International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Industrial Unrest and National Development (A Study of Selected Non-Union-Dominated Manufacturing Firms in South East Nigeria)

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Abstract

This study investigated the effect of industrial unrest on national development by studying selected non-union dominated manufacturing firms in South East Nigeria. It adopted survey research design and collected data from primary sources with structured questionnaire. Relevant literature was reviewed based on conceptual, theoretical, and empirical frameworks. The population was 509 comprising managers and employees selected purposively through stratified random method from the five states. The study used complete enumeration Four hundred and thirteen (413) out of the 509 copies of the questionnaire distributed were correctly completed, returned and used for the analysis indicating a response rate of 81%. Data were presented with tables and research questions were presented with statistically weighted means and standard deviation applied to the Likert scale items. Two hypotheses were formulated and tested with t-test statistic for difference in two means at 0.05 level of significance and 411 degrees of freedom. The results indicated that the managers and workers admitted that the items relating to the causes of industrial unrest were prevalent in the society. It was equally revealed that both respondents did not significantly differ in their perceptions on how to nurture and sustain industrial peace and harmony to foster national development. The study concluded that industrial unrest retards national development by manager's failure to apply those issues that nurture and sustain industrial peace and harmony to foster national development. It recommended that managers should abide by the agreements reached with workers and that both parties should develop the political will to embrace dialogue to reduce the incidence of industrial unrest.

Background to the study

The monumental challenges of the global economy hold the promise of linking this generation in a shared purpose with more rigorous understanding of what makes human networks healthy. Recession, climate change, inequality and even despair that propel radical fundamentalism are indications of a deeply dysfunctional economic ideology that requires a shift to a more effective systemic way of thinking about the next economy which certainly should transform the economic system to embrace a more meaningful purpose in service of a regenerative world. This is established on the core idea that universal patterns and principles which build stable, healthy and sustainable systems should be used as a model for economic system design. This should bring humanity in right relationships, view wealth holistically, accelerate the quality of innovation, adaptability and responsiveness, encourage participation, provide for robust circulatory flow and seek to balance efficiency and resilience, collaboration and competition, diversity and coherence, and small / medium and large organizations need creativity and abundance would flourish.

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The pre-industrial revolution era depicted a simple process of production that required no external intervention because of close proximity between employers and employees. It was characterized by a simple process of management investment, small local markets, and relatively small number of people in employment. It was therefore, easier to secure co-operation between the employer and the employees as any misunderstanding or grievances could be promptly resolved. Akanyi (2005) establishes that modern industry is no longer viewed as a venture of owners alone nor profit as considered as its sole objectives. It is recognized as ventures based on purposeful co-operation between management and labour in the process of production where maximum social good is the ultimate goal and both parties should contribute to its success. Similarly, labour is no more an unorganized mass of ignorant workers who obey instructions without resentment or protest the arbitrary and discretionary dictates of management. Management has to deal with modern workforce both as individuals and as members of organized social groups who are more conscious about their rights with substantial bargaining capabilities. Modern industrial society introduces new complex set of perceptions and approaches to workplace activities attributed to the emergence of industrial revolution. Its structure has increased in size, capital investment, human resource diversity, market reach and the emergence of a new philosophy that has rendered the old one irrelevant (Olajide 2006). The emergence of a new class of professional managers has increased the necessity for separation of ownership from management. This has heightened tension and estranged the relationship between the employer and the employee and gradually tending toward antagonism by breeding complex indirect and impersonal industrial relations (Olajide et al 2006).

Many studies have been conducted on organisational conflict and organizational performance but a good number has been on organized labour environments. This study deviates from that pattern by looking at industrial unrest in non-union dominated workplace environment. This is, therefore a paradigm shift in industrial unrest which affects national development. The paper also developed instruments to measure the relevant dimensions of the variables.

Statement of the Problem: Studies have established conflicting effects of industrial unrest on organizational performance. The variables of this study have also followed similar trend as expressed in the works of . The methodologies of the studies were mainly survey design but the findings were contradictory. It would be observed that no study has been carried on industrial unrest and national development at least in South East Nigeria These mixed results and findings suggest the need for further research

Objectives of the Study: The board objective of this study is to determine the relationship between workforce diversity and socio-human creativity in a recessed economy with 4 selected conpan operating in Anambra, Enugu and Imo States as the focal point.

The specific obkective are to:

i. Find out the limit of relationship between ethno-cultural diversity and socio-human creativity in a recessed economy.

ii. Ascertain the extent of relationship between gender diversity and socio-human creativity in a recessed economy.

iii. Identify the degree of relationship between diversity management producing and socio-human creativity in a recessed economy.

Research questions

i. What is the limit of the relationship between ethno-cultural diversity and socio-human creativity in a recessed economy?

ii. To what extent does gender diversity relate to socio-human creativity in a recessed economy?

iii. What is the degree of relationship between diversity management practices and socio-human creativity in recessed economy?

Hypotheses of the study

i. There is no significant positive relationship between ethno-cultural diversity and socio-human creativity.

ii. There is no significant positive relationship between gender diversity and socio-human creativity.

iii. There is no significant positive relationship between diversity management practices and socio-human creativity.

Significance of the study: The study will be beneficial to manager and employees in the construction forms because its exposes managerial attitudes towards workforce diversity. Research institutes, academic and students will benefit from it as a source of secondary data, while policy makers will find it useful in formulating polices for general social welfare.

Scope of the study: The study is confined to cover construction companies which draw employees from diverse areas and with large population. It is based on three dimensions of diversity namely ethno-cultural, gender and diversity management practices.

Review of Related Literature: The works of other scholars were reviewed based on conceptual, theoretical, and empirical frameworks. Summary of the literature identified the gap that formed the motivation for the study.

Conceptual Review Todaro (2006) explains development as a multidisciplinary term which applies to all nations and seeks to upgrade low capacity of indigenous institutions through extensive efforts for advancements. Where the emphasis is economic, it means mass production and provision of goods and services through industrialization. If the interest is on the social sector of the economy, it may mean social change, symbolized in greater opportunities for education, provision of infrastructure, and improvement in communication. If the emphasis is on the political sector it may mean political/legal independence. Development is about people and the activities they perform to improve their living standards in a society. However these are only aspects of development. Development finds locus from the analysis of economic parameters which serve as measurable instruments for empirical discussions because they can easily be quantified. In this context, therefore, economic growth and economic development form the bases of understanding intellectual discussions on development along with human development index. They strike a balance with the indices which serve as framework for classifying developmental efforts among nations as developed, emerging, and underdeveloped economies. Discussions on industrial conflict or unrest address salient aspects of economic growth and economic development that relate to national development.

Onwuchekwa (2002) explains that traditionally conflict indicates when things are not normal or working well among individuals and groups. It is therefore a negative indicator which is detrimental and should be avoided. The traditional perception of conflict points to searching for its causes and emergence its occurs. Industrial conflict is a global

phenomenon as Fajana (2003) asserts that different countries seek solution to industrial unrest based on their economic, political and social environments. Sudan (2004) classifies conflict as cognitive, affective, procedural, functional, and dysfunctional. While dysfunctional conflict is characterized by complex relationships and a high degree of task independence, functional conflict concerns confrontation between groups which enhances and benefits organizational performance. They can be regarded as "creative tension." Obisi (2003), establishes that conflict involves inconsistencies between individuals or groups, values and norms, and the demands or goals assigned by higher levels in organizations. This perception classifies it as conflict of interest, conflict of right, unorganized conflict, and organized conflict(which is the domain of trade unions or organized labour unions) Conflict of interest borders more on conditions and terms of employment such as working conditions, renewed or agreements, job security, wage and fringe benefits. Conflict of right concerns interpretations of employment contract and agreements and regular grievances relating to production processes, management attitudes, and approaches. Unorganized conflict is individuals' approach to respond to conflict situations as he considers most appropriate to resolve or aggravate the conflict. It is inimical both to the individual and the organization as it could lead to dismissal and destruction of organization's property, punitive reassignment and loss of vital organizational documents among others: organized conflict is usually a group's activity which draws support from members to sue for conflict.

Robbins (2008) views conflict from traditional, human relations and integrationist perspectives. The Hawthorne studies revealed causes of conflict from the traditional perspective as dysfunctional outcome resulting from poor communication, lack of openness and trust between people, managers' insensitivity to the needs and aspirations of employees. The human relations point of view argues that conflict is natural and inevitable in organization and advocates for its acceptance. This perception expresses that certain aspects of conflict favour individuals, groups, and organizations while some cause injuries to these parties such as unfulfilled expectations, reduced performance, disruptive work processes and so on, which are dysfunctional. This viewpoint dominated conflict theory in the late 1940 through 1970s. This approach rationalized the existence of conflict. The integrationist perspective complements the acceptance posture of the human relations approach but encourages that minimum level of conflicts is good enough to keep the group alive, self-regulating and creative. Its proposition is that conflict is all good, or all bad, inappropriate and naïve depending on the situation of its perception.

Theoretical Framework

This paper is anchored on the class-theory by Karl Max in Stabbins (1987).

This paper is anchored on the Adam,s equity theory (1965). The theory emphasizes that free enterprise economic system builds a large pool of alienation, reduces the power of labour, and creates more poverty due to no fault of labourers: It recognize the existence of categories of people who organize themselves to influence state policies in their favour. Those who control ownership of the means of production constitute the dominant class (owners/managers) and resort to exploitation of the dependent class (employess). Such deception through several policies and programs achieve very little for the masses and so much for the ruling class. This is crafty socio-human creativity enshrined in poor application of the management process which culminates in recession.

UNDP Report (2012) supports this postulation when it explained that poverty persists in Nigeria because of failure of past governments to deliver essential public services to the people. The vast majority of Nigerians suffer while the minority elite at the top gets everything it needs (Kwangh-mande 2014, Ukwuegbo 2013) in Idemobi (2017). Offiong (2014) in Idemobi (2017) has established some link between the prevailing insecurity, unemployment and poverty in Nigeria caused by mismanagement, of the economy by the greedy ruling class who manipulate policies to their advantage and to the detriment of the working and poor Nigerians. This situation supports Kotler (1974) views of different groups of people in the society. Nigeria as a rich nation with poor people seems to derive from the ruling class or elite and partly as a result of failure of government to design policies that will stimulate private sector participation (Chaubas, 2012).

Empirical Review Positive effects

The relationship between conflict management and organizational performance has attracted much attention in management literature. Olu and Dupe (2008) in Nigeria examined the impact of conflict management on employees' performance in a public sector organization using Power Holding Company of Nigeria (PHCN) as the case study. This study adopted the survey research design; Data collected were analyzed using descriptive statistics. Hypotheses were tested through regression analysis and correlation coefficient. The findings revealed that effective conflict management enhances employee's performance and that organization's conflict management system influences employee performance.

Ongori (2009) examined organizational conflict and organizational performance using descriptive research method. Empirical findings show that organizations are adversely affected by conflicts in terms of performance and wastage of scarce resources. Similarly organizational conflicts do have positive effects to the organization especially in increasing organizational innovativeness and improving the quality of decisions in the organization. In addition conflicts build the spirit of teamwork and cooperation among the employees of the organization. This occurs especially when they come together to resolve.

Jalaluddin, Eka, Djumilah, and Surachman (2013), examined the role of conflict toward employee performance. This study analysis unit is Regional Working Units at Regional Apparatus Work Unit (RAWU), using survey design and analysis method was Structural Equation Modeling (SEM). The result showed that higher knowledge can increase employee's performance and lower intensity conflict. Organizational commitment can improve employee performance, but cannot reduce conflict intensity. Power can reduce intensity of conflict, but does not improve employee performance. Conflict can drive employee's performance.

Olukayode (2015) in Nigeria examined the impact of workplace conflict management on organizational performance of manufacturing firms using survey design. Employing Spearman correlation analysis and regression, the results showed a significantly positive relationship between conflict management strategies and organizational performance. Union-management conflict was discovered as the most prevalent type of industrial conflict in the organization.

Abdul and Sehar (2015) examined conflict management and organizational performance using survey method. Variance and factor analysis were applied to analyze and interpret the data while Ratio Analysis was used to analyze Askari Bank's performance. The major findings are that there is no significant difference between the, opinions of male and

female respondents regarding the causes of conflict. However, there is a significant effect of conflict on organizational performance.

Uchendu, Anijaobi-Idem & Odigwe (2013), studied conflict management and organizational performance in secondary schools in cross river State, Nigeria. Ex-post facto research design was adopted. Three hypotheses were tested. Stratified random sampling technique was used to sample 500 teachers from the population of 5,410 secondary school teachers in the state. Data were generated using researchers constructed questionnaire called "Conflict Management and Organizational Performance Questionnaire (CMOPQ). The instrument was a 4 point likert type scale consisting 32 items. Pearson Product Moment Correlation Coefficient Analysis was used in analyzing the data. The result of the analysis revealed that there is a significant relationship between conflict management in terms of teacher-teacher conflict (TTC), teacher-student conflict (TSC), principal-teacher conflict (PtC) and organizational performance.

Amineh and Ali Kahgarani (2014) studied the Relationship between Conflict Management Styles and Organizational performance; descriptive data were collected through field method. The statistical population -consisted of 92 employees and managers of southern oil company were selected randomly. The Kolrnogorov-Smirnov Test was- used to determine the normality of the collected data. According to the computational level of significance, the hypothesis that samples are distributed was not rejected. Also, to determine the relationship between conflict management with organization performance, the Pearson correlation coefficient was applied. The study tried to test only one major hypothesis (relationship between conflict management and organization performance). Finally, the Freedman rating test was used to determine rate of conflict management and dimensions of organization performance separately. In conclusion the mathematical function of conflict management relationship with organization performance based on the Pearson's correlation coefficient was provided in form of a regression, model. The result indicated that there is a significant relationship between conflict management with aspects of Organization performance,

Positive and negative effects

Hotepo, Asokere, Abdul-Azeezl and Ajemunigbohun (2010) investigated the effect of organizational conflict on organizational performance in Nigeria. The study employs descriptive research design and uses questionnaire to collect data from 96 managers in some selected Airlines, Road Transport and Insurance companies in Lagos Metropolis. The research' revealed that limited resources is the major cause of conflict and that conflicts have both negative and positive effects on organization, but when managed properly, the positive effects can be used-to encourage organizational innovativeness and build co operation among the employees.

Obasan (2011) examined the impact of conflict management on corporate productivity of First Bank of Nigeria Plc, Lagos Branch. Student t distribution was used to test the significance of response and purposive sampling technique to administer a self-design questionnaire to 50 respondents cutting across all cadres of staff. The study discovered that the sources of conflict in the banking organization are diverse and cut across unacceptable employment terms, work conditions, perceived improper styles of management by the officers and ineffectiveness of grievance communication. It was revealed that the main sources of conflict in the organization relate to perception and value problems. The specific issues bother, on employee compensation, welfare and inadequate communication. It

was further found that the managers prefer to compromise problem solving and dominating strategies. The results showed that conflict management strategies in place at the organization have been relatively useful in minimizing the incidence of disruptive conflicts ' while conflict management strategies have positive impacts on workers' productivity.

Mba (2013) examined conflict management and employees performance in Julius Berger Nigeria Plc. A cross sectional survey research design was used. Data were analyzed with descriptive and inferential statistics. Results indicated that significant relationship exists between conflict management strategies and employees' performance and no differences exist between managerial and non-managerial employees' perception of the effectiveness of conflict management strategies.

Negative effects

Muhammad & Maria (2013) examined the impact of conflict and conflict management on organizational performance. The survey respondents from, the eight corporate sector organizations were selected. Results showed that the two most conflict types are intra-personal and inter-personal conflicts. Both employees and managers shared concerns that conflict does not bring positive effects to organizational performance; rather it brings negative effects more to work performance and organization's productivity.

Muhammad and Mughal (2013) studied the Impact of Conflict and conflict Management on Organizational Performance. A self-administered questionnaire is used to collect data. The survey respondents from the eight corporate sector organizations are selected for this study. Results showed that the two most commonly faced conflict types are infra-personal and inter- personal conflicts. Both employees and managers gave their shared concerns that emergence of conflict does not primarily bring positive effects to the organizational performance; rather it brings negative effects more to the work performance and organization's productivity.

Okoriko (2014) examined Conflict management and organizational performance in national research institute for chemical technology (NARICT) and Nigerian institute of transport technology (NITT), Zaria. The study adopted survey design. The study tested two hypotheses of which analysis were performed by the use of simple percentages and chi-square (%2) statistical tool at 5% level of significance in testing the hypotheses. The findings indicated that staff accommodation in both organizations are inadequate especially NITT and recommended government to acquire land and award contract to build more staff accommodation for the organizations especially NITT to reduce competition for the few, ones available in order to minimize the rate conflict and also to motivate members of staff to give their best, towards moving the organizations forward on the part of increased performance.

Gap in Literature

This study is on the relationship between and Socio-Human Creativity study of selected construction firms in South East Nigeria. Cardrian (2008) explains why firms embrace diversity; and argues that encouraging diversity is a positive motivational tool that attracts and retains the best employees as well as increases the level of organizational competitiveness/performance. on gender diversity the works of Nikam (2015) in Kenya and Omotayo, Abiodum & Fadugba (2012) in Nigeria report conflicting results on the effect of gender diversity on indicating need for further research. Ethnic diversity by Bark, Ingo & Ahmad (2009) recognized the interest of host community while Anlo, Mala & Malise (2011) reported regard line correlation b/w diversity and for cultural diversity,

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Nicole et al, (2009) indicate high ethno cultural initiatives/empathy while Frank, et al (2006) in South Africa report divergent views that in South Africa and Singapore HR practices encourage motivation but conflicting views on retaining knowledge workers. Even the dependent variable supports different approaches to managing diversity and creativity as explained by Meghria et al (2014) Thus, the gap in literature provided by the studies lie in the fact that they were conducted in different contexts but reported conflicting results on the effect of diversity thereby indicating need for further research

Methodology

The study adopted survey research design. The population was 509 managers and workers purposively selected randomly. Data were collected from primary and secondary sources, and were presented with descriptive statistics of tables and percentages

Table 1: Population and sample proportion

states		Employees	……..manager	Total
1	Anambra	78	52	130
2	Abia	65	40	105
3	Ebonyi	54	21	75
4	Enugu	57	23	80
5	Imo	68	51	119
	Total	322	187	509

These firms maintained massive presence in three quarters of each state in the south east executing government construction works.

Method of Data Collection This study combined both primary and secondary data for the analysis. Primary data comprise data obtained by administering questionnaire directly to the respondents. Out of the 509 copies of the questionnaire that were administered, 413 were correctly completed and retrieved thus showing a response rate of 81 percent. The secondary data on the other hand, were sourced from: thesis, publications in academic and professional journals, books, archives among other. The questionnaire was structured on five point – Likert scale with weights assigned to; strongly Agree (SA) = 5, Agree (AG) = 4, Undecided (UND) = 3, Disagree (DA) = 2 and Strongly Disagree (SD) = 1.

Method of Data Analysis The data gathered for the study were analyzed using analysis of variance (ANOVA) developed by Fisher (1923) for studies with population of more than two (2) means. It is known as an F-test. However, the analysis was restricted to one-way analysis of variance. The reason for using ANOVA was to compare different population means existing within the groups and between the groups or determine the existence of differences if any, among several populations means. The null and alternative hypotheses were tested for the opinions of different categories of workers at 0.05 level of significance. Decision rule was applied to either accept or reject the null hypothesis at a point where F-tabulated value or F-calculated value is greater than or less than the other.

Data Presentation and Analysis: Data gathered in this study were analyzed in this section using appropriate statistical tool of analysis for variance (ANOVA) as stated above. All tests were carried out at 0.05 level.

Data Presentation: Research question one what are the major factors which cause industrial unrest that retard national development in Nigeria. The 1st research question was answered with statistically weighted mean and standard deviation applied on the modified five points what seale presented in table 3.2

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Table 3.2 mean and standard deviation of the respondents on major causes of industrial unrest that retard natural development.

	Items	X_1 pd	Mars SD,	Owner $mgrs_2$	SD_2
1	dysfunctional outcome resulting from poor communication	3.15	1.78	3.44	1.85
2	lack of openness and trust between people	3.62	1.90	3.23	1.80
3	managers' insensitivity to the needs and aspirations of employees	3.85	1.96	3.35	1.83
4	Unacceptable employment terms,	3.92	1.93	3.44	1.85
5	perceived improper styles of management by the officers	2.92	1.71	2.85	1.69
6	ineffectiveness of grievance communication	3.15	1.77	2.84	1.69
7	Perceptions and value problems.	3.70	1.50	3.51	1.49
8	issues of employee compensation &, welfare	2.59	1.26	2.56	1.43
9	managers preference to compromise, problem solving and dominating strategies	3.74	1.61	3.88	1.79
10	inconsistencies between individuals or groups, values and norms	3.60	1.69	2.51	1.41

Source field survey 2017 Grand X,=3.42SD,1.72x_2≡3.13 SD_2 1.68

The analysis of table 3.2 revealed that the respondents admitted that the ten items relating to causes of high industrial unrest that retard national development are prevalent in the society. It is very noticeable that the employees strongly agreed with the statement of most of the items than the managers who merely agreed with mean responses 3.42 and 3.13 in some cases. However, highlights of the statements included inadequate communication, inconsistencies between individuals or groups, values and norms, unacceptable employment terms, perceived improper styles of management by the officers etc

The degree of agreement or disagreement with any of the statements is expressed by the response options chosen by the respondents. Interestingly and quite contrary to the popular opinion, the managers in their choice to contribute to national development of the contemporary Nigeria society.

Highlight included…….etc. The respondents agreed in most cases that whatever would be done to nurture and sustain industrial peace and harmony is quite necessary. However the managers disagreed with the notion that decrease in national development is caused by the managers' ineptitude.

Tests of hypotheses Hi

Hi: There is no significant variance in the opinions of managers on their perceptions of the causes of high industrial unrest in the contemporary Nigeria society.

The analysis of data presentation on table 3.2, t-test for the difference in two means was applied at 0.05 level of significance and 411 degrees of freedom

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Table 3.3 summary of t-test result for hypotheses 1

Source of validation	N	$\overline{x}$	SD	DF	T values	t value	P< 0.05
Employees	261	3.42	1.72	411	1.672		No sign
managers	152	3.13	1.68			1.960	Fiscal difference

Note calt= educated t value Crit t= critical t value N= 413 P=< 0.05 Source: field survey 2017

Table 3.3 above shows that at 0.05 level of significance and 411 degrees of freedom (df), the calculated t-value 0.824 was less than the critical value of 1.960. Therefore, there was no significant difference in the opinions of the two groups of respondents concerning nurturing and sustaining industrial peace and harmony to enhance national development of Nigeria.

Table 4.2 above shows that at 0.05 level of significant and 411 degrees of freedom (df) the calculated t value of 1.677 was less than critical t value of 1.960. Therefore, there was no significant difference between the opinions of the managers and those of the employees on the major causes of unrest that retard national development of contemporary Nigerian society. The Null hypothesis was accepted while the alternate hypothesis was rejected.

The degree of agreement or disagreement with any of the statements is expressed by the response options chosen by the respondents intersingly and quote coutracy to the popilar opinion, the owner managers their choice of response option, agreed that managers as well as the society have contributed to a reasonable extent to the high rate of industrial unrest that retard national development in the contemporary Nigeria society.

Research question 2: does improving the factors that cause industrial unrest contribute to national development of contemporary Nigeria society?

Mean scores of respondent opinions in how to nurture and sustain industrial peace and harmony to contributing to National development of contemporary Nigeria society

Table 4.3

	Items	$\overline{X_1}$ empl	SD_1 empl	X_2 mgrs$_2$	SD_2 mgrs$_2$
1		3.92	1.98	3.69	1.92
2		3.69	1.92	2.84	1.69
3		3.23	1.80	2.62	1.62
4		3.15	1.77	3.23	1.80
5		3.33	1.82	3.08	1.75
6		3.31	1.82	3.26	1.81
7		3.54	1.88	3.15	1.77
8		3.46	1.86	3.72	1.84
9		2.00	1.641	2.85	1.69
10		3.85	1.96	3.55	1.88

Grand $\overline{X_1}$=3.35SD, 1.82$\overline{x_2}$=3.20 SD_2 1.77 Source field survey 2017.

Table 4.4 is the presentation of the analysis of research question2. The mean scores and standard deviation of the respondents accessed how to nurture and sustain industrial peace and harmony to contribute to National development of the contemporary Nigeria society. Highlight included……etc

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The respondents agreed in most cases that whatever would be done to nurture and sustain industrial peace and harmony are quite necessary. However the managers disagreed with the notion that decrease in national development is caused by the managers' ineptitude.

Hypothesis II

H_{ii}: The perceptions of the respondents do not differ significantly on how to nertive to contribute to national development of the contemporary Nigeria society.

Table 4.4 which show the percentage of research question 2 was used for test of hypothesis II. It was carried out with t-test statistics at 0.05 level of significances and 411 degree of freedom (df). The result indicated that the null hypothesis was accepted while the alternative hypothesis was rejected.

Table 4.5 summary of t-test results of a hypothesis II

Source of validation	N	$\overline{x}$	SD1	DF	T values	t value	P< 0.05
Employees	261	3.35	1.82	411	0.824	1.960	No significant
managers	152	3.20	1.77				difference

Method of Data Analysis The data gathered for the study were analyzed using analysis of variance (ANOVA) developed by Fisher (1923) for studies with population of more than two (2) means. It is known as an F-test. However, the analysis was restricted to one-way analysis of variance. The reason for using ANOVA was to compare different population means existing within the groups and between the groups or determine the existence of differences if any, among several populations means. The null and alternative hypotheses were tested for the opinions of different categories of workers at 0.05 level of significance. Decision rule was applied to either accept or reject the null hypothesis at a point where F-tabulated value or F-calculated value is greater than or less than the other.

Note calt= educated t value 0.824 Crit t= critical t value 1.1960 N= 413 P=< 0.05 Source: field survey 2017

Discussion of the results

On the factors which dominate industrial unrest the respondents did not differ significantly which supported the views of ……in their ……on the measure to nurture and sustain industrial peace and harmony, they were equally significantly congruent in their opinions to …… This study did differ from the works of …….

The respondents did not differ in their opinions on both the factors which cause industrial unrest and on how to nurture and sustain industrial peace and harmony in Nigeria.

Findings

1. The degree of agreement or disagreement with the items in the instruments expressed by the respondents showed that managers and employees did not significantly differ in their perceptions on the causes of industrial unrest in Nigeria.
2. It was discovered that managers contributed to a reasonable extent to high rate of industrial unrest in Nigeria since their perceptions are congruent with those of employees on how to nurture and sustain industrial peace and harmony in Nigeria.

Conclusion: The result of the analysis showed that industrial unrest causes disruption in the performance of workers as well as productivity of forms, the congruency of the views of both employees and managers indicated that they lacked the political will to implement

agreements hence the unrests. This study, therefore, concluded that industrial unrest significantly retards national development.

Recommendations

1. Managers should try to abide by the teams of agreements reached with employees in order to stem the incidence of industrial unrest.
2. Firms should encourage dialogue between workers and managers on better approaches to nurture and sustain industrial peace and harmony which enhance national development.
3. Managers and employees should explore the possibilities of adopting deliberative and implemental mindset in handling issues of industrial unrest in non-union dominated environment to improve and sustain national development.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Analysis and Optimization of Essential Parameters of Green Sand Process to Minimize Persisting Defects in GI Castings Using Taguchi Approach

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Abstract
The main objective of the work presented in this paper is to analyze the essential parameters in green sand process for identification of most influential parameters that are responsible for the occurrences of the defects which are persisting in complex gray iron components. The defects which are persisting in the foundry industry producing cylinder heads and other castings required in the automotive are shrinkage porosity, blow holes, sand inclusion and low hardness, factory situated in central India. In pursuing for the identification of most influential parameters for respective defects, Taguchi's approach to parameter design is proposed. In the first stage of study, essential parameters iof green sand process are selected and experiments are performed as per the plan given by the suitable Taguchi array, L36 OA. In the second stage optimal levels of the parameters are determined from the signal-to-noise ratio calculations. Analysis of variance (ANOVA) is subsequently performed to identify most influential parameters. Confirmation run of experiments is performed with optimal settings of parameters to verify the results. Outcome of confirmation experiments indicated that persisting defects in cylinder head castings produced by a green sand process are sufficiently reduced.
Keywords: Green sand process, persisting casting defects, process parameters, Taguchi orthogonal array, analysis of variance: ANOVA

Nomenclature:

ANOVA	Analysis of variance
Cont %	Percentage Contribution made by individual parameter
CE	Carbon equivalent
DOE	Design of Experiments
DOF	Degree of freedom
MS	Mean squares
OA	Orthogonal array
S/N	Signal-to-noise ratio
SS	Sum of squares
T	Average value of casting defects at different levels
y_i	Response value of observation in ith test

1 Introduction

The clay bonded sand, commonly known as green sand, is typically bonded with Bentonite (clay) and water to mould the sand. Other common sand casting processes used for the production of casting include CO2, No-Bake, and Shell Sand process depending on the

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type of sand used for production of mould. The choice of particular sand casting process depends upon the factors like the size and intricacy of the components, as well as the volume of production [1]. Wide range of gray iron castings required in automotive is produced in medium & large-scale foundries by a green sand process. The main aim of the foundry industries is to produce quality castings with no rejection**.** Also, in the present era of global competition, manufacturing industries has bound to take the challenge that is demand for high quality product with reduced lead–time [2].In the green sand casting process number of parameters are involved that are associated with main operations performed during casting production. The quality of castings produced in green sand casting process, is always a result of a proper combination and settings of these parameters [3]. A Factor called as 'quality dimensions' is one of the major factors in evaluation of organizational performance accounts for major cumulative variance, this includes such elements as scrap, rework and waste [4]. Among the several possible defects in castings produced by a green sand casting process, some defects are persisting and more challenging to avoid. For example the prediction of shrinkage porosity or closed shrinkage in the complex geometrical components such as the cylinder head is not straightforward in general. Porosity is the most persistent and common complaint of casting users. The final reliability of a casting and mechanical properties of the casting is greatly influenced by the presence of defects such as porosity, blow holes, sand inclusions and low hardness. These defects not only cause the loss in productivity and increased production cost, but also affect the performance of these components [5].

