on their visit to Andaman Islands

Figure 3 showcase the money spent by the tourists with respect to accommodation, transportation, attraction and food and beverages on their visit to the islands. While analyzing the data's it was found that they all were positively correlated to each other. In other words the above mentioned sectors forms basic element of tourism existence showed that increase in one sector gradually increased the other sector as well. To be precise increase in the number of money spent in accommodation resulted in increase in the number of money spent in transportation, attraction and food and beverages. The result obtained showcase that tourism definitely has an impact on the local economy which further helps in stating the fact that the increase in the local economy gradually contributes to the national economy. Thereby making a strong statement that tourism development in Andaman Islands definitely has a positive impact on the Indian economy.

8. CONCLUSION
The research helped in analyzing the basic constituents of the tourism sector which is accommodation, transportation and attractions (natural and manmade). While analyzing the aforesaid sectors, it was found that all these sectors are closely related to each other, which means they form the basic requirement for the existence of tourism in any area. In order to analyze the economical impact of tourism in Andaman Islands, a survey on the money spent by the tourists in accommodation, transportation, attraction and food and beverages was undertaken due to the lack of any solidiﬁy data available in this regard. The results show that tourist on their visit to the islands deﬁnitely spend money and all these expense borne by them helps in the economical development of the local residents which further helps in the
development of the tourism sector across the islands. This makes it clear that tourism definitely has a positive impact on the local economy which further has a major impact on the national economy.

REFERENCES


CHEMICALLY REACTIVE MHD FREE CONVECTIVE FLOW THROUGH A HORIZONTAL CHANNEL IN THE PRESENCE OF RADIATION AND HEAT SOURCE

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Abstract-
Fluid mechanics is studied as a branch of science and engineering; that it contains liquids (fluid, gas and plasma) and many forces acting on this. This branch of fluid mechanics can be divided into two sub-branches respectively fluid kinematics and fluid dynamics. First is a liquid kinematics study when the fluid is in its rest position. While the other branch is fluid dynamics only referred to when the fluid is in some motion. In the last Thesis Dickens; fluid dynamics their maternal branch became an active field of fluid mechanics research. In liquid mobility; basically we study the effects of various forces acting on the fluid and it is necessary that it remains in motion it has produced many other areas of research magneto hydrodynamics, oceanology, aerodynamics, metrology, gas purification etc. There is a large number of applications in crude oil extraction, whether many industries, biological sciences, drugs and petrochemical industry etc.

Keywords- mathematical formulation skin-friction coefficient, nusselt number, Sherwood number

Introduction-
The problem of hydro magnetic flow has been achieved in a horizontal channel due to its many applications in nature, significant attention of many researchers, science and engineering. Which are important with theoretical as well as practical oil industry, pipe flow system, due to their wide utilization in the ground approach water drift etc.

Literature Review-
That Attia et al. (1996) is considered a heat transfer in sticky light incompatible fluid flows with two parallel plates with magnetic effect, when lower plate was kept constant and the upper plate was moving with uniform speed.


Umawathi et al. (2005) considered two-dimensional fluctuating flow of two immersive fluid with horizontal parallel permeable plates, and their converge flow and heat transfer aspects in a horizontal channel with permeable walls can be controlled by
considering various liquids with different viscosity, by varying the conductivity and also the dimension of the transpiration velocity limit.

Seth et al. (2009) studied couple flux in a rotating system magnetic field is applied to an angle with some inclination. This study was carried forward Seth et al (2012) has the presence of the Hall's current influences.

Matin et al. (2013) analyze the effect of heat and mass flow through the porous channel with the first order the chemical reaction on the wall. He studied fully developed compulsions convection flow and mass transfer in horizontal porous channels full of nano fluid.

Couette flux between two infinite parallel plate with magnetic field Kiema et al. (2015) the study of uniform intensity was studied. Mbugua et al. (2015) is considered MHD fluid flow between parallel porous plate between variable intensity of magnetic field.

Priya et al. (2015) examined steady hydro-magnetic rotating flow a sticky incompatible fluid through a porous medium in a horizontal channel with the current effect of radiation heat transfer and hall.

In a horizontal channel with a rapid gradient with pressure gradient the magnetic field lying in the presence of dust-rich visco-elastic fluid is done by the kuiry Et al. (2016).

Recently, Sayehvand et al. (2017) called the thermophoresis and Brownian motion effect in partially a horizontal channel filled with porous medium.

**Mathematical Formulation**

We consider the steady free convection flow of chemically reactive stickiness incomparable electrical conductive fluid through a horizontal parallel plate the channel filled with porous media in the presence of transverse magnetic field, radiation heat source. x*-t-axis is taken in the Cartesian coordinate system horizontally in the direction of flux with the plates. z*-axis is taken vertically x*-t-axis The magnetic field of force is applied to the normal position of direction H₀ flow and channel length The whole system revolves with identical angular about velocity Ω about z*-axis as shown in Fig.(01).
Two horizontal parallel plates are set in the plane \( z^* = 0 \) (lower plate) and \( z^* = h \) (upper plate) and kept at constant temperature \( T_0, T_1 \) and constant concentration \( C_0, C_1 \) respectively. Plates of channel are assumed of infinite length along \( x^* \) and \( y^* \)-axis. Therefore all physical quantities are considered constant in these directions and varying with respect to \( z^* \)-axis only except the pressure gradient. Hence the continuity equation becomes trivially satisfied.

Using Boussinesq approximation, equation of momentum in \( x^* \) and \( y^* \)-direction, energy equation and mass equation are:

\[
-2\Omega v^* = - \frac{1}{\rho} \frac{\partial p^*}{\partial x^*} + v \frac{\partial^2 u^*}{\partial z^*^2} + \frac{\mu_e J H_0}{\rho} - \frac{v}{K_p} u^* + g \beta (T^* - T_0) + g \beta^* (C^* - C_0) \nonumber \\
\tag{1.1}
\]

\[
2\Omega u^* = - \frac{1}{\rho} \frac{\partial p^*}{\partial y^*} + v \frac{\partial^2 v^*}{\partial z^*^2} - \frac{\mu_e J H_0}{\rho} - \frac{v}{K_p} u^* \nonumber \\
\tag{1.2}
\]

\[
\frac{k}{\rho C_p} \frac{\partial^2 T^*}{\partial z^*^2} - \frac{1}{\rho C_p} \frac{\partial q^*}{\partial z^*} + S^* (T^* - T_0) = 0 \nonumber \\
\tag{1.3}
\]

\[
D \frac{\partial^2 C^*}{\partial z^*^2} = K (C^* - C_0) \nonumber \\
= 0 \nonumber \\
\tag{1.4}
\]

Where \( H_0 \) is the intensity of applied magnetic field, \( \Omega \) angular velocity, \( p^* \) pressure of the fluid, \( \mu_e \) magnetic permeability, \( T^* \) temperature of the fluid, \( C^* \) species concentration of the fluid, \( \beta \) volumetric coefficient of expansion for heat transfer, \( g \) acceleration due to
gravity, \( \theta \) kinematic viscosity of the fluid, \( \beta^* \) volumetric coefficient of expansion for species concentration, \( \rho \) density of the fluid, \( K_p^* \) permeability of the medium, \( C_p \) specific heat at constant pressure, \( k \) thermal conductivity, \( S^* \) dimensional heat source parameter, \( q_r^* \) component of radioactive of heat flux, \( D \) mass diffusivity, \( K_l \) chemical reaction parameter and \( J_x, J_y \) are current density in \( x^* \) and \( y^* \) direction respectively. When the strength of magnetic field is very high, then generalized ohm’s law become change for including the hall current and given by

\[
J + \frac{\omega_e \tau_e}{H_0} (J \times H) \\
= \sigma_e \left[ E + V \times H \\
+ \frac{1}{\eta_e} \nabla p_e \right] \quad \cdots \cdots \cdots \cdots \cdots \cdots \cdots (1.5)
\]

Where \( \omega_e \) is the cyclotron frequency of the electrons, \( \tau_e \) the electron collision time, \( e \) the electron charge, \( E \) the electric field, \( \eta_e \) is the number density of the electrons \( Pe \) is the electron pressure, \( H \) total magnetic field and \( \sigma_e \) is the electrical conductivity. Under the usual assumption in equation (1.5) the electron pressure gradient, ion-slip and thermo electric effects are neglected. So we also assume that the electric field \( E=0 \). Under these assumptions (1.5) reduces into

\[
J_x + mJ_y = \sigma \mu_e H_0 v^* \quad \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots (1.6)
\]

\[
J_y - mJ_x = -\sigma \mu_e H_0 u^* \quad \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots (1.7)
\]

Where \( m = \omega_e \tau_e \) is the hall parameter-

On solving equation (1.6) and (1.7) we get,

\[
J_x = \frac{\sigma \mu_e H_0}{1 + m^2} (v^* + mu^*) \quad \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots (1.8)
\]

\[
J_y = \frac{\sigma \mu_e H_0}{1 + m^2} (mv^* - u^*) \quad \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots (1.9)
\]

Using the equations (1.8) and (1.9), we get the equation of motion with reference to rotating frame

\[
-2\Omega v^* = -\frac{1}{\rho} \frac{\partial p^*}{\partial x^*} + v \frac{\partial^2 u^*}{\partial x^*^2} + \frac{\sigma \mu_e H_0^2}{\rho(1+m^2)} (v^* + mu^* - \frac{v}{K_p^*} u^* + g\beta (T^* - T_0) + g\beta^* (C^* - C_0) \cdots \cdots (1.10)
\]
\[ 2Ωu^* = - \frac{1}{\rho} \frac{\partial p^*}{\partial y^*} + v \frac{\partial^2 u^*}{\partial z^*^2} - \frac{\sigma \mu^2 H_0^2}{\rho (1 + m^2)} (m v^* + u^*) - \frac{v}{k'_p} v^* \] 

The boundary conditions for fluid velocity, temperature and concentration distribution are given by
\[ u^* = 0, \quad v^* = 0, \quad T^* = T_0, \quad C^* = C_0 \quad \text{at} \quad Z^* = 0 \]
\[ u^* = 0, \quad v^* = 0, \quad T^* = T_1, \quad C^* = C_1 \quad \text{at} \quad Z^* = h \] 

**Method of Solution**

For solving the equation (1.10) and (1.11), we assume that
\[ F^* = u^* + iv^*, \quad \xi^* = x^* - iy^* \]

After combined (1.10) and (1.11), we get
\[ 2ΩF^* = - \frac{1}{\rho} \frac{\partial p^*}{\partial \xi^*} + v \frac{\partial^2 F^*}{\partial z^*^2} - \frac{\sigma \mu^2 H_0^2}{\rho (1 + m^2)} F^* (1 - im) - \frac{v}{k'_p} F^* + g\beta (T^* - T_0) + g\beta^* (C^* - C_0) \] 

Corresponding boundary conditions are:
\[ F^* = 0, \quad T^* = T_0, \quad C^* = C_0 \quad \text{at} \quad Z^* = 0 \]
\[ F^* = 0, \quad T^* = T_1, \quad C^* = C_1 \quad \text{at} \quad Z^* = h \] 

It is assumed that the medium is optically thin with relatively low density. Following Cogley(1968) equilibrium model, the radiative heat flux term is given by
\[ \frac{\partial^2 T^*}{\partial x^*^2} = 4(T^* - T_0) I^*; \quad I^* = \int_0^\infty K_{\lambda \omega} \left( \frac{\partial e_{\lambda \omega}}{\partial T^*} \right) d\lambda \] 

Where \( K_{\lambda \omega} \) the absorption coefficient at the wall and \( e_{\lambda \omega} \) is the plank constant. Here we assume that the temperature differences within the flow are sufficiently small.

Now introducing the non-dimensional quantities
\[ z = \frac{z^*}{h}, \quad u = \frac{u^*}{u_0}, \quad v = \frac{v^*}{u_0}, \quad F = \frac{F^*}{u_0}, \quad \xi^* = \frac{\xi}{h}, \quad p^* = \frac{p h}{\rho v}, \quad \theta = \frac{T^* - T_0}{T^* - T_1}, \quad C = \frac{C^* - C_0}{C - C_1}, \quad N = \frac{4 k h^2}{\rho C_p} I^*, \quad \gamma = \frac{k h^2}{D}, \quad G_c = \frac{g \beta^*(C - C_1) h^2}{v}, \quad R_0 = \]
\[ \frac{\Omega h^2}{v}, \quad M = \frac{\sigma \mu H h^2}{\rho v}, \quad G_r = \frac{\beta (T - T_1) h^2}{\nu}, \quad S = \frac{S h^2}{\mu C_p}, \quad K_p = \frac{h^2}{K_p}, \quad Pr = \frac{\mu C_p}{k} \]  \tag{2.5}

where \( u \) is non-dimensional velocity component along x-axis, \( T_w \) fluid temperature at the wall, \( C_w \) concentration of fluid species, \( \theta \) non-dimensional temperature, \( C \) non-dimensional concentration, \( U_0 \) mean velocity, \( Pr \) Prandtl number, \( G_r \) Grashof number for mass transfer, \( G_r \) Grashof number for heat transfer, \( R_0 \) rotational parameter, \( N \) non-dimensional radiation parameter, \( \gamma \) non-dimensional chemical reaction parameter, \( M \) Hartman number, \( K_p \) non-dimensional porosity parameter, \( S \) non-dimensional heat source parameter, \( P \) non-dimensional pressure gradient and \( S_c \) is Schmidt number.

By substituting (2.5) into (2.2), (1.3) and (1.4) we get following equations:

\[ \frac{\partial^2 F}{\partial z^2} - \left[ \frac{M}{(1 + m^2)} (1 - im) + K_p + 2iR_0 \right] F = -P - G_r \theta - G_c \rho, \]  \tag{2.6}

\[ \frac{1}{Pr} \frac{\partial^2 \theta}{\partial z^2} - N \theta + S \theta = 0, \]  \tag{2.7}

\[ \frac{\partial^2 C}{\partial z^2} - \gamma C = 0, \]  \tag{2.8}

The corresponding boundary conditions reduced as:

\[ F = 0, \quad \theta = 0, \quad C = 0 \text{ at } z = 0, \]

\[ F = 0, \quad \theta = 1, \quad C = 1 \text{ at } z = 1, \]  \tag{2.9}

Equations (2.6) to (2.8) are linear partial differential equations; these can be solved by straight forward calculation with the boundary conditions. Their solutions are stated as follows:

\[ u = A_{31} e^{A_{72} z} \cos(A_{38} z) - A_{32} e^{A_{72} z} \cos(A_{38} z) + A_{12} e^{-A_{72} z} \cos(z A_{38} z) + A_{13} e^{-A_{72} z} \cos(A_{38} z) + A_9 - A_{12} e^{\sqrt{(S+N)Pr z}} - A_{14} e^{-\sqrt{(S+N)Pr z}} - A_{17} e^{\sqrt{Pr z}} \]  \tag{2.10}

\[ u = A_{31} e^{A_{72} z} \sin(A_{38} z) - A_{32} e^{A_{72} z} \sin(A_{38} z) + A_{12} e^{-A_{72} z} \sin(z A_{38} z) + A_{13} e^{-A_{72} z} \sin(A_{38} z) + A_9 - A_{12} e^{\sqrt{(S+N)Pr z}} - A_{14} e^{-\sqrt{(S+N)Pr z}} - A_{17} e^{\sqrt{Pr z}} \]  \tag{2.11}

\[ \theta = A_6 e^{\sqrt{(S+N)Pr z}} + A_5 e^{-\sqrt{(S+N)Pr z}} \]  \tag{2.12}
\[ C = A_3 e^{\sqrt{\frac{r}{z}}} + A_2 e^{-\sqrt{\frac{r}{z}}} \]  \hfill (2.13)

Where \( A_1 \) to \( A_3 \) are the constant and their values are given in the Appendix-1(A).

**Skin-friction Coefficient** -

The skin-friction coefficient at the upper plate \((z^* = h)\) of the channel is given by

\[
C_f(u) = \frac{\tau_w}{\rho v_0^2} \left. \frac{\partial F}{\partial z^*} \right|_{z^*=h} = \frac{1}{Re} \left( \frac{\partial F}{\partial z} \right)_{z=1} \hfill (3.1)
\]

\[
= i(C_{f_y})_{z=1} \hfill (3.2)
\]

Where

\[
\left( C_{f_x} \right)_{z=1} = \frac{1}{Re} \left( \frac{\partial u}{\partial z} \right)_{z=1} \hfill (3.3)
\]

\[
\left( C_{f_y} \right)_{z=1} = \frac{1}{Re} \left( \frac{\partial v}{\partial z} \right)_{z=1} \hfill (3.4)
\]

The skin-friction coefficient at the lower plate \((z^* = 0)\) of the channel is given by

\[
C_f(l) = \frac{\tau_w}{\rho v_0^2} \left. \frac{\partial F}{\partial z^*} \right|_{z^*=0} = \frac{1}{Re} \left( \frac{\partial F}{\partial z} \right)_{z=0} \hfill (3.5)
\]

\[
= i(C_{f_y})_{z=0} \hfill (3.6)
\]

Where

\[
\left( C_{f_x} \right)_{z=0} = \frac{1}{Re} \left( \frac{\partial u}{\partial z} \right)_{z=0} \hfill (3.7)
\]

\[
\left( C_{f_y} \right)_{z=0} = \frac{1}{Re} \left( \frac{\partial v}{\partial z} \right)_{z=0} \hfill (3.8)
\]

\[
\left( \frac{\partial u}{\partial z} \right)_{z=1} = A_{33} \hfill (3.9)
\]
\[
\begin{align*}
\frac{\partial u}{\partial z} & \bigg|_{z=0} = A_{34} \quad \text{...(3.10)} \\
\frac{\partial v}{\partial z} & \bigg|_{z=1} = A_{35} \quad \text{...(3.11)} \\
\frac{\partial v}{\partial z} & \bigg|_{z=0} = A_{36} \quad \text{...(3.12)}
\end{align*}
\]

Where \( A_{33}, A_{34}, A_{35} \) and \( A_{36} \) are the constants and given in the Appendix-1(A).

### Table 1.1

The numerical values of coefficient of skin-friction at both the plates of the channel for different values of physical parameters when \( Re=1 \).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>S</th>
<th>N</th>
<th>y</th>
<th>Re</th>
<th>Gr</th>
<th>Ge</th>
<th>M</th>
<th>( K_p )</th>
<th>m</th>
<th>Pr</th>
<th>( \left( e_f \right)_{x=0} )</th>
<th>( \left( e_f \right)_{x=1} )</th>
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<td>1</td>
<td>1</td>
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<td>1.5</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
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<td>0.57</td>
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<tr>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
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<td>0.67</td>
</tr>
<tr>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
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<td>1</td>
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<td>0.06</td>
</tr>
<tr>
<td>IV</td>
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<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.5</td>
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<td>1</td>
<td>1</td>
<td>0.33</td>
<td>0.36</td>
</tr>
<tr>
<td>V</td>
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<td>1</td>
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<td>2</td>
<td>1</td>
<td>3</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>1.5</td>
<td>0.5</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>5</td>
<td>1.5</td>
<td>0.5</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1.5</td>
<td>0.5</td>
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<td>1</td>
<td>1</td>
<td>3</td>
<td>1.5</td>
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<td>3</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1.5</td>
<td>0.5</td>
<td>2</td>
<td>1</td>
<td>0.55</td>
<td>0.14</td>
</tr>
<tr>
<td>XII</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1.5</td>
<td>0.5</td>
<td>1</td>
<td>7</td>
<td>0.25</td>
<td>-0.09</td>
</tr>
</tbody>
</table>

### Nusselt Number-

The rate of heat transfer in term of Nusselt number at the upper plate (\( z^*=h \)) of the channel is given by-

\[
Nu(u) = -\frac{qL}{K(T_1^*-T_0)} \bigg|_{z^*=h} = -\frac{L}{K(T_1^*-T_0)} K \left( \frac{\partial T^*}{\partial z^*} \right) \bigg|_{z^*=h} = \quad \text{...(4.1)}
\]

The rate of heat transfer in term of Nusselt number at the lower plate (\( z^*=0 \)) of the channel is given by

\[
Nu(l) = -\frac{qL}{K(T_1^*-T_0)} \bigg|_{z^*=0} = -\frac{L}{K(T_1^*-T_0)} K \left( \frac{\partial T^*}{\partial z^*} \right) \bigg|_{z^*=0} = \quad \text{...(4.2)}
\]

Where \( q \) is the quantity of heat exchanged between the plate and fluid per unit time, \( L \) is the characteristic length and-

\[
\left( \frac{\partial T}{\partial z} \right)_{z=1} = A_0 \sqrt{(S+N)Pr} e^{\sqrt{(S+N)Pr}} - A_5 \sqrt{(S+N)Pr} e^{-\sqrt{(S+N)Pr}} \quad \text{...(4.3)}
\]
\( \frac{\partial \theta}{\partial z} \bigg|_{z=0} = A_3 \sqrt{(S + N)Pr} - \)
\( A_5 \sqrt{(S + N)Pr} \) ......................................................... \( (4.4) \)

Where \( A_2 \) to \( A_6 \) are the constants and given in the Appendix-1(A).

**Table-1.2** the numerical values of Nusselt number at both the plates of the channel for different values of physical parameters

<table>
<thead>
<tr>
<th>S. No.</th>
<th>S</th>
<th>N</th>
<th>Pr</th>
<th>Nu(l)</th>
<th>Nu(u)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
<td>0.78</td>
<td>1.45</td>
</tr>
<tr>
<td>II</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.73</td>
<td>1.59</td>
</tr>
<tr>
<td>III</td>
<td>1.5</td>
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<td>1</td>
<td>0.67</td>
<td>1.72</td>
</tr>
<tr>
<td>IV</td>
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<td>3</td>
<td>1</td>
<td>0.59</td>
<td>1.96</td>
</tr>
<tr>
<td>V</td>
<td>0.5</td>
<td>5</td>
<td>1</td>
<td>0.45</td>
<td>2.38</td>
</tr>
<tr>
<td>VI</td>
<td>0.5</td>
<td>1</td>
<td>7</td>
<td>0.25</td>
<td>3.25</td>
</tr>
</tbody>
</table>

**Sherwood Number**

The rate of mass transfer in term of Sherwood number at the upper plate ( \( z^* = h \) ) of the channel is given by

\[
Sh(u) = \left[ \frac{M_w L}{D_w (C_1^* - C_0)} \right]_{z^* = 0} = -\frac{1}{D_w (C_1^* - C_0)} D_m \left( \frac{\partial C_1^*}{\partial z^*} \right)_{z^* = h} = -\left( \frac{\partial C}{\partial z} \right)_{z = 1} \] ......................................................... \( (5.1) \)

The rate of mass transfer in term of Sherwood number at the lower plate ( \( z^* = 0 \) ) of the channel is given by

\[
Sh(l) = \left[ \frac{M_w L}{D_w (C_1^* - C_0)} \right]_{z^* = 0} = -\frac{1}{D_w (C_1^* - C_0)} D_m \left( \frac{\partial C_1^*}{\partial z^*} \right)_{z^* = 0} = -\left( \frac{\partial C}{\partial z} \right)_{z = 0} \] ......................................................... \( (5.2) \)

Where \( D_m \) is the mass diffusivity, \( M_w \) is the quantity of mass transferred between the plate and fluid per unit time, \( L \) is the characteristic length and

\[ \left( \frac{\partial C}{\partial z} \right)_{z = 1} = A_3 \sqrt{\gamma e^{-\sqrt{\gamma}}} - \]
\[ A_2 \sqrt{\gamma e^{-\sqrt{\gamma}}} \] ......................................................... \( (5.3) \)

\[ \left( \frac{\partial C}{\partial z} \right)_{z = 0} = A_2 \sqrt{\gamma} - \]
\[ A_2 \sqrt{\gamma} \] ......................................................... \( (5.4) \)

Where \( A_2 \) and \( A_3 \) are the constants and given in the Appendix-3(A).
Table 1.3 The numerical values of Sherwood number at both the plates of the channel for different values of physical parameter.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>γ</th>
<th>Sh(l)</th>
<th>Sh(u)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>0.85</td>
<td>1.31</td>
</tr>
<tr>
<td>II</td>
<td>3</td>
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<td>1.84</td>
</tr>
<tr>
<td>III</td>
<td>5</td>
<td>0.48</td>
<td>2.28</td>
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</table>

Results and Discussion

The problem of free convection chemical reactive fluid flow through horizontal parallel plates channel enriched through saturated porous. The presence of heat source and presence of hall has been considered and analytical solution for velocity, the temperature and concentration area are obtained. Effect of various important parameters is presented by graphing. Coefficient of skin-friction, the lower and upper plate of the channel has the Nusselt number and Sherwood numbers.

It is celebrated by the table- (1.1) that the x-factor of the coefficient of the skin-friction on lower plate \( C_{f_x} \) \( z=0 \) increases with an increase of pressure gradient, thermal and mass boom; while its source decreases with a small increase of heat source parameters, radiation parameters, chemical reaction parameters, rotational parameters, Hartman number, permeability parameter, hall current parameter and trendal number. The y-component coefficient of coefficient of skin friction on lower plate \( C_{f_y} \) \( z=0 \) Grows with increase pressure gradient, thermal boom, mass boom and heat source parameter; While radiation parameters, it decreases with the increase in the chemical reaction parameter, rotational parameter, heartman number, permeability parameter, hall current parameters and Prandtl numbers.

The x-component \( C_{f_x} \) \( z=1 \) of coefficient of skin-friction on top plate the heat source parameter increases with the increase of pressure gradient, mass boom and the prandal number, while the radiation parameter decreases with chemical reaction. Parameters, rotation parameters, thermal boom, heartman number, permeability parameters and Hall current parameters. The y-component of coefficient of skin-friction upper plate in upper \( C_{f_y} \) \( z=1 \) increases pressure gradient, increases with the increase of mass boom and thermal boom; while adverse behavior is observed for the heat source parameter, radiation parameters, chemical reaction parameters, rotation parameters, heartman Number, permeability parameter, hall current parameter and prandtl number.

It is illustrated with the table- (1.2) that the Nusselt number in the lower plate, the heat source decreases with the increase of parameters, radiation parameters and Prandtl Number whereas adverse behavior is seen for the upper plate.
This table- (1.3) shows that the Sherwood number is on the lower plate when the adverse reaction occurs, the chemical reaction decreases with coefficient of growth in the case of upper plate is observed.

Conclusions-

1) The speed of the rotation parameter decreases the speed of the fluid. Therefore growing coriolis force forces forward flow due to pressure shield.

2) Due to the current parameters of the hall; Primary and secondary flow is reaching to you high value.

3) The temperature of the fluid can also be controlled by giving higher heat values source parameters and radiation parameters.

4) Since the destructive chemical solvent limit removes the thickness of the layer; such mass transfer becomes more of the increasing value of the chemical reaction parameter.

Such a fluid flow model contains important applications in magnetohydroidanic (MHD) power generator and pump, aerodynamic heat, accelerator, electrostatic polymer technology, petroleum industry, purification and precipitation of crude oil design of cooling system with fluid droplets, spray, liquid metal, and centrifugal separation of substance from fluid and flow meter.

MHD flow of non-neutonic fluids is very important through porous medium especially in the fields of agricultural engineering for irrigation processes; To study petroleum transportation in petroleum technology; For chemical engineering filtration and purification process. Therefore it is proposed that this research work for many non-Newtonian can be extended in the same direction by future researcher’s liquid substance.

Reference-


**Appendix 1(A)**

\[ A_1 = \left( e^{-\sqrt{T}} - e^{\sqrt{T}} \right), \quad A_2 = \frac{1}{A_1}, \quad A_3 = \frac{1 - A_2 e^{-\sqrt{T}}}{e^{\sqrt{T}}} \]

\[ A_4 = \left( e^{-\sqrt{(S+N)Pr}} - e^{\sqrt{(S+N)Pr}} \right), \quad A_5 = \frac{1}{A_4}, \quad A_6 = \frac{1 - A_4 e^{-\sqrt{(S+N)Pr}}}{e^{\sqrt{(S+N)Pr}}} \]

\[ A_7 = \cos \frac{\theta_1}{2}, \quad A_8 = \sin \frac{\theta_1}{2}, \quad A_9 = \frac{P(M+Kp)}{(M+Kp)^2 + 4R_0^2} \]

\[ A_{10} = \frac{2PR_0}{(M+Kp)^2 + 4R_0^2}, \quad A_{11} = S + N - K_p - M, \quad A_{12} = \frac{Gr A_{11} A_{11}^2}{A_{11}^2 + 4R_0^2}, \]
\[
A_{13} = \frac{2R_0 G A_6}{A_{11}^2 + 4R_0^2} \\
A_{16} = D^2 - M - K_p \\
A_{19} = \frac{2G_C A_{16}}{A_{16}^2 + 4R_0^2} \\
A_{21} = A_9 - A_{12} - A_{14} - A_{17} - A_{19}, \quad A_{22} = A_{10} - A_{13} - A_{15} - A_{18} - A_{20}, \\
A_{23} = A_9 - A_{12} e^{\sqrt{(S+N)\Pr}} - A_{14} e^{-\sqrt{(S+N)\Pr}} - A_{17} e^\sqrt{\gamma} - A_{19} e^{-\sqrt{\gamma}}, \\
A_{24} = A_{10} - A_{13} e^{\sqrt{(S+N)\Pr}} - A_{15} e^{-\sqrt{(S+N)\Pr}} - A_{18} e^\sqrt{\gamma} - A_{20} e^{-\sqrt{\gamma}}, \\
A_{25} = e^{-\sqrt{\gamma}} \cos A_4 - e^{\sqrt{\gamma}} \cos A_5, \\
A_{26} = e^{\sqrt{\gamma}} \sin A_4 - e^{-\sqrt{\gamma}} \sin A_5, \\
A_{27} = A_{23} - A_{21} e^{\sqrt{(S+N)\Pr}} - A_{22} e^{-\sqrt{(S+N)\Pr}}, \\
A_{28} = A_{22} e^{\sqrt{\gamma}} \cos A_4 - A_{21} e^{\sqrt{\gamma}} \sin A_4 - A_{24}, \\
A_{29} = \frac{A_{28} A_{25} - A_{27} A_{24}}{A_{25}^2 + A_{24}^2}, \\
A_{30} = \frac{A_{28} A_{25} + A_{27} A_{24}}{A_{25}^2 + A_{24}^2}, \\
A_{31} = -A_{21} - A_{29}, \\
A_{32} = A_{22} + A_{30}, \\
A_{33} = A_{21}^2 \left( A_4 e^{\sqrt{\gamma}} \cos A_4 - A_5 e^{\sqrt{\gamma}} \sin A_4 \right) - A_{22}^2 \left( A_4 e^{\sqrt{\gamma}} \cos A_4 - A_5 e^{\sqrt{\gamma}} \sin A_4 \right) + A_{24} \left( -A_4 e^{-\sqrt{\gamma}} \cos A_4 - A_5 e^{-\sqrt{\gamma}} \sin A_4 \right), \\
A_{34} = A_{35} \left( -A_4 e^{\sqrt{\gamma}} \cos A_4 - A_5 e^{\sqrt{\gamma}} \sin A_4 \right) - A_{32} \left( A_4 e^{\sqrt{\gamma}} \cos A_4 - A_5 e^{\sqrt{\gamma}} \sin A_4 \right), \\
A_{35} = A_{31}^2 \left( A_4 e^{\sqrt{\gamma}} \sin A_4 - A_5 e^{\sqrt{\gamma}} \cos A_4 \right) - A_{32}^2 \left( A_4 e^{\sqrt{\gamma}} \sin A_4 - A_5 e^{\sqrt{\gamma}} \cos A_4 \right), \\
A_{36} = A_{34}^2 \left( -A_4 e^{-\sqrt{\gamma}} \cos A_4 - A_5 e^{-\sqrt{\gamma}} \sin A_4 \right) + A_{35}^2 \left( -A_4 e^{-\sqrt{\gamma}} \cos A_4 - A_5 e^{-\sqrt{\gamma}} \sin A_4 \right). \\
\]
A REVIEW AND STUDY OF MECHANICAL PROPERTIES OF TYRE COMPOSITE

Mr. Manoj Kumar Tamar
Research Scholar at Institute of Technology & Management, Aligarh

Abstract-
Solid waste management is one of the major environmental issues in the world. Waste tires are becoming a major environmental problem. Every year a large amount of waste tires is produced. These tires are thermoset and are almost resistant to biological degradation. World annually, nearly 13.5 million tons of waste tires emerge. Analysis shows that there is almost 1 million tonnes of tire scraps in India. These reserves are dangerous due to environmental hazards, fire hazards and provide breeding grounds for mosquitoes. In ways such as landfill, pyrolysis and incrementation, the deficiencies in the disposal of waste tires encouraged research on waste tires and recycling techniques. Thus, recycling waste tires is a major challenge for both environmental and economic reasons. Several approaches have been proposed to deal with the problem of used tires, such as converting it into a solid fuel burner into tire-derived fuel, using pyrolysis to recover valuable chemical components, non-tire applications including and using them for various rubbing. Filler in plastic / hardening To obtain impact-resistant plastic and thermoplastic alkometers, rubber wastes can be used extensively by adding waste rubber to the plastic. Typically, there are ground for small particles which go into useless tire ground tire rubber (GTR), which are still thermoset. Recycled rubber chips have been used in asphalt concrete. The use of recycled tire rubber in portland cement concrete is an attractiv choice. A technical and economically attractive alternative is the use of recycled tire rubber in the production of tire rubber particulate composites.

Keywords- Composites, Waste Tyre Rubber, Recycled Tyre Rubber & Method

Introduction-
One of the various problems faced by mankind in the 21st century is the crisis of waste disposal management. Environmental pollution is an undesirable change in the physical, chemical and biological characteristics of our air, water and land. As a result of more population, rapid industrialization and the increasing use of transport vehicles, the earth is filled with various pollutants which are released as sub-products. In addition, the used tires have become one of the major waste in the world. Large number of transport vehicles are being used in large numbers throughout the world. Now one day, plastic and rubbers are used extensively in different areas. As polymer materials are not easily decomposed, disposal of their wastage causes a serious environmental problem.
It is estimated that in a year, 2.7 billion waste tire rubber is produced globally; 875 million waste is produced by the United States, 600 million waste tires are produced by European countries, 370 million are produced by Australia and 270 million garbage tires are produced by China and India, respectively. Fig. 1.1 indicates that according to the EU strategy, 11% postconsumer tires are exported, 21% recycled, 22% energy recovery, 12% retreading and 34% illegal tire dump (loan 2013) landfill, stockpiled or are dumped. The waste tires and other rubber products made from various elastomers are one of the biggest sources of pollution and are said to take immediate remedial action.

Composites

The composite material is engineering material made up of two or more component materials and is a single component. There are two categories of component content: matrix, and reinforcement. The matrix material surrounds and supports the reinforcement content while maintaining its relative positions. Reinforcement provides its special mechanical and physical properties to increase matrix properties. Typically, composites can be divided into the following categories: such as matrix matrix composites (MMCs), ceramic matrix composites (CMCs), polymers matrix composites (PMCs), the nature of the matrix and the type of processes.

Waste Tyre Rubber (WTR)

Scrap vendors make important contributions in the production of tire waste. Automobile tires, after the completion of their working life, wear out and have to relinquish it and it is estimated that on average, one tire is used per person per person worldwide. Used tires are a daunting problem, because the tire has almost unlimited life span. Waste tire rubber contaminates soil, water and air and it is confirmed by the following picture 1.3, Figure 1.4 and Figure 1.5. In response to the environmental problems and health hazards generated by countless uncontrolled and abandoned scrap tire hemispheres worldwide, most industrialized countries have prepared a legal framework to resolve this issue. After landfill restrictions are imposed, there is a possibility of legally or illegally scrap tire dumping and dumping (Adhikari 2000 and Senthil 2013)

The laws of country and foreign are different in the country, but the main thrust of such a law is to remove the abandoned piles, to provide the newly generated waste tires for the environmentally safe disposal and through the use of government grants Support for new applications for tire-derived content. Focusing on the rapid recycling of waste tire rubber (WTR), only 21% and the transportation of transport vehicles, thereby increasing the WTR growth rate for the coming years, especially in India. It is a position to control or control the rubber articles necessary to increase the level of use of WTR recycling.

Literature Review-

According to Ju-Young An, Jong-Moon Park, Hyeon-Jun, Byeong-Ha Jeong, Ho-Sung Jang, Jin-Ui Park, Bong-Seok Kim, Myung-Hoon Oh (2013) The tyre recycling is the
process of recycling vehicles tyres that are no longer suitable for use on vehicles due to wear or irreparable damage. Recently, amounts of waste tyres are being raised with development of the automotive industry. In case of Landfill or incineration of waste tyres, environmental pollution and economic problems are causing through waste of resources. As one of the ways to prevent this problems, crushed waste tyre powder used to composite material manufacturing. After physically removed the bead wire from the waste tyres, the waste tyre powder gained mechanical fracturing through crushers and grinders.

According to D. Raghavan and H. Huynh (1998) prepared the recycled tyre rubber-filled cementitious composite. They studied its wokability, mechanical properties and chemical stability. Two different shapes of rubber particles were used- one is granules of about 2 mm diameter and other is shreds having sizes 5.5mm×1.2mm and 10.8mm×1.8mm (length × diameter). They reported that the addition of rubber decreases the flexural strength and plastic shrinkage due to cracking in the mortar. The crack length and crack width due to plastic shrinkage were reduced for mortar containing 10.8mm×1.8mm rubber shreds compared with a mortar without shreds.

According to Siddique R., Naik T.R. (2004) The addition of rubber particles in a cementitious matrix may lead to new composite materials with interesting properties. The particle size of the scrap tyres used has a significant effect on many properties.


According to Nehdi, M. and Khan, A. (2001) represented the overview of engineering properties and potential applications of cementitious composites containing recycled tyre rubber. They reported about the effect of using rubber in concrete on density (unit weight) and on air content. Crumb rubber of different sizes is used in the concrete. Due to the low specific gravity of rubber, the unit weight of rubcrete mixtures decreases as the percentage of rubber increases.