In order to minimize persisting defects, Taguchi approach to parameter design is applied in this study to obtain the optimal settings of process parameters. The proposed methodology suggests a selection of essential process parameters in the first step. The next step is experimentation for the evaluation of the individual parameters to optimize the response. In this study 19 ssential parameters are selected at mixed levels and experimentation is performed as per the plan given by chosen Taguchi array, L36 OA [6, 7]. Results are analyzed using the Taguchi approach to determine optimal levels and ANOVA is used for identification of most influential parameters on the basis of percentage contributions they made in the occurrences of respective persisting defects.

2 Literature review

Most of the previous work in the domain of optimization of process parameters of green sand casting process focuses on minimization of casting rejection percentage due to the presence of defects and quality improvement of cast components. A number of researchers work on the optimal setting of sand casting process parameters over the past few decades [8]. In work done and published in last ten years, a Taguchi DOE technique and other techniques that are Artificial Neural Networks (ANN) & Genetic Algorithms (GA) are also used in order to set the optimal level of desired input parameters.In order to investigate the effectiveness of molasses, Mandal and Roy [9] in their work used central composite design (CCD) and Back propagation neural network (BPNN) with different settings of inputs such as molasses, cement and setting time to predict the compressive strength of the sand mix through S. Guharaja et al. [10] minimized the casting defects in SG Iron cast components by using the Taguchi approach for the optimal settings of green sand casting process parameters. In his work total four (4) parameters associated with green sand and mould are selected as input parameters to minimize casting defects. A comparative study was conducted by Karunakar and Datta [11] by using ANN and Genetic Algorithms (GA)

to determine the set of desired mould properties and successfully predicted the set of controlling parameters. The results predicted by the GA are more accurate as compared to results obtained by ANN approach. Parappagoudar et al. [12]utilized back-propagation neural network (BP-NN) and genetic-neural network (GA-NN) to model green sand mold system in the forward as well as reverse mapping to predict the responses and to predict the set of input parameters respectively. A. Noorul Haq et al. [13] is employed Taguchi DOE technique for optimization of process parameters in CO2 sand casting process for minimization of casting defects. In his work total four (4) parameters consider for optimizing properties of CO2 sand. B. Senthilkumar et al. [14] analyzed identified factors using 'Design of Experiments' approach. Robust design factor values were estimated from the 'signal-to noise' calculations. In his work total three (3) factors related to melting, pouring and methoding (Gating System) are selected for optimization to minimize pull down defect or external shrinkage at the surface. Sushil Kumar et al. [15] in his work proposed Taguchi parameter design approach for optimization of process parameters of green sand casting process to minimize defects of a cast iron differential housing cover. In this work total five (5) parameters are identified, related to molding sand, mold and pouring. Charnnarong et al. [16] in his work optimized sand properties using a mixture of experimental design with the help of Taguchi orthogonal array (OA), RSM, and POE in order to reduce sand related defects on the iron castings. Upadhye et al. [17] in his work applied robust design approach defined by Taguchi to find optimal settings of factors of process and interactions among them with a small number of experiments conducted as per chosen orthogonal array. In his work total eight (8) parameters are selected which are related with green sand, mould & pouring for optimization to minimize casting defects. Uday A. Dabade et al. [18] effectively used Design of experiment method such as the Taguchi method for deciding the optimum settings of process parameters to have a minimum rejection of castings due to the presence of defects. In his work total four (4) parameters are considered to minimize shrinkage porosity defect in castings. A. Kumaravadivel et al. [19] in his research work investigated the influence of various process parameters on casting defects in the sand-casting operation and optimizing the process parameters to reduce the flywheel defect rejection percentage of the green sand-casting process. In his work Taguchi method of experimental design is applied to analyze the optimum levels of individual process parameters. Ganesh G. Patil et al. [20] in his work performed as suggested by L18 Taguchi orthogonal array at different combinations of selected process parameters to analyze the contribution of process parameters in occurrences of defects for minimization of rejection in the cast components. In his work total four (4) parameters associated with green sand and mould are identified to minimize casting defects. Manjunath Patel et al. [21] in his work adopted Taguchi parametric design for the squeeze cast technology to yield high density components and superior surface finish by conducting a minimum number of experiments. L9 orthogonal array was adopted to perform the experiments. In this work total three (3) parameters are identified to minimize defects that are; surface roughness and density. Sanjiv Tiwari et al. [22] in his study uses the Taguchi technique of parameter design and determine the optimal settings of process parameters in order to minimize the casting defect for green sand casting process. In this work total five (5) parameters are considered out of which four (4) are related with molding sand and mould while one is related to pouring. A. Johnson et al. [23]To find the optimized levels of various casting parameters in his work to reduce rejection rates in the

ductile iron castings, Taguchi L-27 orthogonal array was chosen with 3-level settings of parameters for the analysis. In his work he selected total seven (7) parameters out of which six are related to sand and mould.

From the review of the above significant studies, it was revealed that in most of the work done on optimization of sand casting process, the Taguchi approach was used which concentrate on optimization of single quality characteristic or mono response and hardly, cover the parameters associated with all the principal operations involved in the green sand process.Where as in the present work multiple quality characteristics (persisting defects) are conider and 19 essential parameters associated with all the principal operations are analyzed for improvement in the performance.

3 Selection of process parameters

In foundry industry, the inspection activity in the initial stage is performed just after shakeout operation, i.e. operation performed to separate out the casting from the mould after solidification of metal poured. In latter stage inspection activity is performed after shot blasting i.e. operation performed to clean the moulding sand stick on the casting surface by blasting steel shots on the surface. Daily inspection reports indicate the component wise numbers inspected in these two stages and quantity of castings found acceptable and rejected. Details regarding component-wise numbers rejected along with the type of defect responsible for rejection of the component is also mentioned in this report. Quantity rejected at this level is also called as foundry rejection. At the next level, inspection activity is performed after machining operations performed on the castings and quantity rejected is also called machining or customer rejection if machining operation is performed at customer end .In this stage, rejection of castings mainly due to the presence of defects like shrinkage porosity and inclusions which usually lie in the cross section or subsurface area and visible only after machining. During machining castings are also rejected due to occurrence of hard spots (localized excess hardness), difficult to machine .In some cases, defects like shrinkage porosity are also exposed during leak test or pressure test that is mandatory for vital cast components like cylinder heads and performed after machining operations. Apart from this cast components are also rejected because of failure in the field, and called as field rejection. In this study a large amount of data regarding casting rejection is analyzed to expose persisting defects in the foundry industry [6]. From the analysis of large amount of data available with industry regarding casting rejection at foundry levels as well as rejection at customer-end, it is revealed that shrinkage porosity, blow holes, sand inclusion and low hardness are persisting defects and mostly found in complex geometrical components such as cylinder heads. Further analysis of these defects revealed that, defects are associated with different processes or operations required to perform in producing cast components with green sand process [7, 12].All the possible casting defects in green sand casting process are further classified into different groups on the basis of their association with individual process or operation as shown in Table 1. Now, after grouping the defects as shown in Table 1 given below, to analyze the effect of potential process parameters on persisting casting defects, the parameters are selected on the basis of the literature reviewed and opinion by experienced foundry personnel. Table 2 given below indicates the parameters associated with persisting defects.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table1 Casting Defects associated with the different operation's in the green sand process

Process/Operations	*Associated Defects*						
Sand Preparation	Sand Inclusion	Mould Scabbing	Sand Fusion				
Moulding	Blow Hole	Mould Broken	Mould Leakage	Mould Mis-Match	Mould Swelling		
Core Making & Core Setting	Core Blow Hole	Core Lift	Core Shift	Core Swelling	Core Scabbing		
Melting &Pouring	Shrinkage Porosity	Blow Hole	Hardness (Low or High)	Cold	Chemical Analysis	Short Pour	Slag Inclusion
Shakeout	Hardness (Low or High)	Casting Damage					
Fettling	Handling Broken	Extra Grinding					
Pattern Manufacturing	Rejection of casting components due to wrong manufacturing of pattern tool equipments & due to Trial and Error method during sample production in development stage						

Table 2:Process parameters and corresponding levels

Sr. No.	*Process Parameter*	*Parameter Designation*	*Range*	*Level 1*	*Level 2*	*Level 3*
1	Carbon Equivalent Value (nu)	A	3.9 - 4.0	3.9	4.0	---
2	Carbon Content (%)	B	3.3 – 3.4	3.3	3.4	---
3	Pouring Temperature (^{0}C)	C	1400 -1410	1400	1410	---
4	Inoculants Addition (%)	D	0.15 – 0.20	0.15	0.20	---
5	Steel Scrap Addition (%)	E	30 - 40	30	40	---
6	Phosphorus Content (%)	F	0.08 – 0.09	0.08	0.09	---
7	Binder Qty in core sand (%)	G	1.8 – 2.2	1.8	2.2	---
8	Moisture Content (%)	H	4 – 4.8	4	4.4	4.8
9	Permeability (nu)	J	130 -150	130	140	150
10	Sulphur Content (%)	K	0.07 – 0.09	0.07	0.08	0.09
11	Green Compression Strength	L	1.4 – 1.8	1.4	1.6	1.8
12	Compatibility (%)	M	40 - 46	40	43	46
13	Return Sand Temperature (^{0}C)	N	30 - 50	30	40	50
14	Squeezing Pressure (bar)	O	90 - 110	90	100	110
15	Mould Hardness Horizontal (nu)	P	80 - 90	80	85	90
16	Mould Hardness Vertical (nu)	Q	70 – 80	70	75	80
17	Silica content in Sand (%)	R	95 – 98	95	96.5	98
18	Knockout or Cooling Time (min)	S	30 – 40	30	35	40
19	Manganese Content (%)	T	0.6 – 0.8	0.6	0.7	0.8

4 Selection of orthogonal array

Total 19 potential parameters are identified in the first stage of study as they are expected to be responsible for the occurrences of persisting defects. Now, as proposed in the

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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Taguchi approach to parameter design, an experiment can be performed using suitable Taguchi Orthogonal Array. While selecting a particular orthogonal array for conducting the experiments, two points must be considered that are; the number of parameters & the number of levels for the parameters of interest. As mentioned in Table 2 total parameters involved in this study are 19 and therefore it was decided to go with L36 array, one of the suitable arrays for 19 parameters with mixed levels **[24].** As mentioned in Table 3, seven parameters are considered at two levels and remaining twelve parameters are considered at three levels for experimentation. The Taguchi method was applied to the experimental data using statistical software "MINITAB 14". The template for experimental plan for 19 parameters with mixed levels using the Taguchi L36 orthogonal array is given below in Table 3, where -1, 0& +1 represents level 1, level 2 and level 3 of corresponding process parameters. The actual design of experimentation can be obtained by putting values of process parameters at corresponding level as shown in Table 4

Table 3 Template, Taguchi L36 Array

Sr.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0	0	0	0	0	0	0	0
3	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1
4	-1	-1	-1	-1	-1	0	0	-1	-1	-1	-1	0	0	0	0	1	1	1	1
5	-1	-1	-1	-1	-1	0	0	0	0	0	0	1	1	1	1	-1	-1	-1	-1
6	-1	-1	-1	-1	-1	0	0	1	1	1	1	-1	-1	-1	-1	0	0	0	0
7	-1	-1	0	0	0	-1	-1	-1	-1	0	1	-1	0	1	1	-1	0	0	1
8	-1	-1	0	0	0	-1	-1	0	0	1	-1	0	1	-1	-1	0	1	1	-1
9	-1	-1	0	0	0	-1	-1	1	1	-1	0	1	-1	0	0	1	-1	-1	0
10	-1	0	-1	0	0	-1	0	-1	-1	1	0	-1	1	0	1	0	-1	1	0
11	-1	0	-1	0	0	-1	0	0	0	-1	1	0	-1	1	-1	1	0	-1	1
12	-1	0	-1	0	0	-1	0	1	1	0	-1	1	0	-1	0	-1	1	0	-1
13	-1	0	0	-1	0	0	-1	-1	0	1	-1	1	0	-1	1	1	0	-1	0
14	-1	0	0	-1	0	0	-1	0	1	-1	0	-1	1	0	-1	-1	1	0	1
15	-1	0	0	-1	0	0	-1	1	-1	0	1	0	-1	1	0	0	-1	1	-1
16	-1	0	0	0	-1	0	0	-1	0	1	0	-1	-1	1	0	1	1	0	-1
17	-1	0	0	0	-1	0	0	0	1	-1	1	0	0	-1	1	-1	-1	1	0
18	-1	0	0	0	-1	0	0	1	-1	0	-1	1	1	0	-1	0	0	-1	1
19	0	-1	0	0	-1	-1	0	-1	0	-1	1	1	1	-1	0	0	-1	0	1
20	0	-1	0	0	-1	-1	0	0	1	0	-1	-1	-1	0	1	1	0	1	-1
21	0	-1	0	0	-1	-1	0	1	-1	1	0	0	0	1	-1	-1	1	-1	0
22	0	-1	0	-1	0	0	0	-1	0	0	1	1	-1	0	-1	-1	1	1	0
23	0	-1	0	-1	0	0	0	0	1	1	-1	-1	0	1	0	0	-1	-1	1
24	0	-1	0	-1	0	0	0	1	-1	-1	0	0	1	-1	1	1	0	0	-1
25	0	-1	-1	0	0	0	-1	-1	1	0	-1	0	1	1	-1	1	-1	0	0
26	0	-1	-1	0	0	0	-1	0	-1	1	0	1	-1	-1	0	-1	0	1	1
27	0	-1	-1	0	0	0	-1	1	0	-1	1	-1	0	0	1	0	1	-1	-1
28	0	0	0	-1	-1	-1	-1	-1	1	0	0	0	-1	-1	1	0	1	-1	1
29	0	0	0	-1	-1	-1	-1	0	-1	1	1	1	0	0	-1	1	-1	0	-1
30	0	0	0	-1	-1	-1	-1	1	0	-1	-1	-1	1	1	0	-1	0	1	0
31	0	0	-1	0	-1	0	-1	-1	1	1	1	0	1	0	0	-1	0	-1	-1
32	0	0	-1	0	-1	0	-1	0	-1	-1	-1	1	-1	1	1	0	1	0	0
33	0	0	-1	0	-1	0	-1	1	0	0	0	-1	0	-1	-1	1	-1	1	1
34	0	0	-1	-1	0	-1	0	-1	1	-1	0	1	0	1	-1	0	0	1	-1
35	0	0	-1	-1	0	-1	0	0	-1	0	1	-1	1	-1	0	1	1	-1	0
36	0	0	-1	-1	0	-1	0	1	0	1	-1	0	-1	0	1	-1	-1	0	1

(Source: Madhav S. Phadke (2009), Quality Engineering Using Robust Design, Pearson Publication, India)

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

5 Experimentation

Actual experimentation can be performed after the parameters assigned to a particular column of the selected orthogonal array, as shown in Table 4, **[7, 24]**.The casting of Cylinder Head (3 Bore) was made against the experimental plan given in Table No.4. As per chosen array L36, 36 experiments are conducted and experimental outcomes are recorded, in the present work outcomes are a percentage of castings rejected due to presence of respective persisting defects. Casting rejection percentage due to the presence of defects for each experimentation was recorded and then by using the given formula, rejection percentage due to presence of respective persisting defects were calculated for each trial condition which is a ratio of the number of castings rejected due to presence of respective Persisting defects to the total number of castings rejected.

$$\text{Percentage Defects} = \frac{\text{No. of castings rejected due to Persisting of respective persisting defects}}{\text{Total Rejection}} * 100 \quad \text{...Equation 1}$$

Table 4 Actual Experimentation Plan

Sr. No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
1	3.9	3.3	1400	0.15	30	0.08	1.8	4.00	130	0.07	1.4	40.0	30	90	80	70	95.0	30	0.6
2	3.9	3.3	1400	0.15	30	0.08	1.8	4.40	140	0.08	1.6	43.0	40	100	85	75	96.5	35	0.7
3	3.9	3.3	1400	0.15	30	0.08	1.8	4.80	150	0.09	1.8	46.0	50	110	90	80	98.0	40	0.8
4	3.9	3.3	1400	0.15	30	0.09	2.2	4.00	130	0.07	1.4	43.0	40	100	85	80	98.0	40	0.8
5	3.9	3.3	1400	0.15	30	0.09	2.2	4.40	140	0.08	1.6	46.0	50	110	90	70	95.0	30	0.6
6	3.9	3.3	1400	0.15	30	0.09	2.2	4.80	150	0.09	1.8	40.0	30	90	80	75	96.5	35	0.7
7	3.9	3.3	1410	0.20	40	0.08	1.8	4.00	130	0.08	1.8	40.0	40	110	90	70	96.5	35	0.8
8	3.9	3.3	1410	0.20	40	0.08	1.8	4.40	140	0.09	1.4	43.0	50	90	80	75	98.0	40	0.6
9	3.9	3.3	1410	0.20	40	0.08	1.8	4.80	150	0.07	1.6	46.0	30	100	85	80	95.0	30	0.7
10	3.9	3.4	1400	0.20	40	0.08	2.2	4.00	130	0.09	1.6	40.0	50	100	90	75	95.0	40	0.7
11	3.9	3.4	1400	0.20	40	0.08	2.2	4.40	140	0.07	1.8	43.0	30	110	80	80	96.5	30	0.8
12	3.9	3.4	1400	0.20	40	0.08	2.2	4.80	150	0.08	1.4	46.0	40	90	85	70	98.0	35	0.6
13	3.9	3.4	1410	0.15	40	0.09	1.8	4.00	140	0.09	1.4	46.0	40	90	90	80	96.5	30	0.7
14	3.9	3.4	1410	0.15	40	0.09	1.8	4.40	150	0.07	1.6	40.0	50	100	80	70	98.0	35	0.8
15	3.9	3.4	1410	0.15	40	0.09	1.8	4.80	130	0.08	1.8	43.0	30	110	85	75	95.0	40	0.6
16	3.9	3.4	1410	0.20	30	0.09	2.2	4.00	140	0.09	1.6	40.0	30	110	85	80	98.0	35	0.6
17	3.9	3.4	1410	0.20	30	0.09	2.2	4.40	150	0.07	1.8	43.0	40	90	90	70	95.0	40	0.7
18	3.9	3.4	1410	0.20	30	0.09	2.2	4.80	130	0.08	1.4	46.0	50	100	80	75	96.5	30	0.8
19	4.0	3.3	1410	0.20	30	0.08	2.2	4.00	140	0.07	1.8	46.0	50	90	85	75	95.0	35	0.8
20	4.0	3.3	1410	0.20	30	0.08	2.2	4.40	150	0.08	1.4	40.0	30	100	90	80	96.5	40	0.6
21	4.0	3.3	1410	0.20	30	0.08	2.2	4.80	130	0.09	1.6	43.0	40	110	80	70	98.0	30	0.7
22	4.0	3.3	1410	0.15	40	0.09	2.2	4.00	140	0.08	1.8	46.0	30	100	80	70	98.0	40	0.7
23	4.0	3.3	1410	0.15	40	0.09	2.2	4.40	150	0.09	1.4	40.0	40	110	85	75	95.0	30	0.8
24	4.0	3.3	1410	0.15	40	0.09	2.2	4.80	130	0.07	1.6	43.0	50	90	90	80	96.5	35	0.6
25	4.0	3.3	1400	0.20	40	0.09	1.8	4.00	150	0.08	1.4	43.0	50	110	80	80	95.0	35	0.7
26	4.0	3.3	1400	0.20	40	0.09	1.8	4.40	130	0.09	1.6	46.0	30	90	85	70	96.5	40	0.8
27	4.0	3.3	1400	0.20	40	0.09	1.8	4.80	140	0.07	1.8	40.0	40	100	90	75	98.0	30	0.6
28	4.0	3.4	1410	0.15	30	0.08	1.8	4.00	150	0.08	1.6	43.0	30	90	90	75	98.0	30	0.8
29	4.0	3.4	1410	0.15	30	0.08	1.8	4.40	130	0.09	1.8	46.0	40	100	80	80	95.0	35	0.6
30	4.0	3.4	1410	0.15	30	0.08	1.8	4.80	140	0.07	1.4	40.0	50	110	85	70	96.5	40	0.7
31	4.0	3.4	1400	0.20	30	0.09	1.8	4.00	150	0.09	1.8	43.0	50	100	85	70	96.5	30	0.6
32	4.0	3.4	1400	0.20	30	0.09	1.8	4.40	130	0.07	1.4	46.0	30	110	90	75	98.0	35	0.7
33	4.0	3.4	1400	0.20	30	0.09	1.8	4.80	140	0.08	1.6	40.0	40	90	80	80	95.0	40	0.8
34	4.0	3.4	1400	0.15	40	0.08	2.2	4.00	150	0.07	1.6	46.0	40	110	80	75	96.5	40	0.6
35	4.0	3.4	1400	0.15	40	0.08	2.2	4.40	130	0.08	1.8	40.0	50	90	85	80	98.0	30	0.7
36	4.0	3.4	1400	0.15	40	0.08	2.2	4.80	140	0.09	1.4	43.0	30	100	90	70	95.0	35	0.8

International Journal of Management, IT & Engineering
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6 Taguchi analysis of experimentation output

Table 5 Casting defects and corresponding S/N ratio

Exp. No.	*Avg. Value in % for Persisting Defects & Corresponding S/N Ratio*							
	ShrinkagePorosity (Y1)	**S/N Ratio**	**Blow Hole (Y2) (Y2)**	**S/N Ratio**	**Sand Inclusion (Y3)**	**S/N Ratio**	**Low Hardness (Y4)**	**S/N Ratio**
1	3.8	-11.5957	0.7	3.0980	1.06	-0.5061	0.45	6.9357
2	3.33	-10.4489	1	0.0000	0.89	1.0122	0.28	11.0568
3	3	-9.5424	1.04	-0.3407	0.89	1.0122	0.18	14.8945
4	3.67	-11.2933	1.6	-4.0824	1.12	-0.9844	0.22	13.1515
5	3.8	-11.5957	1.17	-1.3637	0.9	0.9151	0.33	9.6297
6	3.56	-11.0290	1.07	-0.5877	0.86	1.3100	0.26	11.7005
7	3.32	-10.4228	1.05	-0.4238	0.98	0.1755	0.24	12.3958
8	3.95	-11.9319	1.08	-0.6685	1.3	-2.2789	0.46	6.7448
9	4.22	-12.5062	0.98	0.1755	1.08	-0.6685	0.29	10.7520
10	3.82	-11.6413	1.3	-2.2789	1.2	-1.5836	0.27	11.3727
11	3.96	-11.9539	1.26	-2.0074	1.06	-0.5061	0.2	13.9794
12	4.02	-12.0845	0.98	0.1755	1.34	-2.5421	0.4	7.9588
13	4.5	-13.0643	0.88	1.1103	1.28	-2.1442	0.3	10.4576
14	3.6	-11.1261	1.09	-0.7485	1.09	-0.7485	0.27	11.3727
15	4.5	-13.0643	1.05	-0.4238	1.1	-0.8279	0.33	9.6297
16	4.21	-12.4856	1.06	-0.5061	0.9	0.9151	0.36	8.8739
17	3.7	-11.3640	1.05	-0.4238	0.98	0.1755	0.28	11.0568
18	3.94	-11.9099	1.74	-4.8110	1.3	-2.2789	0.24	12.3958
19	2.68	-8.5627	1.32	-2.4115	1.1	-0.8279	0.25	12.0412
20	2.87	-9.1576	1.22	-1.7272	1.11	-0.9065	0.4	7.9588
21	3	-9.5424	1.55	-3.8066	0.89	1.0122	0.33	9.6297
22	3.24	-10.2109	1.33	-2.4770	0.9	0.9151	0.3	10.4576
23	3.65	-11.2459	1.39	-2.8603	1.1	-0.8279	0.25	12.0412
24	4.02	-12.0845	1.67	-4.4543	1.3	-2.2789	0.32	9.8970
25	3.66	-11.2696	0.84	1.5144	1.28	-2.1442	0.36	8.8739
26	3.56	-11.0290	0.93	0.6303	1.1	-0.8279	0.26	11.7005
27	3.3	-10.3703	0.74	2.6154	0.98	0.1755	0.3	10.4576
28	2.66	-8.4976	0.76	2.3837	1	0.0000	0.22	13.1515
29	3.01	-9.5713	1.1	-0.8279	0.87	1.2096	0.33	9.6297
30	2.4	-7.6042	1.3	-2.2789	1.22	-1.7272	0.34	9.3704
31	2.64	-8.4321	0.52	5.6799	0.85	1.4116	0.38	8.4043
32	3.01	-9.5713	0.87	1.2096	0.89	1.0122	0.29	10.7520
33	2.88	-9.1878	1.16	-1.2892	1.18	-1.4376	0.24	12.3958
34	2.9	-9.2480	1.24	-1.8684	1.2	-1.5836	0.35	9.1186
35	3.54	-10.9801	1.6	-4.0824	1.08	-0.6685	0.2	13.9794
36	3.3	-10.3703	1.46	-3.2871	0.98	0.1755	0.24	12.3958

The Taguchi method uses the signal-to-noise S/N ratio instead of the response value obtained as a result of in the optimum setting analysis. The S/N ratio replicates both the

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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average and the variation of the response or quality characteristics [7, 24-25]. The percentages of castings rejected due to presence of respective persisting defects that occur in each trial condition were calculated by using equation 1 given above. The casting defects are the "lower-is -the better" type of quality characteristics. S/N ratios for this condition are calculated by the equation No. 2 given below. S/N ratios are calculated for each of the 36 trials and Corresponding S/N ratios are given above in Table 5.

$$\frac{S}{N} = -10\log\left(\frac{1}{n}\sum_{i=1}^{n} y_i^2\right) \quad \text{.....Equation No. 2}$$

Where, 'n' is trial number of observations and 'y_i' is the response or observed data in 'i^{th}' is the experiment number. After calculating the S/N ratios, the average S/N value is calculated for each factor at different levels **[25-26]**. The mean response refers to the average value of the performance characteristics for each parameter summarized in Tables 6 to 9. The average values of S/N ratios for individual process parameters at different levels are plotted on response graph and shown in Figures 1 to 4. From response tables 6 to 9 and Figure 1 to 4 for main effect plots or response graph, it can be concluded that which process parameter level works better to minimize persisting casting defects.