According to Gintautas Skripkiūnas, et al. (2009) reported damping properties of concrete with rubber waste additives. The influence of rubber waste additive on hardened concrete damping characteristics and strength properties were evaluated. Compressive and flexural strength of concrete are decreased with increasing tyres rubber waste additive amount. The addition of rubber waste to concrete decreases the dynamic modulus of elasticity but increases damping decrement of the concrete. The amount of rubber waste has more noticeable effect on concrete damping properties than particles size distribution. He suggested that concrete with rubber waste can be used for isolation of structure-borne-noise in buildings, foundations and industrial floors.

Paulo J. R. O. Nóvoa, et al. (2006) reported mechanical performance of polyester resins modified with powder from scrap tyre rubber. A low reactivity unsaturated polyester resin (UPR), containing 39 wt % styrene was used in this investigation. A constant rubber powder content (5%) was used throughout all modified resin systems. From flexural properties and Charpy impact behaviour of the fully cured systems it is clear that all
composite systems showed a systematic decrease in performance. There appears to be a small positive shift in flexural properties for system, where a higher pre-treatment temperature was involved. They also reported that toughness can be improved if rubber is purified prior to utilization.

Chan Wen Shan, et al. (2012) used the coir fibers and tyre particles as fillers reinforced in the flexible polyurethane (PU) foams and specimens were developed and analyzed. The characteristics of fillers were examined. They prepared five types of flexible PU foam composites with 2.5wt% of fillers in combination of coir fibers only, tyre particles only, and combined of both. The coir is treated with 5% NaOH and was used to reinforce the flexible PU foams as compared with untreated coir due to a good bonding may obtained in between matrix and fibers. There was no any treatment process selected for tyre particles.

Recycled Tyre Rubber Particles

Recycled tire rubber particles are collected from the surrounding tire retreading center in Aligarh. Tires of trucks, buses, cars and tractors are kept in retreating centers. The grinding wheel of the tire is grinding, which is made of steel wires in radial directions. These wires causes abrasion on the tyre surface and small particles are generated and a rough surface on the tyres is resulted. This surface is now ready for retreading. The particles size between 100-200μm is obtained using two sieves of 100 μm and 200 μm successively. Recycled tyre rubber particles are used as reinforcing agent. Particles are black in colour.

Figure 1: Recycled Tyre Rubber Particles

Method of Specimen Preparation

Samples are fabricated using open mold casting techniques. For the size of 300mm × 100mm × 6mm size, compression test sampling for molding of tensile and fluxural test samples, sample for sample casting 100mm × 100mm × 25.4 mm and test sample 300mm × 100mm Damp-ing sample for 4 mm. Are making. To remove the mold plate plate easily, the interior of the mold is coated with petroleum jelly. Epoxy PG100 and Hardner SY 31 (B) are added in the ratio of 10: 1. A similar mixture is prepared to insert sample plates. Beams are prepared by mixing different weight percentages or beams (10%, 20% and 30%) in 100-200 square meters of recycled tire rubber particles in the epoxy and hardener mix and mixing them in the same molded molds. Are. Plates are treated at room temperature (about 300C) for
24 hours. After proper treatment, the plates are carefully taken out of the mold. Different sizes of the sample are then cut from mixed plates according to the test standards.

**Tensile Test Specimens**

Figure 2 shows tensile test samples of various structures of rubber particles ie 10%, 20% and 30% (by weight) with epoxy resin of tire rubber reinforcement.

![Figure 2: Specimens for Tensile Test](image)

**Compressive Test Specimens**

Figure 3 shows specimens for compressive test. These specimens are made of 10%, 20% and 30% (by weight) reinforcement of tyre rubber particles with epoxy resin. The numbering 10, 20 and 30 on the specimens is representing the %wt. reinforcement of tyre rubber particles.

![Figure 3: Specimens for Compressive Test](image)

**Flexural Test Specimens**

Figure 4 shows the flexural test specimens prepared by reinforcing 10, 20 and 30 percentages (by weight) of tyre rubber particles in epoxy resin.

![Figure 4: Specimens for Flexural Test](image)

**Damping Test Specimens**

Here a control specimen i.e. pure epoxy specimen, along with 10, 20 and 30 wt. percentage of reinforcement of tyre rubber particles, is also prepared. Following figure shows these specimens.
Results-

Tensile test-

Figure 5: Specimens for Damping Test

Figure 6: Load/Displacement curves for tensile test with variation of tyre rubber particles wt. percentage

The load/displacement graph shows that initially load is more for the 30 wt% rubber particulate composite but 30% rubber particulate composite breaks at lowest of the three loads i.e. at 961.38 N. 10% rubber particulate composite breaks at maximum load. Hence increasing the particulate decreases the load at fracture.

Figure 7: Stress/Strain curves for tensile test with variation of tyre rubber particles wt. percentage

Here the tensile stress is decreasing on increasing the particulate wt. percentages. Tensile stress for 10 wt % rubber particulate composite decreases by about 85% of the pure epoxy. The decrease in 20% and 30% rubber particulate composite is recorded as 86% and 90%.

Compressive Test
Compressive strength is also decreasing on increasing the reinforcement of rubber particulates. It has been seen that 75%, 76% and 83% decrease in compressive strength are occurred for 10%, 20% and 30% rubber particulate composites respectively as compared to that of pure epoxy (compressive strength 190 MPa). 10 wt% rubber particulate composite have high value of compressive strength (47.6 MPa) of these three configurations.

**Flexural Test**

Compressive strength is also decreasing on increasing the reinforcement of rubber particulates. It has been seen that 75%, 76% and 83% decrease in compressive strength are occurred for 10%, 20% and 30% rubber particulate composites respectively as compared to that of pure epoxy (compressive strength 190 MPa). 10 wt% rubber particulate composite have high value of compressive strength (47.6 MPa) of these three configurations.
Here flexural strength is decreasing on increase in the tyre rubber particulate reinforcement in the composite. A decrease of 68%, 74% and 82% in flexural strength is noted as compared to that of pure epoxy (flexural strength 112 MPa).

Damping Test

Figure 11: Flexural Strength at break with variation of tyre rubber particles reinforcement by wt. percentage

Figure 12: Time domain response of the Pure Epoxy beam in Impact damping method

Figure 13: Time domain response of Epoxy + 10% (by wt.) Tyre Rubber particulate beam
Figure 14: Time domain response of Epoxy + 20% (by wt.) Tyre Rubber particulate beam

Figure 15: Time domain response of Epoxy + 30% (by wt.) Tyre Rubber particulate beam

Figure 16: Variation in Loss Factor with varying wt. % of Tyre Rubber Particulate

Conclusions

The focus of this thesis is to use the waste material (tyre rubber) in preparing composite material, which can be used in many applications. This thesis focuses on the effective utilization of environmentally hazardous waste tyres. The composites are successfully prepared by reinforcing different weight percentages of tyre rubber particulates with epoxy matrix. The mechanical behavior of prepared composites is experimentally determined. Structural properties such as tensile, compressive, flexural, and dynamic property such as damping characteristics are determined. It has been observed that the difference in weight percentage of particle reinforcement plays an important role in
influencing these properties. In the present case, with overall increase in the restructuring of tire rubber particulate, tensile, compressed and fluxural strength in nature is decreasing. Tensile, compressive and flexural strength are maximum for 10% (by weight) tyre rubber particulate reinforcement composite. Viscoelastic materials have good damping characteristics, which can be used for vibration suppression. Tyre rubber particles in particulate composite with epoxy matrix increase the loss tangent (loss factor). In the present case, logarithmic decrement, damping ratio, and loss factor are determined for various weight percentages of tyre rubber particulate reinforcement in the composite for impact damping test. Loss factor is maximum for 30% (by weight) tyre rubber reinforcement composite. The prepared composite material can be used in many applications such as flooring, playground surfacing, isolation etc. Fabrication of brake pad in automotive field is an ongoing process. The prepared composite material has lower density as compared to metal particulate reinforced composites.

References-
“MOTIVATIONAL FACTORS OF WOMEN ENTREPRENEURS”

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INTRODUCTION

Entrepreneurship is an important aspect of the business and industrial growth of a modern nation. The spirit of Entrepreneurship is marked by enthusiasm, persistence and ability to seek opportunities. It is an instrument of change. But Female Entrepreneurship has not a very major share in the entrepreneurship sector. In today era Women Entrepreneurs have been designated as new engines for the growth. They are rising stars of the economies in developing countries to bring prosperity and welfare. A variety of stakeholders has pointed at them as an important “untapped source” of economic growth and development.

Objective of the study
1. To study the Socio-economic profile of women who want to become entrepreneurs.
2. To evaluate the factors responsible for encouraging women to become entrepreneurs.

WOMEN ENTREPRENEURS

Entrepreneurship by character is a Dynamic function which allows itself to evolve in a very perceptive manner as the social processes are adapted to the conditions of needs. Such needs aroused through entrepreneurial efforts thus help in enhancing the economic conditions of the population of the country. Globalization process factors such as flexibility, speed and innovation contributed entrepreneurship to emerge as a key player in driving economic development. It constitutes an important input in the process of economic development. Economic growth draws its vital nourishment from a stream of fresh ideas, inventions and innovations. Without Entrepreneurial functions perceptions of the opportunity based on an invention, promotion and in general the modern development would have been inconceivable.

Entrepreneurship has led balanced regional development. It is an instrument of change. It is a (new business formation) as a Key element within the development and revitalization process of lagging areas. This very element transforms technological possibility into technological facts. For healthy development in agriculture, industry or any other sphere of an economy there must be men/women who possess drive, ambition, foresight and imagination to break through. Traditional barriers overcome social interalia and transforms theory into practice. If the many shortages which impede the progress of developing countries one of the most serious limiting factors on their economic development is the acute shortage of Entrepreneurs. Economic development is the last analysis, the outcome of human decisions and activity. As the center of the process stands man as organizer of the community’s resources as worker and as user of the goods produced.
From time immemorial man’s Endeavour has been for the benefit of the society. In recent times the most important factor contributing to the advancement has been industrialization by bringing about social and economic development of the society. Entrepreneurs are the real heroes of economic life. Developed nations like U.S.A, U.K and JAPAN have realized the importance of enterprise. 

Entrepreneurship is a phenomenon it is recognized in India through TATAS, AMBANIS AND NOW ADANIS. These are the leaders who left an indelible Mark on the history of India. TATA Group, on industry, on the community and on the country. Much of their enterprise was an expression of self belief that the country could manufacture steel, generate power and use modern technologies. From building India’s first luxury hotel, to pioneering civil aviation, to taking the lead in the development of harmonious industrial relations in the country.

The vision of Entrepreneurship also emphasized the importance of returning to society the wealth that was generated. Entrepreneurship is the core of economic development. Entrepreneur is a key factor of entrepreneurship. In present time women are an emerging economic force. Women constitute the family, which leads to society and family. Social and economic development of women is necessary for development of any country. Every woman wants to start their own business but can not success in our Indian environment in way in which it should be. Due to changing environment, now men are easily acceptable the women entrepreneurial opportunity. Our increasing service sector also promotes the women entrepreneurship. Purpose of the study is to find out various motivating and de-motivating internal and external factor of women entrepreneurship. It will also suggest the investment and interesting working time of women.

Entrepreneurship refers to setting a new business to take advantages from new opportunities. Entrepreneur is the key factor of entrepreneurship and now women are successful in this as they have qualities desirable for entrepreneurship development. Entrepreneurship is a suitable profession for women than regular employment.

Problems Faced By Women Entrepreneurs: Indian women entrepreneurs face the following challenges in setting up and running business units:

A) Less Confidence: Women entrepreneurs are not confident about their strengthened competence. Their family members don’t stand by their entrepreneurial Growth. In recent
years, though the situation is changing, yet the women have to face further change for increased entrepreneurial growth.

B) Non-Availability of Finance: They have lack of access to funds, because they do not possess any tangible asset and credit in the market. Very few women have the tangible property in hand. So, they are suffering from inadequate financial resources and working capital.

C) Socio-cultural Disturbance: Women have to manage both home and business duties at a time. Such obligations may become a great barrier for some women in succeeding as an entrepreneur.

D) Lack of Managerial Skills: It is argued that women entrepreneurs have low level of management skills. They have to depend on other persons like office staff and middle men to get things done, particularly marketing function. They are at the mercy of middle men who pocket major part of the surplus or profit. Because of social conditioning, women are discouraged to develop the capacity of mobility and confidence required for marketing function. So, they lag behind in this domain.

E) Competition from Male Entrepreneurs: Competition from male counterparts develops hurdles to women entrepreneurs in business management process. Women entrepreneurs have to face the constraints of competition from male entrepreneurs due to less organizational skills than men.

F) Production Problem: Production in a manufacturing enterprise involves coordination of a number of activities. While some of these activities are in control of entrepreneur, there are others over which she has little control. Improper coordination or unintended delay in execution of any activity is going to cause production problems in the industry.

G) Lack of Knowledge of Availability of Raw Materials: For running business, Entrepreneur requires having knowledge of alternative source of raw material availability and high negotiations skills. Women entrepreneurs have lack of such knowledge and skills which affect their business adventures.

H) Lack of Education and Awareness: Entrepreneurs must have knowledge of latest technological changes; know how, etc for running business efficiently. But it needs high level of education among entrepreneurs. In a country like India, the literacy rate of women is found at low level compared to male population. So, they have not sufficient knowledge of technologies; know how, etc. that affect their business ventures adversely.

I) Low Level of Risk Taking Attitude: One pre-requisite of the entrepreneurial success is risk taking. It is normally believed that women being feminist gender have low risk taking ability. Because of this, they are suppressed by the protected environment and are not allowed most of the time to take any type of risk even if she has capacity to bear it.

J) Mobility Constraint: The Indian society is a conservative society which restricts the mobility of women entrepreneurs. Women are less mobile than men. The confidence to travel day & night and to different regions and States is lacking in women comparing with men.

K) Other Constraints: They are poor self image of women, inadequate motivation, discriminating treatment, lack of freedom of expression, etc.

REVIEW OF LITERATURE
Entrepreneurship is developing and particularly women entrepreneurship, the world over. A number of studies have been undertaken in other countries as well as in India to investigate the various aspects of women entrepreneurship. These studies clearly indicate that women entrepreneurship is indispensable for the overall development of the nation. The general purpose of reviewing the literature of studies is to develop an understanding and insight into
the work already done and areas left untouched or unexplored. These studies also enable to search out many more related problems as suggestions for future research. It is presumed that the survey of such studies will make the preset investigation more direct and to the point. So, the different studies investigating most of the aspects on the subject matter of present study published in the forms of Books, articles and research papers will be studied. The important among them are as following:

Schumpeter: He views Entrepreneurship as on aristocrat character, part of a Schumpeter (1961) is arguably the most influential economics of Entrepreneurship. He stressed the view that the individual Entrepreneur embodies the innovation function in society and the stands out as leader. Schumpeter rather emphasized the non-utilization qualities of Entrepreneurship and speculated about the unique psychological make-up creative elite in capitalist society that is driven by dream of founding a “Private Kingdom”, an intrusive desire to success for the sake of success itself, who feels the joy of creating and delight in reline” (1961: 93-94). He stressed that practical side of Entrepreneurship, arguing that Entrepreneurship are the individuals that get things done in society. (Schumpeter 1975).

Sexton and Kent (1981) that women Entrepreneurs had slightly lower levels of education than female executives. Self determination, expectation for recognition, Self esteem and career goal are the key drivers for taking up Entrepreneurship by women(Moore and Bhuttten,1997). The overwhelming majority of early research about women Entrepreneurs focused on individual aspects. 

Writers such as Wolf (1990) and Chapkiss (1986) have been unambiguously negative about the effects of the ‘beauty system’ or the ‘fashion-beauty complex’. Wolf, for example, describes how eating disorders, the appearance of women in the work place and reproduction amongst other arenas have become subject to the ‘beauty myth’. This system of beauty has arisen as a part of a wider backlash to the social, economic and political advances made by women.

Other work has, however, emphasised the complex nature of discourses and practices which regulate the body and produce femininity (Bordo, 1993; Butler, 1993; Skeggs, 1997). It needs to be acknowledged that there is room for tension and ambiguity within femininity, not least in the sense that class, age and ethnicity will fundamentally alter the ways in which femininity is experienced and defined (Gimlin, 1991; hooks 1992). In our research we have discovered that the beauty industry, its role and the experiences of the women who come into active contact with it is indeed a complex matter?

In approaching this complex area then we broadly agree with Davis' statement that: “Feminist theory on beauty needs to be grounded; that is, it must take the ambiguous, contradictory, everyday social practices of women as its starting point.” (Davis, 1991)
RESEARCH METHODOLOGY:

**Statement of problem:** This study deals with the “MOTIVATIONAL FACTORS OF WOMEN ENTREPRENEURS.”

**Research design:**
It is the descriptive research. The main aim is, to find out the factors responsible for women to become Women Entrepreneurs.

**Sample Design:**
In this research Haryana area is selected as sample area with 200 total women entrepreneurs.

**Sample**
I have selected Haryana region. For this research study, the Stratified Random Sampling Method

**Sample Size:** 200 respondents would be taken from four zones of HARYANA. This will be randomly contacted out of four i.e. North, South, East, and West Zones of Haryana.

Ambala: North
Gurgaon: South
Fathabad, Hisar: West
Karnal: East

Random sampling method is used for filling up the questionnaire from employees and employers. 200 respondents are selected on random basis from these 4 zones of Haryana in this region in India. 200 is a good and reasonable sample size for this research study. The questionnaire made for employers is filled up by the 200 Female entrepreneurs.

**DATA ANALYSIS AND INTERPRETATION:**

**Presentation and Analysis of Demographic variables**

**Age Distribution Data Grid**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>No. of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20</td>
<td>10</td>
</tr>
<tr>
<td>21-30</td>
<td>40</td>
</tr>
<tr>
<td>31-40</td>
<td>70</td>
</tr>
<tr>
<td>41-50</td>
<td>10</td>
</tr>
<tr>
<td>50 and above</td>
<td>70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
</tr>
</tbody>
</table>

**Pie Chart classification of age.**

The Demographic profile of respondents shows their age classification that
35% respondents are of age between 31 to 40 and 10 respondents are of age between 41-50 and less than 50. That shows 5% respondents belong to category of 41-50 and less than 20. So mostly people are of age above 50 and above.

**Education Level**

<table>
<thead>
<tr>
<th>Education Level</th>
<th>No. of Respondents</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Matric</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Sr. Secondary</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Graduation</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>Post Graduation</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

**Education Data Grid**

This table shows that 60% respondents belong to the category of graduates. 5% respondents belong to the category of below Matric. 25% respondents belong to the category of Senior secondary education. 10% respondents graduates with post graduation degree.

**Analysis and Presentation of Socio-Economic Profile of Women Entrepreneur in Beauty Service Sector.**

**Caste distribution Data grid**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>135</td>
<td>67</td>
</tr>
<tr>
<td>SC/ST</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>O.B.C</td>
<td>25</td>
<td>13</td>
</tr>
</tbody>
</table>
Respondents shows that 67% belong to General category, SC/ST are 40%, O.B.C. are 13%. So Mostly Entrepreneurs are of General category. So mostly women Entrepreneur belong to General category in this sector.

Caste system shows their classification.

*Entrepreneurial Experience*

<table>
<thead>
<tr>
<th>Period of Service</th>
<th>No of Entrepreneurs</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2 years</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>2-4 years</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>5-8 years</td>
<td>30</td>
<td>14</td>
</tr>
<tr>
<td>8-10 years</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>More than 10 years</td>
<td>100</td>
<td>48</td>
</tr>
</tbody>
</table>

*Entrepreneurial experience Data Grid*

It shows that 50% of respondents have more than 10 years of experience. 10% are having experience of 2 to 4 years. 20% are having experience of five to eight years. 15% are having experience of 5 to 8 years. 10% are having experience of 8 to 10 years.
Income level

<table>
<thead>
<tr>
<th>Salary</th>
<th>No of Respondents</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10,000</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>10,000-20,000</td>
<td>38</td>
<td>19</td>
</tr>
<tr>
<td>20,000-50,000</td>
<td>85</td>
<td>42</td>
</tr>
<tr>
<td>50,000-1,00000</td>
<td>61</td>
<td>31</td>
</tr>
<tr>
<td>More than 100000</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Income distribution Data

Income table shows that 42% respondents earn between Rs.20000 to 35000 per month. 6% earn less than 10,000 and 19% earn between Rs.10,000 and 20000.31% respondents earn between Rs.50,000-1,00000.

PRESENTATION AND ANALYSIS of the factors responsible for encouraging women to become Entrepreneurs.

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>Least Imp</th>
<th>Slightly imp</th>
<th>Moderately Imp</th>
<th>Very imp</th>
<th>Extremely imp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial needs</td>
<td>2%</td>
<td>4%</td>
<td>14%</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>Hobby</td>
<td>3%</td>
<td>5%</td>
<td>40%</td>
<td>50%</td>
<td>2%</td>
</tr>
<tr>
<td>Self independence</td>
<td>1%</td>
<td>3%</td>
<td>3%</td>
<td>23%</td>
<td>70%</td>
</tr>
</tbody>
</table>
1. **Financial needs**: 60% respondents said that financial needs are extremely important and 20% said that financial needs are very important factor for starting their business and none said that it is not important.

2. **Hobby**: Respondents revealed that 50% say that hobby is very important Factor for starting a business and 40% said that hobby is moderately important for starting a business. 3% respondents said that this factor is least important and 5% said that it is least important.

**Self independence**: Self independence is the most important factor and 70% said that it is the extremely important factor for starting their business. Women want to become independent and self reliant. 23% said that it is moderately important.

**Survival**: 34% said that survival is very important factor.32% said it is moderately important. 9% it is extremely important.10% said that survival is slightly important factor and 15% said that it is least important.

**Experience**: Experience is also important factor for starting a business. 55% said that it is moderately important. 20% said that it is extremely important factor. 10% said that it is slightly important. 12% said that it is least important and 10% said that it is slightly important.

**Rising Demand**: 10% said that it is least important factor for starting a business. 22% said that it is slightly important.33% said that it is moderately important. 28% said that it is very important and 7% said that it is extremely important.

**Less investment and more profit**: This factor shows that 5% respondents analysed that it is least important factor.32% said that it is slightly important factor for starting a business.43% said that this factor is moderately important. 8% said that this factor is very important factor and other said that is 2% respondents said that it is extremely important factor for starting a business.

**Skill Based**: 11% respondents say that skill factor is least important for starting a business, 15% said that it is slightly important and 26% said that it is moderately important.38% said that it is very important and 10% said that it is extremely important. So mostly respondents said that skill factor is Very important factor for starting a business.
ANALYSIS of Objective 2: To evaluate the factors responsible for encouraging women to become entrepreneurs in this sector.

**Data grid**

**KMO and Bartlett’s Test**

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</th>
<th>0.552</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett's Test of Approx. Chi-Square</td>
<td>175.689</td>
</tr>
<tr>
<td>Df</td>
<td>28</td>
</tr>
<tr>
<td>Sig.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

KMO test shows the sample adequacy. Since it is more than .5 so our sample is adequate. We can apply factor analysis to it. So next step is to apply factor analysis to find out the variables which are more important for starting a business.

This table shows the loading factor of different variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Loading Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) financial needs</td>
<td>0.567</td>
</tr>
<tr>
<td>2) hobby</td>
<td>0.766</td>
</tr>
<tr>
<td>3) self independence</td>
<td>0.682</td>
</tr>
<tr>
<td>4) Meaning of survival</td>
<td>0.706</td>
</tr>
<tr>
<td>5) Experience</td>
<td>0.731</td>
</tr>
<tr>
<td>6) Demand</td>
<td>0.736</td>
</tr>
<tr>
<td>7) Investment</td>
<td>0.592</td>
</tr>
<tr>
<td>8) skill</td>
<td>0.729</td>
</tr>
</tbody>
</table>

**Total Variance Explained**

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>2.054</td>
<td>25.673</td>
</tr>
<tr>
<td>2</td>
<td>1.284</td>
<td>16.045</td>
</tr>
</tbody>
</table>
When we did factor Analysis on these Variables we found that these variables financial needs, hobby,self independence,Meaning of Survival,Experience,Demand,Investment and skill based Among these factors variables four factors are analyzed first 4 have Eigen values more than 1 so they are extracted.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen Values.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Financial needs</td>
<td>2.054</td>
</tr>
<tr>
<td>2 Hobby</td>
<td>1.284</td>
</tr>
<tr>
<td>3 Self Independence</td>
<td>1.127</td>
</tr>
<tr>
<td>4 Meaning of Survival</td>
<td>1.043</td>
</tr>
</tbody>
</table>

So these factors financial needs, hobby ,self independence ,Meaning of Survival are the most important factors for starting a business. These are the Motivators,MOTIVATORS which motivates young women Entrepreneurs to start their business.

**Summary and analysis: Impact of technical assistance on Young Entrepreneurs.**

**Whether Training Motivates the Young Entrepreneurs**

<table>
<thead>
<tr>
<th>Training Type</th>
<th>No of Respondents.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 6 Months-12 months</td>
<td>100</td>
</tr>
<tr>
<td>2 2 year diploma course</td>
<td>50</td>
</tr>
<tr>
<td>3 4 or 3 year diploma course</td>
<td>40</td>
</tr>
<tr>
<td>4 Not taken any training</td>
<td>10</td>
</tr>
</tbody>
</table>
Ho(null hypothesis): There is no relationship between training and becoming a successful entrepreneur.

H1(alternate hypothesis): There is a relationship between training and becoming an entrepreneur.

Test: **Chi square test** to test the null hypothesis.

<table>
<thead>
<tr>
<th>Training period</th>
<th>Observed frequency</th>
<th>Expected frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months-12 months</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2 years</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>3-4 years</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>No training</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>

The formula for chi square is

$$x^2 = \sum \frac{(O-E)^2}{E}$$

Where:

- $x^2$ is the value for chi square.
- $\sum$ is the sum.
- $O$ is the observed frequency
- $E$ is the expected frequency.

Calculations:

<table>
<thead>
<tr>
<th>TRAINING Period</th>
<th>O(Observed frequency)</th>
<th>E(Expected frequency)</th>
<th>O-E</th>
<th>(O-E)^2</th>
<th>(\frac{(O-E)^2}{E})</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 – 12 mths</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>2500</td>
<td>50</td>
</tr>
<tr>
<td>2 years</td>
<td>40</td>
<td>50</td>
<td>-10</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>3-4 years</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No training</td>
<td>10</td>
<td>50</td>
<td>-40</td>
<td>1600</td>
<td>32</td>
</tr>
</tbody>
</table>

Calculated value of chi square = \(x^2 = 102\)

degree of freedom (d.f) = 3, Level of significance = 5%

Table value of chi square is \(x^2_{0.05} = 9.48\)

According to the main objective to determine the impact of training as a success factor for women in such entrepreneurial activities and to check the hypothesis in this regard that training is a motivating factor in developing women entrepreneurship we applied chi square test which is a non parametric test results were interpreted that the table value of chi square is less than calculated value. So null hypothesis is rejected and we accept the alternate hypothesis which says that there is a relationship between training and becoming an entrepreneur.
SUMMARY AND ANALYSIS OF ROLE, POLICIES, PROGRAMMES AND INSTITUTIONAL NETWORK IN WOMEN ENTREPRENEURSHIP DEVELOPMENT.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Bank</th>
<th>Details of SHG’s having linked with banks</th>
<th>OUT of total SHGs Exclusive Women SHG’s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No. of SHGS</td>
<td>No. of members</td>
</tr>
<tr>
<td>1</td>
<td>Bank of Baroda</td>
<td>152</td>
<td>725</td>
</tr>
<tr>
<td>2</td>
<td>Bank of India</td>
<td>139</td>
<td>1398</td>
</tr>
<tr>
<td>3</td>
<td>Canara Bank</td>
<td>453</td>
<td>4925</td>
</tr>
<tr>
<td>4</td>
<td>Central Bank of India</td>
<td>482</td>
<td>5296</td>
</tr>
<tr>
<td>5</td>
<td>Indian Bank</td>
<td>114</td>
<td>1710</td>
</tr>
<tr>
<td>6</td>
<td>Punjab &amp; Sind Bank</td>
<td>704</td>
<td>7040</td>
</tr>
<tr>
<td>7</td>
<td>Punjab National Bank</td>
<td>10703</td>
<td>109260</td>
</tr>
<tr>
<td>8</td>
<td>State Bank of India</td>
<td>4984</td>
<td>59808</td>
</tr>
</tbody>
</table>

According to this table the relationship between Bank SHGs and Women SHGs is shown. According to above in haryana region 2010-2011 highest SHG savings amount to women in Punjab National Bank is 4264.17 lakh and lowest in Bank of India is 2.20Lakh.

FINDINGS:

The age group profile of the owners reveals that there are more or less an equal proportion of women starting a business in the various age groups up to 35 years. This shows that many women start this business well into their mid ages once they have taken care of their family responsibilities like bringing up of their children to a certain age and also when they find their financial needs rising.

As to the educational background, the average business woman in this segment has a secondary degree (Higher secondary education). In fact, 42% of women entrepreneurs confirmed to have secondary education, whereas 30% had tertiary education (University Degree) and 28% launched their enterprise with a degree of primary education.

Those with university degree however showed a mismatch to the present profession being done by them. This reveals that many take up UG and PG degrees mostly without a proper goal in life or do not find the right employment and are hence driven to starting a passion for business. Regarding this further shows that unmarried women entrepreneurs are not more prevalent as it needs a lot of support from the family members to give permission to these women.

The situation with regards to availability of help at home is varying as most of these women have the help of their parents/husband to take care of each family when they are at work- as job of a beautician is very demanding and keeps one away from home during the late evening hours and also on holidays. Though about 19% of the respondents have also said that they have to take care of family and work, all by themselves.

As to the choice of entrepreneurship as the main occupation, 47.7% of women entrepreneurs confirmed that they have always worked for themselves, whereas 52.3% have become entrepreneurs after having occupied various jobs.
Around 85% of the respondents said that this was the first enterprise they owned while the remaining had experience in running other small business like garment previous venture and expanded into beauty care while few went out of business in their earlier venture. A majority of the respondents had started their venture solely on the basis of the support rendered by their family members like their husband, father / mother. It is thus seen that the immediate family plays a very important motivator for the women to cherish her dream to establish a business. Financial questions came clearly first with 49.7% of respondents quoting this factor as the most important one, followed by the combination of work and family life with 31.4% and the lack of information and advice with 28.1%.

Nearly one fifth (17.0%) stated that they did not experience any problems when starting their business. It may be worthwhile having a closer look at this category of women to investigate their success paths and the possible relationship between educational levels, cultural background and family situations for example. Yet these kinds of considerations go beyond the scope of the present study, and would need to be looked at in a separate analysis.

The need for economic independency motivating women into entrepreneurship is very much evident from the fact that about 56% of the women meet their household income to the extent of 75 – 100% while 28% meet 50 – 75% of their household income in comparison to the other proportions. It is indeed sad to know that the small industries development institutions have not rendered any support to these women entrepreneurs in starting their enterprises as only 16% have received any such support.

A highly encouraging support of their family members has the foundation of success of these women entrepreneurs standing high in the field of beauty care. It is also worthwhile to mention the support rendered by the society to these women entrepreneurs though much later in their business cycle when they have successfully withered away the storms and have established themselves towards glory.

**SUGGESTIONS:**
- Women Entrepreneurs should be Encouraged to take loans.
- Special financial skills should be developed.
- SHGs and Extended financial credit should be provided as They encounter finance problem in starting a business.
- Industry ready trainees should be made available for these female entrepreneurs.
- Women Entrepreneurs should have a Tie –up with Educational institutions.
- Awareness drive should be launched to get their business registered to get the financial incentives.
- Establish linkages with Skin Doctors
- TREATMENT TRAINING should be provided to these women Entrepreneurs.

**CONCLUSION:**
To conclude this empirical study, it can be said Thus the study brings forth the characteristics of a typical female entrepreneur who is mostly educated with secondary education, runs a micro enterprise, has a husband and children and mostly supported by husband / father/mother for help and no other outside help. Mostly women are married. The woman creates her enterprise before the age of 35, after having gained some working experience working for others. The main reason for creating her business is the desire for control and freedom to take own decisions, yet she does not lose the perspective of making money out of sight. She dedicates over 48 hours (typically around 60 hours) to her business on a weekly basis, and has made it thanks to hard work, perseverance, family support and solid self-confidence. The main problems she faced when creating her enterprise were financial
questions and combining work and family. The main reason for creating her business is the desire for control and freedom to take own decisions, yet she does not lose the perspective of making money out of sight. The women entrepreneur who have already a set-up of beauty services they join that for career and succession planning.

Entrepreneurship is a motivating factor in building capital formation. Female entrepreneurs in this sector very Meager (FEW) Women have taken loan they are not aware of schemes and self help groups. This segment is going organised because of affluent choice for diversification of business.

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ANALYSIS OF CARBURISED MILD STEEL SAMPLE FOR MECHANICAL AND WEAR PROPERTIES

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Research Scholar at Translam Institute of Technology & Management, Meerut, Uttar Pradesh

ABSTRACT

In the present work the wear and mechanical properties of sample mild steel are to be studied that are carburized at with several temp. of 850, 900°C and 950 degree Celsius. From the study this is obtained that through application of heat treatment the wear resistance, Tensile Strength and hardness are increased. The objective at here is to examine the result of different carburization temp. on wear and mechanical properties for sample mild steel and which carburizing temperature is more preferable for carburizing of mild steel. To attaining these conditions firstly the sample mild steel has been carburized for different temp. ranges, then tempting is done at 200 degree celsius with the soak time of half hour. Now when the sample is prepared they are subject to different test such as toughness test, hardness and abrasive wear test. The result of experiment performed shows that mild steel which is carburized at a temperature of 950 degree celsius show the best result for different wear and mechanical properties. This is because at this temperature of 950 degree celsius it shows largest wear resistance, Tensile Strength and Hardness, so it must be chosen for required application.

Keywords - Carburization, Hardness, Toughness, Wear Rate, Wear Resistance

INTRODUCTION

The carburization make a change in the upper surface of the specimen by changing its Carbon content with results in the change of its mechanical and wear properties. The heat treatment process followed by carburization improves the mechanical and wear resistance of the mild carbon steel. Carburization can be simply said to be as the addition of carbon on to the upper surface of low carbon steel with the temperature generally ranging from 850 to 950 °C (1560 - 1740 F) on which austenite, which has high solubility for carbon, is at the stable crystal structure.

Steels which are used in case hardening normally having the carbon content on around as 0.2% and when the carburization is done, the carburized layer usually have a carbon content between 0.8 to 1%. However the carbon content of the surface is limited 0.9 percent because if the carbon content is high this may occur in withheld brittle Martensite and Austenite.
CARBURIZATION

In the carburization process the sample of mild steel are positioned over dense bed of carburizer which are placed inside stainless steel container & it is entirely sheltered from all borders, steel plate is covered over upper portion of container. The container filled with mild steel samples is now kept in muffle furnace and different carburization temp. are maintained such as 850, 900°C and 950 degree Celsius, the soaktime is two hrs. In this way the specimen becomes carburized & further they are quench inside water that is hardening process which applied directly afterwards the carburization. Through the application of carburization procedure the mech. & wear property of the samples (M.S) gets amplified. The obtained carburized steel is now tempered for a particular temp. and time & after that different processes are applied for several type of mech. & wear testing.

It is the generally applied Surface Hardening method. Carburizing can be in simply said to be as adding carbon on the upper surface of L.C.S with temperature ranging from 850 degree Celsius to 950 °C. Approximately of around 0.03 mm depth carbons is applied on to the exterior portion of steels. This process improve the wear resistance and mechanical properties without affecting the tougher interiors and softer part.

Fig 1: Carburization of Mild steel specimen in muffle furnace

TESTS PERFORMED

1. Abrasive wear test: abrasive wear test is performed in pin on disc machine
2. Hardness test: hardness test is performed in Rockwell harness tester
3. Toughness test: This test is performed with the help of charpy impact test machine
4. Tensile test: This is performed with Instron 1195 tensile test machine

RESULT AND DISCUSSION

Different kind of carburized & tempered Mild steel sample are prepared over several temp. conditions and after that these samples are checked for various test like toughness, hardness, A.W test & tensile strength test. Table 1 to 3 gives the record of result of
abrasive wear test as established for several weights. Table gives the record of Rockwell hardness test at a load of 150 kg, tensile strength test and toughness test.

Table 1. At load 14.7N, Result for A.W test of carburized M.S

<table>
<thead>
<tr>
<th>Carburization Situation</th>
<th>Tempering State</th>
<th>Weight loss (g)</th>
<th>Wear Volume (Cm³×10⁻²)</th>
<th>Wear Rate (Cm²×10⁻⁷)</th>
<th>Wear Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.108</td>
<td>1.35</td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.117</td>
<td>1.48</td>
</tr>
<tr>
<td>At 850⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.134</td>
<td>1.65</td>
</tr>
<tr>
<td>Plain M. S</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.211</td>
<td>2.65</td>
</tr>
</tbody>
</table>

Table 2. At load 29.4N, Result for A.W test of carburized M.S

<table>
<thead>
<tr>
<th>Carburization Situation</th>
<th>Tempering State</th>
<th>Weight loss (g)</th>
<th>Wear Volume (Cm³×10⁻²)</th>
<th>Wear Rate (Cm²×10⁻⁷)</th>
<th>Wear Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.124</td>
<td>1.57</td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.135</td>
<td>1.73</td>
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<tr>
<td>At 850⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.155</td>
<td>2.00</td>
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<td>Plain M. S</td>
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<td>-</td>
<td>0.250</td>
<td>3.19</td>
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</table>

Table 3. At load 49N, Result for A.W test of carburized M.S

<table>
<thead>
<tr>
<th>Carburization Situation</th>
<th>Tempering State</th>
<th>Weight loss (g)</th>
<th>Wear Volume (Cm³×10⁻²)</th>
<th>Wear Rate (Cm²×10⁻⁷)</th>
<th>Wear Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td>Temp (⁰C)</td>
<td>Soak time (Hrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.149</td>
<td>1.93</td>
</tr>
<tr>
<td>At 950⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.163</td>
<td>2.11</td>
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<tr>
<td>At 850⁰C</td>
<td>2</td>
<td>200⁰C</td>
<td>0.5</td>
<td>0.191</td>
<td>2.39</td>
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<tr>
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<td>-</td>
<td>-</td>
<td>0.303</td>
<td>3.89</td>
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</table>

Result of abrasive wear test:

Table 1 to 3 gives result for abrasion wear test carried out for M.S sample that are carburize at several temp. as 800, 900⁰C & 950 degree Celsius. The following results can be drawn from the A.W test perform for samples:

7. For an un carburized mild steel sample the weight loss due to abrasion is highest and it is lowest for the carburized mild steel at 950 degree Celsius.