Table 6: S/N ratios at different levels for Shrinkage Porosity (Y1)

Process Variable	*Level 1*	*Level 2*	*Level 3*	*Delta Value*	*Rank*
A	-11.614	-9.830	……	1.785	1
B	-10.769	-10.675	…….	0.093	18
C	-10.647	-10.797	……	0.151	17
D	-10.698	-10.746	…….	0.047	19
E	-10.077	-11.367	…….	1.290	2
F	-10.315	-10.315	……..	0.815	3
G	-10.513	-10.931	……	0.418	10
H	-10.560	-10.831	-10.775	0.271	14
J	-11.059	-10.649	-10.459	0.600	8
K	-10.607	-10.736	-10.824	0.217	15
L	-10.925	-10.783	-10.459	0.466	8
M	-10.571	-10.854	-10.741	0.284	13
N	-10.956	-10.654	-10.557	0.399	11
O	-10.951	-10.587	-10.629	0.364	12
P	-10.715	-10.811	-10.640	0.171	18
Q	-10.448	-10.627	-11.091	0.643	4
R	-10.998	-10.532	-10.636	0.466	9
S	-10.975	-10.752	-10.440	0.535	7
T	-10.968	-10.769	-10.428	0.540	6

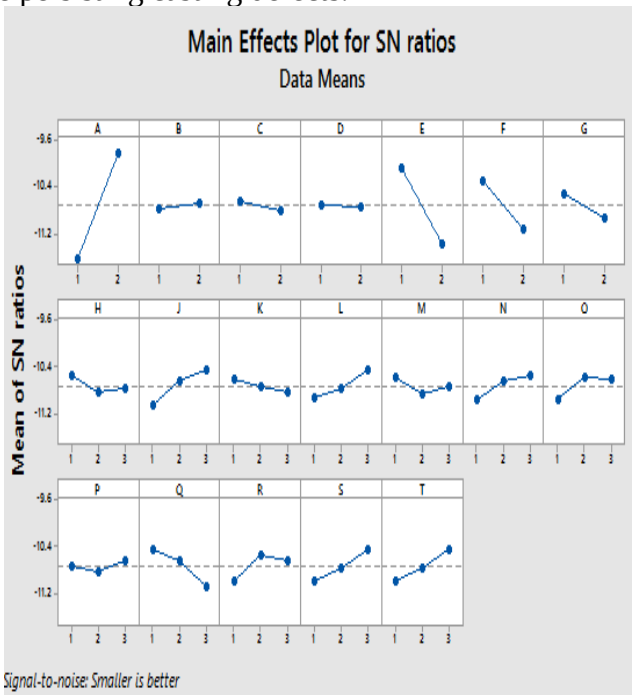

Fig. 1 Graph of the main effects of *S/N* for Shrinkage Porosity (Y1)

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 7: S/N ratios at different levels for Blow Holes (Y2)

Process Factors	*Level 1*	*Level 2*	*Level 3*	*Delta Value*	*Rank*
A	-0.78371	-0.96319	…..	0.17947	16
B	-0.95389	-0.79301	….	0.16088	17
C	-0.34803	-1.39887	…..	1.05083	7
D	-1.28283	-0.46407	…..	0.81876	9
E	-0.67140	-1.07550	…..	0.40410	14
F	-1.12091	-0.62599	…..	0.49492	13
G	0.63423	-2.38113	…	3.01536	1
H	-0.02180	-1.07248	-1.52607	1.50427	4
J	-1.68775	-1.04697	0.11437	1.80212	2
K	-0.93139	-1.04370	-0.64525	0.39845	15
L	-1.05062	-1.09385	-0.47588	0.61797	11
M	-0.92246	-0.79798	-0.89991	0.12447	18
N	-0.29326	-0.97343	-1.35366	1.06041	6
O	-0.54328	-0.98076	-1.09631	0.55303	12
P	-1.20664	-0.83201	-0.58170	0.62495	10
Q	-0.43547	-0.80844	-1.37644	0.94097	8
R	-0.86484	-0.89484	-0.86067	0.03417	19
S	-0.32238	-0.86228	-1.43569	1.11331	5
T	-0.02259	-0.99378	-1.60398	1.58138	3

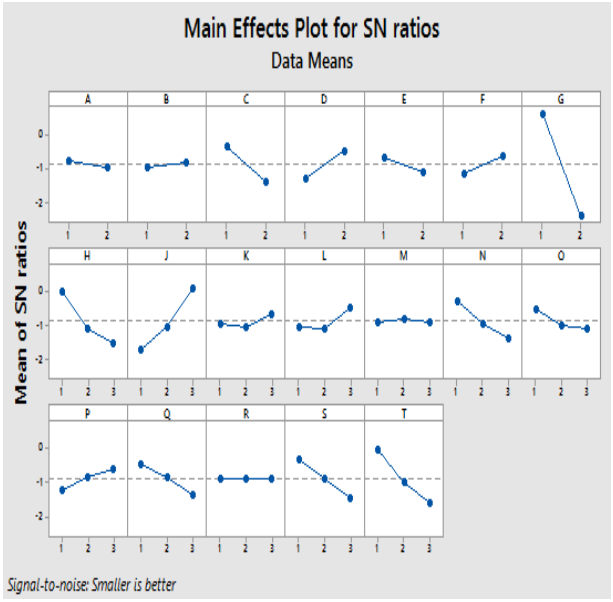

Fig. 2 Graph of the main effects of *S/N* for Blow Hole (Y2)

Table 8: S/N ratios at different levels for Sand Inclusion (Y3)

Process Factors	*Level 1*	*Level 2*	*Level 3*	*Delta Value*	*Rank*
A	-0.53075	-0.40657	…..	0.12417	17
B	-0.31795	-0.61937	…..	0.30143	11
C	-0.31999	-0.61733	…..	0.29734	14
D	-0.31929	-0.61802	…..	0.29873	12
E	0.07319	-1.01050	…..	1.08369	2
F	-0.51121	-0.42611	…..	0.08510	18
G	-0.40567	-0.53164	…..	0.12597	16
H	-0.52972	-0.20329	-0.67297	0.46967	9
J	-0.54554	-0.40111	-0.45933	0.14444	15
K	-0.70567	-0.64897	-0.05134	0.65432	5
L	-1.26271	-0.43949	0.29623	1.55894	1
M	-0.48581	-0.43611	-0.48405	0.04971	19
N	0.00709	-0.47994	-0.93313	0.94022	3
O	-1.00220	-0.18923	-0.21454	0.81297	4
P	-0.58641	-0.54692	-0.27264	0.31377	10
Q	-0.13094	-0.55822	-0.71682	0.58588	7
R	-0.52899	-0.69532	-0.18166	0.51366	8
S	-0.34047	-0.22762	-0.83789	0.61027	6
T	-0.52474	-0.29158	-0.58966	0.29808	13

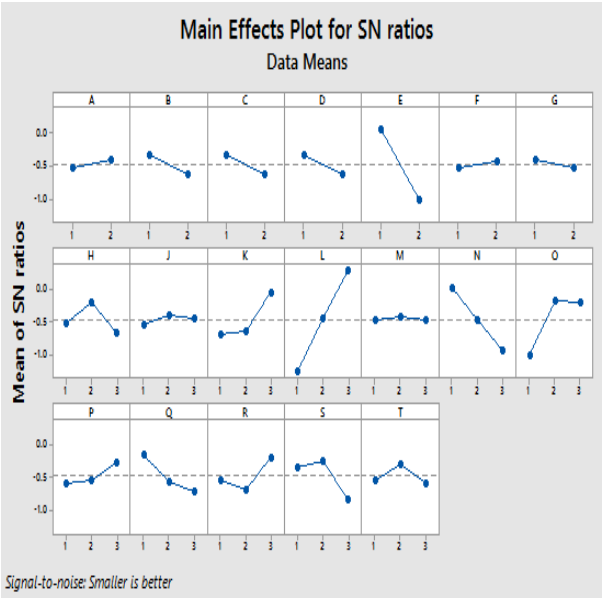

Fig. 3 Graph of the main effects of *S/N* for Sand Inclusion

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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Table 9: S/N ratios at different levels for Low Hardness (Y4)

Process Factors	*Level 1*	*Level 2*	*Level 3*	*Delta Value*	*Rank*
A	10.798	10.681	…..	0.117	15
B	10.573	10.905	…..	0.332	12
C	11.042	10.436	…..	0.606	6
D	11.048	10.430	…..	0.618	5
E	10.724	10.755	…..	0.031	18
F	10.743	10.736	…..	0.007	19
G	10.499	10.980	…..	0.481	8
H	10.436	10.825	10.956	0.520	7
J	10.956	10.655	10.607	0.349	11
K	10.740	10.824	10.654	0.170	13
L	9.920	10.746	11.552	1.633	2
M	10.738	10.664	10.816	0.151	14
N	10.691	10.779	10.748	0.089	17
O	10.668	10.784	10.766	0.115	16
P	10.270	10.747	11.202	0.932	4
Q	10.109	10.872	11.237	1.128	3
R	10.563	10.703	10.952	0.389	10
S	10.985	10.579	10.654	0.405	9
T	8.770	10.788	12.660	3.890	1

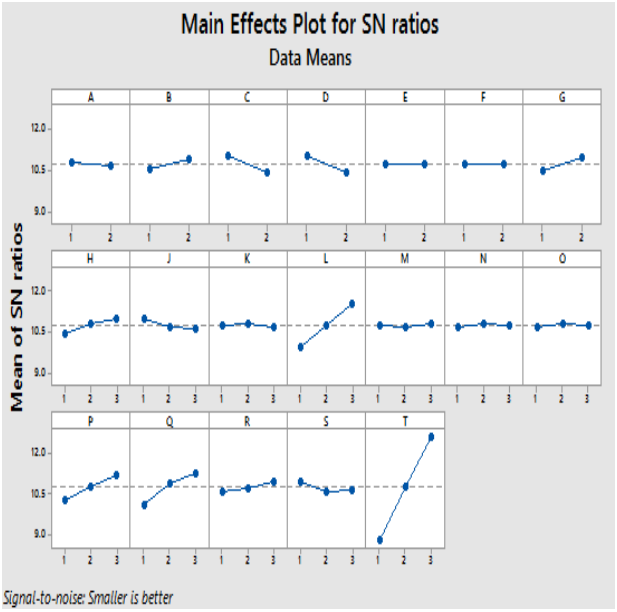

Figure 4. Graph of the main effects of *S/N* for Low Hardness

As mentioned in the response table, the Taguchi method gives the rank of individual parameter and optimal level can also be determined from the response graph for respective quality characteristics. Since the quality characteristics are the lower the better type of characteristics, the maximum S/N ratio gives the optimum level for setting of process parameters [30, 31**].** But the Taguchi method cannot judge and determine the effect of individual process parameters on the entire process. Therefore, analysis of variance (ANOVA) is used to identify the parameters which are significantly influencing the process and contributes comparatively more towards occurrences of persisting defects **[27, 31]**.

7 ANOVA Analysis

The aim of the ANOVA tests is to look into the most significant parameter in green sand casting process that potentially affects the quality characteristics. The results of the ANOVA analysis of S/N ratio correspond to the response; persisting defects in this study are reported in Tables 10 to 13 respectively. This analysis is performed to the level of significance α=0.05, i.e. for a confidence level of 95%.This analysis classifies the green sand casting process parameters in order to influence on various persisting defects. The ANOVA is carried out using the 'MINITAB 14' software. The results of Taguchi and ANOVA analysis are summarized in Table 12 given below. As mentioned in the summary; there is a close match between the results obtained by Taguchi approach and ANOVA analysis. For example, as mentioned in the table for ANOVA analysis of shrinkage porosity, carbon equivalent (CE) and percentage of steel scrap in the charge mix are found most influential parameters with percentage contributions of about 42.7% & 22.3 % respectively. Whereas from the Taguchi analysis and according to delta value

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corresponding rank of these parameters is 1 & 2.Same observations are made in case of other persisting defects that are sand inclusion, blow hole,and low hardness.

Table10 ANOVA results for signal-to-noise ratio for Shrinkage Porosity (Y1)

Var	Degre-es of Freed-om (DOF	Sum of Squares (SS)	Mean Square (MS)	F ratio	P	% Cont.
A	1	28.665	28.665	118.2	0	**42.70813**
B	1	0.0786	0.0786	0.32	0.6	0.117104
C	1	0.2039	0.2039	0.84	0.41	0.303784
D	1	0.0201	0.0201	0.08	0.78	0.029946
E	1	14.967	14.967	61.72	0.00	**22.29902**
F	1	5.9795	5.9795	24.66	0.00	**8.908671**
G	1	1.5724	1.5724	6.48	0.06	2.34267
H	2	0.4903	0.2451	1.01	0.44	0.730483
J	2	2.2582	1.1291	4.66	0.09	3.364422
K	2	0.2862	0.1431	0.59	0.59	0.4264
L	2	1.3704	0.6852	2.83	0.17	2.041716
M	2	0.4902	0.2451	1.01	0.44	0.730334
N	2	1.0407	0.5203	2.15	0.23	1.550507
O	2	0.9533	0.4766	1.97	0.25	1.420292
P	2	0.1769	0.0884	0.36	0.71	0.263558
Q	2	2.6462	1.3231	5.46	0.07	3.942491
R	2	1.4346	0.7173	2.96	0.16	2.137366
S	2	1.7334	0.8667	3.57	0.12	2.582539
T	2	1.7897	0.8948	3.69	0.12	2.666418
Erro	4	0.9701	0.5463			1.16
Total	35	67.127				100%

Table11 ANOVA results for signal-to-noise ratio for Blow Hole (Y2)

Var	Degree-es of Freed-om (DOF)	Sum of Squares (SS)	Mean Square (MS)	F ratio	P	% Cont.
A	1	0.2899	0.2899	0.67	0.46	0.15975
B	1	0.2329	0.2329	0.54	0.504	0.12834
C	1	9.9382	9.9382	22.92	0.009	**5.476464**
D	1	6.0333	6.0333	13.91	0.02	**3.324662**
E	1	1.4696	1.4696	3.39	0.139	0.809826
F	1	2.2046	2.2046	5.08	0.087	1.214849
G	1	81.8304	81.8304	188.68	0	**45.0928**
H	2	14.2898	7.1449	16.47	0.012	**7.874422**
J	2	20.0281	10.014	23.09	0.006	**11.03652**
K	2	1.0129	0.5065	1.17	0.399	0.558161
L	2	2.8563	1.4281	3.29	0.143	1.57397
M	2	0.1056	0.0528	0.12	0.889	0.058191
N	2	6.9267	3.4634	7.99	0.04	3.816971
O	2	2.0422	1.0211	2.35	0.211	1.125358
P	2	2.3742	1.1871	2.74	0.178	1.308307
Q	2	5.3887	2.6943	6.21	0.059	2.969454
R	2	0.0083	0.0042	0.01	0.99	0.004574
S	2	7.4392	3.7196	8.58	0.036	4.099386
T	2	15.2656	7.6328	17.6	0.01	8.412138
Error	4	1.7348	0.4337			1.30
Total	35	181.4711				100%

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 12 ANOVA results for signal-to-noise ratio for Sand Inclusion (Y3)

Var	Degre-es of Freed-om (DOF)	Sum of Squares (SS)	Mean Square (MS)	F ratio	P	% Cont.
A	1	0.1388	0.1388	0.52	0.512	0.267954
B	1	0.8176	0.8176	3.05	0.156	1.578381
C	1	0.7958	0.7958	2.97	0.16	1.536296
D	1	0.8031	0.8031	3	0.158	1.550389
E	1	10.5693	10.5693	39.45	0.003	**20.40409**
F	1	0.0652	0.0652	0.24	0.648	0.125869
G	1	0.1428	0.1428	0.53	0.506	0.275676
H	2	1.3906	0.6953	2.6	0.189	2.684561
J	2	0.1267	0.0634	0.24	0.8	0.244595
K	2	3.154	1.577	5.89	0.064	6.088815
L	2	14.5971	7.2986	27.24	0.005	**28.17978**
M	2	0.0191	0.0095	0.04	0.965	0.036873
N	2	5.3063	2.6532	9.9	0.028	**10.24384**
O	2	5.128	2.564	9.57	0.03	**9.899633**
P	2	0.701	0.3505	1.31	0.365	1.353284
Q	2	2.204	1.102	4.11	0.107	4.254834
R	2	1.6486	0.8243	3.08	0.155	3.182632
S	2	2.5304	1.2652	4.72	0.089	4.884952
T	2	0.5897	0.2949	1.1	0.416	1.138419
Error	4	1.0717	1.0717			2.07
Total	35	51.7999				97.93

Table 13 ANOVA results for signal-to-noise ratio for Low Hardness (Y4)

Var	Degre-es of Freed-om (DOF)	Sum of Squares (SS)	Mean Square (MS)	F ratio	P	% Cont.
A	1	0.1229	0.1229	0.66	0.462	0.090509
B	1	0.992	0.992	5.34	0.082	0.730551
C	1	3.3011	3.3011	17.75	0.014	**2.431069**
D	1	3.4386	3.4386	18.49	0.013	**2.53233**
E	1	0.0086	0.0086	0.05	0.84	0.006333
F	1	0.0004	0.0004	0	0.966	0.000295
G	1	2.0847	2.0847	11.21	0.029	1.535261
H	2	1.7569	0.8784	4.72	0.088	1.293855
J	2	0.8577	0.4289	2.31	0.216	0.631646
K	2	0.1732	0.0866	0.47	0.658	0.127552
L	2	15.9915	7.9957	43	0.002	**11.77681**
M	2	0.1376	0.0688	0.37	0.712	0.101334
N	2	0.0484	0.0242	0.13	0.881	0.035644
O	2	0.0926	0.0463	0.25	0.791	0.068195
P	2	5.2142	2.6071	14.02	0.016	**3.839956**
Q	2	7.9504	3.9752	21.38	0.007	**5.855009**
R	2	0.9324	0.4662	2.51	0.197	0.686659
S	2	1.1164	0.5582	3	0.16	0.822164
T	2	90.8246	45.4123	244.23	0	**66.88706**
Errorr	4	0.7438	0.1859			0.55
Total	35	135.788				99.45

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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8 Summary of Taguchi and ANOVA analysis

The results obtained from Taguchi and ANOVA analysis are summarized in Table 14. As mentioned in the table, Taguchi and ANOVA results are verified for the group of parameters which are associated with a process or operation responsible for the occurrences of respective persisting defects. The major findings in this summary are as given below,

1. Taguchi results and ANOVA results are having close matches.

2. Delta value and corresponding rank in the Taguchi response table for Significant parameters identified in the ANOVA analysis ($P<0.05$) is having good agreement with each other.

3. Percentage contribution made by group of parameters that are associated with particular process and in turn responsible for persisting defects is in the range of 60-75%, as compared to contributions made by other process parameters consider for experimentation.

4. Contributions made by other parameters are in the range of 25-40 %

Table 14 Summary of Taguchi and ANOVA analysis

Quality Characteristics	*Selected Process Parameters*	*Design atio*	*P in ANO-VA*	*% Cont.*	*Remarks*	*Delta Value (Taguchi Rank)*	*Optimal settin*	*Optimal Level*
Shrinkage Porosity	Carbon Equivalent Value (nu)	A	0	**42.70813**	Significant	1.785 (1)	4.0	Level 2
	Carbon (%)	B	0.6	0.117104	….	0.093 (18)	3.4	Level 2
	Pouring Temperature (^oC)	C	0.411	0.303784	….	0.151 (17)	1400	Level 1
	Inoculants Qty (%)	D	0.788	0.029946	….	0.047 (19)	0.15	Level 1
	Steel Scrap in Charge mix (%)	E	0.001	**22.29902**	Significant	1.290 (2)	30	Level 1
	Phosphorus content (%)	F	0.008	**8.908671**	Significant	0.815 (3)	0.08	Level 1
	Total Contribution (%) =74.36%							
Blow Holes	Binder (%)	G	0	**45.0928**	Significant	3.01536(1)	1.8	Level 1
	Moisture (%)	H	0.012	**7.874422**	Significant	1.50427 (4)	4.0	Level 1
	Permeability	J	0.006	**11.03652**	Significant	1.80212 (2)	150	Level 3
	Pouring Temp.(^0C)	C	0.009	**5.476464**	Significant	1.05083 (7)	1400	Level 1
	Sulphur content (%)	K	0.399	0.558161	……	0.39845 (15)	0.09	Level 3
	Total Contribution (%) =70.03%							
Sand Inclusion	Green Compression Strength (Kg/Cm2)	L	0.005	**28.17978**	Significant	1.5589 (1)	1.8	Level 3
	Moisture (%)	H	0.189	2.684561	….	0.46967 (9)	4.6	Level 2
	Compatibility (%)	M	0.965	0.730334	….	0.04971(19)	43	Level 2
	Return Sand Temp.(^0C)	N	0.028	**10.24384**	Significant	0.94022 (3)	30	Level 1
	Squeezing Pressure (bar)	O	0.003	**9.899633**	Significant	0.81297 (4)	100	Level 2

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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	Mould Hardness Horizontal	P	0.365	1.353284	….	0.31377(10)	90	Level 3
	Mould Hardness Vertical	Q	0.107	4.254834	….	0.58588 (7)	70	Level 1
	Total Contribution (%) = 57.34%							
Low Hardness	Carbon Equivalent Value	A	0.462	0.090509	….	0.117 (15)	3.9	Level 1
	Knockout Time (Minute)	S	0.16	0.822164	….	0.405 (9)	30	Level 1
	Inoculants Qty (%)	D	0.013	**2.53233**	Signifi-cant	0.618 9(5)	0.15	Level 1
	Manganese (%)	T	0	**66.88706**	Signifi-cant	3.89 (1)	0.8	Level 3
	Total Contribution (%) = 70.33%							

9 Confirmation Experiments

Confirmation of findings from analysis of results is a necessary step for completion of any DOE study. Before accepting predicted optimum condition, it is essential that the predicted performance at the optimum be confirmed by running a number of samples in that condition. To confirm predicted performance, mean (average) of the actual test results is compared with the confidence interval calculated for the expected performance **[7, 30]**.

9.1Estimation of mean

Once an experiment is conducted and the optimal combination of process parameters within the experiment is determined, one of the following two possibilities exists:

1. The prescribed combination of parameters at optimal levels is identical to one of those in the experiments conducted.

2. The prescribed combination of parameters at optimal levels is not obtained in the experiments conducted with chosen orthogonal array.

In the present work, the second situation exists, and hence, to estimate the mean for that treatment condition is to average all the results for the trials which are set at levels those are optimal levels of parameters. The estimation of mean for casting defect, shrinkage porosity is achieved by the following equation:

$$\mu(\textbf{\textit{Shrinkage Porosity}}) = T + (\overline{A2} - T) + (\overline{B2} - T) + (\overline{C1} - T) + (\overline{D1} - T) + (\overline{E1} - T) + (\overline{F1} - T) + (\overline{G1} - T) + (\overline{H1} - T) + (\overline{J3} - T) + (\overline{K1} - T) + (\overline{L3} - T) + (\overline{M1} - T) + (\overline{N3} - T) + (\overline{O2} - T) + (\overline{P3} - T) + (\overline{Q1} - T) + (\overline{R2} - T) + (\overline{S3} - T) + (\overline{T3} - T)$$

……Equation 3

Where, μ is the mean of casting defects at optimal level of parameters. *'T'* is the average value of shrinkage porosity defect and $\overline{A2}, \overline{B2}, \overline{C1} \ldots\ldots\ldots\ldots \overline{T3}$ are the average of shrinkage porosity defect at optimal level of parameters .The mean (optimal value) for a selected trial condition for parameters of the level's mentioned in the above equation is

μ (Shrinkage Porosity) =1.687%.

Similarly, mean (μ) for other defects are calculated as given below,

$$\mu(\textbf{\textit{Blow Hole}}) = T + (\overline{A1} - T) + (\overline{B2} - T) + (\overline{C1} - T) + (\overline{D2} - T) + (\overline{E1} - T) + (\overline{F2} - T) + (\overline{G1} - T) + (\overline{H1} - T) + (\overline{J3} - T) + (\overline{K3} - T) + (\overline{L3} - T) + (\overline{M2} - T) + (\overline{N1} - T) + (\overline{O1} - T) + (\overline{P3} - T) + (\overline{Q1} - T) + (\overline{R1} - T) + (\overline{S1} - T) + (\overline{T1} - T)$$

……Equation 4

μ (Blow Hole) = 0.1931%.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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$$\mu(\textbf{\textit{Sand Inclusion}}) = T + (\overline{A2} - T) + (\overline{B1} - T) + (\overline{C1} - T) + (\overline{D1} - T) + (\overline{E1} - T) + (\overline{F2} - T) + (\overline{G1} - T) + (\overline{H2} - T) + (\overline{J2} - T) + (\overline{K3} - T) + (\overline{L3} - T) + (\overline{M2} - T) + (\overline{N1} - T) + (\overline{O2} - T) + (\overline{P3} - T) + (\overline{Q1} - T) + (\overline{R3} - T) + (\overline{S2} - T) + (\overline{S2} - T) + (\overline{T2} - T)$$

……..Equation 5

μ (Sand Inclusion) = *0.465%*

$$\mu(\textbf{\textit{Low Hardness}}) = T + (\overline{A1} - T) + (\overline{B2} - T) + (\overline{C1} - T) + (\overline{D1} - T) + (\overline{E1} - T) + (\overline{F1} - T) + (\overline{G2} - T) + (\overline{H3} - T) + (\overline{J1} - T) + (\overline{K2} - T) + (\overline{L3} - T) + (\overline{M3} - T) + (\overline{N2} - T) + (\overline{O2} - T) + (\overline{P3} - T) + (\overline{Q3} - T) + (\overline{R3} - T) + (\overline{S1} - T) + (\overline{T3} - T)$$

……..Equation 6

μ (Low Hardness) = 0.04%

9.2 Confidence interval around mean

The optimum levels of process parameters have already been obtained. The estimate of the mean (μ) is only a point estimate based on the average of the output values obtained as a result of experiments conducted. Statistically, this provides a 50% chance of the true average being greater than μ and a 50% chance of the true average being less than μ. The confidence level is the maximum and minimum value between which the true average should fall at some stated level. The 95% confidence interval of confirmation experiments (CICE) is calculated by using the following equations

$$CI_{CE} = \sqrt{F_{\alpha}(1, f_e) V_e \left[\frac{1}{n_{eff}} + \frac{1}{R}\right]}$$

……..Equation 7

Where α is the level of risk, *Ve* is the error variance, *ve* is the degrees of freedom for the error. ηeff is the effective number of replications and r is the number of test trials in confirmatory experiments.

$$n_{eff} = \frac{N}{1 + [\text{DOF associated in the estimate of mean response}]}$$

N=total experiments=36

η_{eff} = *36 /*(1 + 31) = 36/(1+31) = 1.125

F(α, 1, νe)= F(0.05, 1, 4)=7.7086(tabulated)

α = 1- Confidence limit (95%)=0.05

Ve is the error variance = 0.02964

νe is the degrees of freedom for the error = 4

Ve & νe is calculated from ANOVA analysis for casting defect output i.e. shrinkage porosity

CI = [7.7086x 0.02964 [1/1.125 + 1/10]$^{1/2}$

CI = ± 0.4752

Predicted optimal range (for a confirmation run with 10 experiments) at 95% interval for respective casting defects is

[μ − CI]< μ <[μ + CI],

Therefore, For shrinkage porosity,

[1.687-0.4752] < 1.687< [1.687+0.4752]

1.2118< 1.1687< 2.1622

International Journal of Management, IT & Engineering
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Similarly, CI is calculated for other persisting defects that are blow hole, sand inclusion, and low hardness to predict optimal range at 95% and values obtained is as given below,
For blow hole,
μ(Blow Hole)= 0.1931, CI=±0.2647
[*0.1931-0.2647*]< *0.1931*< [*0.1931*+0.2647]
0.0716< 0.1931< 0.4578
For sand inclusion,
μ(Sand Inclusion)=0.4655, CI=±0.172
[*0.4655*-0.172]< *0.4655*< [*0.4655*+0.172]
0.293< 0.4655< 0.6375
For Low Hardness,
μ(Low Hardness)=0.04, CI= ± 0.0393
[0.04-0.0393]< 0.04< [0.04+0.0393]
0.0007< 0.04< 0.0793

9.3 Results of confirmation run

The objective of the confirmation run is to determine that the selected control parameter values at optimum level will produce better results than those produced in the first part of the experiment. The confirmation experiments are used for verification of the optimal levels suggested through screening experiments for selected potential parameters that will give desired output of the process. The confirming experiment is an important step to verify the experimental conclusions and is interpreted in this manner. If the average of the output of the confirmation run is within the range of the confidence limits, then the significant factors as well as the optimum levels for obtaining the desired results are properly chosen. If the average of the results of the confirmation experiment is not within the range of the CI, the parameters selected and/or levels to control the results for a desired value are incorrect or have excessive measurements, in this case further experimentation is required **[29]**. Ten confirmation experiments are conducted at the optimum settings of the process as shown in Table 15. The average of the results of confirmation experiments are 2.093 for shrinkage porosity which is less than 2.1622% (maximum of CI), 0.441 for blow hole which is less than 0.4578, 0.62 for sand inclusion which is less than 0.6375 and 0.072 for low hardness which is less than 0.0793Therefore, the selected parameters as well as their appropriate levels are significant enough to obtain the desired result.

Table 15 Results of confirmation run

Experiments at optimum level of parameters for respective defects	Test Results (%Defects)			
	Shrinkage Porosity	Blow Hole	Sand Inclusion	Low Hardness
1	3.1	0.7	0.8	0.1
2	2.26	0.58	0.6	0.1
3	1.89	0.54	0.7	0.1
4	2.38	0.6	1	0.17
5	1.92	0.27	0.63	0.03
6	1.9	0.3	0.48	0.05
7	1.45	0.36	0.71	0.08
8	1.88	0.48	0.46	0.04
9	1.7	0.28	0.21	0.05
10	2.45	0.3	0.61	0
Average %	2.093	0.441	0.62	0.072

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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10 Conclusions

In this work optimization of process parameters and identification of most influential parameters that are responsible for the occurrences of respective persisting defects in gray iron castings produced in green sand casting process was considered. The defects which are found persisting in cylinder head castings produced in foundry in central India was analyzed by Taguchi method and ANOVA analysis. Shrinkage porosity, blow hole, sand inclusion and low hardness are the defects which are found persisting and contribute to productivity loss with increased production cost. The important findings of this work are mentioned in the following specific conclusions.

1. The mixed orthogonal array of Taguchi is used to determine the optimal setting of the green sand casting process parameters in order to minimize the persisting defects in this process.

2. Based on the ANOVA analysis of S/N ratio the most influential parameters are identified which are responsible for the occurrences of persisting defects in complex castings for example cylinder head cast component considered in this study.

3. Carbon equivalent (CE) value, percentage (%) of steel scrap in charge mix and percentage (%) of phosphorus content in gray iron is found most influential parameters and having contribution of 42.70%, 22.3% and 8.90%, respectively in the occurrence of shrinkage porosity defect.

4. In Persisting defect blow hole, percentage of binder (resin used in 2-part no bake core making system) is the most influential parameter followed by other parameters that are, permeability, percentage of moisture in green sand and pouring temperature. The contributions made by these parameters are 45.09%, 11.03%, 7.87% and 5.47% respectively.

5. Green compression strength of sand, return sand temperature and squeezing pressure on the sand during mould preparation are found most influential parameters and responsible for sand inclusion defects with a contribution of 28.17%, 10.24% and 9.89%.

6. For the persisting defect low hardness in cast components, percentage of manganese in metal is the most influential parameter and contribution made is 66.88%.

7. As presented in the Table 12, summary of Taguchi and ANOVA analysis, results obtained by Taguchi and ANOVA analysis are verified for the parameters selected on the basis of their association with respective persisting defects. It is observed from the summary that, group of selected parameters contributes in the range of about 60-75% (including significant parameters) in the occurrences of respective persisting defects.

8. In green sand casting process great number of parameters is involved, but if the defects are properly identified and associated processes or operation is correctly defined which is responsible for the occurrences of respective defects, defects can be minimized through proper setting of parameters. In the initial course of action only significant parameters can be targeted instead of changing setting of so many other parameters used in trial and error approach.

9. The results of the confirmation test prove that the persisting defects found in gray iron castings produced in green sand casting process that are shrinkage porosity, blow hole, sand inclusion and low hardness consider in this work are minimized through the optimal combination of the green sand casting process parameters.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

ULTRA SOUND PROMOTED CLAY CATALYZED HOSOMI-SAKURAI REACTION VIA IN SITU DESILYLATION OF SILYL ETHER IN PRESENCE OF TBAF

Kanchan Joshi Kulkarni (Ph.D. Research Student)*
Dr. B. D. Ajalkar (Research Guide)**

Abstract
The chemists think about the construction of physiologically active compounds, the novel synthetic methodologies that promote greener reactions is essential. Chemical transformations under ultrasound irradiation are advantageous to mild reaction conditions, high yield, short time period, simple experimental procedure and saving of energy.
The homoallyl alcohols can serve as intermediates which are useful and plays vital role in the synthesis of bioactive compounds like glycols, polyether antibiotics, and nucleoside antibiotics.
Hosomi-Sakurai allylation using montmorillonite K-10 in the presence of ultrasound energy is novel method and overcomes drawbacks. In this reaction the preparation of 1-phenly but-3-en-1-ol such compounds are prepared.
Keyword– Ultrasound irradiation, Homoallylation, Montmorillonite K10

Introduction
As concern in the point of view to shape the reaction nowadays chemists focus on the construction of physiologically active compounds, the development of synthetic methodologies that promote greener reactions is essential. The utilization of high intensity ultrasound or integrated ultrasound-microwave technologies under heterogeneous catalytic systems offers a facile, versatile synthetic tool for large number of organic reactions[1]
Chemical transformations under ultrasound irradiation are more advantageous in view of its milder reaction condition, high yields in shorter reaction time, improved selectivity, simple experimental procedure and energy conservation.
Therefore, under heterogeneous sonocatalysis, different properties of the final products such as particle size, shape and its purity would be controlled by as sonication output power, temperature, the solvent, the chemical species and their concentrations in the reaction mixture.[2] Many clay based catalysts such as claycop, clayzine, clayfen, environcat, etc., are commercially available. But there are only two K-10 and KSF montmorillonites are most commonly used and applied in organic synthesis.[3] Despite its tremendous applications, there is no examples of the use of Montmorillonite clay 10 as a catalyst for the synthesis of homoallyl alcohol (Hosomi—Sakurai lation) under ultrasonic energy. Various catalytic systems have been successfully probed in Hosomi—Sakurai allylation chemistry, whereas use of heterogeneous catalytic sy stem has opened new horizons.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Hosomi—Sakurai allylation

Allylation of aldehydes with allyltrialkylsilanes is a most powerful C-C bond forming reactions and has attracted much attention as a useful method to generate homoally1 ethers in organic synthesis. They became ingenious functional groups and their utility serve as an important bridge between fundamental aspects of stereochemistry and applications in target oriented synthesis.

At the same time homoallyl ethers can serve as useful precursors to cyclic enol ethers via ring closing metathesis reactions,[141] which plays vital role in the synthesis of bioactive compounds such as glycols,[51 polyether antibiotics and natural products[61 and nucleoside antibiotics. [7]

There are some drawbacks in using traditional methods The traditional synthetic techniques on Hosomi—Sakurai allylation reaction comprises use of strong Lewis acids[81 catalyst such as TiC14, BF3—OEt2, NbCl5 and SnC14. Recently, several metal triflates [91 such as Sc(OTf)3, Yb(OTf)3, Zr(OTf)4 and Hf(OTf)4 are found to be effective for this transformation. But in most of the cases either a long reaction time or drastic reaction conditions were employed.

However, many of these Lewis acids are moisture sensitive and metal triflates are highly expensive. Instead, the negative Impact of these reagents on the environment has urged the development of alternative, greener methodologies for effecting this and related synthetic transformations. The use of eco-friendly, recoverable and ecological heterogeneous solid Lewis acids catalysts can accomplish this stubbornness.

Clays

Environmentally benign clays are ideally suited for the 'greening' of modern synthetic chemistry as they are naturally abundant, inexpensive, non toxic, chemically versatile and recyclable[10]. Many clay based catalysts such as claycop, clayzine, clayfen, environcat, etc., are commercially available. But there are only two K-10 and KSF montmorillonites are most commonly used and applied in organic synthesis.[11]

Clays are a type of fine-grained crystalline earth materials, primarily composed of aluminium and silicate minerals.[12] Montmorillonite clays have ability to catalyze a wide range of chemical reactions[13] which includes addition, elimination, substitution, rearrangement, oxidation-reduction, Hetero-Diels-Alder reactions,[14] Heck coupling reaction,[15] in masking of heterocycles[16] and others.[17]

Montmorillonite catalysts are easily recovered and reused [18,19].

1. Clays are: safe to handle, reusable, inexpensive, can prevent waste, promote atom economy
2. May lower the activation energy of a reaction by stabilizing the transition state.
3. May act as a general acid or base.
4. Environmentally benign

Ultrasound in Organic Synthesis

The utilization of high intensity ultrasound technology under heterogeneous catalytic systems offers a facile, versatile synthetic tool for large number of organic reactions [20] and has been introduced as an eco-environmental tool in green chemistry.

It presents a significant scientific challenge to understanding its physical phenomenon – acoustic cavitations. There are number of applications of sonochemistry in synthesis has made the subject attractive to many chemists and interest has spreads beyond academic laboratories into industry and chemical engineering.(21-25) Ultrasound is defined as sound of

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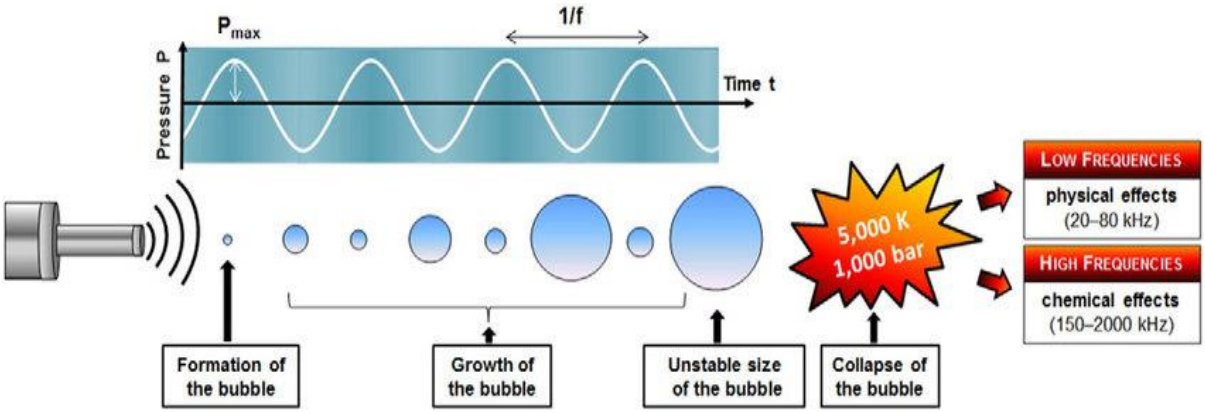
frequency beyond that to which normal range of hearing is between 16 Hz to 18 kHz and



ultrasound is generally between 20 kHz to beyond 100 MHz. Sonochemistry

Fig. 1 Ultrasonicated 'hot-spot' theory

The interplay between ultrasonic irradiation and heterogeneous catalysis can also be regarded within the green chemistry domain, even if some organic solvents cannot be completely avoided.[26] In heterogeneous sonocatalysis, the fundamental rule is diffusion and sorption of the main components over a solid catalytic surface that permits the series of reactions on active sites or surfaces[27].

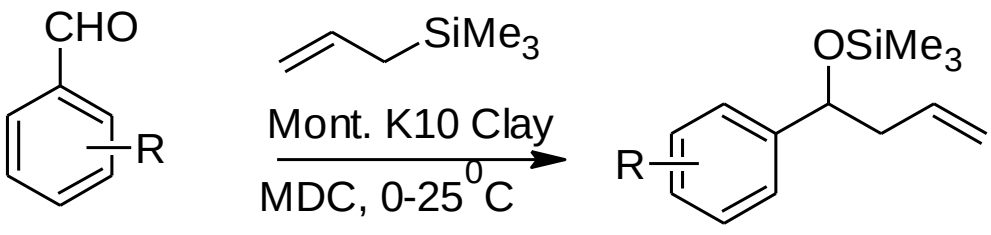
Despite remarkable usage of heterogeneous catalysis in Hosomi—Sakurai allylation), there is relatively little attention has been paid towards effectiveness of montmorillonite K10 clay. There was only one disclosure of Hosomi—Sakurai allylation reaction of aromatic aldehydes with allyltrimethylsilane for the synthesis of homoallylicsilylethers by Dintzner and co-worker.[281 (Scheme 1) But the major disadvantages of protocol are formation of sillylether, longer reaction time and tedious work-up procedure

Scheme 1

This swing to commercial application of Montmorillonite K10 clay for diverse organic transformations prompted us to report expediency of Montmorillonite K10 clay in synthesis of homoallylic via in situ desillyation of sillyl ethers under ultrasonic energy.

Present Work

Hosomi—Sakurai allylation is the most widely utilized carbon—carbon bond-forming reactions where in addition of allylsilanes to aldehydes has been occurred in presence of Lewis acids catalyst. The literature records for this particular transformation with various Lewis acids have its own merits as well as demerits such as expensive catalyst and solvent, harsh reaction condition, longer reaction time, poor yields and difficulties in work-up procedure. Therefore, the introduction of a simple and efficient procedure based on green methodology is still in demand.



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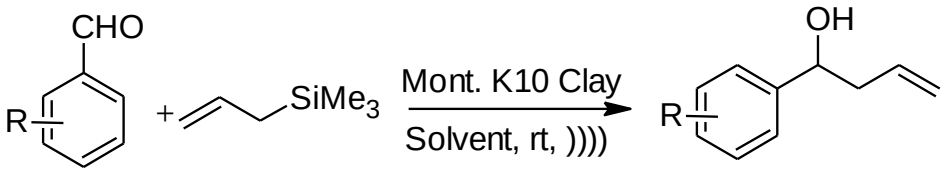
The green chemistry perspective is, however, considerably broader and includes criteria for waste generation, use of reagents and solvents, use of hazardous chemicals, energy intensity and general safety.

Therefore, the ultimate challenge in Hosomi—Sakurai allylation reaction for the synthesis of homoallylic alcohol is to utilize inexpensive, clean, environmentally benign, and commercially available catalysts. In this content and in continuation of our work on heterogeneous acid catalyzed reaction, we would like to examine the efficiency of Montmorillonite K10 clay catalyst for synthesis of homoallylic alcohol from aromatic aldehydes and allyltrialkylsilanes (Scheme 2).

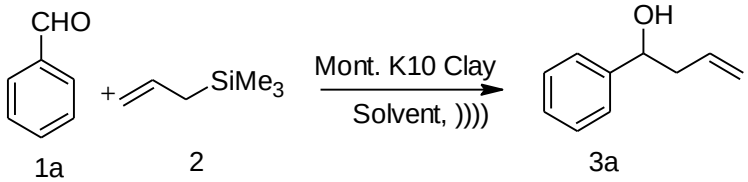


Scheme 2

Result and discussion

Our initial focus was to establish the optimal reaction conditions for the synthesis of homoallyl alcohol. Accordingly, one pot reaction of benzaldehyde with methylsilane (2) under ultrasound was chosen as a model reaction that was run under various conditions (Table 1 and 2). When the reaction performed initially in methanol that had gone to completion and yields mixtures of free alcohol as well as silylated products. Then after in situ treatment with tetrabutylammonium fluoride (TBAF), and chromatographic purification, the corresponding 1-phenylbut-3-en-l-ol (3a) was obtained in moderate yields. Therefore, in next attempts alteration in solvent were performed using protic and aprotic solvent (Table 1, Entries 1-8). To our delight the notable improvement in yield of product quantity was observed when reaction was performed in aprotic chlorinated solvent (Table 1, Entries 7-8). Further shift towards greener solvent like water did not showing satisfactory enhancement in yield. (Table 1, Entry 9) While the performance of reaction in absence of solvent, (Table 1, Entry 5) did not show any considerable change in product yield. (Table 1, Entry 10). Thus, dichloromethane (DCM) was found to be best solvent in this allylation this reaction.

1 Optimization of the solvent conditions[a]



Entry	Solvent	Reaction time (min)	% Yield[b]
1	Methanol	70	47
2	Ethanol	60	42
3	Toluene	90	38
4	Tetrahydrofuran	80	52
5	Acetonitrile	50	62

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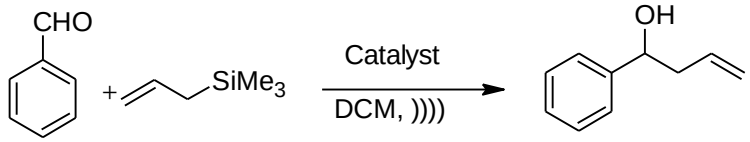
6	N,N Dimethyl formamide	50	57
7	Chloroform	20	85
8	Dichloromethane	20	92
9	Water	90	Trace
10	Solvent free	60	57

'Reaction conditions: Benzaldehyde (1 mmol), allyltrimethylsilane (2) Mont. K10 Clay (50 mg), TBAF (1 mmo), rt, 20 min, Solvent (3 mL) isolated yields after chromatography.

In next attempts we have examined catalytic loading on model reaction. So to investigate the effect of amount of Montmorillonite K10 Clay catalyst on the rate and yield of product, the model reaction was screened by varying the amount of catalyst at ambient temperature in DCM and the results are summarized in Table-2. Which shows that the absence of catalyst did not initiating reaction, (Table 2, Entry 1) this indicates that the key role played by Montmorillonite K10 clay for this particular one-pot Hosomi—Sakurai allylation reaction. In next attempts the yield of 1-phenylbut-3-en- 1 -ol (3a) was increased with an increase in catalyst from 10 to 50 mg (Table 2, Entries 1-6). However, further increase in amount of catalyst, did not show any considerable increase in product yield (Table 2, Entries 7-8). Thus, 50 mg of catalyst loading was selected as optimum concentration for further studies.

Table 2: Effect of amount of Montmorillonite K10 Clay on model reactions[a]



1a 2 3a

Entry	Catalyst (mg)	Time (min.)	Yield[b] (%)
1	Catalyst-free	90	-
2	10	30	64
3	20	30	67
4	30	25	72
5	40	20	80
6	50	20	92
7	60	22	90
8	70	22	91

Reaction conditions: Benzaldehyde (1 mmol), allyltrimethylsilane (2) DCM (3 mL), TBAF (1) rt, 20 min, 'Isolated yields after chromatography.

To test effectiveness of Montmorillonite K10 Clay on structurally different aldehydes were examined_ (Table 3) It was pleasing to find that both activated and unactivated aromatic aldehydes worked well, giving good to high yields of homoallyl alcohols (Table 3, Entries a-o). The allylation of these aldehydes were depending upon the physical state of the substrate and the nature of the substituents. We were pleased to find that allyltrimethylsilane coupled: efficiently with diverse electron deficient aromatic aldehydes (Table 3, Entries b-g) very efficiently in good yields. However, aldehyde bearing election rich functionality (Table .3, Entries h-i) yields moderate product quantity. Additional examples (Table 3, Entries -1) were explored with hetero aromatic aldehydes showing the

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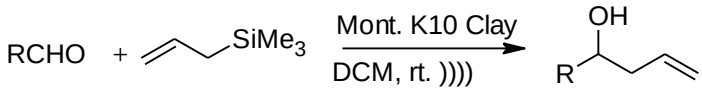
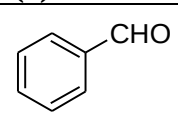
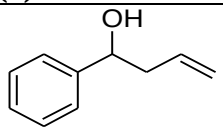
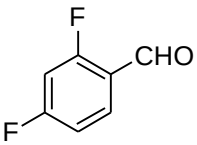
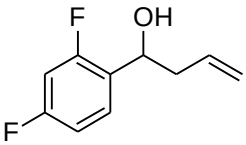
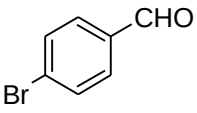
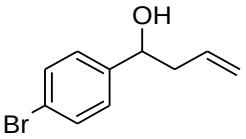
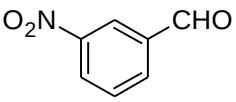
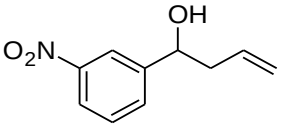
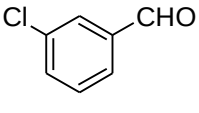
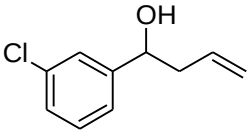
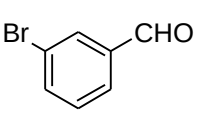
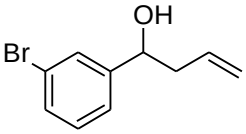
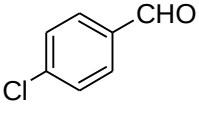
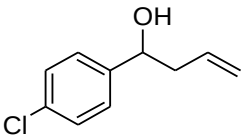
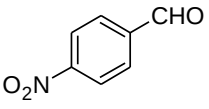
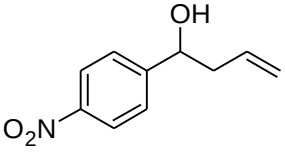
successful reactivity of allyltrimethylsilane and the compatibility of Montmorillonite K-10 clay. The reaction proceeded fairly with some aliphatic aldehydes (Table 3, Entry n) and sterically hindered aldehydes, (Table 3, entry m) it was neither as clean nor as high yielding as with the aromatic systems, presumably due to their intrinsic lower reactivity and steric interaction respectively. No reaction was observed with unsaturated aldehydes (Table 3, Entry o).

Table 3: Allylation of aldehyde with allyltrimethylsilane catalyzed by Mont. K10 Clay' Montmorillonite. K10 Clay[a]



1 (a-o) **(2)** **3 (a-o)**

Sr. no.	'R-CHO' (1)	Product (3)	Reaction time (min)	Yield[b] %
			20	92
			15	95
			25	90
			30	88
			30	85
			30	89
			25	90
			45	92

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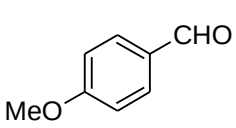
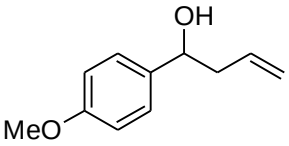
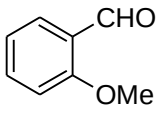
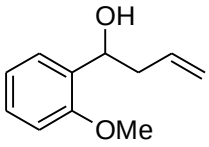
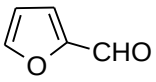
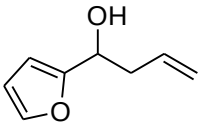
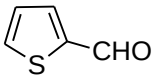
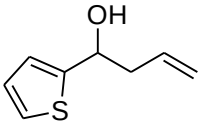
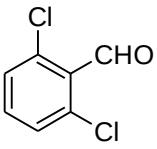
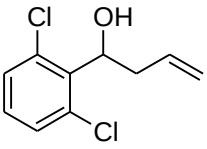
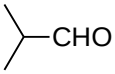
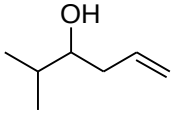
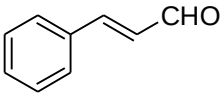
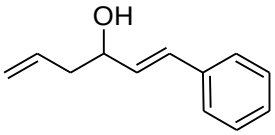
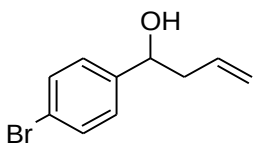
		60	80
		65	72
		55	75
		55	72
		70	50
		90	45
		90	-

Reaction conditions: Aldehyde (1) (1 mmol), allyltrimethylsilane (2) DCM (3 mL), Montmorillonite K10 clay (50 mg), TBAF (1 mmol), rt, 20-90 min, 'Isolated yields after chromatography.

Characterization of product

The structures of all homoallylic alcohol derivatives 3 (a-o) were elucidated on the basis of FTIR, 111 NMR and 13C NMR spectroscopy as well as mass spectrometry. The spectral data is in agreement with the proposed structures.

For compound 3c (Table 3, entry c), it was observed that in IR spectrum (Fig.) the appearance of peak at 3376.00 for —OH group and common absorption bands are at 3079, 2980, 1900, 1776, 1681, 1488, 1429, 1073, 1010, 992, 748, 716. In 11-1 NMR (Fig.) the appearance signals at 6=7.51-7.49 (m, 2H), 7.48-7.26 (m, 2H) are for aromatic Yi protons whereas signals at 6= 5.77-5.69 (m, 1H), 5.15-5.10 (m, 2H), 4.71-4.68 (m, 1H), 2.79-2.74 (m, 2H), are for olefinic and aliphatic protons respectively.



International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Analyzing the 13C NMR spectra (Fig. 3.10), the appearance of signals between 140.2. 133.4, 131.7, 128.7, 122.2, 118.6, for aromatic and olefinic protons while the Is at 6=61.7, 44.0 ppm indicate the presence of aliphatic substituents. The 'H NMR 13C NMR were in agreement with the proposed structures. Also noteworthy DEPT analysis (Fig.) for olific at 6=118.6 and aliphatic CH2 at 6=44.0 confirms the structure desired compound.

3.2.4. Catalyst reusability

In order to study the catalysts reusability, on model reaction, the catalyst was filtered and dried on completion of reaction and subsequently washed with copious amount of ethanol. Then before to perform it for next catalytic cycle that was oven dried at 50°C for hrs. The results of recycled catalyst are shown in Fig. 3. The fresh catalyst showed yield of 1-phenylbut-3-en- 1 -ol, which then marginally decreased to 84% after the fourth consecutive recycle run and remained same for the fifth run. Thus, the catalyst can reused at least up to six times under the standard reaction conditions.

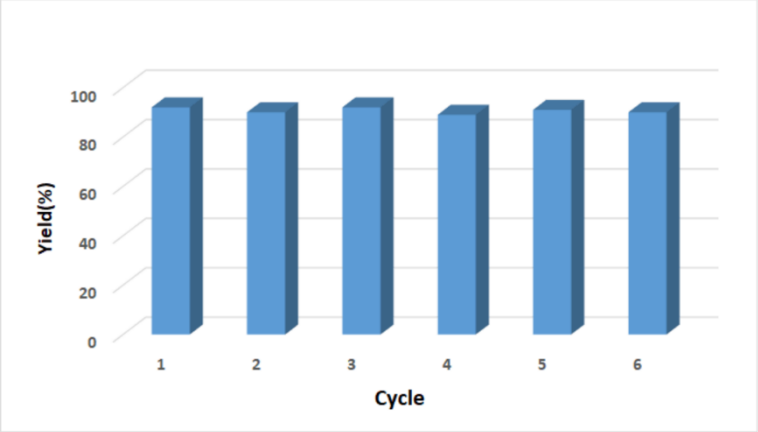

Fig. 2. Recycling of Montmorillonite K10 clay catalyst for preparation of 1-Phenylbut-3-en-1-ol

Mechanistic study

On the basis of literature a possible mechanism to explain the one-pot, formation of homoallyl alcohols by reacting aldehydes and trimethylsilane followed by desilylation is depicted in scheme 3. As shown in this scheme, it is likely that the initial step under the activation of aldehyde by Montmorillonite K-10 clay to form intermediate [I]. Sequently, the catalyst-induced nucleophilic addition of the trimethylsilane followed consecutive intramolecular cyclization occur to provide the intermediate [II],[29] which rearranges to expected homoallylic silyl ethers [III]. Finaly deprotection of silyl group can be effected quantitatively by adding TBAF and stirring for additional 5-10 min prior to filtering of catalyst.

International Journal of Management, IT & Engineering
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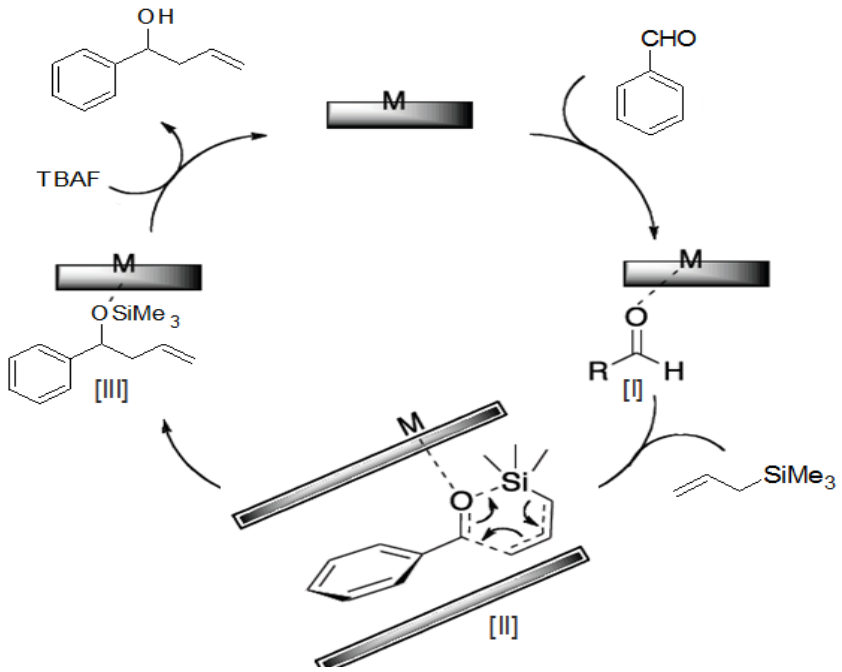

Fig 3 Proposed mechanisms for Mont. K10 clay-catalyzed Hosomi-Sakurai reaction

Conclusion

We have carried out convenient synthesis of homoallyl alcohol (Hosomi-Sakurai allylation. The principal benefits of the present protocol are efficiency, versatility, good yield, short reaction times, clean reaction, easy workup procedure, catalytic recyclability, and reusability without loosing activity, which makes this protocol useful and attractive in development of benign chemical processes and products.