8. The abrasive test which is done for different loads of 49 N, 29.4 N and 14.7 N and the result found is that the weight loss during abrasion is lowest at the load of 14.7
Newton and highest for the load 49 Newton so we can say that on the increment of load the weight loss due to abrasion also increases. This is also shown graphically on figure 1.

9. The weight loss of carburized mild steel during abrasion is highest for the temperature 850°C us and is lowest at temperature 950°C. There is low carbon content at lower carburization temperature. Hence the result drawn is that the weight loss due to abrasion decreases with increase in the carburization temp.

10. The wear rate of a material depends on the load applied. The abrasive test result says that the wear rate increases with increase in the load applied. Hence we can say that the wear is maximum for the load of 49 Newton and it is smallest for the load of 14.7 Newton.

11. For the uncarburized mild steel the wear rate is highest and is smallest for the mild steel which is carburized at the temperature of 950°C. On increase in the carburization temperature the wear rate decreases. This is also proved graphically through fig 3.

12. For an uncarburized mild steel the wear resistance is lowest and for the mild steel which is carburized at the temp. of 950°C the wear resistance it is highest. On studying the case of mild Steels the wear resistance is highest for the sample which is carburized at temp. of 950°C and is smallest for the sample which is carburized at temp. of 850°C. Hence the result found is that the wear resistance is directly proportional to carburization temperature. Shown graphically through fig 2.

13. The final result achieved is that the mild steel which is carburized at temperature of 950°C gives the best result as it shows the highest wear resistance, less weight loss and less wear rate due to abrasion.

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**Figure 2**: Comparison of loss of weight because of abrasion Vs temperature for 3 dissimilar load as 49N, 29.4N and 14.7N
Figure 3: Comparison with Wear rate and temp. at different load

Figure 4: Comparison of Wear rate and temp. at dissimilar load
The summarised form of the result is given in following points:

- Tensile Strength ranges from 439 MPa to 1962 MPa as shown in table 4. Tensile Strength is smallest for un-carburized Mild steel (M.S) and largest for the M.S which is carburized at a temp. of 950 degree celsius. Hence carburization improve the Tensile Strength of a metal.
On considering the case of carburized samples only, we can say that Tensile Strength is largest for sample which is carburize at a temp. of 950 degree celsius and is smaller for sample carburize at a temp. of 850 degree celsius. The Tensile strength of a material increase by rise in carburized temp.

Toughness test result it is obtained that toughnes is ranging from 53J to 31 J and it is smaller for carburized M.S sample and is largest for un carburized M.S. Hence we can say that toughness decrease with the application of carburization process on mild steel.

Toughness test results say that on increase in the values of carburization temp. there is a small decrease in toughness readings. Hence we can say that the toughness decrease with an increment carburization temperature.

Hardness readings range from 50Rc to 58Rc and it shows the highest reading for ample which is carburize at temp. of 950 degree celsius and this is smaller for sample carburize at 850 degree celcius. Hence we can say that reading of hardness increase with the upsurge in carburization temp.

Sample which is carburize at a temp. of 950 degree celcius shows the top outcomes for wear and mech. Properties.

Carburization temp effect on weight loss of sample which is carburize

Table 1 to 3 shows the relationship b/w weight loss due to abrasion and carburization temp. From the table it is known that through the increment in carburized temp. the weight loss decrease. From this we can say that it is smallest for carburization temp. of 950 degree celcius and it is largest to sample carburize at a temperature of 850 degree celcius. So, with the increase in temperature the hardness of material increases and as the hardness increase the weight loss of material due to abrasion decrease.

Action of load on Weight loss of carburized samples.

Three dissimilar loads (i.e 49 N, 29.4 N & 14.7 N) are taken for Abrasive wear test and the result of these has been written in Table. 1 to 3 and we got the output that at a load of 49N the weight loss because of abrasion is largest and at 14.7 N the weight loss is minimum. Hence on studying the result we can say that weight loss because of abrasion increases when load applied is increased this is all due to the fact that force is increased, the fiction also increases which results in the increment of weight loss.

Carburizing temp. impact on Wear rate of carburized M.S sample:-

Carburizing temp. impact on W.R of carburized mild steel sample is given in table 1 to 3. From these table we can say that carburization temp is directly varied with the wear resistance which means when carburization temp is increased, the wear resistance is also increased. it is maximum for 950°C and minimum for 850°C. Hence we can say that 950°C gives the best result toward wear resistance and hence choosen.
Hardness effect on Weight loss of carburize samples.

We find that hardness plays an important role in weight loss because of abrasion & these both have inverse relationship with each other means when the hardness is increased the weight loss is decreased. This is result of the fact that harder materials have larger abrasive wear resistance.

Carburizing temp. effect on Tensile strength of carburize samples:

Table 4 shows the carburization temp. effect on tensile strength of carburize sample. The observed result show that carburization procedure increases the tensile strength of sample M.S. these both have direct relationship with each other which means that the tensile strength increases with upsurge in the carburization temp and when all the three temperatures are compared then we can say that the sample of 950 degree Celsius is showing the the top results and it must be opted.

Carburization temp. effect on toughnes for carburized sample

Mild steel toughness property are greatly affected by the carburization process. Table 4 gives the result of toughness for carburized and un carburized sample. By observing the table we can say that with the increase in carburization temp., the toughness of a material decrease. Hence the carburization process decreases the toughness of sample M.S. By studying it is clear that toughness of carburized simple mild steel decreases with an increase in carburization temp.

CONCLUSION

From the present work on "Analysis of carburized mild steel sample for mechanical and their properties" the following conclusions can be obtained:

- Wear & Mechanical property of specimen (M.S) are strongly altered by the carburization process.
- Quenching, done after carburization treatment increase W.R, hardness, tensile strength of mild Steel.
- Carburizing decrease the toughness of specimen. Toughness tends to decrease with the increase in carburization temp..
- With the increment in load, the loss of wt. Due to abrasion, W.V and W.R also rises.
- With rise in carburizing temp., the loss of wt. due to abrasion, W.R and toughness declines.
- With rise in carburizing temp., there is an growth in hardness, tensile strength and wear resistance.
- Wear resistance rises with rise of hardness. However there is decrement in W.L because of abrasion and W.R.
On considering the dissimilar temperatures, the M.S carburize at 950 degree Celsius shows the topmost quality combination of higher hardness, high wear rate and high tensile strength with less wear rate and less weight loss.

As a final point the result obtained is that the M.S specimen which is carburize at dissimilar temp. Range of 850, 900°C and 950 degree celcius, among all these 950°C give the better result for or wear and Mechanical properties.

SCOPE FOR FUTURE WORK

On considering wear properties and Mech. property of Steel specimen for different temp. of 850, 900°C and 950 degree celcius. The subsequent suggestions can be considered:

- Wears as Abrasive wear, Erosive wear and Corrosive wear also these type of studies can be done.
- Identical study can also be done for other Mech. Property as ductility, brittleness compressive streth, plasticity, elasticity & malleability.
- Identical study can also be done through altering the Carburization temp.
- Identical study can also be done through altering tempering temperature and soaking period.
- Identical study can also be done through altering quenching temp.
- Identical study can also be done for heat treated medium carbon steel.
- Identical study can also be done for procedure as cyaniding, nitriding-carbo-nitriding etc.

REFERENCE


AN ANALYTICAL STUDY OF ORGANISATIONAL LIFE CYCLE AND FACULTY PERFORMANCE IN HIGHER EDUCATIONAL INSTITUTE

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TIMIT, TMU

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Fairleigh Dickinson University, Vancouver, Canada

Abstract

In the world of business and management, the practice of learning is deemed important for Institution to survive or stay competitive. According to organizational life cycle (OLC) theory, during the Institution’s growth from inception, to high-growth, to maturity, Institution characteristics differ and the internal resources and capabilities of the Organisation develop. The faculty performance in such an institution has been discussed by a number of scholars. However, few of them have empirically addressed the issue in educational context. The purpose of this paper is to contribute to the limited previous research on relationship between organisational life cycle & faculty performance in higher educational Institute, by examining the impact of faculty participation on the performance of a private university in Moradabad. The literature has discussed the dynamics of organizational life cycle, but little is known about how it possibly relates to Institution learning. The study findings indicated that faculty performance is positively influenced by employee participation in decision-making and significantly associates with academic results of the university. Additionally, employee participation is also positively associated with the academic results of the university.

Keyword: higher education, public university, Organizational development, Organizational life cycle

INTRODUCTION

The organizational life cycle theory has many appealing aspects as it uses metaphors generally used for living organisms to explain the sequential stages of firm growth and development. These stages present unique sets of effectiveness and difficulties that companies face throughout their life cycles. The description of these stages vary across different literatures however, a common assumption is that they experience transitions often initiated by crisis in the course of ‘improvement’. Nevertheless, fast growing small-medium sized ventures are no exceptions to these crises. Despite their successes in achieving high growth, if they do not adjust for constraints, they cannot sustain the growth rate that will eventually lead them to a downfall. Thus identifying the current life cycle stage of an organization is crucial for both the management and future plans. It is important that they recognize their competencies as well as constrains to overcome the growing pains in the future.

In reality, higher education institutions have long been regarded as centres of knowledge creation and application for the larger society, but not only as learning organizations developing and transferring knowledge for the improvement of their own basic processes. In their competitive environment throughout the world, universities should be given the
incentives to become active learning organizations or promote learning activities at organizational level to enhance the quality of teaching and doing research and getting sustainably developed.

Thus, the aim of this research is to analyse the faculty Performance in higher education institutions and clarify its antecedents and consequences. First, we consider faculty Performance as a process to analyse how the organizations promote learning. We then propose and test several hypotheses about its’ role as the mediator of faculty participation in decision-making and academic results using data collected from 100 employees in a public university in Moradabad. Finally, our findings and the implications for further study are discussed.

BACK GROUND AND THEORETICAL PART OF FRAMEWORK

A. The Organizational Life Cycle Stages
a. The Birth: The initial stage, called Birth, the company is trying to be possible. The main feature of young companies that are managed by their owners and structure are simple and informal. At this stage, scattered thoughts formed and the need for high levels of creativity. If during this period obligation and the practice is not and is not responsible organization, not be moved. In this step the company, the level of product innovation, remarkable service, limited market scope, informal organizational structure, the use of certain raw information in decision-making and the solutions are simple decisions.

b. Growth Stage- Growth stage, expected the company to establish its sector and in the production of differentiated skills to be successful. If the idea of the creation and growth of the organization, then optionally determine criteria at the stage of rapid growth, the system provides a chance to grow new ideas and creativity to develop, means the rapid growth of strong investment.

c. Maturity - Maturity by maintaining the level of sales, decreased level of innovation and making more administrative organizational structure is determined. At this point, the goals are homogeneous and efficient. New professional managers with the aim of creating and arming the organization to new systems, the quality of attention to the organization to reach maturity. At this stage, the level of innovation is low, decentralized ownership and shareholder dividends worth more to consider

d. Reduction Stage- The rebirth of the elaborate stage structure at this stage, the product and the market are varied and extended company structure part to accommodate more complex and more homogeneous markets in the fall. The emphasis is more complex control and planning systems. Innovation is a very system it is possible to obtain the markets or new products to seize young companies do. At this stage, the presence of executive power in the organization is essential that the organization is able to birth ideas to implement.

e. The Decline- In the final stage or dissolution, the market is stagnant and inactive, external challenges and a lack of earnings due to reduced innovation, and lead to the demise of the company. it the initial stage of aristocracy and bureaucracy with the weakening of the executive power, negative bureaucratic organization with a full and complete bureaucracy, only to follow the administrative system, is created and the system has become much subsystems and maximum distance from the environment arises.

B) faculty Performance in higher educational institute
This study provides important contributions. Unlike most prior studies investigating the research/teaching relationship, it explicitly considers the role of a performance evaluation system in providing incentives and motivations for academics. It challenges the conventional wisdom that research activity facilitates teaching effectiveness with a finding that only high-quality research enhances teaching quality. The performance measurements may be detrimental to quality teaching are discounted based on the finding that high-quality research is actually congruent with quality teaching. Following the introduction, contemporary performance evaluation trends in academia are outlined.

**Objective of study**

1. To study the Parameters which are affecting the organizational life cycle in higher education.
2. To analyze the Parameters which are affecting faculty performance in higher education

**Hypotheses**

H0: There is significant result are affecting the organizational life cycle in higher education.

H1: There is significant results are affecting the faculty performance in higher education.

**Research Methodology**

The researchers have attempted to try to approve this conviction. Hence, the principle of this research was to find the descriptive study between organization life cycle and Faculty Performance practices of the higher education in public university of the region Moradabad city.

The subject is chosen after thorough exercise of perusing different Journals, Online Articles and News, reaction from employees working in institute.

**Design/methodology/approach** – The research was designed out with the help of Questionnaire for Employees working in private university and higher education institute in Moradabad city.

The sample size of respondents for data collection was 100 from different OLC of the age group 25-60 years. The technique used for carrying out the research was mean score by likert scale.

**Primary**- The data was collected from the faculties working in private universities and Higher Education Institute in Moradabad city by a pre-designed Questionnaire.

**Secondary** – The data was collected from Journals, Articles and online sources.

**Data Collection**

The primary data was collected from the faculties working in private universities and Higher Education Institute in Moradabad city by a pre-designed Questionnaire.

The secondary data was collected from Journals, Articles and online sources. The sample for the current study demonstrates the following respondents under study. We chose Organisational Life Cycle parameters variable & faculty performance variable.
Table A) Parameters measured variable model of organizational life cycle

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter affecting OLC of Higher Education</th>
<th>Total respondents</th>
<th>Strongly agree</th>
<th>Agree</th>
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<td>3.</td>
<td>Student development targets</td>
<td>93</td>
<td>52</td>
<td>18</td>
<td>4</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>4.</td>
<td>Curriculum planning</td>
<td>92</td>
<td>50</td>
<td>20</td>
<td>3</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Innovation activities</td>
<td>98</td>
<td>52</td>
<td>22</td>
<td>10</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Collaboration &amp; Self Protection</td>
<td>85</td>
<td>32</td>
<td>22</td>
<td>5</td>
<td>18</td>
<td>8</td>
</tr>
</tbody>
</table>

Table: 1(B) Average Agreement at Each Level Regarding Organisational Life Cycle

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter affecting OLC of Higher Education</th>
<th>Total respondents</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Continuous learning</td>
<td>97</td>
<td>2.05</td>
</tr>
<tr>
<td>2.</td>
<td>Research activities</td>
<td>95</td>
<td>2.75</td>
</tr>
<tr>
<td>3.</td>
<td>Student development targets</td>
<td>93</td>
<td>2.00</td>
</tr>
<tr>
<td>4.</td>
<td>Curriculum planning</td>
<td>92</td>
<td>2.01</td>
</tr>
<tr>
<td>5.</td>
<td>Innovation activities</td>
<td>98</td>
<td>1.90</td>
</tr>
<tr>
<td>6.</td>
<td>Collaboration &amp; Self Protection</td>
<td>85</td>
<td>2.38</td>
</tr>
</tbody>
</table>

It is clearly mentioned from the Table 1(A) and Table1 (B) that the most noteworthy factor ensures research activity. It suggests that Suitable research activities are necessary for organisation growth and faculty development. From the table researcher get the highest rank estimated as 2.75 on the liker scale which implies that the respondents. Thus with different variables like Innovation activities likewise getting lowest rank 1.90 dimension of Weakness of Organisation This suggests that if organisation are able to organisation life cycle easily they are happy to work in present organizations.

The sample for the current study demonstrated the following respondents under academic study. We chose faculty performance in higher education as an independent Variable

Table: 2(A) Percentage of involvement in teaching activities
### Table: 2 (B) Average Agreements at Each Level Regarding Faculty Performance

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter affecting in faculty performance</th>
<th>Total respondents</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Strongly disagree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Updating courses</td>
<td>85</td>
<td>35</td>
<td>22</td>
<td>16</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Increasing my knowledge base</td>
<td>94</td>
<td>48</td>
<td>25</td>
<td>8</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>Planning course instruction</td>
<td>86</td>
<td>22</td>
<td>38</td>
<td>20</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Creating syllabi for courses</td>
<td>80</td>
<td>28</td>
<td>25</td>
<td>21</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>Assessment &amp; feedback to students</td>
<td>90</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Interaction with students</td>
<td>91</td>
<td>28</td>
<td>45</td>
<td>10</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>Professional development</td>
<td>93</td>
<td>44</td>
<td>27</td>
<td>8</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>Providing student opportunities</td>
<td>86</td>
<td>22</td>
<td>38</td>
<td>20</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>Assisting with student research</td>
<td>88</td>
<td>38</td>
<td>24</td>
<td>20</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>Comprehensive exams</td>
<td>92</td>
<td>46</td>
<td>25</td>
<td>8</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>Department activities</td>
<td>90</td>
<td>38</td>
<td>25</td>
<td>21</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>12.</td>
<td>Organising workshops</td>
<td>89</td>
<td>25</td>
<td>32</td>
<td>20</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>13.</td>
<td>New course development</td>
<td>88</td>
<td>38</td>
<td>24</td>
<td>20</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>Teach new course preparation</td>
<td>83</td>
<td>30</td>
<td>42</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
It is clearly mentioned from the Table 2(C) and Table 2(D) that as with teaching, activities and pursuits related to research are numerous. Tenured and tenure-track professors were asked to indicate whether they had engaged in various research activities as described; and, whether they had produced any research products typically measured as a sign of productivity. Research activities most frequently reported by faculty included engaging in scholarly professional development activities in Assessment & feedback to students getting highest rank 2.56 by the help of Likert scale. Thus with different variables like Teach new course preparation likewise getting lowest rank 1.84 dimension of Weakness of Faculty Performance. This suggests that if organisation are able to work on these factors that can be easily faculty are happy to work in present organizations.

**Conclusion**

The organizational life cycle process in higher educational universities has been explored and the influencing factors and its’ consequences were described. Those results help understanding more about OLC theory in the higher education settings. Further researches could address weaknesses seen in this paper to study more on organizational life cycle and faculty performance in larger context of private universities in Moradabad, empirically testing its relationship with other antecedents and consequences. Additional studies might explore variations in workload among disciplines as suggested and across differing types of higher institute. It seems imperative that as institutions are reshaped to meet the challenges of greatly reduced state funding that their faculties be at the centre of those processes of change. In what world does it make sense that expertise inherent in highly trained faculty of such universities is excluded from decision making processes in favour of state legislators and political players who, no matter how well intentioned, are basing their proposals on a set of assumptions that are greatly flawed, and who have little understanding of the consequences to students’ education likely to be unleashed by ill-founded reforms.