1 Experimental

Solvents, reagents and Montmorillonite K10 catalyst were commercially sourced from Sigma Aldrich and used without further purification. Melting points were determined in an open capillary and are uncorrected. Products were recrystallized from ethanol as a solvent. The purity of compound checked by the TLC on silica gel plates. The Infrared spectra were obtained on Perkin Elmer FT-IR spectrometer. The samples were examined as KBr discs 5%w/w.1H NMR and 13C NMR spectra were recorded on Bruker Avon 300/400 MHz spectrometer using CDC13/ DMSO as solvent and TMS as internal standard, the chemical shift are reported in ppm. Multiplicities are indicated by 's' (singlet),'d' (doublet), 't' (triplet), 'q (quartet), 'm' (multiplet), bs (broad singlet).

2. General procedure for 3 (a-o)

To a 50 cm3 tapered Pyrex flask was added aromatic aldehyde (2.0 mmol), allyltrimethylsilane (2.1 mmol), Montmorillonite K10 clay (0.1 g), and anhydrous dichloromethane (DCM) (2 cm3). The mixture was irradiated in the water baths of an ultrasonic cleaner at 25-30°C for mentioned time in Table 3.3. Added tetrabutyl ammonium fluoride (1.1 mmol) and again continued sonication for 5-20 min. until silyl ethers had dis-appeared, as indicated by TLC. Then on dilution with DCM, reaction mixture was filtered and catalyst was recovered. The resulting filtrate mL was quenched with aqueous sodium thiosulphate and extracted with DCM (2x 10 ml). The combined organic layers on drying over anhydrous sodium sulfate, concentrated and column purified

on silica gel (Merck, finer than 200-mesh, hexane/ ethyl acetate, 4:1) to afford pure product.

3. Spectral data

1) 1-Phenylbut-3-en-l-ol 3a. 0i1,50' IR (v/cm-1): 3372, 3073, 2907, 1641, 1493, 1445, 043, 997, 917, 757, 701; 1H NMR (400 MHz, CDC13): 6= 7.39-7.23 (m, 5H), 5.84-5.74 , 1H), 5.18-5.12 (m, 2H), 4.72 (t, J1/48 Hz, 1H), 2.53-2.45 (m, 2H), 2.23 (s, 14); 13C (100 MHz, CDC13): 6= 143.8, 134.4, 128.3, 127.5, 125.8, 118.3, 73.2, 43.7; EI-MS , %) 148 (Mt).

2) 1-(2,4-DiFluoro-phenyl)but-3-en-ol 3b. Oil, IR (v/cm-1): 3082, 2980, 1617, 1503, 1278, 1141, 1111, 992, 965, 865, 849; 1H NMR (400 MHz, CDC13): 6= 7.52-7.46 (m,1H), 6.94-6.90 (m, 1H), 6.89-6.78 (m, 1H), 5.81-5.71 (m, 1H), 5.22-5.15 (m, 1H), 5.14-5.11 (m, 2H), 2.91-2.76 (m, 2H), 13C NMR (100 MHz, CDC13): 6=133.1, 129.7, 129.6, 129.5, 124.5, 124.3, 111.8, 111.6, 104.1, 103.5, 65.8, 54.3, 43.1; EI-MS (m/z, %) 184 (W)

3) 1-(4-Bromo-phenyl) but-3-en-l-ol 3c. Oil," IR (v/cm-1): 3079, 2980, 1900, 1776, 1681, 1488, 1429, 1073, 1010, 992, 748, 716; 11-INMR (400 MHz, CDC13): 6=7.51-7.49 (m, 2H), 7.48-7.26 (m, 2H), 5.77-5.69 (m, 1H), 5.15-5.10 (m, 2H), 4.71-4.68 (m, 1H), 2.79-2.74 (In , 2H); 13C NMR (100 MHz, CDC13): 6=140.2, 133.4, 131.7, 128.7, 122.2, 118.6, 61.7, 44.0; El-MS (m/z, %) 226 (M±).

4) 1-(3-Chloro-phenyl) but-3-en-1-ol 3e. Oil," IR (v/cm-1): 3377, 3075, 2927, 1709, 1641, 1574, 1429, 1196, 994, 919; 1H NMR (400 MHz, CDC13): 6=7.36-7.17 (m, 4H), 5.84-5.73 m, 1H), 5.19-5.10 (m, 2H), 4.72-4.68 (m, 1H), 2.55-2.43 (m, 2H), 2.14 (s, 1H); 13C INTMR 1100 MHz, CDC13): 6=145.8, 134.2, 133.8, 129.6, 127.5, 125.9, 123.9, 118.9, 72.5, 43.8; EI-MS (m/z, %) 182 (Mt).

5) 1-(3-Bromo-phenyl) but-3-en-1-ol 3f. Oil," IR (v/cm-1): 3373, 3076, 2978, 2906;1643, 1433, 1166, 1035, 919, 701; 1H NMR (400 MHz, CDC13): 6=7.52 (s, 1H), 7.41-7.28 (m, 1H), 7.27-7.19 (m, 2H), 5.84-5.72 (m, 1H), 5.19-5.14 (m, 2H), 4.72-4.68 (m, 1H), 2.54-2.40 (m, 2H), 2.11 (s, 1H); 13C NMR (100 MHz, CDC13): 6=146.1, 133.8, 130.5, 129.9, 128.9, 124.4, 119.0, 109.7, 72.4, 43.8; EI-MS (m/z, %) 226 (M1).

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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Invariance of Weak Separation Properties under Pair Homeomorphism

Harjot Singh*

Abstract. This research study deals with selective weak separation properties of bitopological spaces and to examine and establish that how these weak separation properties are preserved under pair homeomorphic mapping.
Keywords: Bitopological spaces, weak separation properties, pair continuous, pair homeomorphism.

1. Introduction and Preliminaries

As far as the theory of bitopological spaces is concerned, it is relatively a new field of research in mathematical sciences. J. C. Kelly [1] is the first mathematician who introduced the notation of bitopological spaces is in 1963. Further, for this newly introduced space, Kelly [1] introduced the concept of pairwise separation axioms such as pairwise Hausdorff bitopological space, pairwise regular bitopological space and pairwise normal bitopological space corresponding to separated properties of traditional topological spaces. Keeping in mind the idea that concepts of classical topological space can be generalized in bitopological spaces, research concerned with concepts of pairwise compactness, pairwise connectedness, pairwise total disconnectedness and more detailed pairwise separation properties of bitopological spaces is carried out by many other mathematicians and some of them are Kim [2], Fletcher [3] et al., Patty [4], Pervin [5], Saegrove [6].

Research work to be carried out in present research study is to list selective weak pairwise separation properties, from the available literature and to investigate that which of these weak separation properties are topological, i.e., are preserved under pair homeomorphism.

A triplet (X, τ_1, τ_2), where τ_1, τ_2 are arbitrary topologies on X, is called a bitopological space on X. For any subset A of (X, τ_1, τ_2), τ_1 –cl(A) and τ_2 –cl(A) denote closure of A with respect to τ_1 and τ_2 respectively. Further, τ_1–open (τ_1–closed) and τ_2 –open (τ_2–closed) will be used to denote open (closed) set in a bitopological space (X, τ_1, τ_2) with respect to τ_1 and τ_2 respectively.

Definition 1 [3]. (X, τ_1, τ_2) is said to be weak pairwise T_0 if and only if for each pair of distinct points *x*, *y*, there exists a τ_1-open or a τ_2-open containing one point but not the other.

Definition 2 [7]. (X, τ_1, τ_2) is said to be weak pairwise T_1 if and only if for each pair of distinct points *x*, *y*, there exists a τ_1-open set U and a τ_2-open set V such that either $x \in U$, $y \notin U$ and $y \in V$, $x \notin V$ or $x \in V$, $y \notin V$ and $y \in U$, $x \notin U$.

Definition 3 [8]. (X, τ_1, τ_2) is said to be weak pairwise T_2 if and only if for each pair of distinct points *x*, *y*, there exists a τ_1-open set U and a τ_2-open set V such that either $x \in U$, $y \in V$ or $x \in V$, $y \in U$ and $U \cap V = \phi$.

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Definition 4 [1]. In a bitopological space (X, τ_1, τ_2),τ_1 is said to be regular with respect to τ_2 if for each point $x \in X$ and for each τ_1 -closed set A such that $x \notin A$, there exists a τ_1-open set U and a τ_2-open set V such that $x \in U$, $A \subseteq V$ with $U \cap V = \phi$.

Definition 5 [1]. Bitopological space (X, τ_1, τ_2) is said to be pairwise regular if and only if τ_1 is regular with respect to τ_2 and τ_2 is regular with respect to τ_1.

Definition 6 [6] Bitopological space (X, τ_1, τ_2) is said to be weak pairwise T_3 if and only if it is pairwise pairwise regular and weak pairwise T_1.

Definition 7 [6] A function f from (X, τ_1, τ_2) into (Y, τ'_1, τ'_2) is pair continuous if and only if the induced functions f from (X, τ_1) into (Y, τ'_1) and (X, τ_2) into (Y, τ'_2) are pair continuous.

Definition 8 [6]. A bitopological space (X, τ_1, τ_2) is pairwise completely regular if and only if for each for each τ_1 -closed set A and for each point $x \notin A$, there exists a pair continuous function

$f : (X, \tau_1, \tau_2) \to ([0, 1], R, L)$ such that $f(x)=1$ and $f(A)=\{0\}$, and for each τ_2 -closed set B and for each point $y \notin B$, there exists a pair continuous function $g : (X, \tau_1, \tau_2) \to ([0, 1], R, L)$ such that $g(y)=0$ and $g(B)=\{1\}$.

Definition 9 [6] Bitopological space (X, τ_1, τ_2) is said to be weak pairwise $T_{3\frac{1}{2}}$ and only if it is pairwise completely regular and weak pairwise T_1.

Definition 10 [1]. Bitopological space (X, τ_1, τ_2) is said to be pairwise normal if and only if for each τ_1-closed set A and τ_2-closed set B disjoint from A, there exists a τ_1-open set U and a τ_2-open set V such that $A \subseteq V$, $B \subseteq U$ and $U \cap V = \phi$.

Definition11 [6] Bitopological space (X, τ_1, τ_2) is said to be weak pairwise T_4 if and only if it is pairwise pairwise normal and weak pairwise T_1.

Definition 12 [6] A function f from (X, τ_1, τ_2) into (Y, τ'_1, τ'_2) is said to be pair homeomorphic if and only if the induced functions f from (X, τ_1) to (Y, τ'_1) and (X, τ_2) to (Y, τ'_2) are pair homeomorphic.

2. Invariance of Weak Separation Properties Under Pair Homeomorphism

Theorem 1. The property of being weak pairwise T_0 in a bitopological space is preserved under pair homeomorphism.

Proof. Suppose that (X, τ_1, τ_2) is a weak pairwise T_0 bitopological space and $f : (X, \tau_1, \tau_2) \to (Y, \tau'_1, \tau'_2)$ is a pair homeomorphism. Let x and y are any two distinct members of Y, there exist two different members x' and y' such that $f(x')=x$ and $f(y')=y$. Since, (X, τ_1, τ_2) is weak pairwise T_0 , therefore there exists a τ_1-open set, say U, such that $x' \in U$ but $y' \notin U$. Evidently, $f(x') \in f(U)$ but $f(y') \notin f(U)$. Map f is pair open, therefore f(U) is τ'_1-open set. Thus, for any two distinct members x and y in Y there exists a τ'_1-open set f(U) such that $x=f(x') \in f(U)$ but $y=f(y') \notin f(U)$. This completes the proof.

Theorem 2. The property of being weak pairwise T_1 in a bitopological space is preserved under pair homeomorphism.

Proof. Let (X, τ_1, τ_2) is a weak pairwise T_1 bitopological space and $f : (X, \tau_1, \tau_2) \to (Y, \tau'_1, \tau'_2)$ is a pair homeomorphism. Let x and y are any two distinct members of Y, there exists two different members x' and y' such that $f(x')=x$ and $f(y')=y$. Since, (X, τ_1, τ_2) is weak pairwise T_1 , therefore there exists a τ_1-open set U and a τ_2-open set V such that either $x' \in U$, $y' \notin U$ and $y' \in V$, $x' \notin V$ or $x' \in V$, $y' \notin V$ and $y' \in U$, $x' \notin U$. Clearly, either $f(x') \in f(U)$, $f(y') \notin f(U)$ and $f(y') \in f(V)$, $f(x') \notin f(V)$ or $f(x') \in f(V)$, $f(y') \notin f(V)$ and $f(y') \in f(U)$, $f(x') \notin f(U)$. As f is pair open, therefore, f(U) is τ'_1-open set and f(V) is τ'_2-

open set. Thus, for any two distinct members x and y in Y there exists a τ'_1-open set f(U) and a τ'_2-open set f(V) such that either $x=f(x')\in f(U)$, $y=f(y')\notin f(U)$ and $y=f(y')\in f(V)$, $x=f(x')\notin f(V)$ or $x=f(x')\in f(V)$, $y=f(y')\notin f(V)$ and $y=f(y')\in f(U)$, $x=f(x')\notin f(U)$. Hence, (Y, τ'_1, τ'_2) is weak pairwise T_1.

Theorem 3. The property of being weak pairwise T_2 in a bitopological space is preserved under pair homeomorphism.

Proof. Consider a weak pairwise T_2 bitopological space (X, τ_1, τ_2). Let $f: (X, \tau_1, \tau_2) \to (Y, \tau'_1, \tau'_2)$ is a pair homeomorphism. To prove required result, let x and y are any two distinct members of Y, therefore there exists two different members x' and y' such that $f(x')=x$ and $f(y')=y$. Since, (Y, τ_1, τ_2) is weak pairwise T_2, therefore there exists a τ_1-open set U and a τ_2-open set V such that either $x'\in U$, $y'\in V$ or $x'\in V$, $y'\in U$ and $U\cap V=\phi$. It is obvious that either $f(x')\in f(U)$, $f(y')\in f(V)$ or $f(x')\in f(V)$, $f(y')\in f(U)$ and $f(U)\cap f(V)=f(U\cap V)=\phi$. As f is pair open, therefore f(U) is τ'_1-open set and f(V) is τ'_2-open set. Thus, for any two distinct members x and y in Y there exists a τ'_1-open set f(U) and a τ'_2-open set f(V) such that either $x=f(x')\in f(U)$, $y=f(y')\in f(V)$ or $x=f(x')\in f(V)$, $y=f(y')\in f(U)$ and $f(U)\cap f(V)=\phi$. From this desired result follows.

Theorem 4. The property of being pairwise regular in a bitopological space is preserved under pair homeomorphism.

Proof. Let $f:(X, \tau_1, \tau_2) \to (Y, \tau'_1, \tau'_2)$ is a pair homeomorphism, where (X, τ_1, τ_2) is a pairwise regular bitopological space. To show that (Y, τ'_1, τ'_2) is also pairwise regular. Let y is any member of Y and A is any τ'_1-closed set such that $y\notin A$. Then, there exists x in X such that $y=f(x)$ also $x\notin f^{-1}(A)$, a τ_1-closed set. Since, (X, τ_1, τ_2) is pairwise regular, therefore there exists a τ_1-open set U and a τ_2-open set V such that $x\in U$, $f^{-1}(A)\subseteq V$ and $U\cap V=\phi$. It is obvious that $y=f(x)\in f(U)$, $A\subseteq f(V)$ and $f(U)\cap f(V)=f(U\cap V)=\phi$. As f is pair open, therefore f(U) is τ'_1-open set and f(V) is τ'_2-open set. Thus, for any τ'_1-closed set A not containing arbitrary $y\in Y$, there exists a τ'_1-open set f(U) and a τ'_2-open set f(V) such that $y=f(x)\in f(U)$, $A\subseteq f(V)$ and $f(U)\cap f(V)=\phi$.This proves that τ_1 is regular with respect to τ_2. Similarly, it can be proved that τ_2 is regular with respect to τ_1. This completes required proof.

Remark. Result of theorem 4 will be used to show that pair homeomorphic image of weak pairwise T_3 bitopological space is also weak pairwise T_3.

Theorem 5. Any pair homeomorphic image of a pairwise completely regular bitopological space is pairwise completely regular.

Proof. Suppose that $f: (X, \tau_1, \tau_2) \to (Y, \tau'_1, \tau'_2)$ is a pair homeomorphism, where (X, τ_1, τ_2) is a pairwise completely regular bitopological space. To demonstrate that (Y, τ'_1, τ'_2) is also pairwise completely regular. Let y is any member of Y and A is any τ'_1-closed set such that $y\notin A$. Then, there exists x in X such that $y=f(x)$ also $x\notin f^{-1}(A)$, a τ_1-closed set. Since, (X, τ_1, τ_2) is pairwise completely regular, therefore there exists a pair continuous function

$g: (X, \tau_1, \tau_2) \to ([0, 1], R, L)$ such that $g(x)=1$ and $g(f^{-1}(A))=\{0\}$. It means $g(f^{-1}(y))=(gof^{-1})(y)=1$ and $(gof^{-1})(A)=\{0\}$. As f is pair homeomorphism, therefore $f^{-1}: (Y, \tau'_1, \tau'_2) \to (X, \tau_1, \tau_2)$ is pair continuous and hence $gof^{-1}: (Y, \tau'_1, \tau'_2) \to ([0, 1], R, L)$ is also pair continuous. Similarly, desired result can be attained for any member y' of Y and any τ'_2-closed set B is such that $y'\notin B$. Hence, (Y, τ'_1, τ'_2) is pairwise completely regular

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Remark 2. With the help of theorem 5, it can be established that pair homeomorphic image of weak pairwise $T_{3\frac{1}{2}}$ bitopological space is also weak pairwise $T_{3\frac{1}{2}}$.

Theorem 6. The property of being pairwise normal in a bitopological space is preserved under pair homeomorphism.

Proof. Consider a pair homeomorphism f: $(X, \tau_1, \tau_2) \rightarrow (Y, \tau'_1, \tau'_2)$, here (X, τ_1, τ_2) is a pairwise normal bitopological space. To prove that (Y, τ'_1, τ'_2) is also pairwise normal. Let A is any τ'_1-closed set and B is τ'_2-closed set such that $A \cap B = \phi$. Then, $f^{-1}(A)$ is a τ_1-closed set and $f^{-1}(B)$ is a τ_2-closed set such that $f^{-1}(A) \cap f^{-1}(B) = f^{-1}(A \cap B) = \phi$. Since, (X, τ_1, τ_2) is pairwise normal , therefore there exists a τ_1-open set U and a τ_2-open set V such that $f^{-1}(B) \subseteq U$, $f^{-1}(A) \subseteq V$ and $U \cap V = \phi$. It is evident that $B \subseteq f(U)$, $A \subseteq f(V)$ and $f(U) \cap f(V) = f(U \cap V) = \phi$. As f is pair open , therefore f(U) is τ'_1-open set and f(V) is τ'_2-open set. Thus, (Y, τ'_1, τ'_2) is pairwise normal.

Remark3. Taking in to consideration the result of theorem 6, it can be readily deduced that pair homeomorphic image of weak pairwise T_4 bitopological space is also weak pairwise T_4.

Conclusion. In this research manuscript, it is established that weak pairwise separation properties namely weak pairwise T_0, weak pairwise T_1, weak pairwise T_2, pairwise regular, pairwise completely regular, weak pairwise $T_{3\frac{1}{2}}$, pairwise normal and weak paiwise T_4 are preserved under pair homeomorphism. In fact, weak pairwise T_0, weak pairwise T_1, weak pairwise T_2 are preserved under pair one-one, pair onto and pair open map.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

At Crossroads With Betting: Will India Crossover?

Tapesh Singh*

Introduction

Gambling and betting have been going on since thousands of years now. For, people have always been keen to know the future, whether it is regarding life, marriage, money or even the next day's events.

Lately, it has becomean organized business, with lots of betting organizations inviting people to bet and make money.Gambling is not considered legal because it results in addiction and is allegedly responsible for people losing everything in the hope of making tons of money. Although betting has also lead to similar kind of losses, but comparatively on a smaller scale. Also, the word betting is coined to give gambling a legal mask. Betting is considered quite normal whereas gambling is unwelcome.

General gambling legislation in India.The main piece of legislation relating to gambling in India is the public gaming actof 1867.It can be said that in cricket betting is skill based, and so it is not covered by the public gamingact, whereas betting on a rolling dice is a pure chance.

The thought ofgaining easy money and the excitement to win over a bet has attracted people to gamble and bet but given its illegal status it goes on in India behind closed doors and curtains.In India, Horse-racing remains the single game whereingambling is legal. It also means that betting in all other sports, mostly cricket with its enormous popularity in India has settled and thrived in a secret world.

The apex court recently decided to give a thought to legalization of betting and gambling in sports which is at present prohibited and punishable under law. The reason for this is the losses that occurred to the country's economy because of unregulated betting and gambling activities. There is an estimatethat legalization of betting would benefit the economy as it will generate a revenue of around 12000 crore per year.

Advantages of Legalising Betting

Gambling and betting is anyway going on in India on big scale which law and administration not able to curb it. It is mostly done covertly and is said to be controlled by underworld organizationswhich use the illegal money obtained from gambling for wicked activities like terror financing. Legalising and then regulating the activity will not only help unearth important sources of black money used by criminal syndicates, but also bring generate revenue to the state revenue department, which can be beneficial for social welfare schemes.

When betting is legalised and regulated, bookies with a government authorized license will assist the police in curbing illegal betting. Not only police but common tax paying people also are of the view that legalising and regulating sports betting can check the illegal side of this activity.

Betting could lead to an economic explosion. Even a rough calculation says that the governments can earncrores of money as tax revenue by legalising sports betting and gambling. By legalising it, the government would earn more tax. People from inside the government feel that by not keeping betting and gambling legally within reach, the

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government loses the opportunity to both protect its citizens from the negative side of gambling and generate a whole lot of money in the form of taxes, which otherwise remains black money. "Legalising betting will attract a good amount of FDI too. Establishing a commission for gaming will endorse responsible gaming and check money laundering a well.

Besides generating revenue, a legalised and regulated gambling industry will also create employment opportunities on an enormous scale. Worldwide, wherever gambling is regulated, it has created a hugeplatform for generating employment. For example, regulated gambling industry in the United States employs more than 2.5 lakh people, whereas more than 1 lakh people are occupied by this sector in the United Kingdom.

It is also debated that this would help a great deal in controlling many criminal syndicates operating from outside the country to avoid law enforcement.

The government is contemplating positive results behind these decisions. There are speculations that legalizing betting and gambling will equip and strengthen the government to differentiate between harmless betting and corrupt activities like match fixing. It will also provide more credibility to sports because the government will have more control over unwanted elements which are existing in the betting business. Currently, due to lack of regulation many controversial transactions are happening whether by various criminal organizations or by the underworld who are controlling this sector.

Problems and Challenges

It is argued that gambling is not morally correct in the Indian context. If the government legalises betting, it would become ground for people falling prey to attractive schemes of organizations offering common man to gamble.Any move to legalise cricket betting may face stiff political and social resistance. Gambling, across all age-groups and cultural backgrounds, is considered a vice because it is addictive, with compulsive gamblers staking valuables dear to life and living, harming not only themselves but also their close ones. Companies will host betting apps, luring poor people to try their luck. They put forward the argument that it is accountable for gambling obsession, loss of livelihoods and insolvency. These concerns are groundless. Gambling or for that matter anything considered morally incorrect for the society has been around since the ancient times for e.g. prostitution, but it has always been up to the individual to control his urges and take a rational decision. Means of getting addicted and spoilt have always been present in the society we live in but men are derived by their prudent nature and not by what they perceive.Besides, gambling has been accepted as a form of recreation on various social occasions. As far as the apprehensions about betting and gambling leading to addiction and bankruptcy are concerned, it must be noted that even though gambling is largely illegal, it is still flourishing and unrestricted. There are numerous cases of people losing their livelihoods and committing suicide due to unchecked gambling even today, with authorities paying least attention to this problem.

In its recent report, the commission has been pushing for regulation of betting and gambling activities, saying that a complete ban has not been giving much needed results.The law commission after having discussed the pros and cons of regulating gambling and betting said "it would be appropriate to say that arguments in favour of regulating betting and gambling easily outweigh the arguments supporting the immorality of these activities".

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

While hearing a case on reforming Indian cricket administration, the Supreme Court commented: "The recommendations that betting should be legalised involves the enactment of a law, which is a matter that may be examined by the law commission and the government for such action as may be considered necessary in the facts and circumstances of the case." One of the main recommendations was: 'Legalisation for betting and criminalisation for match-fixing'.

Law Commission's perspective

In its 276th report, the Law commission of India says complete ban is not working and has recommended regulating of gambling and betting in sports. The regulation will give power to the government to detect and stop instances of gambling by minors, 'problem-gamblers' and curb fraud and black-money generation through illegal gambling.

The law commission has been exploring legal options to suggest to the Central govt. and the apex court to bring a law to regulate online sports betting and gambling. Gambling is a subject in the state list in the Constitution — meaning that the states are empowered to legislate on it — whereas online activities can be regulated through a central act.

As it is impossible to completelyput off these activities, effectively controlling them through regulation remains the only feasible option. The Commission feels that if Parliament or the State Legislatures decide to go ahead in this direction, regulating these activities would ensure uncovering of fraud and money laundering etc. Such regulation of gambling would need a three tier strategy, firstly reforming the existing gambling (lottery, horse racing) market, secondly regulating illegal gambling and thirdly inducing strict regulations.

So stringent regulations would empower the enforcement agencies to distinguish and stop practices of gambling by minors and 'problem-gamblers' as well as keep the public away from any kind of embarrassment at the hands of the law enforcement agencies. Besides this such regulations would also help the government a great deal to "successfullyrestrain the evil of black-money creation by means of illegal gambling.

"It's up to the government to accept these recommendations in total, or accept some of them, or reject all of them. Regulation is the step that comes after legalization,"

The report of commission calls for the regulation of casinos, maintenance of accounts, audits, and the safeguarding of its employees.

It also suggests that the exemption given to horse-racing from the gambling ban should further be extended to other skill-involving games, with the operativesconcentrating on the safety and well-being of players indulged in such games.

By recommending legalising sports betting and gambling activities in India in its latest report the Law Commission has taken a drastic measure which might prove fundamental to alter the way sports is perceived in India. However, the commission has also clearly stated in its report, which has been submitted to law minister that match-fixing and sports fraud should be treated as criminal offences.

Before coming to the conclusion that regulation was required instead of complete prohibition, the commission took opinions of various students, experts and the general public.

Supreme Court panel commented that "In the light of the fact that the on-going black-market operations pertaining to these activities are a major source of inflow of black money in the economy, regulation rather than complete prohibition seems to be the logical step forward".

Solutions

"The proposed law should have provisions to ensure that a person does not get addicted, he should be barred from betting more than a certain number of times in one year or gamble on more than a certain fraction of his money,". One of the proposals was for setting up a gaming commission and providing licenses to operators. A strongmonitoring framework prevailing the gaming segment will ensure that people do not fall prey to excess gambling. Awareness campaigns educating people about the ill effects of excessive gambling; minors, habitual gamblers and susceptible sections should be barred from having access to such gaming facilities; and limits must be put on the quantity of money that can be staked, based on a person's economicabilities. It's a fact that as of now, most of the betting is limited to people who have huge reserves of black money and want to make quick money. The number of people who bet with hard earned money is very minimal. Betting as they say is very common easy and goes unchecked, if that were the case then people who have hard earned money would also start betting once betting is legalised, but this not the case even if betting is legalised then also the common man would not be tempted towards betting. Those who are lured towards betting are still doing it when it is illegal irrespective of their earning capacity or income. "Problem gamblers will always gamble, irrespective of its legality or illegality "Therefore, the better option is to legalise gambling, monitor and regulate it." "Regulation of betting is critical to prevent corruption in sports.

"Gambling and betting activities should allowed to be offered strictly by licensed operators who are citizens of India having valid licences sanctioned by the game licensing authority," Gambling and betting activities should be restricted to money with a linked to PAN card and Aadhaar card to guarantee transparency andgovernment supervision. The commission advocates a bar on the participation of people who get subsidies or do not fall within the purview of the Income Tax Act or the goods and services tax (GST) Act.

There must be a limit on the amount that a person can legally "gamble", as well as on the number of transactions an individual can make in a certain time period. Besides this, taxation of any income resulting from gambling and betting activities, as well as allowing FDI in those states which decide to grant licence to casinos. This would further "boost the growth of the tourism industry of India".