**Reference**


ECONOMIC ANALYSIS OF THE PERFORMANCE OF MGNREGA IN SHAHABAD BLOCK, ANANTNAG DISTRICT, JAMMU AND KASHMIR

MUHSIN MUKHTAR GANIE*

Abstract

The MGNREGA Act gives legal guarantee of at least 100 days of wage employment in a financial year to the rural households, whose adult members volunteer to do unskilled and manual work. All the rural households who are willing to take up unskilled labour are required to register with their respective village council (called Gram Panchayats) and are issued with a Job card. After receiving the job card, a household can demand work anytime and will be provided employment within 15 days of expressing demand, else will be compensated with a daily unemployment allowance (Government of India 2008).

Objectives: 1. To study the socio-economic condition of the sample respondents. 2. To assess the activities of the scheme in terms of income generation in the study area. 3. To analyze the days of work and income generated under the MGNREGA sample respondents.

Methodology: Simple Random Sampling method was adopted to select the Sample of 90 respondents.

Conclusion: The government provides 100 days of guarantee employment to a family during the financial year. The overall performance in getting the employment opportunities differ significantly, it could be seen under the three class intervals below-50, 51-75 and 76-100 days of employment. It was found that majority of the respondents 48 participated in the road maintenance activities. It was found that on an average, respondents worked 75 days of employment in one year (2012-13). It was found that the respondents on an average earned the wage income of Rs 9760 in one year.

Key Words: MGNREGA, Irrigation, Cropping Patterns, Crop Yields, Wages, Employment Women’s Participation, Agricultural labour

*Ph.D Research Scholar, Department of Economics, Bhagwant University, Ajmer Rajasthan
INTRODUCTION

India has more than three decades of experience in implementing different Employment Generation Programmes. These Programmes have their origin during the Great Depression days when western countries used these as counter cyclical policy instruments. Several countries of the developing world have also used Public Work Programmes to deal with droughts and famines. Over time these schemes have evolved into employment creation and Poverty alleviation Programmes. These Programmes have been used and advocated for alleviating both chronic and transient poverty in the South Asian context for a long time (Hirway, Saluja and Yadav, 2010).

The Act gives legal guarantee of at least 100 days of wage employment in a financial year to a rural house hold, whose adult members volunteer to do unskilled and manual work. All the rural households who are willing to take up unskilled labour are required to register with their respective village council (called Gram Panchayats) and are issued with a Job card. After receiving the job card, a household can demand work anytime and will be provided employment within 15 days of expressing demand, else will be compensated with a daily unemployment allowance (Government of India 2008). In some cases, rural households belonging to backward castes are allowed to perform work on their own fields. More importantly, the Act aims at eradication of extreme poverty and at making villages self-sustaining through productive asset creation (such as water tanks and soil conservation works). This is meant to regenerate the rural natural resource base, which in turn will result in sustainable livelihoods for residents. The scheme has been implemented in a phased manner. It was launched in two hundred selected districts on 2nd February 2006 in Phase I and was extended to 130 more districts in 2007-08 in Phase II. It was further extended to the remaining 285 districts from 1st April 2008 onwards, in Phase III. The government has referred to it as an “Act of the people, by the people, and for the people.

Before MGNREGA, time to time, different wage employment programmes were introduced in the country. The MGNREGA ranks first among the most powerful initiatives ever undertaken for transformation of rural livelihoods in India (Ghosh, 2011). MGNREGA has come after almost 56 years of experience of other rural employment programmes, which include both Centrally Sponsored Schemes and those launched by State Govt. These comprise the National Rural Employment Programme (NREP) 1980-89; Rural Landless Employment Guarantee Programme (RLEGP) 1983-89; Jawahar Rojgar Yojana (JRY) 1989-90; Employment Assurance Scheme (EAS)1993-99; Jawahar Gram Samridhi Yojana (JGSY) 1999-2002; Sampoorna Grameen Rojgar Yojana (SGRY) from 2001; National Food For Work Programme (NFFWP) from 2004 were National Rural Employment Schemes. Among these, the SGRY and NFFWP have been merged with NREGA in 2005. In many ways the MGNREGA is a replication of earlier schemes with a legal guarantee. The most critical difference now is that people’s entitlement, by law, the employment is mandated through MGNREGA. While other programmes are allocation-based, MGNREGA is demand-driven (Dreze).

The state of Jammu and Kashmir is the prominent state in the Indian union. The state comprises three divisions namely, Jammu, Kashmir and Ladakh and for administrative purposes, It has been demarcated into two divisions, i.e. Kashmir and Jammu spread over 12 and 10 districts respectively. There are 121 Community Development Blocks, 2661...
Panchayats & 6652 villages. In Jammu and Kashmir the implementation of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has been done in various phases. In the first phase, three districts, viz. Poonch, Doda and Kupwara were brought within the ambit of this Scheme which has been extended to the districts of Anantnag and Jammu during phase second. The programme was extended to all the remaining districts by April, 2008. As envisaged in the Act, the Scheme is being implemented on a cost sharing basis between the Centre and the State in the ratio of 90:10. In District Pulwama MGNREGA has been implemented in third phase that is, 7th April 2008 in the year and has been extended to the various blocks in the same year.

REVIEW OF LITERATURE

Chhaya Datar (2007) has explained and compared the two schemes of MEGS and NREGA. The study portrays why the rural employment guarantee scheme failed in Maharashtra in 1976. The study has pointed out various irregularities in the execution of the scheme. The Sarpanch and Gram Sevaks receive a large sum of money to develop village assets. But they resist strongly because of the increased burden and the lack of kickbacks through the contractor. The organizations in Maharashtra have been moulded in old time politics of demanding and protesting against the state but are not used to the politics of participation of the people to override the state.

Dreze (2007) looks at the corruption in rural employment programs in Orissa and how this has continued in a NREGS as well. However, he believes that there is tremendous potential of NREGA in the survey areas. Where work was available, it was generally found that workers earned close to (and sometimes more than) the statutory minimum wage of Rs 70 per day, and that wages were paid within 15 days or so. This is an unprecedented opportunity for the rural poor, and there was evident appreciation of it among casual labourers and other disadvantaged sections of the population. There is the hope among workers that NREGA would enable them to avoid long-distance seasonal migration. Further, there is plenty of scope for productive NREGA works in this area, whether it is in the field of water conservation, rural connectivity, regeneration of forest land, or improvement of private agricultural land.

Krishna Murty (2006) has dealt with the employment guarantee programme from the perspective of responding to sudden (and rapid) onset of events like economic crises, natural and man-made. The impact of such local disasters/crisis is large. Hence, the author addressed the disaster management strategies in India. This platform of NREGS could be used for mitigating the impact of disasters. The National Rural Employment Guarantee Scheme must have the built-in elasticity and capacity to respond to disasters and crisis, particularly those of a localized nature, by expanding wage employment opportunities with minimum loss of time and aiding the recovery of the affected local economy.

Vidhiya Das and Pramod Pradhan (2007) have explored the execution in NREGA and process in empowering and offering benefits to tribal people. The author has appreciated the government for taking several progressive steps. Further they devised not to sit back and count its laurels. The government of Orrisa must rise to the occasion and take immediate step to stop this most hypothetical and cruel joke on its poorest and most vulnerable communities.

Vinayak Reddy (2007) has adopted descriptive research design and used the available literature related to Rural Employment Guarantee Scheme in the state of Orrisa. The author
has observed that in a country where we have no unemployment insurance and social security, there is no better alternative than the public works programmes for many unorganized sectors. NREGA has emerged as biggest social security programme for the unorganised workers. These efforts require reorientation of the several institutions and policies and adoption of new strategies to achieve the objectives of national rural employment guarantee programme more effectively for inclusive growth as emphasized in the eleventh plan document.

OBJECTIVES

1. To study the socio-economic condition of the sample respondents in the study area.
2. To assess the activities of the scheme in terms of income generation in the study area.
3. To analyze the days of work and income generated under the MGNREGA sample respondents.

METHODOLOGY

In order to study the Economic Analysis of the Performance of MGNREGA, Shahabad block was selected from Anantnag district of the Jammu and Kashmir. The data was collected from two villages of Shahabad block namely Hardu Shichan (village V1) and Qamar (village V2). Simple Random Sampling method was adopted to select the Sample of 90 respondents. A sample of 45 respondents was selected from the two selected villages and a total sample of 90 respondents was selected for the present study.

ANALYSIS AND DISCUSSIONS

Table -1
Education-Wise Classification of the Respondents

<table>
<thead>
<tr>
<th>S. No</th>
<th>Education</th>
<th>Villages</th>
<th>V1</th>
<th>V2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Illiterate</td>
<td></td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(8.9)</td>
<td>(6.7)</td>
<td>(7.8)</td>
</tr>
<tr>
<td>2.</td>
<td>Primary Education</td>
<td></td>
<td>9</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(20)</td>
<td>(2.2)</td>
<td>(11.1)</td>
</tr>
<tr>
<td>3.</td>
<td>Middle Education</td>
<td></td>
<td>7</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(15.5)</td>
<td>(13.3)</td>
<td>(14.5)</td>
</tr>
<tr>
<td>4.</td>
<td>Secondary Education</td>
<td></td>
<td>13</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(28.9)</td>
<td>(40)</td>
<td>(34.4)</td>
</tr>
<tr>
<td>5.</td>
<td>Higher Secondary</td>
<td></td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td></td>
<td>(20)</td>
<td>(20)</td>
<td>(20)</td>
</tr>
<tr>
<td>6.</td>
<td>Collegiate Education</td>
<td></td>
<td>3</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(6.7)</td>
<td>(17.8)</td>
<td>(12.2)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>45</td>
<td>45</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data

Note: Figures in the parentheses denotes percentages to the column total

Table-1 shows the education wise classification of the respondents. Out of the 90 respondents, 10 respondents had completed their primary education followed by 13 respondents who had completed their middle education. 31 respondents had completed their secondary education and 18 respondents had completed their higher secondary education in the study area. 11 respondents were graduates. Only few respondents were illiterate.
Table-2

<table>
<thead>
<tr>
<th>S. No</th>
<th>Sex</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>Male</td>
<td>38 (84.4)</td>
<td>35 (88.9)</td>
</tr>
<tr>
<td>2.</td>
<td>Female</td>
<td>7 (15.6)</td>
<td>10 (11.1)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45 (100)</td>
<td>45 (100)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data
Note: Figures in the parentheses denotes percentages to the column total

Table-2 shows the gender wise classification of sample respondents in the study area. Out of the 90 sample respondents, majority of respondents is 73 which belong to male category, in this total 38 respondents are in V1 and 35 respondents are in V2. 17 respondents are females, in this total, 7 respondents are in V1 and 10 respondents are in V2.

Table-3

<table>
<thead>
<tr>
<th>S. No</th>
<th>Age</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>18-30 years</td>
<td>7 (15.6)</td>
<td>11 (24.5)</td>
</tr>
<tr>
<td>2.</td>
<td>31-45 years</td>
<td>21 (46.7)</td>
<td>17 (37.8)</td>
</tr>
<tr>
<td>3.</td>
<td>46-60 years</td>
<td>10 (22.2)</td>
<td>11 (24.4)</td>
</tr>
<tr>
<td>4.</td>
<td>Above-61 years</td>
<td>7 (15.5)</td>
<td>6 (13.3)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45 (100)</td>
<td>45 (100)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data
Note: Figures in the parentheses denotes percentages to the column total

Age determines the active participation of the community in promoting their economic and education position. Table-3 shows that out of 90 samples respondents, majority of respondents 38 were between 31-41 age-group, in this total, 21 respondents are in V1 and 17 respondents are in V2. 21 respondents were between the 46-60 age group, in this total, 10 are in V1 and 11 are in V2. 18 respondents were between 18-30 age group, in this total, 7 respondents were in V1 and 11 in V2. 13 respondents were above 61years, in this total 7 respondents were in V1 and 6 respondents in V2.
### Table-4 Average Annual Household Income

<table>
<thead>
<tr>
<th>S. No</th>
<th>Income</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>Agriculture</td>
<td>161100</td>
<td>282600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(36.8)</td>
<td>(52.9)</td>
</tr>
<tr>
<td>2.</td>
<td>Agricultural Labor</td>
<td>588800</td>
<td>76400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.4)</td>
<td>(14)</td>
</tr>
<tr>
<td>3.</td>
<td>Daily Wages</td>
<td>83600</td>
<td>101600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(19.1)</td>
<td>(19.0)</td>
</tr>
<tr>
<td>4.</td>
<td>Business</td>
<td>46200</td>
<td>36800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.5)</td>
<td>(6.9)</td>
</tr>
<tr>
<td>5.</td>
<td>Private Employment</td>
<td>3200</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.7)</td>
<td>(0.7)</td>
</tr>
<tr>
<td>6.</td>
<td>Government Employment</td>
<td>85300</td>
<td>32500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(19.5)</td>
<td>(6.1)</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>438200</strong></td>
<td><strong>174900</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>(100)</strong></td>
<td><strong>(100)</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from primary data

**Note:** Figures in the parentheses denotes percentages to the column total.

Household income is one of the proxy indicators in assessing the levels of development of the households. Table-4 portrays the sources of household’s income of the sample respondents. The sources of household annual income come from six sources of the study area. On an average, per household income is Rs 486100. Where the highest source of income comes from agriculture (45.6%). Daily wage stands as a second source of income (19.1%), contributes more towards other sources. Income from agricultural labour is (14%) to the total income. They are involved in agricultural operations, such as sowing of seeds, transplantation, weeding out, manuring, harvesting etc. A few of them involve themselves in tailoring, running shops, embroidery, shawl making, poultry farms and fish farms which come under business. Income from government employment is (12.1%). Income from business is (8.5%). The income from private employment is (0.7%). Private employment includes textile labourers. Mainly they work in the manufacturing of inner garments industries, hotels and small scale industries, private schools, networking companies etc.

### Table-5 Average Annual Household Expenditure

<table>
<thead>
<tr>
<th>S. No</th>
<th>Expenditure</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>Food</td>
<td>64800</td>
<td>77100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50.9)</td>
<td>(55.1)</td>
</tr>
<tr>
<td>2.</td>
<td>Dress</td>
<td>28000</td>
<td>31600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(22.1)</td>
<td>(22.6)</td>
</tr>
<tr>
<td>3.</td>
<td>Education</td>
<td>25200</td>
<td>22200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(19.8)</td>
<td>(16)</td>
</tr>
<tr>
<td>4.</td>
<td>Electricity</td>
<td>5700</td>
<td>5700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.5)</td>
<td>(4)</td>
</tr>
<tr>
<td>5.</td>
<td>Health</td>
<td>3500</td>
<td>3200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.7)</td>
<td>(2.3)</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>127200</strong></td>
<td><strong>139800</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>(100)</strong></td>
<td><strong>(100)</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from primary data

**Note:** Figures in the parentheses denotes percentages to the column total
Food expenditure pattern of the households is the best indicator of the existing economic condition of a community. The villagers have to spend for Food, Dress, Education, Electricity, Health and Others. Table-5 shows that on an average, the annual family expenditure stood at Rs133400. They have to spend the same for Food (53.1%), Dress (22.3%), Education (17.8%), Electricity (4.3%). Next to this they spent on Health (2.5%). Same pattern of expenditure could be observed in both villages. The sample respondents spent (17.8%) on education, which is to be appreciated. Education may bring awareness to the people in utilizing the government programmes like NREGA there by strengthening the available resources.

Table 6

<table>
<thead>
<tr>
<th>S. No</th>
<th>Annual Family Saving</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>Post Office Saving</td>
<td>1500 (1.2)</td>
<td>1100 (1.2)</td>
</tr>
<tr>
<td>2.</td>
<td>Bank Deposits</td>
<td>82000 (60.8)</td>
<td>52000 (56.1)</td>
</tr>
<tr>
<td>3.</td>
<td>Cash</td>
<td>39000 (28.9)</td>
<td>32400 (35.0)</td>
</tr>
<tr>
<td>4.</td>
<td>Private Saving</td>
<td>7400 (5.5)</td>
<td>4400 (4.8)</td>
</tr>
<tr>
<td>5.</td>
<td>Life Insurance</td>
<td>4900 (3.6)</td>
<td>2600 (2.9)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>134800 (100)</td>
<td>92500 (100)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data
Note: Figures in the parentheses denotes percentages to the column total

Table 7

Performance of MGNREGA Activities of the Sample Respondents

<table>
<thead>
<tr>
<th>Nature of work</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of working days</td>
<td>N=45</td>
<td>N=45</td>
</tr>
<tr>
<td>Below-50</td>
<td>4 (44)</td>
<td>3 (47)</td>
</tr>
<tr>
<td>51-75</td>
<td>7 (55)</td>
<td>6 (63)</td>
</tr>
<tr>
<td>76-100</td>
<td>14 (87)</td>
<td>14 (89)</td>
</tr>
<tr>
<td>Total</td>
<td>25 (71)</td>
<td>23 (77)</td>
</tr>
<tr>
<td>Road Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canal slit Removal</td>
<td>2 (38)</td>
<td>2 (43)</td>
</tr>
<tr>
<td>Drain Construction</td>
<td>2 (37)</td>
<td>2 (44)</td>
</tr>
<tr>
<td>Total</td>
<td>8 (41)</td>
<td>7 (45)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data
Note: Figures in parentheses denote average working days
Table-7 reveals the average number of days worked in asset creation activities in the villages V1 and V2. In V1 out of the 45 respondents, the majority of the respondents 25 worked in the road maintenance. On an average 25 respondents worked 71 days of employment. 13 respondents worked in canal slit removal, and on an average they worked 73 days of employment. And 7 respondents worked in drain construction, and on an average they worked 70 days of employment. All the 45 respondents on an average worked 71 days in all the three activities of work. In village V2 out of the 45 respondents, the majority of the respondents 23 worked in road maintenance category. On an average these respondents worked 77 days of employment. 13 respondents worked in canal slit removal and on an average they worked 79 days of employment. Only 9 respondents worked in drain construction and on an average they worked 75 days of employment. All the 45 respondents worked on an average 77 days of employment. On comparing both the villages, the respondents of the village V2 worked more number of days as compared to the respondents of the village V1. This is because the village V1 is near to town and the people of the village went to town for doing other jobs at higher wage rates. On the other hand, the village V2 is a far flung village and the respondents of the village have least opportunities for other jobs. This is the main cause for doing more days of work in village V2 and less number of days of work in V2.