The commission states that match-fixing and sports fraud should be made criminal offences with severe punishments and suggests that a council be established to prevent "problem gambling" and "gambling by minors".

To facilitate "age-limiting", bookies will have to install age-gating technologies at the time of placing bets. Problem gambling can only curbed if bookies set up 'pattern monitoring cells', which will study the betting pattern of clients while customer service cells will have to be set up to counsel and wean away addicts. "In foreign countries, sophisticated technologies are used to address many of these issues, especially fraud detection," "Specialised units must be put in place, like UK's Sports Betting Intelligence Unit, to assist the enforcement authorities to effectively implement the law."

The current govt. has been mandating on fulfilling KVC norms, Aadhar linkages and maintaining of citizen data base at various forums and levels shall provide a sufficient platform / raw material for Indian govt. to begin with the work of regulating betting on individual basis.

To check black money flooding betting rings, the Centre will have to make transactions cashless. Bettors should be mandated to use the banking/e-wallet channels to price their

calls. Then there is the matter of going easy on taxing winnings. Here again, legal horse-race betting offers lessons.

India will have to rely a lot on technology if it wants to legalise sports betting. Apart from widening the ambit of IT and telecom laws, the government will have to reduce manual intervention in the whole betting process.

Battling Legal Provisions and Technology

Simply the word 'wager' means 'a bet', something stated to be lost or won depending on the result of something uncertain. Wagering agreements are ordinary betting agreements. The corresponding Legal provision is Section 30 Indian Contract Act 1872which reads that "agreements by way of wager are void".

Gambling is the wagering of money or somethingvaluable on an event with has an indeterminateresult with the main intent of winning money or goods. Hence three elements constitute gambling: consideration, chance and prize.

A gambling contract is an agreement to engage in a gamble. In the contract of gambling two parties put something at stake, mostly money, for a chance to win a prize or an amount of money. Contracts related to gambling activities become enforceable only where gambling is legal.

Although gambling and betting is a State subject, the primary law on which India has framed their gambling legislation is an archaic, British-era law called the Public Gambling Act, 1867. Ironically while India follows a British-era prohibitionist statute, the United Kingdom legalised and regulated different forms of gambling and betting decades ago. Therefore the Law Commission of India's endeavour to study the issue that whether or not gambling and betting should be legalised in the country is a timely initiative to start the process of a much-needed reform.Supreme Court of India has instructed the Law Commission to have a look at this matter. The existing law on gambling was passed years before the Constitution came into effect and it was a Central law. If Parliament is looking to legislate on this subject, it will be difficult to do so, because gambling is placed in the State List. Resultantly, a Constitutional amendment is required first so that gambling can be placed in the Concurrent List.

The problem of online gaming cannot be restricted merely by amending the Information Technology Act where it finds a mention. Lately, there has been a sharp rise in online gambling and governments are trying hard to find ways of controlling this menace. Relevant provisions will have to be made in the new act if gambling is to be regulated. There will still be the issue of jurisdiction as online gambling goes way beyond India's borders. How can one ensure that gambling online is safe and protects the interests and rights of players? It is easier said than done.

International Scenario

The government could take some pointers from nations having legalised betting. Countries like United Kingdom have embracedprocedures to control 'problem betting' and framed laws to support legalised betting and gambling. United Kingdom since past many years has been managing a well-developed betting industry with sports betting options and lotteries. Between April 2008 and September 2011, the gross gambling yield (excluding telephone betting) was £20.1 billion, according to a UK Gambling Commission report.

Licensed bookies in United Kingdom are required to report suspicious betting activity to the Gambling Commission and other concerned bodies. The commission also runs aforum

related to sports betting, which facilitates information-sharing between stakeholders and gambling sectors.

Conclusion

If and when India makes up its mind to legalize betting in sports, it should first observe and learn from other countries experiences and make sure that it is ready for contingencies and complicacies that arise out of lack of infrastructure and technology. In short itshould be legalized when the govt. has enough resources and technological advancement to regulate, monitor and control it.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Aquatic Diversity of Pteridophytes in Gorakhpur, Uttar Pradesh

Shobhit Kumar Srivastava, Jonnada A.V. Prasada Rao and S. D. Rajkumar*

Abstarct
The Pteridophytes are considered to be one of the primitive groups in vascular plants which are scattered all over the world. There are about 12000 different species of Pteridophytes present in the world and in India about 1200 species are present (Manickam & Irudayaraj 1992). The ferns are found to be abundant in the Himalayas and Western Ghats, which are the two hotspots of biodiversity in India. Aquatic systems are the unique fragile ecosystem with greater importance for their biodiversity. Being a group of lower plants, they were always uncared for and their important aspect has been ignored. Very less attention has been given towards the utility of Pteridophytes though they possess economic importance and medicinal value. The present study describes in details the aquatic diversity of ferns and their use in different places of Gorakhpur. The study area Gorakhpur district lies between latitude 26°46´N and longitude 83°22´E. It is bounded by Maharajganj district to the north, Kushinagar and Deoria districts in the east, Ambedkar Nagar, Azamgarh, and Mau districts to the south, and Sant Kabir Nagar district to the west. Gorakhpur is surrounding by rivers, ponds & lakes with rich diversity.
Key words: Aquatic Pteridophytes, Diversity, Gorakhpur, Uttar Pradesh

Introduction

Pteridophytes are a group of plants also known as vascular cryptogams. They are the vascular plants which reproduce by the means of spores. There are about 12000 different species of Pteridophytes present in the world and in India about 1200 species are present (Manickam & Irudayaraj 1992). The ferns are found to be abundant in the Himalayas and Western Ghats, which are the two hotspots of biodiversity in India. Aquatic systems are the unique fragile ecosystem with greater importance for their biodiversity. Ferns are one of the common and crucial inhabitants in various aquatic habitats. Indian aquatic habitats are rich of ferns and fern allies (Mehra and Bir 1964; Cook 1996; Singh and Upadhyay 2012). Gorakhpur is surrounding by many rivers, ponds & lakes with rich diversity.

Material and Methods

The collections were made during 2012 – 2015 to different seasons. About Six species were collected from different localities. The specimens were properly processed, poisoned, preserved and herbarium is deposited in the Department of Botany, St. Andrews College, and Gorakhpur for future reference.

Observation and Enumeration

Taxonomic details, diagram and photographs are provided for their identification.

Key to Genera- *Azolla*

Leaves many, minute (mm in size) normal, free floating,

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Sporocarp in pairs Leaves covered by simple trichome above……..….***Azolla***

Key to Species

Floating, Stem horizontal, profusely branched, zig- zag,bearing roots which are densely covered by about 2 mm long hairs, veins distinct, anastomosing, Brownish, glabrous; microsporocarps globose…….***pinnata***

Azolla pinnata R. Br., Prodr. F1. Nov. Holl. 167 (1810). Holttum, F1. Mal. 2; 621 (1954); De Vol, F1. Taiwan 1: 60 (ed. 2) (1980); Dixit, Cens. Ind. Pterid. 174 (1984); Jamir and Rao, Ferns Nagaland, 405 (1988).

Stem horizontal, profusely branched, zig- zag, bearing roots which are densely covered by about 2 mm long hairs. Leaves alternate, arise from the dorsal lobe, margin entire with a narrow whitish, transparent membraneous border, grey- green, thick, enclosing large mucilage filled cavities that harbour blue-green algae, upper surface of the aerial lobe with dense, short blunt, whitish trichomes or with their scars; veins indistinct; ventral lobes submerged, broadly ovate, base cuneate, margin entire, veins distinct, anastomosing, lobes thin membranaceous, transparent, brownish, glabrous; microsporocarps globose, 1 mm in diameter, brown with two layered wall, containing numerous microsporangia which arise from the central columella; megasporocarp smaller than the microsporocarps, ovate, enclosing a single megasporangium.

Fertile: May to September

Uses: Widely used as green manure

Key to Genera- *Ceratopteris*

Aquatic plants; erect or sub-erect, bearing, thick fibrous or fleshy, apex covered by scales; scales soft. Uniformly pale brown, ovate, acute, entire comprising small, curved cell all over.

Fronds arranged in rosette; terete, fleshy, pale green……***Ceratopteris***

Key to Species

Lamina dimorphous; sterile lamina bipinnatifide or tripinnate, primary pinnae about five pairs apex acute, margin entire…….***thalictroides***

Floating plants sometimes submerged. Fronds few; stipes 9-33 cm fertile blades longer than the sterile ones, 4-5 pinnate…….sub species (***thalictroides***) ***gaudichaudii***

Ceratopteris thalictroides (L) Brongn

Aquatic plants; erect or suberect, bearing, thick fibrous or fleshy, long roots densely on the abaxial side, apex covered by scales; scales soft. Lamina dimorphous; Lamina glabrous above and below, pale green; texture soft herbaceous. Fertile lamina ovate, up to 40 × 23 cm, tripinnate, ultimate segment needle like, up to 6 × 0.2 cm, acute, margin reflexed and completely covering the lower surface on which two rows of larger sporangia are borne; spores trilete, 120 µm in diameter, pale green, exine with thick dense, convexed ridges.

Fertile: September to December

Uses: Young fronds edible and used as cooling agent

Ceratopteris gaudichaudii (L) Brongn. Bull. Soc. Philom. 187 (1821)

Floating plants sometimes submerged. Fronds few; stipes 9-33 cm; sterile blades 1 pinnate, deltate to ovate, 20-50 cm long; fertile blades longer than the sterile ones, 4-5 pinnate; pinnae narrowly linear, margins convolute. Sporangia ordered in 1-4 rows. Floating in free water or rooted in mud of swamps.

Fertile: September to December

Uses: Young fronds are edible

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Key to Genera- *Salvinia*

Rhizome long creeping, repeatedly dichotomously branched, Leaves in whorls of three, two floating and one submerged. Floating leaves simple 2 cm long and a much broad, ovate/ oblong, leaves flat or infolded along the mid rib ……..***Salvinia***

Key to Species

Leaves flat or infolded along the mid rib, base cordate, lamina crowded wider than long, upper surface papillate……..***natans***

Salvinia natans (L.)Alioni, FI. Pedem 2: 289 (1785)

Marsilea natans L. Sp. PI: 1099 (1753).

Rhizome long creeping, repeatedly dichotomously branched, 0.1 cm diameter. Hairy, hairs brown. 7-9 or more celled. Leaves in whorls of three, two floating and one submerged. Floting leaves simple 2 cm long and a much broad, ovate/ oblong, leaves flat or infolded along the mid rib, base cordate, basal margins slightly curved up wards texture thick herbaceous, upper surface hairy, submerged leaves: axis 2-4 mm long 1mm diameter, terminating in 2 or 3 sporocarp bunches subtended by a tuft of (up to 15) root like simple filiform 2-3 cm long branches, covered densely with long acicular hairs, hairs 0.2-0.3 cm long, brown, fine. Sporocarps 2-6, globose, sessile, clustered; megasporocarps 1-2 at base, rest all microsporocarps.

Fertile: November to April

Uses: As green manure

Key to Genera- *Marsilea*

Leaflets 4, sporangia in sporocarp, at the base of the stipes ……..***Marsilea***

Key to Species

1. Rhizome long creeping, branched thick, terrestrials Leaves four, sessile, lateral margin entire, veins distinct above and below, flabellately branched, Sporocarps borne at the nodes in clusters……..***minuta***

1. Aquatic, long creeping, branched; four leaves

2. Plants forming diffuse clones. Roots arising at node and 1--3 on internodes. Sporocarp stalks ascending, frequently branched, petiole; Leaves floating in deep water or erect in shallow water or on land…….***quadrifolia***

Marsilea minuta L. Mant. 308 (1771); Sledge, Bot. J. Linn. Soc. 84: 22 (1982); Dixit, Cens. Ind. Pterid. 85 (1984)

Rhizome long creeping, branched subterranean, Leaves four, sessile, arranged at the tip of the stipe in clover leaf model, margin entire, veins distinct above and below, flabellate branched, connected occasionally by lateral veins; leaves pale or dark green, glabrous with few hairs; texture thin, soft herbaceous . Sporocarps borne at the nodes in clusters alternately, black or dark brown, very hard, densely hairy when young, sparsely or rarely so when mature; microsporangia and megasporangia enclosed in the same sporocarp and covered by gelatinous layer; microspores yellowish brown, globose; megaspores ovate, up to 0.65 x 0.5 mm.

Fertile: January to April

Uses: A good sleep inducer, young fronds edible

Marsilea quadrifolia Linnaeus, Sp. Pl. 2: 1099. 1753.

Plants forming diffuse clones. Roots arising at nodes and 1-3 on internodes. Pinnae 7-21 × 6--19 mm. Sporocarp stalks ascending, frequently branched, attached 1-12 mm above base of petiole. Sporocarps perpendicular to ascending, 4-5.6 × 3-4 mm, 2.3-2.8 mm thick,

rounded, oval, or elliptic in lateral view, pubescent but soon glabrate; raphe 1.4-1.9 mm, proximal tooth usually absent, distal tooth absent or 0.1-0.2 mm. Sori 10--17. Leaflets obdeltoid, to 3/4" long, glaucous, petioles to 8" long; sporocarp ellipsoid, to 3/16" long, dark brown, on stalks to 3/4" long, attached to base of petioles.
Fertile: January to April
Uses: young fronds edible
FIGURE

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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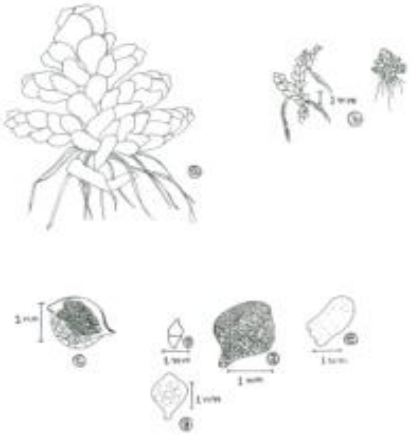

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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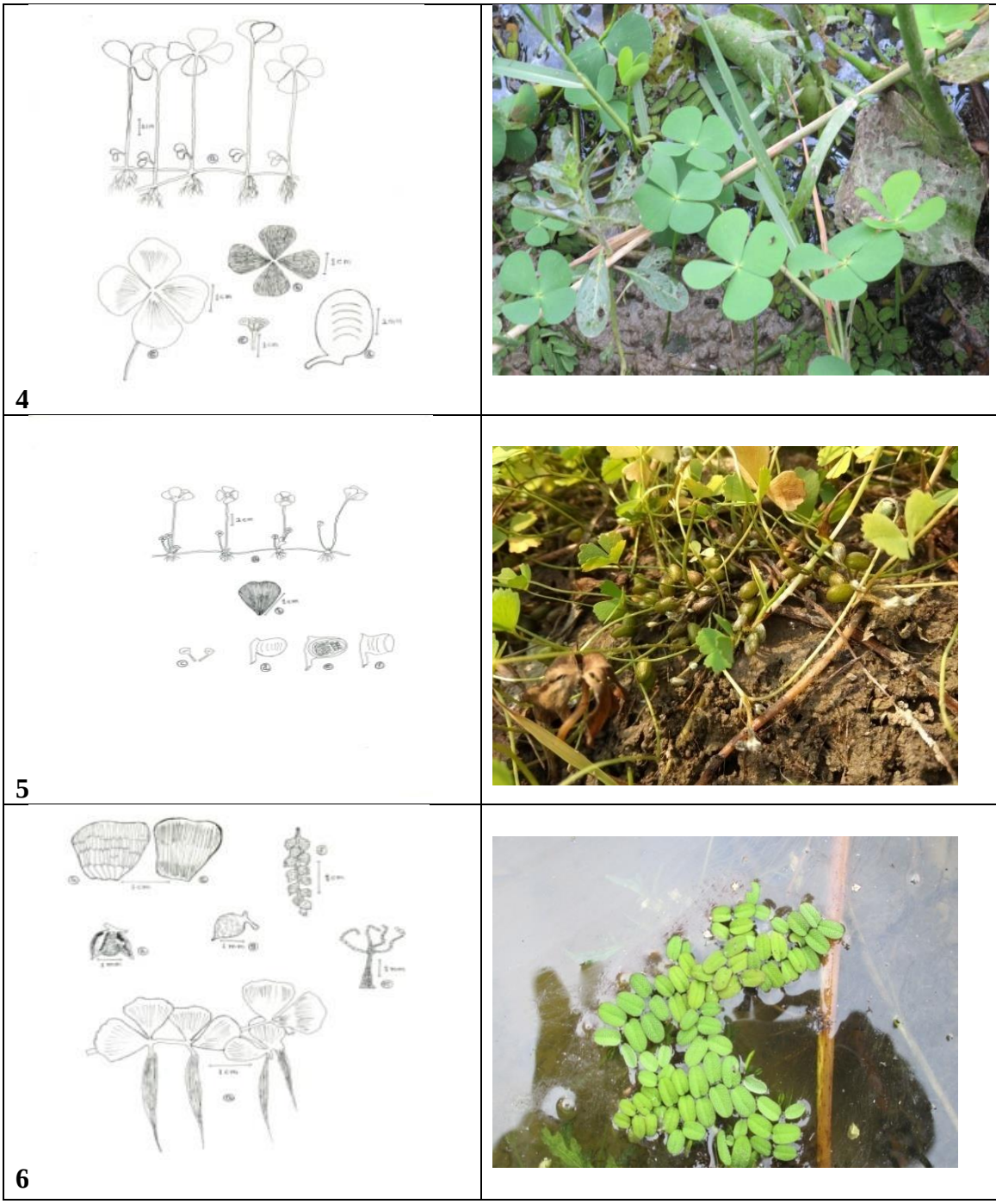

1. ***Azolla pinnata*** R. Br **2**. ***Ceratopteris thalictroides*** (L) **3**. ***Ceratopteris gaudichaudii*** (L)
4. ***Marsilea quadrifolia*** (L) **5.** ***Marsilea minuta*** L. **6.** ***Salvinia natans*** (L.)

Acknowledgement
The authors are thankful to the Principal, St. Andrew's college (PG), Gorakhpur & DDU Gorakhpur University, Gorakhpur, and Uttar Pradesh for the facilities and the encouragement given to us. One of the authors (Shobhit) is thankful to SERB New Delhi, India (Sanction No. PDF/2017/000407) for the financial assistance.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Process Conflict and Employee Well-Being: Buffering Effect of Perceived Social Support

Vijay Kuriakose*
Dr. P.R Wilson**

Abstract
The present study empirically examines the relationship between process conflict and employee well-being and also examines the buffering role of perceived social support at work. The study hypothesized an inverse relationship between process conflict and well-being and based on the buffering hypothesis, the study hypothesized the buffering role of perceived social support at work. Data was collected from 554 IT employees working in Kerala. Hypothesized direct relationship was tested using regression analysis and hypothesized moderating role of perceived social support was tested using Process Macros. The results supported the hypothesized negative relationship between process conflict and employee well-being and the buffering role of perceived social support.

Introduction
Conflicts are innate in organizations (Katz & Kahn, 1978) and a reality that occurs daily in organizations (Jehn et al., 2013) which are difficult to avoid. Pondy, (1992) stated that organizations are conflict-ridden and conflicts are inherent in an organization. Research in the domain of conflict at the workplace has made considerable progress and established its various functional and dysfunctional impacts on individual, groups, and organisations (Meier et al., 2013; Sonnentag et al., 2013; De Dreu & Weingart, 2003; Frone, 2000; Mughal & Khan, 2013). Studies in the domain of workplace conflict have established that workplace conflict results in stress and strain among employees (De Dreu et al., 2004), results in burn out (Richardsen et al., 1992), depression (Spector & Jex, 1998), and somatic complaints (Frone, 2000). In sum, workplace conflict has the potential to diminish employee well-being (Sonnentag et al., 2013). Though, literature in the conflict domain have made considerable progress, the number of studies examining the consequential effect of different types of workplace conflict on employee well-being are limited (Sonnentag *et al.*, 2013). More specifically, the majority of the existing studies in this domain (e.g., Dijkstra *et al.*, 2005) used a general measure of conflict and these studies did not differentiate between different types of conflicts.
For example, task conflicts are disagreements among group members regarding the goal of a task, process conflicts are related disagreements about how to accomplish a task and relationship conflicts are disagreements and incompatibilities among members of the group about personal issues which are not related to various tasks of the group (Jehn, Greer, Levine, & Szulanski, 2008). Though there is this classification, process conflict have been omitted from conflict studies considering it as similar to task conflict. Hence the effect of

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process conflict on various outcomes is not known. Hence this study tries to understand the effect of process conflict on employee well-being.

Though conflict is a reality, experienced by every employee, the effect of conflict on well-being differs for individuals. Studies indicated that various dispositional and situational factors can influence this relationship (Ilies et al., 2011). For example, the role of personality in moderating conflict-well-being relationship was established in various studies (e.g, Dijkstra et al., 2005; Spector & Bruk-Lee, 2008). Social support at workplace has been found to influence various stressors and influences its impact on various outcomes. Social support at work-place is considered as vital resource from which an individual can draw strength during different situations and solve specific problems (Ilies et al., 2011). Social support is considered is an important protective factor for employee well-being (Halbesleben, 2006). Thus, there is a need to examine the conditional influence of perceived social support in the relationship between process conflict and well-being.

Hence, this study has two specific objectives. Firstly, the study tries to understand the effect of one specific type of workplace conflict on employee well-being. Secondly, the study tries to understand the reason for differential effect conflict on employees by incorporating one situational variable which can influence the relationship between process conflict and employee well-being.

The study tires to fill the following gaps in the conflict literature. By incorporating process conflict which has been omitted from conflict literature the study tries to specifically understand the effect of process conflict on employee well-being which adds to the existing knowledge and the theory. Though social support is found to buffer the effect of stressor on various outcomes, the study specifically tries to understand the role of social support in the process conflict context.

Hypotheses development

Process conflict and employee well-being

Though researchers have stated that process conflicts are a distinct type of conflict at the workplace, process conflicts have been neglected from conflict literature assuming it as similar to task conflict. However, recent research findings differentiated process conflict from task conflict and established its uniqueness (Behfar, Mannix, Peterson, & Trochim, 2011; Greer & Jehn, 2007). Process conflict is defined as: "conflict about how task accomplishments should proceed in the work unit, who is responsible for what, and how things should be delegated" (Jehn, 1997, p. 540). Jehn (1997) stated that process conflict and task conflicts are inherently different because process conflicts are related to task accomplishment whereas task conflicts are related to the goals of the task.

There are ample research evidences which have established the detrimental effect of process conflict on both proximal and distant group outcomes (Behfar et al., 2002; Greer & Jehn, 2007; Jehn et al., 2008; Matsuo, 2006). But with regard to the effect of process conflict on individual level outcomes such as well-being and satisfaction not much is known. Considering conflict as a negative event, process conflicts are also likely to adversely influence employees. Process conflict is considered as a threat to the perception of creativity (Dirks & McLean Parks, 2003; Matsuo, 2006), and escalates negative emotions such as anger and animosity (Greer & Jehn, 2007; Jehn, 1997; Jordan et al., 2006; Passos & Caetan, 2005). For employees, the experience of process conflicts increases frustration, dislike (Stearns, 1972), and reprimand (Allport, 1937). Issues over process conflicts such as assignment of roles duties and task delegations have personal

implications related to the skills and abilities of the employees (Jehn & Bendersky, 2003). When employees perceive that roles, duties, and responsibilities allocated to them are below the perceived skills and abilities they have, they consider it as a personal embarrass and consider process conflicts as highly personally distressing.This may negatively affect the well-being of the individuals (Greer & Jehn, 2007). Process conflicts are often associated with emotive reactions and negative emotions, emotive affective emotions are generally associated with impaired well-being. Hence, drawing on these empirical evidences the study assumes the detrimental effect of process conflict on employee well-being. Hence, the following hypothesis is proposed:

Hypothesis 1: Process conflict at workplace is inversely related to employee well-being.

Role of perceived social support

The importance of social support at work in influencing various work-related outcomes have been proved in various studies (Dormann & Zapf 1999; Etzion, 1984; Bakker et al., 2002; George et al., 1993; Halbesleben, 2006; Karlin et al., 2003; Viswesvaran et al., 1999). Social support has been defined broadly as "the availability of helping relationships and the quality of those relationships" (Levy, 1983) (Leavy, 1983, p.5). It was established that perceived social support enhances positive psychological outcomes (Rees et al., 2010; Luo & Wang 2009) and lack social support at work diminishes positive psychological outcomes (Teoh & Rose, 2001). Generally, social support is considered as a protective factor against burn out (Etzion, 1984; Halbesleben, 2006), negative affect (Ilies et al., 2011; Buunk & Verhoeven, 1991) and cardiovascular symptoms (Evans & Steptoe, 2001).

The present study building on Main effect theory (Cohen and Wills, 1985), proposes the moderating role perceived social support at work in the relationship between process conflict and employee well-being. The main effect theory states that, employees with higher perceived social support at work will have fewer physical and mental health problems compared to those who have lower perceived social support at work. Social support at work is considered as a contributor and protective factor of well-being. (Bolger et al., 1989; Wallston et al., 1983). Considering this beneficial role of social support at work, the present study postulates that perceived social support at work moderates relationship between process conflict and employee well-being. Perception of supportive supervisors and co-workers acts as a resource to cope with process conflicts and mitigates the negative impact of process conflict on employee well-being.

Further with the aid of the buffering hypothesis (Cohen & Wills, 1985) also the moderating role of perceived social support can be assumed. According to the buffering hypothesis perception of social support influences judgments of various adverse work events such as process conflicts as threatening or less threatening. Various studies have established the moderating role of perceived social support at work in different contexts (Cohen & Wills 1985; Dean & Lin, 1977; Lin et al., 1985; Schaffer, 1992; Hence, building on main effect theory , buffering hypothesis and various empirical evidences, the present study postulates the moderating role of perceived social support at work. Hence, the following hypothesis is proposed:

Hypothesis 2: Perceived social support at work moderates the inverse relationship between process conflict and employee well-being.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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Research Methodology

Method

Sample and Procedure

Responses were collected from 554 IT engineers working in projects. A total of 1000 questionnaires were distributed among IT engineers working in major IT companies and received back 620 questionnaires.66 questionnaires were removed from the analysis as it was found incomplete after initial screening. Thus the average response rate was 55.4 percent.

A covering letter explaining the purpose of the study and assuring the confidentiality was attached along with the questionnaire. The definition of each type of conflict type was given above the questionnaire to differentiate between different types of conflict.

Among the usable responses 327 (59 %) were male participants and 227 (41%) were female participants. Majority of the participants (82.5 %) were less than 30 years of age and 17. 5 percent of the participants were in the age group of 31-40 years. 293 were married and 261 participants were unmarried. 59.7 percent of the respondents were in the middle level, 31 percent were in the junior level and 9.2 percent were in the top level of the organisation .72.9 percent were graduates, 25.8 percent were post graduates and 1.2 percent have educational level above post-graduation.

Measurement

Process Conflict: Process conflict was measured using a subscale from extended intragroup conflict scale (Jehn *et al.,* 2008). The scale consists of 4 items. The study used a five point Likert scale (1= never; 5 = very much)

Perceived social support at work place: Perceived social support at work place was measured using a scale adapted from Ilies *et.al.* (2011). the scale consists of six items five point Likert type scale (1= strongly disagree; 5 = strongly agree) which measures the perceived social support at work place by the employees from co-workers and supervisors.

Employee well-being: Employee well-being was measured using two sub-scales measuring mental health and physical health from occupational stress indicator, adapted from Evers *et al.* 2000. The participants are requested to report how often they felt each of the following mentioned in the scale. Each sub-scale consists of seven items each and the items are reverse coded.

Data Analysis

Measurement model confirmation

Before the formal test of hypotheses, a confirmatory factor analysis was performed to examine the psychometric properties of all the hypothesized latent construct measures. From the analysis, the study found that the overall measurement model fits the data well ($\chi 2$ = 820.712, df = 512, RMSEA = 0.033, CFI = 0.986, SRMR = 0.029). Further, the convergent validity and reliability of the scale measures were also examined. Cronbach's alpha coefficients ranged from 0.92 to 0.98, construct reliability coefficients ranged from 0.92 to 0.98) and item-to-construct loadings ranged from 0.73 to 0.96 and average variance extracted values ranged from 0.624 to 0.905. All these coefficients were above the conventional threshold levels, thus confirmed convergent validity and reliability of the scale measures. Additionally, the study examined discriminant validity for all constructs following Fornell & Larcker (1981) and the results supported that in all cases AVE values exceeding corresponding squared correlations for its construct pairs (See Table 1).