Table-8
Income and Performance of MGNREGA in the Sample Study Area

<table>
<thead>
<tr>
<th>Nature of work</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=45</td>
<td>N=45</td>
</tr>
<tr>
<td></td>
<td>Average Wage Income</td>
<td>Average Wage Income</td>
</tr>
<tr>
<td></td>
<td>Below- Rs 6550</td>
<td>Rs 6551- 9825</td>
</tr>
<tr>
<td>Road Maintenance</td>
<td>4 (5764)</td>
<td>7 (7205)</td>
</tr>
<tr>
<td>Canal slit Removal</td>
<td>2 (4978)</td>
<td>4 (9039)</td>
</tr>
<tr>
<td>Drain Construction</td>
<td>2 (4847)</td>
<td>2 (9039)</td>
</tr>
<tr>
<td>Total</td>
<td>8 (5371)</td>
<td>13 (8122)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data

Note: Figures in parentheses denote average wage income

Table-8 shows the average wage income earned by the sample respondents from the activities of MGNREGA in villages V1 and V2. In V1 out of the 45 respondents, the majority of the respondents 25 worked in the road maintenance. On an average they earned Rs 9301. 13 respondents worked in canal slit removal, and on an average they earned the wage amount Rs 9563. And 7 respondents worked in drain construction, and on an average they earned the wage amount of Rs 9170. All the 45 respondents on an average earned wage amount of Rs 9432. In village V2 out of the 45 respondents, the majority of the respondents 23 worked in road maintenance category. On an average these respondents earned the wage amount of Rs 10087. 13 respondents worked in canal slit removal and on an average they earned the wage amount of Rs 10349. Only 9 respondents worked in drain construction and on an average...
they earned the wage amount of Rs 9825. All the 45 respondents worked on an average earned the wage amount of Rs 10087. On comparing both the villages, the respondents of the village V2 earned more wage amount as compared to the respondents of the village V1. This is because the village V1 is near to town and the people of the village went to town for doing other jobs at higher wage rates. On the other hand, the village V2 is a far flung village and the respondents of the village have least opportunities for other jobs. This is the main cause for doing more days of MGNREGA works in village V2 and less number of days of work in V1.

Table-9
Age-Group Wise Participation of the Respondents in the MGNREGA Activities

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Age in Years</th>
<th>V1 N=45</th>
<th>V2 N=45</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Working Days</td>
<td>Working Days</td>
</tr>
<tr>
<td></td>
<td>Below-50</td>
<td>51-75</td>
<td>76-100</td>
</tr>
<tr>
<td>1.</td>
<td>18-30</td>
<td>2 (83)</td>
<td>2 (111)</td>
</tr>
<tr>
<td>2.</td>
<td>31-45</td>
<td>3 (135)</td>
<td>6 (377)</td>
</tr>
<tr>
<td>3.</td>
<td>46-60</td>
<td>2 (72)</td>
<td>5 (349)</td>
</tr>
<tr>
<td>4.</td>
<td>Above 61</td>
<td>2 (72)</td>
<td>3 (217)</td>
</tr>
<tr>
<td>Total</td>
<td>9 (362)</td>
<td>16 (1054)</td>
<td>20 (1778)</td>
</tr>
</tbody>
</table>

Source: Computed from primary data
Note: Figures in the parentheses are total number of days.

Table-9 shows the total number of respondents worked under the age group of respondents in the activities of MGNREGA in villages V1 and V2. In V1 out of the 45 respondents, the majority of the respondents are 21 come under the age group of 31-45 and they worked 568 days. 10 respondents are under the age group of 46-60 and they worked 688 days. 7 respondents come under the age group of 18-30 years and they worked the 463 days. 7 respondents come under the age group of above 61 years and they worked 475 days. All the 45 respondents worked 3194 days of employment. In village V2 out of the 45 respondents, the majority of the respondents are 17 which come under the age group of 31-45 and they worked 1323 days. 11 respondents come under the age group of 46-60 and they worked 909 days. 11 respondents worked under the age group of 18-30 years and they worked the 860 days. 3 respondents come under the age group of above 61 years and they worked 462 days. All the 45 respondents worked 3554 days of employment. In both the villages, the majority of the respondents come under the age group of 31-45 and 46-60 years and worked more days of employment, because these were the middle aged respondents and they are busy with their family matters and has no other options to go outside for other works .alternatives of work.
### Table-10

#### Days of Employment Generated by Respondents from MGNREGA Per annum

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Days</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1.</td>
<td>Below 50</td>
<td>8 (41)</td>
<td>7 (45)</td>
</tr>
<tr>
<td>2.</td>
<td>51-75</td>
<td>13 (62)</td>
<td>12 (67)</td>
</tr>
<tr>
<td>3.</td>
<td>76-100</td>
<td>24 (87)</td>
<td>26 (90)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>45</strong> (72)</td>
<td><strong>45</strong> (77)</td>
</tr>
</tbody>
</table>

**Source:** Computed from primary data  
**Note:** Figures in parentheses denote average working days

Table-10 shows the number of days of employment availed by the sample respondents in the study area. This table gives an idea why the respondents have not opted for all the days of employment. After reading the data, it has been grouped into three classes. It is interested to note that in all the classes there are entries. It reveals that the sample respondents have availed the employment depending on their need. On comparing both the villages, the respondents of the village V2 worked more number of days as compared to the respondents of the village V1. This is because, the village V1 is near to town and the people of the village went to town for doing other jobs at higher wage rates. On the other hand, the village V2 is a far flung village and the respondents of the village have least opportunities for other jobs. This is the main cause for doing more days of work in village V2 and less number of days of work in V2. The total 90 respondents on an average worked 75 days of employment in one year in the study area.

### Table-11

#### Wage Income Generated by Respondents from MGNREGA Per annum

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Wage Income</th>
<th>Villages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>V2</td>
</tr>
<tr>
<td>1</td>
<td>Below 6550</td>
<td>8 (5371)</td>
<td>7 (5895)</td>
</tr>
<tr>
<td>2</td>
<td>6551-9825</td>
<td>13 (8122)</td>
<td>12 (8777)</td>
</tr>
<tr>
<td>3</td>
<td>9826-13100</td>
<td>24 (11397)</td>
<td>26 (11790)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>45</strong> (9432)</td>
<td><strong>45</strong> (10087)</td>
</tr>
</tbody>
</table>

**Source:** Computed from primary data  
**Note:** Figures in parentheses denote average wage income

Table-11 shows the Wage income earned by the sample respondents from the MGNREGA works. The wage income of respondents is categorised into three classes. In V1 out of the 45 respondents the majority of the respondents are 24 and they come under the income category of below Rs 6550.13 respondents come under the income category Rs 6551-9825. 8 respondents come under the income category of Rs 5371. In V2 out of the 45
respondents the majority of the respondents are 50 and they come under the income category of Rs 9826-13100. 25 respondents come under the income category Rs 6551-9825.15 respondents come under the income category of Rs 5371. The respondents of the V2 earned more wage income as compared to the V1 because the respondents of the village V1 went to the town to search for other jobs at high market wages. On the other hand the V2 is a far flung village and the respondents cannot search other jobs. They take part actively in MGNREGA works. All the 90 respondents on an average earned wage income of Rs 9760.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Payment of wages</th>
<th>V1</th>
<th>V2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Availing weekly wage payment?</td>
<td>3</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>2.</td>
<td>Recording the wage payment on the muster roll and job card?</td>
<td>37</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>3.</td>
<td>As per the guidelines and measurement, wages are given?</td>
<td>42</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>4.</td>
<td>Availed wages within 15 days?</td>
<td>30</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>5.</td>
<td>Received wages on the work spot?</td>
<td>2</td>
<td>43</td>
<td>40</td>
</tr>
<tr>
<td>6.</td>
<td>Received wages in the panchayat office?</td>
<td>-</td>
<td>45</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Received wages through bank?</td>
<td>45</td>
<td>-</td>
<td>45</td>
</tr>
</tbody>
</table>

**Source:** Computed from primary data

**Note:** Figures in parentheses denote percentages to row total.

Table-12 Shows the number of respondents giving answers to the questions regarding the payment of wages received in the study area. About the answer of the question (1) Availing weekly wage payments? Out of the 90 respondents, 10 respondents answer was Yes and 80 respondents answer was No. About the answer of the question (2) Recording the wage payment on the muster roll and job card? Out of the 90 respondents, 73 respondents answer was Yes and 17 respondents answer was No. About the answer of the question (3) As per the guidelines and measurement, wages are given? Out of the 90 respondents, 77 respondents answer was Yes and 33 respondents answer was No. About the answer of the question (4) Availed wages within 15 days? Out of the 90 respondents, 63 respondents answer was Yes and 27 respondents answer was No. About the answer of the question (5) Received wages on the work spot? out of the 90 respondents, 42 respondents answer was Yes and 48 respondents answer was No. About the answer of the question (6) Received wages in the panchayat office? Out of the 90 respondents, 90 respondents answer was No. About the answer of the question (7) Received wages through bank? Out of the 90 respondents, 90 respondents answer was Yes.

**MAJOR FINDINGS**

1. It was found that majority of the respondents belong to middle class age group (42.2%) where young and aged constitutes less comparatively.
2. It was found that majority of the sample respondents (86.7%) were males and (13.3%)
of the respondents were females.

3. The household members are scattered in all educational categories from primary level education to collegiate. Majority of the respondents are educated up to secondary (34.4%) percent and higher secondary school level (20%).

4. Majority of sample respondents (32.2%) were agricultural labourers, (27.8%) of them were daily wagers, businessman (24.4%) and farmers (15.6%).

5. On an average, per household annual income is Rs 486100 where income from agriculture is (45.6%) and from daily wage earner is (19.5%) contributes more towards other sources.

6. On an average, per household annual expenditure stood at Rs 133400 and they have spent the same for food (53.1 %), dress (22.3%) and education (17.8%) respectively.

7. On an average, per household annual savings is Rs 113600 where majority of savings is as bank deposits (58.9%) and as cash is (31.4%).

8. The scheme also creates vital physical assets in the villages, where they renovate, build and rebuild the existing infrastructure in the rural areas aiming to enhance the agricultural productivity. Physical assets like road maintenance, canal slit removal and drain construction has been created under this programme with a view to filling in the critical infrastructural gaps in rural areas and enhancing the quality of life of rural people.

9. The government provides 100 days of guarantee employment to a family during the financial year. The overall performance in getting the employment opportunities differ significantly, it could be seen under the three class intervals below 50, 51-75 and 76-100 days of employment.

10. It was found that majority of the respondents 48 participated in the road maintenance activities.

11. It was found that on an average, respondents worked 75 days of employment in one year (2012-13).

12. It was found that the respondents on an average earned the wage income of Rs 9760 in one year (2012-13).

13. It was found that only 2 female respondents between the age group of 18-30 years participated in the MGNREGA works.

POLICY SUGGESTIONS

1. The MGNREGA provides 100 days of employment to the rural households during one year which is not sufficient for them. The days of employment should be increased, so that the people will get the employment during the lean agricultural season when employment opportunities shrink.

2. The act aims at eradication of extreme poverty and at making villagers self sustaining through productive asset creation. For this purpose the government should give the first priority in issuing the job cards to the weaker sections of the society i.e the people living under below poverty line.

3. The wage rate has to be revised regularly on par with the local wages, considering the general level of prices. These steps attract the labour force and also produce or strengthen the infrastructure and utilize the earmarked fund within the stipulated period.

4. There is a practice in giving attendance and not doing the assigned work effectively or
taking rest and going home. The practice is noticed in the study area at different levels with the co-operation of all the stake holders. Steps should be taken immediately and the institutions have to ensure the utilization of the scheme.

References


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WEB MINING TECHNIQUES FOR KNOWLEDGE DISCOVERY AND ITS IMPORTANT IN BUSINESS INTELLIGENCE: A STUDY

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¹²Shri Venkateshwara University, Gajraula (Uttar Pradesh)

Abstract

This Research analyzes past examples of overcoming adversity, the ebb and flow endeavors, and future headings of ‘Web mining’ as an application for business computing. Models are given in various business angles, for example, item proposals, misrepresentation recognition, process mining, stock management, and how the utilization of Web mining will empower development income, limit expenses, and upgrade vital vision. Holes in existing technology are likewise clarified, along with pointers to future bearings. Web mining is the utilization of data mining techniques to extricate knowledge from Web data, including Web reports, hyperlinks among records, and use logs of Web locales. The proposal for utilizing web mining techniques can be connected effectively with a sharp analysis of plainly comprehended business needs and prerequisites. Additionally, one all the more administering element is the measure of data, as the data is voluminous. The outcomes can be more towards the right patterns and examples to be anticipated from the given arrangement of data.

1. OVERVIEW

We live in a data-driven world, the immediate consequence of approaches in information and communication technologies. A large number of resources for knowledge are made conceivable gratitude to the Internet and Web 2.0 coordinated effort technologies. Never again do we live in disconnection from immense measures of data. The Information and Communication Technologies unrest gave us comfort and simple entry to information, versatile communications, and even conceivable commitment to this measure of information. Additionally, the need for information from these huge measures of data is much all the more squeezing for undertakings. Mining information from crude data is a very crucial and repetitive procedure in the present information-driven world. Endeavors today depend on a lot of computerized apparatuses for knowledge discovery to pick up business understanding and intelligence.

Numerous parts of knowledge discovery devices were created to help the present aggressive business markets flourish in the time of information. World’s electronic economy has likewise pressed endeavors to adjust to such new business condition. Principle apparatuses for getting information from these large sums are computerized mining devices, explicitly data mining, content mining, and web mining. Data Mining (DM) is characterized as the way toward investigating huge databases, more often than not data distribution centers or internet, to find new information, shrouded examples, and practices.

In real-time data, technology has created and utilized an extensive measure of databases and put away huge data in different areas. The research in databases and data technology has offered to ascend to a way to deal with store and control this valuable data for further basic leadership [1]. Data mining is a process of removing already obscure and process capable data from substantial databases and utilizing it to settle on important business choices. It is additionally called a knowledge discovery process; Data mining ought to be utilized only for the discovery phase of the KDD process.

Data mining is the center piece of the knowledge discovery process. In this, the process may comprise of the accompanying advances Data choice, Data cleaning, Data change, design looking (data mining), discovering an introduction, discovering elucidation and discovering

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assessment. Data mining and KDD frequently utilized conversely because Data mining is the key piece of the KDD process[2]. The term Knowledge Discovery in Databases or KDD for short alludes to the wide process of discovering knowledge in data and stresses the "abnormal state" utilization of specific data mining methods.

It is important to researchers in AI, design acknowledgment, databases, measurements, man-made consciousness, knowledge securing for master systems, and data perception. The binding together objective of the KDD process is to remove knowledge from data with regards to extensive databases. It does this by utilizing data mining methods(algorithms) to extricate (distinguish) what is esteemed knowledge, as per the particulars of measures and edges, utilizing a database alongside any required preprocessing, sub testing, and changes of that database.

**KDD process**

The knowledge discovery process is iterative and interactive, consisting of nine steps [3]. Note that the process is iterative at each step, meaning that moving back to previous steps may be required. So it is required to understand the process and the different needs and possibilities in each step. A typical knowledge discovery process and the process is elaborated in each step

- Developing an understanding of the application domain
- Selecting and creating a data set on which discovery will be performed.
- Preprocessing and cleansing.
- Choosing the appropriate Data Mining task.
- Choosing the Data Mining algorithm.
- Employing the Data Mining algorithm.
- Evaluation.
- Using the discovered knowledge.

The terms of knowledge discovery and data mining are unmistakable. KDD alludes to the general process of finding helpful knowledge from data. It includes the assessment and perhaps elucidation of the examples to settle on the choice of what qualifies as knowledge. It likewise incorporates the decision of encoding plans, preprocessing, inspecting, and projections of the data before the data mining step. Data mining alludes to the use of calculations for separating designs from data without the extra strides of the KDD process.

**2. HOW WEB MINING CAN ENHANCE MAJOR BUSINESS FUNCTIONS**

This section discusses existing and potential efforts in the application of Web mining techniques to the major functional areas of businesses. Some examples of deployed systems as well as frameworks for emerging applications yet-to-be-built are discussed. However, the examples are no means to be regarded as solutions to all problems within the framework of business function they are cited in. Their purpose is to illustrate that Web mining techniques have been applied successfully to handle certain kind of problems, providing the evidence of its utility[3-6].

**Marketing**

Marketing is typically defined as: "Marketing is the ongoing process of moving people closer to making a decision to purchase, use, follow or conform to someone else's products, services or values. Simply, if it doesn't facilitate a 'sale', then it's not marketing" Marketing is responsible for keeping the enterprise attentive to market trends, as well as keeping the sales unit aware of where the target segment is. In the following examples, we illustrate how Web
mining techniques have been used for marketing products to a customer and also to identify possible new areas of potential market for an enterprise.

**Product recommendations**

Prescribing items to buy is a key issue for all businesses. As the customer-driven methodology drives the present business models, customary physical stores need to depend on data gathered unequivocally from customers through studies to offer customer-driven proposals. In any case, the approach of web-based business not just empowers a dimension of closeness in customer-to-store connection (that is far more noteworthy than conceivable in the physical world), yet in addition prompts remarkable data collection, particularly about the 'process of shopping'.

**Product area and trend analysis**

"With the past, we can see directions into the future - both cataclysmic and imaginative projections." Businesses might want to see such projections onto what's to come. Extraordinarily, recognizing new product regions dependent on patterns is key for any business to catch markets. Expectation utilizing pattern analysis for another item more often than not addresses two sorts of issues. Also, a solitary item may result in a stage to build up a class of items that have a high potential market.

**Human resources**

In any enterprise, the expansive duty of the Human Resource office is to coordinate the privilege gifted workforce with the correct capacity effectively. HR is likewise mindful of building up strategies, rules and to give tools to representatives and management to empower a wonderful work air, solid culture, sound, and spare condition, and to guarantee that the company's representatives are reliably getting roused. The accompanying application looks at how to adequately oversee human resource office by keeping up the perfect measure of the workforce as far as post-viability. It shows the utilization of Web mining techniques to lessen pointless human remaining task at hand.

**Sales management**

In an enterprise, sales are a key responsible function that sells the enterprise’s core-competency to customers, usually, with the final goal of bringing in and maximizing revenue from them. As is intuitive, in order to maximize the sales revenue, it is important to both bring in the customers to door, as well as to execute a good sales and operations management strategy, thus resulting in the final sale. Identification of new sales opportunities and the associated risks plays a crucial role in deciding new projects.

**Business opportunity risk evolution**

With developing aggressive markets, better comprehension of customer's necessities and coordinating those to the enterprise's contributions have picked up unmistakable quality in an enterprise's basic leadership processes.

3. **BUSINESS PROCESS MANAGEMENT IN MINING**

The term Business Process Management (or BPM) alludes to exercises performed by businesses to upgrade and adjust their processes. Any business exchange can be modeled as an arrangement of processes that are intended to play out some particular assignments by increasing the value of the entire exchange. There can be many bottleneck processes in business exchange, and these bottlenecks can seriously hinder the entire exchange. It is fundamental to decide these bottlenecks in a process with the goal that we can overhaul the business process model and, in this way,, improve limit usage, throughput rate, and process time. Business Process Management itself contains overseeing plan, execution, and observing of a process.
In the accompanying precedent, we show how Web mining techniques can be connected to occasion logs from different processes to grow better models for various processes. Business process mining, additionally called work process mining, uncovers how existing processes work and, in this manner giving significant ROI (PMR). Business process mining is the errand of extricating helpful information from business occasion logs gathered by Workflow Management Systems, for example, IBM's WebSphere and SAP R/3. ProM, EMiT and Thumb are a few instances of business process mining tools.