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Table 1: Reliability and validity of scales

	CR	Cronbach α	AVE	MH	PC	PSS	PH
MH	0.921	0.92	0.624	**0.790**			
PC	0.966	0.96	0.876	-0.524	**0.936**		
PSS	0.983	0.98	0.905	0.073	-0.104	**0.951**	
PH	0.942	0.94	0.698	0.727	-0.472	0.152	**0.835**

Note: MH= Mental Health, PC=Process conflict, PSS=Perceived social support, PH= Mental health.

Descriptive Statistics

In table II correlations, mean and standard deviations of the constructs in the study are given. The correlation analysis shows a negative correlation between process conflict and well-being. Perceived social support has a negative correlation between process conflicts and positively related to well-being.

Table 2: Mean, standard deviation and correlations of study constructs

Construct	Mean	S.D	1	2
Process Conflict	2.46	1.36		
Perceived social support	3.58	1.27	-.103**	
Well-being	3.64	.79	-.518	-.119

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

Hypotheses testing

To test the proposed direct relationship between process conflict and employee well-being, the study relied on regression analysis and to check the moderating hypothesis, the study relied on the PROCESS Bootstrapping method (Model 1, Hayes, 2013) with a bootstrapped sample size of 5000.

The current study postulated a negative relationship between process conflict and employee well-being. To test this hypothesis a regression analysis was performed and from the analysis of the regression model the study found support for the proposed hypothesis (β =-.29, t= -12.95, p<.0.01) and the H1 is accepted. The result of the regression analysis is shown in table 3.

Table 3: Direct effect process conflict on employee well-being

Predictor	B*	SE	t	p
	Well-being			
Process Conflict (PC)	-.29	.02	-12.95	<.001

Note. N=554 IT employees; *Unstandardized regression coefficients are reported

Test of simple Moderation

To test the proposed moderating hypothesis, the study relied on PROCESS Macros in SPSS 22 following a bias-corrected Bootstrapping Method (Model 1, Hayes, 2013), with a bootstrapped sample size of 5000.

Table 5 presents the hypothesis testing result of H2 which predicted that perceived social support moderates the relationship between process conflict and employee well-being. Results indicated that the overall model was found to be significant

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F(3,550)=60.92,p<.001,R=.27, which estimates that 27 percentage of variance in the well-being of an employee is explained by the process conflict and social support. Further the interaction effect between process conflict and perceived social support on well-being was significant *(B=.03, t(550)= 2.27, p<.05),* even at different levels of social support, however to confirm the interaction effect , slops of process conflict at different levels (*M ± 1 SD*) were plotted in Figure: 2.

Table 6: Conditional Process Analysis of Perceived social support on Process conflict and well-being

Predictor	B*	SE	t	p	BC[a] 95% CI[b]
R^2=.27, p =.00	**Wellbeing**				
Constant	3.64	.02	126.19	<.001	[3.58,3.70]
PC	-.29	.02	-14.15	<.001	[-.34, -.25]
PSS	.04	.02	2.02	.0415	[.001, .09]
PC×PSS	.03	.01	2.27	.0233	[-.06, -.005]

R-square increase due to interactions

Interaction	R^2 Change	F	Df1	Df2	p
Social Support	.018	11.99	1.00	550	.000
Social Support	**.006**	**5.17**	**1.00**	**550**	**.02**

Conditional effect of process conflict on well-being at different levels of moderators

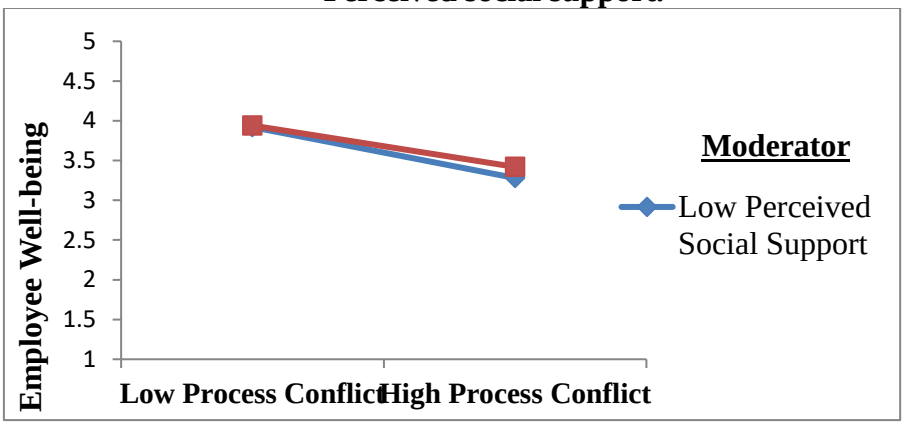
PSS	Boot indirect Effect	Boot se	t	p	BC[a] 95% CI[b]
-1.27	-.34	.03	-10.43	<.001	[-.41,-.28]
.00	-.29	.02	-12.95	<.001	[-.34,-.25]
1.27	-.34	.03	-7.83	<.001	[-.31,-.18]

Note. N=554 IT employees. *Unstandardized regression coefficients are reported. BC[a]= Bias Corrected.CI[b]=Confidence Interval. PSS=Perceived Social Support, PC= Process Conflict.

The interaction pattern is clearly visible in the Figure 2, which explains that the adverse effect of process conflict on employee well-being strengthens (weakens) at lower (higher) levels of social support. This confirms the moderating role of perceived social support in the relationship between process conflict and well-being. So H2 is accepted.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Figure 2: Well- being predicted by process conflict and moderated by Perceived social support.



Findings and discussions of the study

The results of the study established the detrimental effect of process conflict on employee well-being. Process conflicts which take place at workplace over task accomplishment and delegation issues diminish the perception of employee's physical and mental health. This can be justified using Job Demand – Resource model (Bakker & Demerouti, 2016). The job demand resource model states that stressors are additional job specific demand requiring additional physical and mental effort to cope with the situation which have an adverse impact on employee's mental and physical health. Process conflicts are additional job demands which require additional physical and mental resources which diminish the employee well-being. The findings are in line with previous research findings which have established that conflicts in general are detrimental to employee well-being (Dijkstra et al., 2005; Frone, 2000).

In the conflict literature process conflict has got scarce attention. The findings of the study indicate that process conflict is also a specific type of conflict which can adversely impact employee well-being. This highlights the need of more research to understand the effect of process conflict on various levels of outcomes.

The study has addressed the moderating role of perceived social support in the relationship between process conflict and employee well-being. The results supported the moderating role of perceived social support at work place in the relationship between process conflict and employee well-being. Perception of supportive supervisors and co-workers attenuates the detrimental effect of process conflict on employee well-being. This is in accordance with the previous studies which established a buffering role of social support (Giebels & Janssen, 2005; Ilies, Johnson, Judge, & Keeney, 2011). The study also established that the adverse effect of process conflict on employee well-being decreases at higher levels of social support and increases at lower levels of social support. This provides valuable insights for managers to use social support as an intervention to reduce the detrimental effect of process conflict. Hence, managers should motivate employees to provide social support during episodes of process conflict to mitigate the detrimental effect of process conflict. The finding that perceived social support at work mitigates the adverse effect of process conflict on employee well-being highlights the importance of workplace environment and the quality of employee network in influencing individual level outcomes.

Limitations and directions for future research

The study has the following limitations. Firstly, the cross sectional nature of the data limits causal conclusions. Secondly, self-report nature of data collection arises the question of common method bias. Thirdly, the study overlooked the effect of other types of conflicts such as relationship and task conflict on employee well-being. Finally, the study did not address the differential effect of conflict with a supervisor and conflict with a co-worker on employee well-being.

`Future research should using a longitudinal research design should examine address the effect of process conflict on employee well-being. The study examined the direct effect of process conflict on employee well-being. Future research should examine the possible mechanisms through which process conflict influence employee well-being. Further, future research should address the differential effect of other types of conflict such as task and relationship conflict on employee well-being.

Conclusion

The study has established the detrimental effect of process conflict on employee well-being and established the importance of social support at work. The study not only highlights the importance harmonious relationships among employees and establishes how the nature of interpersonal relationships among employees can be utilised as an effective intervention strategy to influence employee well-being. Thus the study extends the theoretical understanding and provides avenues for practice.

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Extent of Employment, Income Inequality and Poverty in Tiruvannamalai District

L. Baby Albert*

Introduction

The nature of distribution of income and the changes in the same has attracted many researchers all over the world for a long time. The nature of income distribution in a country also decides the size of poor population and also the rate of reduction in the same. However, it is also noted that a mere rise in income level would not a sufficient condition to alleviate poverty, since access to social, economic and political endowments greatly influence the level of poverty. This has attracted many scholars all over the world to unravel the nuances and also the determinants of poverty. Some of the important studies are reviewed in this chapter in order to trace the research gap.

Review of Literature

Income Distribution in India

According to Gupta (1973), public sector undertakings play a greater role in bringing down the disparity among the different regions in India. The main substantive conclusion was that public sector investments over the period 1950-66 had led to bringing down the income variations among different regions in the country. He used measures like concentration coefficients of regional income at the base period of first four plans, i.e., 1950-51, 1955-60, 1960-61 and 1969-70; the concentration coefficients of regional public investment activities for the first four plan periods, separately; and the concentration coefficients of regional income against some base period population in order to isolate the impact of investment decisions on regional per capital income. Though the Fourth Plan emphasized the need to reduce regional disparities, its objectives were not fulfilled and he mentioned that although the central government's role in redistribution has increased significantly, much of its favourable impact might be washed away by the pattern of the State's investment allocations.

Bardhan (1975) studied income distribution in urban and rural sectors of India during 1960-69 and found that during this period of not so high growth, distribution as measured by Gini ratio declined marginally, both for rural and urban sectors.

Mathur (1983) investigated nature of economic variations in India during the 25 year period of 1950-51 to 1975-76. He analysed the sectoral income disparities by using coefficients of variation. The primary sector displayed a marked narrowing down tendency till the sixties. Thereafter, the regional disparities in this sector started increasing at a fast pace, although this process appeared to have been arrested during the first half of the seventies. On the other hand, the secondary sector was marked by a period of rising regional disparities, but thereafter this sector showed a consistently declining trend in disparities. He found that regional disparities in the primary and tertiary sectors displayed a U-shaped behaviour and the secondary sector revealed an inverted U-shaped behavior.

Rao (1984) carried out a study in 1984 which was confined to disparities 22 within the state of Karnataka. The author developed sectoral indices of development and finally a

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composite index of development considering 'Taluk' as 'region'. The aim of the study was to identify the backward regions and to measure overall development. The study was based on 85 socio-economic development indicators pertaining to various sectors such as agriculture, industry, education, health, banking, etc., and covered 19 districts and 175 Taluks of Karnataka for the period 1975-76 to 1979-80. Inter-district disparities were examined on the basis of fifteen key indicators. Delineation of homogeneous regions was done through identification of Taluks based on factor scores for land utilization and cropping pattern.

Dholakia (1985) analysed variations in the growth of States' economies in India taking fifteen major states covering the period from 1960-61 to 1979- 80. He examined the trend in state income inequalities considering the sectoral classification and tried to identify the major factor responsible for such inequalities. The regional aspects of economic growth and productivity changes in India were examined taking crucial aggregates like real output, employment and the real stock of capital in the states. His analysis showed that the regional disparities in India had gone up till 1979-80.

Rathinakumar (1987) tried to examine the magnitude of poverty through consumer spending on food and non-food items. It also tried to measure the degree of distribution in the distribution of consumer expenditure. His study was based on the various years of National Sample Survey (NSS) data. The author used Lorenz curve, Gini co-efficient, Kuznets index and standard deviation of log for measuring distribution. He found that distribution of expenditure had increased in the rural and urban areas of Tamil Nadu over two decades.

Chowdhury (1993) analyzed the growth pattern of the states and related it to the standard of living of the people. This study for the first time constructed constant price comparable series of State Domestic Product (SDP) and made inter-state comparison for the results to be more meaningful. The author ranked the states using their average per capita income and average household expenditure and showed that irrespective of the measure used, the states at the extreme ends continued to remain the same. But, the variation in the consumer expenditure among the states was lower than in the case of per capita income. The results also suggested that the country is moving towards industrialized base through higher growth of manufacturing and infrastructure and this phenomenon was widespread covering more of the lower income states than higher income ones.

Mathur (1983) studied the inter-state disparities in terms of overall development measures, such as, SDP and household consumptions expenditure. Consumption expenditure showed a lower inter-state disparity than per capita income and per capita SDP at current prices indicated less disparity than that at constant prices. Rankings of the states like Rajasthan, Jammu & Kashmir and Uttar Pradesh were higher under average household expenditure than under per capita income, while it was vice versa in the case of Tamil Nadu and Karnataka. Finally, the author found that the growth in manufacturing and infrastructure was higher than in agriculture and this phenomenon was widespread covering more of lower income states than higher income ones.

Economic Growth and Poverty

Country-level studies have identified many policies and institutions which act as barriers for creation of jobs and productivity. These include the legal and regulatory barriers to business entry, operation and exit, and poor labour market regulations. For instance, inflexible or costly hiring and firing regulations are identified as an obstacle to

employment growth in Chile, India, Mexico and Zambia (World Bank, 2009). Wage rigidity can also hamper job creation. In many developing countries it has been related to the inflexibility of public sector wages, while binding minimum wages are also thought to increase the reservation wage (World Bank, 2007a). Studies for Afghanistan and Ukraine note that intricate regulatory regimes tend not be perceived as a major barrier by firms because they are loosely enforced. However the nonenforcement of regulations presents a problem in itself – the opportunity for arbitrary application of rules and corruption (**World Bank, 2007b).**

In response to the policy and institutional barriers to job creation, country-level policy advice often recommends measures to lower the costs of doing business and introduce more flexible labour market regulations (Ramesh, 2006). Reforms in Colombia brought down the costs of firing workers as a means of encouraging employers to recruit more workers during boom periods, while in the Slovak Republic a new Labour Code introduced the option of non-standard contracts. Strategies to alleviate wage rigidity often suggest reforming public sector compensation policies or the introduction of subminimums to encourage the employment of often excluded groups, such as young people (**World Bank, 2014).**

In order to ensure job security with minimal distortions in the labour market, social protection measures should be de-linked from specific jobs, where possible (World Bank, 2006). In low income countries, public works programmes may be the most feasible policy response. These programmes are self-targeting and can be implemented even if levels of informality are high. If well-designed, the labour oriented Government programmes for infrastructure can also have a lasting impact on the quantity and quality of jobs by releasing binding constraints to growth **(Radwan, 1995).**

To increase employment generation following trade liberalization, nations need to have a complementary agenda, including improvements to customs, ports and other critical infrastructure, regulatory reforms, innovation and education (Revenga and Bentolila, 1995). The adoption of international product standards, including sanitary and phytosanitary measures, are also identified as prerequisites for realizing the job-creating potential of tariff reductions (**Limão** and **Venables, 2001).**

The study made by the United Nations Development Programme (UNDP) created a unique employment dynamic to reduce poverty in Bangladesh. This consists of bringing down the underemployment in the agricultural sector, not by classical expansion of employment by industrialization but by a faster rise in more productive non-farm employment in the rural areas. The sustainability of this path to poverty reduction is subject to numerous questions that are dealt with later (**Shukla, 1991).**

Desai and Namboodiri were of the view that increasing total factor productivity in agriculture was more important than poverty alleviating programmes in reducing rural poverty since, the former would provide more employment opportunities in the non-farm sector to the rural poor (Desai and Namboodiri, 1998). Gill and Sawhney using the 2001 Census data noted that the intra-country variations in the percentage of rural non-agricultural employment. According to them, the gross state domestic product in agriculture per male worker alone explained more than 50 percent of inter-state variations (Gill and Sawhney, 2003). However, there are also some contrasting views. Kumar's study on inter-state variations in rural non-agricultural employment in the 1970s and 1980s which used agricultural growth rate as one of the explanatory variables did not find it to be

significant in explaining the inter-state growth variations (Kumar, 1993). In a slightly different but notable argument, Ray in his theoretical analysis asserted that in an inequitable agrarian economy, growth in agricultural productivity can hardly bring any farm – nonfarm linkages at the local level since, majority of the rural population who are landless, small and marginal farmers remain only marginal beneficiaries (**Ray, 1994).**

The micro level study done by Saleth based on the data belonging to 218 households from four villages of Trichy district in Tamil Nadu has also underlined the importance of equitable asset ownership at the village level for the production linkages to materialise (Saleth, 1996). Lanjouw and Stern too endorsed this view. Taking the survey data done at five different points of time during the period 1957-2000 for the village Palanpur (Moradhabad district, Uttar Pradesh) the authors observed that the large landholding households were not 'pushed' outside to seek a job over that period (**Lanjouw and Stern, 2003).**

As far as the linkages between agricultural growth and the proportion of rural employment from the non-agricultural sector are concerned, Chandrasekar (1993) explained that they involve three phases. In the preGreen Revolution phase, 'push' effects took place – rural workers pushed out of agriculture – due to low technology and productivity levels, while in newgreen revolution phase, land-augmenting and labour-using technologies took care of 'pull' effects. Workers were pulled into agriculture. And in phase three - matured-green revolution phase - labour-saving and cost-cutting technologies again created 'push' effects. There must be some 'pull' factors, however weak they might be, present in non-agricultural sector, and if at all the share of rural non-agricultural employment has to increase **(Ram, 1998).**

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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An Analytical Study of Software Testing Models

Raj Sinha*

Abstract
Software Testing may be purely independent, non-obstructing, incremental and iterative activity. Much of its nature depends upon the context and adapted strategy. Software test Coverage is an important indicator of software quality and an essential part of software maintenance. It is helps in evaluating the effectiveness of testing by providing data on different coverage items. There are tons of methodologies available for software development and its corresponding testing. Each methodology is designed for a specific purpose and has its relative merits and de-merits. Selection of particular methodologies depends on many factors such as the nature of project, client requirement, project schedule, etc. From a testing perspective, some methodologies push for testing input early in the development life cycle, while others wait until a working model of the system is ready. The goals of testing are to find a scenario where the product doesn't do things what it is supposed to do. This is deviation from requirement specification. This paper provides a study of the current test coverage researches conducted by other researchers for test coverage in software testing.
Keywords: *Software, Client, effectiveness, life cycle, Models*

Introduction

Software testing is a broad term encompassing a variety of activities along the development cycle and beyond, aimed at different goals. Hence, software testing research faces a collection of challenges. A consistent roadmap of the most relevant challenges to be addressed is here proposed. Testing is widely used in industry for quality assurance: indeed, by directly scrutinizing the software in execution, it provides a realistic feedback of its behavior and as such it remains the inescapable complement to other analysis techniques. Software testing Models are the descriptive and diagrammatic representation of the software life cycle. A life cycle model maps the different activities performed on a software product from its inception retirement into a set of life cycle phases. Different life cycle models may map the basic development activities to phases in different ways. Thus, no matter which life cycle model should follow, the basic activities are included in all life cycle models, through the activities may be carried out in different order in different life cycle models. Software testing is a broad term encompassing a wide spectrum of different activities, from the testing of a small piece of code by the developer (unit testing), to the customer validation of a large information system (acceptance testing), to the monitoring at run-time of a network-centric service-oriented application.

Purpose of Testing

- Debugging Oriented- Whether the implementation was working correctly or not?
- Demonstration Oriented- To show that the software work.
- Destruction Oriented- To show that the software doesn't work
- Evaluation Oriented- To minimize the risk of not working up to an acceptable level.
- Prevention Oriented- Defects-free products can be produced.

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Testing Process: Indeed, much research in the early years has matured into techniques and tools which help make such "test-design thinking" more systematic and incorporate it within the development process. Several test process models have been proposed for industrial adoption, among which probably the "V model" is the most popular. All of its many variants share the distinction of at least the Unit, Integration and System levels for testing.

Test Criteria: Extremely rich is the set of test criteria devised by past research to help the systematic identification of test cases. Traditionally these have been distinguished between white-box (a.k.a. structural) and black-box (a.k.a. functional), depending on whether or not the source code is exploited in driving the testing.

Comparison among Test Criteria: In parallel with the investigation of criteria for test selection and for test adequacy, lot of research has addressed the evaluation of the relative effectiveness of the various test criteria, and especially of the factors which make one technique better than another at fault finding.

Reliability Testing: Given the ubiquity of software, its reliability, i.e., the probability of failure-free operation for a specified period of time in a specified environment, impacts today any technological product. Reliability testing recognizes that we can never discover the last failure, and hence, by using the operational profile to drive testing.

Need to test the application: It is the primary duty of a software vendor to ensure that software delivered doesn't have defects and the customer's day to day operations doesn't get affected. This can be achieved by rigorously testing the software.

Characteristics: Testing is an activity in which a system or component is executed under specified conditions; the results are observed and recorded and an evaluation is made of some aspects of the system or component. Software testing is an integral part of the system development function, not an afterthought. It holds the several characteristics including the following:

It may start with the requirements not the code.
It is both the static and dynamic activity.
Prevents the occurrences of failure
Helps in finding the fault sooner in the development life cycle, and hence reduces the cost to fix the bugs.
Process creates reusable test wares.
It is a group activity and not a one-person job.

Software testing: It is a critical element of SQA and represents the ultimate process to ensure the correctness of the product. Testing is a process of planning, preparing, executing and analyzing the difference between the actual status and the required status. Several historical definitions of software testing are available in the literature.

In 1973, Hetzel explained that," Testing is the process of establishing confidence that a program does what it is supposed to do", in his book Program Test Methods. This definition focuses on the customer satisfaction.

In 1979, Glenford Myers explained "Testing is the process of executing a program or system with the intent of finding errors", in his classic book, The Art of Software Testing. Myers definition focuses on the fact that testing occurred at the end of the SDLC and its main purpose was to find the errors.

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In the Complete Guide to Software Testing, Bill Hetzel(1983) stated, "Testing is any activity aimed at evaluating an attribute aimed at evaluating an attribute of a program or system. Testing is the measurement of software quality".

The primary role of software testing is not to demonstrate the correctness of software product, but to expose hidden defects so that they can be fixed. Testing is done to protect the common users from any failure of system during usage.

Hurdles in testing: As in many other development projects testing is not free from hurdles. Some of the hurdles normally encounters are:

- Usually late activity in the project life cycle.
- No "Concrete" output and therefore difficult to measure the value addition.
- Lack of historical data.
- Recognition of importance is relatively less.
- Politically damaging as we are challenging the developer.
- Delivery commitments.
- Too much optimistic that the software always works correctly.

Let's us understand the Article with the help of **Employee Portal** Software of an organization

Problem Statement: Following are the list of problem which the Organization handed over to us:

- To **Access** the Employee Information System in most efficient Manner.
- To G**roup** Daily Reports in a format which is easy to view.
- To **Update** Telephone Directory of Employees so that it become easy for Employees to access the same according to their need.
- To **Provide** Help Desk Facility to Employees so that problem can be addressed efficiently.
- To **Maintain** Project Monitoring System in a Computerized Format.

Let's us study previous system of the same organization on the following basis.

- Design.
- Technology.
- Efficiency.
- Security.
- Easy to Access.

Design

The Previous System design was based on purely HTML. It did not provide proper validation due to which data inconsistencies became often and obvious.

For Eg: There was no provision of System date. Dates were entered manually so the chances of Data inconsistencies increase in Reports section.

In Contrast to,

The Previous system's Design, this system is designed keeping in view the Non-IT Persons and it also takes care of Validations wherever required.

For Eg: There was no concept of manual entry of data. System date facility was there which prohibits the user from wrong entry of date.

Dynamic page was not provided that lacked online modification of Information. Also there was no provision for Drill-Down Online Queries.

This provision is provided in current System.

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For Eg:
The Employee is searched with the help of following fields:
CPF No.
Employee Name
Designation
The Following figure depicts this:

Technology

- Though the Previous System was designed using VB.NET 2005, Oracle 8i, and ASP.NET their essence was missing from the system. The concept of 3-Tier Architecture was also missing.

Here,
We have used visual studio 2010 with C#, ASP.NET, DHTML, JQuery, Ajax and SQL Server 2005.HTML has been used for designing the page only. The whole system is developed keeping 3-tier Architecture in mind.

- Concept of **Enterprise Library** was efficiently used in the current system so that the whole database can be shifted to new platform without any difficulty. This concept was lacking in previous system.

Efficiency

- With the Voluminous increase in data, it was very difficult to manage the previous system as the system behaves in slow mode. It took too much time to respond which was tedious for the person operating it.
- **Quick Links** provision was not there in previous project.

Here, Quick links are established with the help of Bottom JQuery and Site Map. Quick Links are those links which provide fast access to certain contents very easily.

- **Search Facility** was not efficiently installed in previous version but here this facility is accomplished with the help of Ajax Control. This control provide Drop Down list of field when only 3 words are written.

Security

The previous system did not have this kind of security depth as it is there in current system. Following table depicts this:

Comparisons	Previous System	Current System
Login Facility	Sign Up facility	No Sign Up Facility
Feedback Give	All User	Only Login User
Reports View	All User	Only Login User
Announcement	All department at once	Department-Wise
Meetings	All department at once	Department-Wise
Login History Reports	Access to everyone	Only Admin can access

Easy to Access

- Navigation in the system was sometime hectic as there were too many steps to go through.

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For Eg:

- To check PNR No. Online following steps are followed:

Other→Facility→Travel→Railway→Indian Rail

- There was no provision for direct access.

This problem was solved to the great extend in the current system.

For Eg:

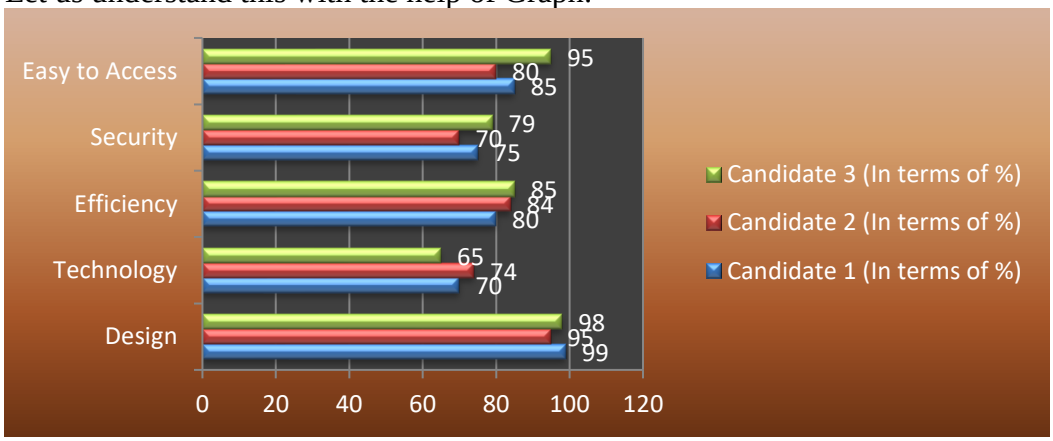
- To check PNR No. Online following steps are followed:

Travel→Railway→Indian Rail

- Directly from Important Links on R.H.S.
- Bottom Jquery.

Comparison	Candidate 1 (In terms of %)	Candidate 2 (In terms of %)	Candidate 3 (In terms of %)
Design	99	95	98
Technology	70	74	65
Efficiency	80	84	85
Security	75	70	79
Easy to Access	85	80	95

Let us understand this with the help of Graph:



Objectives: Following is the list of Objectives of the current system:

1. Access Efficiently
2. Knowledge Update
3. Automated Report Generation
4. Ease of Communication
5. In Time Communication
6. Project Monitoring System

Access Efficiently: To efficiently access Employee Information inside the department.

Knowledge Update: To make people aware of News, announcement and Notice Department wise. Thus, it adheres to one of the main features of a proper MIS, "Right Information at Right Time and Right Place".

Automated Report Generation: Reports that were handled manually in the previous system, have been automated which have the facilities to frame Reports Date wise, Reference Name wise and Submitted By Type.

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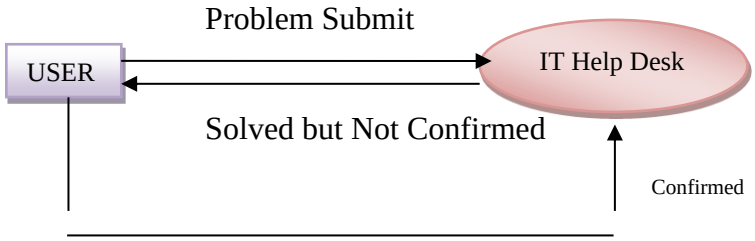
The above Reporting nature of new MIS system nullified the extra work load of searching information manually from the heap of hard copies of report files.

Ease Of Communication:- One of the major factor of MIS is to address any problem immediately by the correct personnel which otherwise may dearly cost to the organization.