4. THE FUTURE OF WEB MINING IN BUSINESS
We believe that the future of Web mining is entwined with the emerging needs of businesses, and the development of techniques fuelled by the recognition of gaps or areas of improvement in existing techniques. This section examines what is on the horizon for Web mining, the nascent areas currently under research, and how they can help in a business computing setting.

Micro Formats
It is critical to not exclusively to exhibit the correct content on a Web website, yet also in the correct arrangement. For instance, an initial phase in organizing for the Web was the utilization of to give the program's capacity to parse and show a message in a progressively clear and satisfactory organization. Be that as it may, researchers before long created configurations with higher semantics and adequacy.

5. WEB MINING: A KEY TO IMPROVE BUSINESS ON WEB
The information on the internet is in the form of static and dynamic web pages of various areas from education, industry to every walk of life including blogs. As per the web sites’ survey more than 160,000,000 web sites are having interned, intra linked web pages. The speed of increase of web information is rapid. The hidden knowledge discovery, patterns and trends of user access can be found from the way the web sites and web pages are accessed and it is useful from the business perspective giving future directions for decision making. The Data Mining techniques help in identifying the patterns implying the future trends in the studied data.

The Web Mining is an application of the data mining techniques to find interesting and potentially useful knowledge from web data. Infinite web pages are either used or unused by users adding to large volume of space and their occurrence in web searches. 30-40% web pages are having duplication of the content approx. Best estimate of unique static HTML pages is in billions from widely used search engines such as Yahoo, Google and increase continually. The following table shows the facts of web sites increase from 1995 till February 2008.

6. KDD FOR BUSINESS INTELLIGENCE
Over the past few decades, the industrialized economy has been going through a transformation from being based on natural resources to being based on intellectual assets. The knowledge-based economy is a reality. Rapid changes in the business environment cannot be handled in traditional ways as companies are expanding and are much larger today than they used to be, fueling the need for better tools for collaboration, communication and knowledge sharing. Competing in the globalized economy and markets requires quick and effective response to customer needs and problems. For companies spread over wide geographical areas and virtual organizations, managing knowledge is critical for providing services. Companies must develop the strategies to sustain competitive advantage by leveraging their intellectual assets for optimal performance.

7. CONCLUSION
The research and execution of a support system for Knowledge Discovery is the test of numerous researchers. As Web Data Mining is the primary key advance in Knowledge Discovery process in Databases (KDD), web data extraction assuming the job of data gathering from the web and data mining methods on the removed downright data to find knowledge. This research is proposing an approach to apply the clustering idea on all-out web data and to utilize the clustering results as a component of the contribution for the characterization led on another arrangement of data.

Web mining is an extremely hot research theme which joins two of the actuated research regions: Data Mining and World Wide Web. The Web mining research identifies with a few research networks, for example, Database, Information Retrieval, and Artificial Intelligence. Even though there exists very some perplexity about Web mining, the most perceived methodology is to order Web mining into three territories:

The qualification between these two classes is not reasonable some of the time. Web utilization mining is relatively free, yet not disengaged, class, which mostly portrays the techniques that discover the client's use example and attempt to foresee the client's practices. This research is a review dependent on them as of late distributed research papers. Other than giving a general perspective on Web mining, this research will concentrate on Web use mining.

Potential applications can be On-line social networking network software applications can utilize web mining techniques to investigate the viability of on-line networking, additionally regions, for example, knowledge management web destinations and web mining can likewise be valuable in bioinformatics, e-administration, and e-learning. In this research, we review the researches in the region of Web mining with the emphasis on Web Usage Mining. Three perceived sorts of web data mining are presented by and large. Around the key subject of this research - use mining, we give a definite portrayal of the three periods of the process. A case of a use mining system is given to represent the general utilization mining process. Besides, the research of real applications of use mining – personalization and route design discovery are examined. At last, we wrap up this research with the most disputable subject - client security. Other than the speculation of the flow research work, we likewise attempt to explain some perplexity and uncover the up-to-data research issues. This research examines the date impact of data mining strategy in business intelligence.

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CONNECTION TO THE MACHINE - BRAIN COMPUTER INTERFACE

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Abstract
Brain wave is a generic term used to refer to the electrical impulses generated by the neurons or during interaction between them. These impulses also known as Neural Oscillations can be observed by the measuring technique known as Electroencephalogram (EEG). Brain–computer interfaces (BCI) are direct connections between the brain and a computer. Regulation of neuroelectrical activity or brain activity as a response to sensory stimulation is used to replace or improve lost or impaired function. More details are explained in the paper like how brain waves affect human body and what impact yoga have on our brain?

Keywords:
BCI, Brain waves, Impact of yoga on brain.

1. Introduction
A natural way for humans to communicate with the outside world is to use some individual muscles of the human body. Intentions born in the human brain are transmitted through the nervous system to selected parts of the body and stimulate their movement. Speech (throat, tongue, lips) is predominantly used for communication among people, as are also fingers in case of the sign language. Man-machine communication (MMC) means a type of communication where the same principles can be applied. Some simplification of the problem is a human-computer interaction (HCI) which traditionally involves a keyboard, touchpad and/or a mouse. An alternative way is to use a microphone and a sound board to issue voice commands or a camera to provide instructions in form of facial expressions and/or hand placement. Finally, we can imagine controlling a computer via electrical signals extracted from various parts of the peripheral nervous systems or even from the central nervous system - directly from the brain. The last type of communication is called a brain-computer interface (BCI). The main task of a brain-computer interface is to allow communication with the outside world for patients with severe stages of neurological diseases such as amyotrophic lateral sclerosis, cerebral subcortical stroke, Guillain-Barré syndrome, cerebral palsy or multiple sclerosis. Measuring brain activity is centrepiece to BCI. However, detection of brain activity as such is not sufficient. BCI systems cannot read any “human thoughts”. They can only classify some selected states of brain activity, associated with specific events or stimuli. Generally, the main task given to a user of the brain-computer interface is to “generate” appropriate models of brain activity by using certain mental strategies. Those strategies define what a BCI user has to imagine or on what event his attention has to focus in order to “generate” appropriate EEG waves. Some strategies require long training. Therefore, practical realization of a brain-computer interface requires several basic conditions.
to be fulfilled. Firstly, the system has to selectively measure brain activity. Next, user feedback has to be implemented. Finally, the system must have a “control block” to execute user's intentions. Devices that measure, in a passive manner, certain changes in brain activity, without the need to “read” user’s intentions (e.g. medical EEG recorders) are considered not to be BCI systems.

EEG signals can be classified based on skull positions, frequency ranges, amplitudes, signal waveforms, periods and signal-induced actions. Basically, the EEGs signals are synchronize when the external stimulated has been measured. The EEG signal passes through Dura, cerebrospinal fluid and skull to scalp will produces peak-to-peak amplitude is only about 1 ~ 100μV with frequency range 0.5 ~ 100 Hz. In addition, the electrode material, contact tightness and electrode paste may even affect the recordings due to some unpredictable noise which interfere with EEG detection. Brain waves are measured in cycles per second or Hertz (Hz) also known as frequency of brain wave activity Brain-computer interface is nothing but the interaction between the human neural system and machines, it is a control system which enables the people to communicate [5] and control a device by mere thinking. This is done through three steps 1st step is to get the signal acquisition from the (user’s) human brain and sends the digital signal to the signal processing unit which contains two blocks namely i) feature extraction, ii) translation, here the signal is processed and sends the commands to BCI application and the application acts accordingly.

2. Methods of detecting brain activity
Brain activity - related to neuronal activity - boils down to the motion of electric charges which produce electric and magnetic fields. Brain-computer interfaces measure that activity of the brain which is the consequence of certain stimuli or mental task. Suitable sensors, placed or attached close to the selected areas of the brain, allow measurement of both electric and magnetic brain activity.

3. Electroencephalography (EEG)
Electroencephalography (EEG) is a non-invasive method of measuring the bioelectrical activity of the brain. Signals are acquired through electrodes placed on the surface of the scalp which detect potential changes caused by the activity of neurons of the cerebral cortex.
EEG is very useful to monitor and diagnose epilepsy, sleep disorders, head trauma, brain tumours, disorders of consciousness and other brain conditions. The examination itself is not unpleasant for the patient, and lasts 15 to 20 minutes. During the test, the patient sits or lies comfortably with electrodes stuck to the scalp. Position the patient assumes depends on what is the purpose of the examination. Typically 6 to 64 electrodes are used (there are also known solutions using a much greater number of electrodes, e.g. 256). Usually, the electrodes are attached using an adhesive paste (gel) and are connected through an amplifier to a recording device.

The measured EEG signal is largely an individual feature and varies depending on the psychophysiological state of a person. Both the signal amplitude and dominant frequencies undergo changes. It is assumed that a healthy human brain generates waves at frequencies ranging from 0.5 Hz to 100 Hz and amplitudes from several to several hundred μV. There are some distinctive rhythms of the EEG signal, usually slightly different defined by various authors:

- **alpha** rhythms with frequencies from 8 Hz to 13 Hz, which are particularly evident during the absence of visual stimuli,
- **beta** rhythms with frequencies from 12 Hz to 30 Hz, which can be seen in the frontal region of the brain and are observed during concentration,
- **gamma** rhythms found between 30 Hz – 100 Hz, which can be seen during motor activities,
- **delta** rhythms with frequencies from 0.5 Hz to 4 Hz, which can be observed at stage 3 and 4 of sleep,
- **theta** rhythms with frequencies from 4 Hz to 8 Hz, which occur during light sleep and are observed during hypnosis,
- **mu** motor rhythm in the range 8 Hz – 12 Hz which is used in Motor Imagery (MI) BCI paradigm.
Normally during an examination, a set of 19 EEG electrodes is used, according to the so-called 10-20 system, which is recommended by the International Federation of Clinical Neurophysiology (IFCN). In a brain-computer interface which does not have to comply with medical standards, a different number of electrodes can be used, sometimes up to 512, according to need. The number of electrodes (BCI channels) and their distribution on the scalp is one of the major problems of BCI.

4. Brainwaves Table

<table>
<thead>
<tr>
<th>Brainwave Frequency</th>
<th>Experience</th>
<th>Helpful For</th>
<th>Neurotransmitters</th>
<th>Hormones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lambda</td>
<td>20-60Hz - Higher</td>
<td>Ecological experiences, Feeling of Oneness</td>
<td>Little study done</td>
<td>Not yet determined</td>
</tr>
<tr>
<td>Epsilon</td>
<td>10Hz - 20Hz</td>
<td>Ecological experiences, Feeling of Oneness</td>
<td>Little study done</td>
<td>Not yet determined</td>
</tr>
<tr>
<td>Gamma</td>
<td>40Hz - 100Hz</td>
<td>Ecological experiences, Feeling of Oneness</td>
<td>Deep meditation, (Samadhi, Nirvana, Satori, etc)</td>
<td>Serotonin, Endorphins</td>
</tr>
<tr>
<td>Beta (High)</td>
<td>25Hz - 60Hz</td>
<td>Anxiety, Nervousness, Panic Attacks</td>
<td>Not helpful</td>
<td>Adrenaline, Cortisol, Nor epinephrine</td>
</tr>
<tr>
<td>Beta (Mid to Low)</td>
<td>14Hz - 25Hz</td>
<td>Alertness, Focus, Concentration</td>
<td>ADD/ADHD, CFS, SAD</td>
<td>Dopamine</td>
</tr>
<tr>
<td>Alpha</td>
<td>8Hz - 14Hz</td>
<td>Peaceful, Relaxed, Daydream</td>
<td>Relaxation, Meditation, Anxiety, Stress, Panic, Focus</td>
<td>Serotonin, Endorphins</td>
</tr>
<tr>
<td>Alpha/Theta</td>
<td>7.3Hz Schumann Resonance</td>
<td>Calm, Meditative, Physically Relaxed, Sleepy</td>
<td>EMF resistance, Immune System, Insomnia</td>
<td>GABA, Serotonin, Acetylcholine, Endorphins</td>
</tr>
<tr>
<td>Theta</td>
<td>4Hz - 8Hz</td>
<td>Deeply Relaxed, Sleepy (REM stage sleep)</td>
<td>Deep Meditation, Insight, Creativity, Immune System</td>
<td>GABA, Serotonin, Acetylcholine, Anti-convul, Endorphins, Human Growth Hormone</td>
</tr>
<tr>
<td>Delta</td>
<td>0.5Hz - 4Hz</td>
<td>Deep Rest/Sleep (dreamless), Deeply Meditative (w/greatly reduced thought)</td>
<td>Deepest Meditation, Sleep</td>
<td>Human Growth Hormone, Melatonin</td>
</tr>
</tbody>
</table>

5. A review of EEG signal processing algorithms for use in BCI

In order to interpret and classify measured EEG potentials it is necessary to first extract and select their features. The feature extraction process delivers a set of values (data) which essentially describe signal properties. It can take place directly in the time domain or after...
some transformation, for example to the frequency domain. Feature selection is commonly used in processing large data sets, in order to choose the best ones and at the same time, to reduce their number. This process, in many scientific papers, is considered centrepiece to classification accuracy.

There are many methods of feature selection known that are optimized for:
- increasing the effectiveness of classification,
- reducing computational effort,
- reducing the amount of stored data,
- reducing data redundancy.

6. Effect of yoga on brain
Studies are continuing to show that yoga practices can change your brain. A review of the literature in *Complementary Therapies in Clinical Practice* suggests that yoga may change not only brain structure but brain waves as well.

**Yoga Changes Brain Wave Activity**

Different types of brain wave activity are associated with a variety of different cognitive and emotional functioning. For example, *alpha waves* (8-13Hz frequency) are low amplitude signals that occur when a person is resting but still alert. Alpha waves are linked to decreased pain and discomfort, but also related to increased memory retrieval, improved word recognition, and the perception of calmness.

*Beta waves* (12-38 Hz) on the other hand occur during heightened states of awareness, and are associated with active concentration. Previous research correlates higher beta wave activation with increased academic performance, as well as decreased emotional exhaustion, generalized fatigue and state anxiety.

*Theta waves* (4-7 Hz) arise in the presence of repetitive tasks or when someone has established a relatively predictable routine. They are linked to short-term memory functioning. Like alpha waves, theta waves are associated with reduce anxiety.
When considering brain waves from the perspective of attention, concentration and relaxation it is easy to see why the relationship between yoga practices and brain waves presents an interesting proposition.

After reviewing and evaluating the literature researchers drew several conclusions:

1. Although the studies were of varying quality, there is general support for yoga practices (movement, breath exercises and meditation) being associated with positive brain states.
2. Changes in alpha brain waves associated with decreased pain and increased calmness were found after breathing, meditation and posture-based yoga practices.
3. Increases in beta wave activation, which is linked with improved task performance, were related primarily to breathing based yoga (pranayama). These included practices designed to achieve both activation (e.g. Kapalabhati) and relaxation (e.g. AnulomaUjjayii).
4. Theta wave activation, which is associated with repetitive tasks, decreases in anxiety and increases in focus, was found to increase after both asana (posture-based) and pranayama (breathing-oriented) practices.

Yoga and Structural Brain Changes

There is growing evidence of the relationship between regular yoga practice and improved mood, memory, and decreased perceptions of pain. Much of these experiences are controlled by the amygdala - a small, relatively round structure just adjacent to the hippocampus. The amygdala is the integrative center for emotions, emotional behavior, and motivation.

One study of Iyengar yoga students found decreased blood flow to the amygdala after 12-weeks of training. Increased cerebral blood flow to regions of the frontal lobes of the brain that are related to persistent focus and attention were also reported. Other studies suggest increased brain volume (which implies increased activation) in the frontal lobes of yoga and meditation practitioners.

Increases in the volume of gray matter in the hippocampus have also been detected following asana-based and pranayama-based yoga practices. The hippocampus is responsible for the consolidation of short-term memory into long-term memory as well as spatial navigation. This could be particularly important as reductions in hippocampal volume/hippocampal atrophy, are associated with a number of degenerative brain disorders associated with aging (i.e. Alzheimer’s Disease, Parkinson’s Disease and dementia).

Lastly, there is some evidence that individuals who had practiced yoga at least 4-10 times per week for 6-11 years had increased gray matter in the insular cortex. This increased volume was associated with a higher pain threshold when exposed to a pain-inducing, temperature-related stimulus.

7. Conclusion

Measuring specific brain waves throughout the EEG is not a trivial task. Such a system must implement typical functions known from measurement techniques like: data acquisition, data processing and data presentation. Signals acquired from electrodes have very small amplitudes and are strongly disturbed by noise and series of physiological and technical artifacts. Therefore those signals have to be carefully conditioned and then converted into digital form. Next action is sophisticated signal pre-processing. After that, an EEG signal is ready for feature extraction. There are several feature extraction algorithms. Each of them is
expected to generate features which will, to the greatest possible extent, describe selected
properties of the signal in the current application. There is often need to eliminate some
redundant features throughout the selection process. Finally, the classification process is
implemented to feature vectors. Then some control process can be executed. At the same time
BCI system quality should be evaluated.

Design and implementation of brain-computer interfaces is one of greatest challenges posed
to modern science. This is proved true by numerous publications in scientific journals as well
as extensive media coverage. The possibility of direct human-computer interaction (without
manual manipulation of peripheral devices) opens new channels of communication in
medicine, psychology, media and military. Use of such an interface in medicine is of
particular importance, both in terms of studying human brain, and for supporting people
affected by neurological inefficiency. Brain-computer interfaces can help people with severe
neurological conditions such as amyotrophic lateral sclerosis, brain stroke, Guillain-Barré
syndrome, amyotrophic lateral sclerosis, cerebral palsy or multiple sclerosis to communicate
with the outside world. Many people suffer from amyotrophic lateral sclerosis, the
neurodegenerative disease of the nervous system that destroys part of the central nervous
system responsible for movement, but does not influence senses, cognitive abilities and
intellect. People, who suffer from it, gradually lose control over their own body and within 2
to 3 years reach a state where they have no ability to communicate with the environment.
Another group of people who could communicate with the environment by BCI are those
who have strokes, particularly the brain stem strokes. Victims of traffic accidents, which
resulted
in damage to the cervical spinal cord, could also belong to those groups.
The barriers to dissemination of direct brain-computer communication methods, using the
EEG signals, are high price and complexity of the apparatus. In fact the amplifiers used for
BCI are designed for applications in medical diagnostics, containing from 32 to 512 channels.
In addition, they are usually designed to work with other types of medical equipment, often
through a specialized interface whose communication protocol is not widely known. This
raises the need for a dedicated, cheaper amplifier and other signal conditioning modules for
use in BCI. Although, according to studies, it is possible to reduce the number of
electrodes, their minimum number and location remain unknown. Besides, deployment of
electrodes may be different for each user. The knowledge and intuition of a doctor is most
helpful here. Also important is the fact that the features of the EEG signal can change with
changes in mental states of the user. Additionally, in ERD/ERS interfaces the features
strongly depend on the process of “imagining movement.” Furthermore, the tools that enable
quick and effectiveness selection of the best features have not been tested thoroughly. Resolving
those issues will help to overcome barriers to effective use of brain-computer interfaces in
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