To provide facility for IT Help Desk where people can submit their problem related to IT as Intercom are sometime busy which in turn delay the work of the employee thereby incurring the loss to the organization sometime.

In Time Communication:- It also facilitates in time Communication. To provide Report to their Department Head of how much problem was there and till what extend it is solved. Thus, it facilitates recording of information related to the problem and its solution which in turn helps to address such problem easily in near future.



Project Monitoring System:- Project Monitoring System is a very sensitive issue inside Organization. It is a way by which the profit/loss of Company or their employees is efficiently monitored.

Every Year the MIS Department decide the Number of Groups and their Group Name department wise. Based on their field work the project is assigned to them. The project has to be completed in 4 Quarter i.e.

- 1st Quarter April-June.
- 2nd Quarter July-Sept.
- 3rd Quarter Oct-Dec.
- 4th Quarter Jan-Mar.

Plans of each quarters is made with the help of MIS and Group which they have to submit in this Quarter. Based on the completion of Project the Remarks are granted to them.

This Report is handed over to the Delhi Headquarters which decide the promotion of Employees.

- **Information Gathering:-** The Previous Project which was running in the Organization were studied deeply before understanding their new Requirement. Basically we focus on the part that why it is necessary to renew the System and addition of new Module.

Several Meetings were done on Weekly basis so that user gets the desired output without any error.

Types of Process model: Commonly used models are Build and Fix Model, Waterfall model, agile model, Iterative Waterfall model, Prototyping model, Evolutionary model, Spiral Model, RAD Approach, etc.

Build and Fix model: In the build and fix model (also referred to as an ad hoc model), the software is developed without any specification or design. This model includes the following two phases.

- **Build:** In this phase, the software code is developed and passed on to the next phase.

International Journal of Management, IT & Engineering
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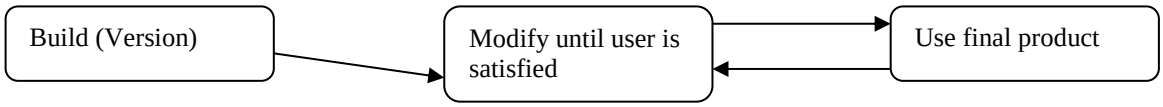
- **Fix:** In this phase, the code developed in the build phase is made error free. Also, in addition to the corrections to the code, the code is modified according to the user's requirements.



Advantages

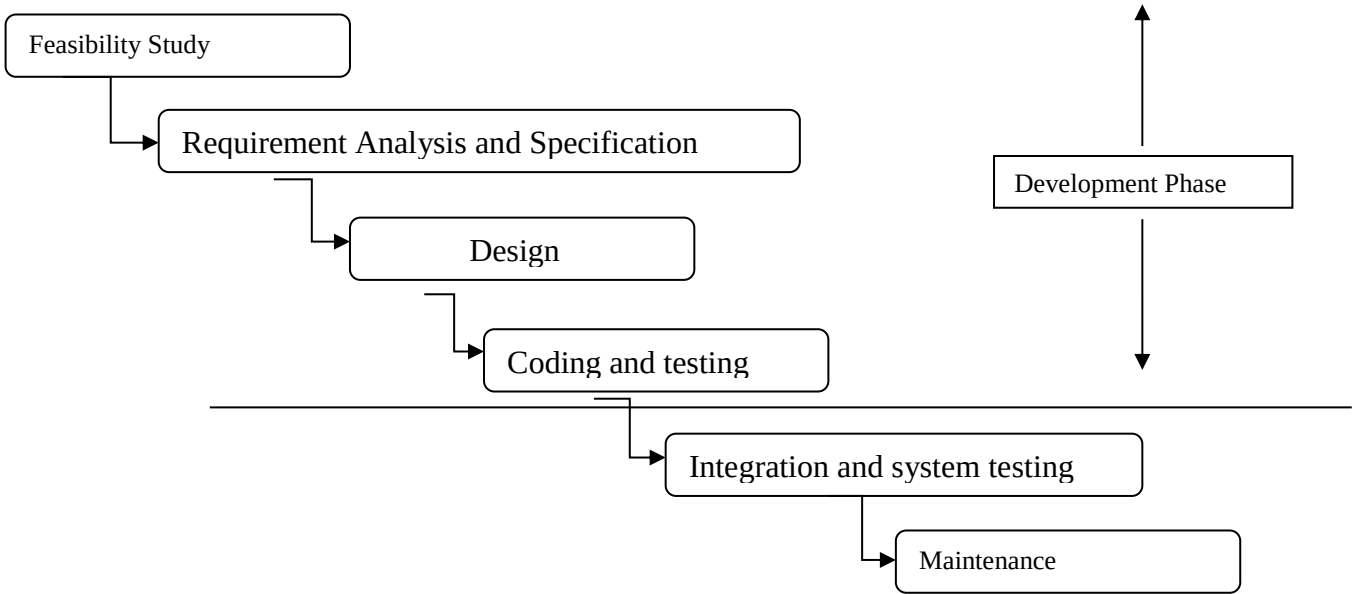
- Requires less experience to execute or manage other than the ability to program.
- Suitable for smaller software.
- Requires less project planning.

Disadvantages

- No real means is available of assessing the progress, quality, and risks.
- Cost of using this process model is high as it requires rework until user's requirements are accomplished.
- Informal design of the software as it involves unplanned procedure.
- Maintenance of these models is problematic.

Waterfall model: It is the simplest, oldest and most widely used process model. This model can be considered as a theoretical way of developing software. All life cycle model is based on the classical waterfall model. This model divides the life cycle into different phases such as:

- Feasibility study
- Requirement Analysis and Specification
- Design
- Coding and testing
- Integration and system testing
- Maintenance



Observe that the diagrammatic representation of the model resembles a cascade of waterfalls. This resemblance possibly justifies the name of this model. Let's we describe the different phases of life cycle model briefly:

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Feasibility study: The main aim is to determine whether it would be financially and technically feasible to develop the product. Feasibility is the determination of whether or not a project is worth doing. The process followed in making this determination is called feasibility study. This type of study determines if a project can and should be undertaken.
In the conduct of feasibility study the analyst will usually consider distinct but interrelated types of feasibility. Different types of Feasibility Study that were conducted in Organization are as follows:

1. Economic Feasibility
2. Technical Feasibility
3. Behavioural Feasibility
4. Operational Feasibility

Economic Feasibility:- The Objective that were fixed according to the problem statement were achieved 100%.Therefore, the amount spend on buying the new Requirement software was feasible to the organization.

Technical Feasibility

- Back-End Tools

Data can be migrated easily using the Enterprise Tools of SQL Server 2005 to other database such as Oracle 10g/11g, etc.

- Front-End Tools

They are:

- HTML
- DHTML
- ASP.NET
- Jquery
- C#

For coming 2 to 3 years this software will be in use. When version of this software will get updated then the current project code will not be affected.
Behavioural Feasibility: As the system was new to the employee first hand trainee was required which was given to them according to following schedule:

MONTH	WEEK (No. Of Days)	HOURS (In a Day)	TOTAL (Hours)
April	3	2	12
May	2	2	8
Total			20

From each Department one or two Employee were deputed by the Project Leader for the Training.
Let us depicts the above table with the help of Graph:

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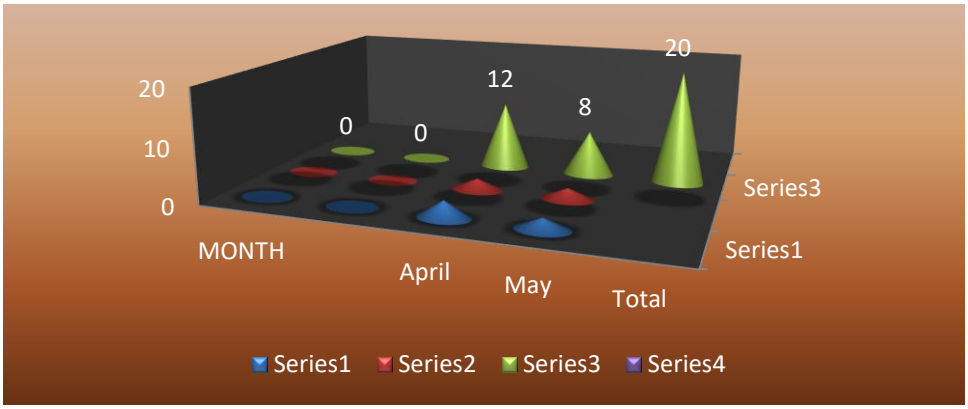


Fig 5.1 Behavioural Feasibility

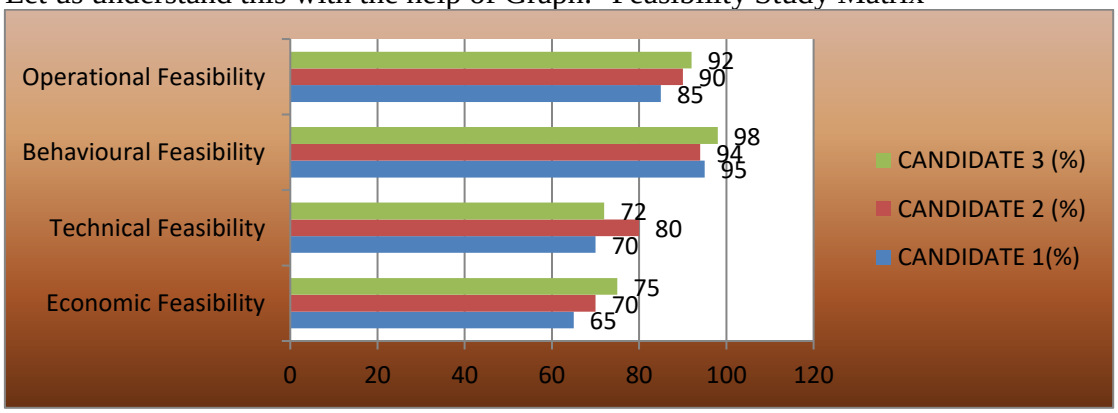
Operational Feasibility:- As the training were given to the Employees the system becomes easy to access.

Easibility study matrix: Is used when there are multiple selection criteria and none of the alternatives are superior across the board.

Let us depict feasibility with the help of Feasibility Study Matrix:

Description	Candidate 1(%)	Candidate 2(%)	Candidate 3(%)
Economic Feasibility	65	70	75
Technical Feasibility	70	80	72
Behavioural Feasibility	95	94	98
Operational Feasibility	85	90	92
Rank	3rd	2nd	1st

Let us understand this with the help of Graph:- Feasibility Study Matrix



Requirement Analysis and Specification: The aim of this phase id to understand the exact requirements of the customer and to document them properly. This phase consists of 2 distinct activities:

- Requirement gathering and analysis
- Requirement Specification

Requirement gathering and analysis: This activity consists of first gathering the requirements and then analyzing the gathered requirements. The goal of the requirements gathering activity is to collect all relevant information regarding the product to be

developed from the customer with a view to clearly understand the customer requirements. Once the requirement has been gathered, the analysis activity is taken up. The goal of requirements analysis activity is to weed out the incompleteness and inconsistencies in these requirements.

Requirement Specification: The customer requirements identified during Requirement gathering and analysis activity are organized into a SRS. The 3 most important content of this document are:

- Functional requirements- Input data, Processing required and output data
- Non-functional requirements- Identify the performance requirements, the required standard to be followed, etc
- Goal of implementation

Design: In technical terms, during the design phase the software architecture is derived from the SRS document. Two distinct different design approaches are being used at present.

- Traditional Design Approach
  - Structured Analysis- Data Flow Diagram
  - Structured Design-Architecture design and detailed design
- Object-Oriented Design Approach

Coding and testing: The purpose of coding is to translate the software design into source code. The coding phase is also sometimes called the implementation phase. Each component of the design is implemented as a program module. The end product of this phase is a set of program modules that have been individually tested. After coding is complete, each module is unit tested. The main goal of unit testing is to determine the correct working of the individual modules during unit testing.

Integration and system testing: During the integration and system testing phase, the different modules are integrated in a planned manner. Integration of various modules is done over a number of steps. During each integration step, previously planned modules are added to the partially integrated system and the resultant system is tested. Finally, after all the modules have been successfully integrated and tested, system testing is carried out. The goal of system testing is to ensure that the developed system conforms to its requirement laid out in the SRS document.

Maintenance: Maintenance of a typical software product requires much more effort than the effort necessary to develop the product itself. It involves performing any one or more of the following 3 Kinds of activities:

- Corrective Maintenance- Involves correcting errors that were not discovered during the product development phase.
- Perfective Maintenance- Involves improving the implementation of the system, and enhancing the functionalities of the system according to customer's requirements.
- Adaptive Maintenance- Required for porting the software to work in a new environment.

Advantages

- Simple to use and easy to understand
- Easy to manage and maintain thanks to rigid and precise phases
- All stages are well documented
- High visibility on the current progress
- Low chance of unexpected financial expenses

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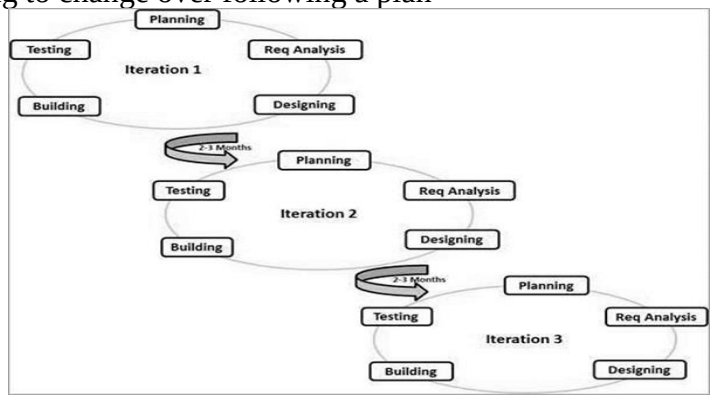
- Easy testing
- The outcome is clear

Disadvantages

- Lack of flexibility
- Increased delivery time
- A small change in one phase causes many changes in all subsequent
- Software deliverables are available only at the end of a cycle

Agile Model: This methodology is a practice that promotes continuous iteration of development and testing throughout the software development lifecycle of the project. Both development and testing activities are concurrent unlike the Waterfall model**.** The agile software development emphasizes on four core values.

- Individual and team interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan



It is a combination of iterative and incremental process models with focus on process adaptability and customer satisfaction by rapid delivery of working software product. Agile Methods break the product into small incremental builds. These builds are provided in iterations. Each iteration typically lasts from about one to three weeks. Every iteration involves cross functional teams working simultaneously on various areas like −

- Planning
- Requirements Analysis
- Design
- Coding
- Unit Testing and
- Acceptance Testing.

At the end of the iteration, a working product is displayed to the customer and important stakeholders.

Advantages

- Is a very realistic approach to software development.
- Promotes teamwork and cross training.
- Functionality can be developed rapidly and demonstrated.
- Resource requirements are minimum.
- Suitable for fixed or changing requirements
- Delivers early partial working solutions.

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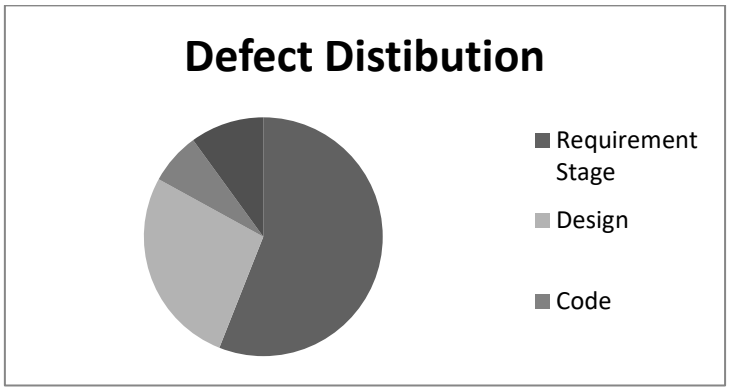
- Good model for environments that change steadily.
- Minimal rules, documentation easily employed.
- Enables concurrent development and delivery within an overall planned context.
- Little or no planning required.
- Easy to manage.
- Gives flexibility to developers.

Disadvantages

- Not suitable for handling complex dependencies.
- More risk of sustainability, maintainability and extensibility.
- An overall plan, an agile leader and agile PM practice is a must without which it will not work.
- Strict delivery management dictates the scope, functionality to be delivered, and adjustments to meet the deadlines.
- Depends heavily on customer interaction, so if customer is not clear, team can be driven in the wrong direction.
- There is a very high individual dependency, since there is minimum documentation generated.
- Transfer of technology to new team members may be quite challenging due to lack of documentation.

Defect Distribution: The overall defect distribution is shown in below figure:



Levels of Testing: A software product is normally tested into 3 levels:

- Unit Testing
- Integration Testing
- System Testing

During unit testing, the individual component of a program is tested. After testing all units individually, the units are slowly integrated and tested after each step of integration, which is referred to as integration testing. Finally, the fully integrated system is tested, known as System testing. Unit testing is referred to as testing in the small, whereas integration and System testing are referred to as testing in the large. Unit Testing is carried out in the coding phase itself as soon as coding of a module is complete. On the other hand, integration and system testing are carried out during the testing phase.

Conclusion

The waterfall model provides a systematic and sequential approach to software development. But, in this model, complete requirements should be available at the time of commencement of the project, but in actual practice, the requirement keep on originating

during different phases. An activity that spans all phases of any software development is Project Management. The Waterfall is an excellent choice:

- For small projects
- For products with a stable definition
- For projects with unchangeable requirements
- When project requirements are well known and not fluctuating
- Where there are no unclear requirements

Software testing methodologies should not be setup just for the sake of testing software code. The big picture should be considered and the prime goal of the project should be satisfied by the testing methodology.

- Scheduling - Realistic scheduling is the key to the implementation of successful testing methodology and the schedule should meet the needs of every member of the team.
- Defined deliverables - In order to keep all the members of the team on the same page, well defined deliverables should be provided. The deliverables should contain direct content without any ambiguity.
- Test approach - Once scheduling is complete and defined deliverables are made available, the testing team should be able to formulate the right test approach. Definition documents and developer meetings should indicate the team about the best test approach that can be used for the project.
- Reporting - Transparent reporting is very difficult to achieve, but this step determines the effectiveness of the testing approach used in the project.

Many organizations do and believe that Software testing is a structured "waterfall" idea. This indicates that testing starts after coding. This is not right. Good testing follows the type and nature of software development. Like development, software testing also can be Agile model, V model, iterative, incremental, spiral, evolutionary, and so on.

Agile method proposes incremental and iterative approach to software design whereas in waterfall model development of the software flows sequentially from start point to end point.

The **agile process** is broken into individual models that designers work on. The customer has early and frequent opportunities to look at the product and make decision and changes to the project whereas the design process is not broken into individual models in waterfall model and the customer can only see the product at the end of the project.

Agile model is considered unstructured compared to the waterfall model. Small projects can be implemented very quickly. For large projects, it is difficult to estimate the development time. Error can be fixed in the middle of the project. Development process is iterative, and the project is executed in short (2-4) weeks iterations. Planning is very less. Documentation attends less priority than software development. Every iteration has its own testing phase. It allows implementing regression testing every time new functions or logic are released. In agile testing when an iteration end, shippable features of the product is delivered to the customer. New features are usable right after shipment. It is useful when we have good contact with customers.

Testers and developers work together. At the end of every sprint, user acceptance is performed. It requires close communication with developers and together analyzes requirement and planning

Whereas, Waterfall model are more secure because they are so plan oriented. All sorts of project can be estimated and completed. Only at the end, the whole product is tested. If the

requirement error is found or any changes have to be made, the project has to start from the beginning. The development process is phased, and the phase is much bigger than iteration. Every phase ends with the detailed description of the next phase. Documentation is a top priority and can even use for training staff and upgrade the software with another team. Only after the development phase, the testing phase is executed because separate parts are not fully functional. All features developed are delivered at once after the long implementation phase.

Testers work separately from developers. User acceptance is performed at the end of the project. Developer does not involve in requirement and planning process. Usually, time delays between tests and coding.

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International Journal of Management, IT & Engineering
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Identifying Fabric Defects Causes by using Pareto Analysis in an Apparel Industry

Sakshi Garg*
Kamaljit Singh Rana**

Abstract
Knitting is the technique by means of which yarn is interlocked to create the textile or material for use in lots of forms of garments. Knitting creates a couple of loops of yarns referred to as stitches; it could be visible in a line. As the increasing demand of high quality knitted fabric consumers are become more aware of "Non- quality" problems. But in the process of fabric production in a company, there are some defects are detected which may cause the quality of fabric. Defects may occur due to stitching process, production, machine, dying and printing etc. Due to the defects a major amount of fabric is rejected in an industry. So in the knitting mills, they have to produce high quality of fabric constantly. The main importance of this project is to analysis of fabrics defects in some areas of company, and provides appropriate solution to the defect problem.

After this, data is collected of eleven defects like oil stain, holes, needle line, thick yarn joint, and contamination, shade variation, broken needle etc in a company. The major causes of defects type are needle line, contamination, holes, and thick yarn joint. The main tool used quality tool as Pareto analysis for the detection of fabric defects.

Due to the major causes of defects like needle line, holes, contamination and thick yarn joint we found that fabric rejection was 7.92% which may influence the running performance of company. The presence of defect in fabric may also sell out in low rates which may incurred fewer profits also.

Keywords: Quality, Defects, Textile Industry, Solution Suggested.

1. Introduction

There are the various reasons of fabric defects which are caused by raw materials, weaving, spinning process, dying and knitting. Defects which come in the fabric are responsible for the major defects which are found by the garment industry. As customers are more conscious about the quality of the product, their awareness about the non-quality products are increasing. As the demand is increasing for the quality fabrics, requirements of the quality products are high today. Every customer wants the product with the good quality, if they are spending their money on it.

Knitting is the technique by means of which yarn is interlocked to create the textile or material for use in lots of forms of garments. Knitting creates a couple of loops of yarns referred to as stitches; it could be visible in a line. Knitting has more than one stitch on the needle at one time. Knitted material includes number of rows of intermeshing of loops. Each row progress a newly created loop that is pulled via one or greater loops from this placed on the previous row that is located on the second needle and loops from the

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previous row are then pulled off the other needle[2]. It may be completed with the aid of hand or the usage of devices.

There are various faults or defects in knitting production which can be caused in different ways and few of them cannot be related to or occurs by just one cause. Knitted fabrics faults are different from each other as in nature and appearance and are often superimposed each other.

Problem Identification

There are three sections in the textile wing of the company of which knitting section is one. This section is beginning of fabric production that is playing significant role in the succeeding process that special care need to be given for its output from quality perspective. Likewise, this section has relatively good data record but revealing the existence of different type of defect. The section has been found to have higher rejection due to different defects and this problem has resulted in high rejection rate (7.9%) as it is revealed from the existing data of the section.

Even though, this amount of rejection rate is indicated in the section's recorded data, the trail to distinguish between the most influential and least influential defects are not found yet made and their respective root causes are not clearly figured out. This in turn paves the way for the problem to remain inherent and created difficultly in solving them. Therefore, this work incorporates the process of finding the dominant defect with their respective root cause and in turn solving them accordingly.

Objective of study

- To identify and measure the critical fabric defect types
- To eliminate cost of rejection rate for the section under investigation
- To provide the possible solution for the identified critical defects.
- Identification of the area of the problem. (e.g. sewing defects, manufacturing defects)
- To minimize the fabric defects percentage.

2. Experimental Methodology

2.1 Findings and Data Analysis

In this research different data is analyzed in different some area and also data is collected after reviewing all the literature review, direct observation, and reviewing recorded data. As the research is start from defining statement of problems and specifying the objective of the study. After reviewing literature related to the subject matter, all necessary data were collected. The outline of the study gives clear procedures on how data is collected and analyzed to achieve objective of the study. Some steps are involved:-

Step-I: Selection of factory

For conducting the case study selection of factory is the first step in which we should gather an appropriate information about the different types of defects.

Step-II: Case Study Conducted

Then, we conducted a case study at a particular garment industry named as "Active Clothing Co. Pvt Ltd." Situated in Mohali, Punjab

Step-III: Gathering Information

The next step is to gathering information; we gather information at various areas sections with the help of employees and management for the purpose of analysis of case study.

Step-IV: Analysis and Suggestions

To minimize the defects percentage we use the quality tool a Pareto Analysis and also give suggestions for the critical defects types.

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2.2 Data Collection

We have collected the data for six weeks for the research work. The data is to be taken in different section of areas of knitted fabric. We identified the eleven defects like thick yarn joint, oil stain, contamination, holes, needle line, hard stain, slub, yarn variation etc with the help of employees and management.

2.2.1 Weekly rejection rate and their frequency

The company recorded data are summarized and the rejection rate together with their respective frequency is figure out tabulated here below.

Table 2.1 Weekly rejection rate with their defect frequency

WEEKS	REJECT DEFECT ON		DEFECT TYPE WITH THEIR FREQUENCY %									
		THICK YARN	KNIT LINE	MENDING	HOLES	CONTAMINATION	PATCHES & SHADE VARIATION	HARD STAINS	NEEDLE LINE	LYCRA JUMP	SLUB	YARN VARIATIO
MAY 25-30	2.10	20	7	13	28	15	2	8	15	11	1	0
JUNE 1-4	5.68	14	8	18	15	30	1	19	22	13	0	1
JUNE 5-9	4.67	8	6	14	13	18	0	5	17	1	1	2
JUNE 11-15	32.62	11	3	5	11	14	5	14	30	5	2	0
JUNE 17-21	4.03	11	2	1	17	81	3	13	6	14	4	1
JUNE 25-29	1.59	17	4	11	21	17	8	6	18	18	0	1
TOTAL	47.52	89	57	62	105	102	19	65	108	62	8	5
AVERAGE	7.92	13.04	8.35	9.09	15.39	14.95	2.78	9.53	15.83	0.09	1.17	0.73

This six weeks quality rate of the section based on the data from the department, were characterized intensively and resulted in the following and this result is depicted in table 2.2 below:-

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Table 2.2: Summarized weekly Quality Rejection rate and Production Report

S.N.	REJECTION RATE %	PRODUCTION (KG)	REJECTED FABRIC
1	2.10	101364	2129
2	3.72	102512	5823
3	3.46	82648	3864
4	32.62	77024	25132
5	4.03	79624	3212
6	1.59	84591	1352
TOTAL	**47.52**	**527763**	**37160**
AVERAGE	**7.92**	**87960.5**	**6966.4**

According to table 2.2, the rate of rejection is revealed in percentage and in kilogram. And this clearly shows there is a loss and this loss is financially expressed here below. Rejection rate in value: According to the finance report, the average selling for the first grade is 69 per kg where as the second grade fabric has been sold for 43.5 per kg which is discounted by 25.5 per each kg of fabric therefore its value has reduced by 37%.

Table 2.3: Calculation of quantity of rejected fabric

Labor & FOH	After the compilation of six weeks quality and production reports, the average weekly rejection rate is 7.92% and production is 87960.5 kg.
Average weekly production	87960.5 kg.
Average weekly rejection rate	7.92%
Rejected fabrics	87960.5 kg*7.92%=6966.4 kg
Cost incurred due to rejected fabric	Loss in price*qty of rejected fabrics
	25.5*6966.4=Rs. 45,299,01.6

Therefore the company is incurring 285367.95 kg in six weeks because of second grade fabric. Then again the defects in the section has been figured out and summarized on tabular format as follows on table 2.3. This result in arranged in their emphatic order in ascending manner, from more emphatic to the least emphatic relatively.

2.3 Pareto Analysis

❖ Rule of 80/20 for Pareto Diagram

A Pareto diagram is a simple bar chart that ranks related measures in decreasing order of occurrence. The principle was developed by Vilfredo Pareto, an Italian economists and sociologist who conducted a study in Europe in the early 1900s on wealth and poverty. He found that wealth was concentrated in the hands of the few and poverty in the hands of the

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

many. The principle is based on the unequal distribution of things in the universe. It is the law of the 'significant few versus the trivial many'. The significant few things will generally make up 80% of the, whole the trivial many will make up about 20%[2].

Table 2.4: Summarized defects with their frequency

S/N	Defect Type	Frequency(occurrence)	Percent of total
1	Needle line	108	15.83
3	Contamination	102	14.95
4	Thick yarn joint	89	13.04
5	Hard stains	65	9.53
6	Mending	62	9.09
7	lycra jump	62	0.09
8	Knit line	57	8.35
9	Patches & shade variations	19	2.78
10	Slub	8	1.17
11	Yarn variations	5	0.73
	Total	**682**	**90.95**

The table 2.4 described the arranged defects and the following Pareto chart shows the vital few and trivial many, 80/20. It is depicted here below on figure 2.1.

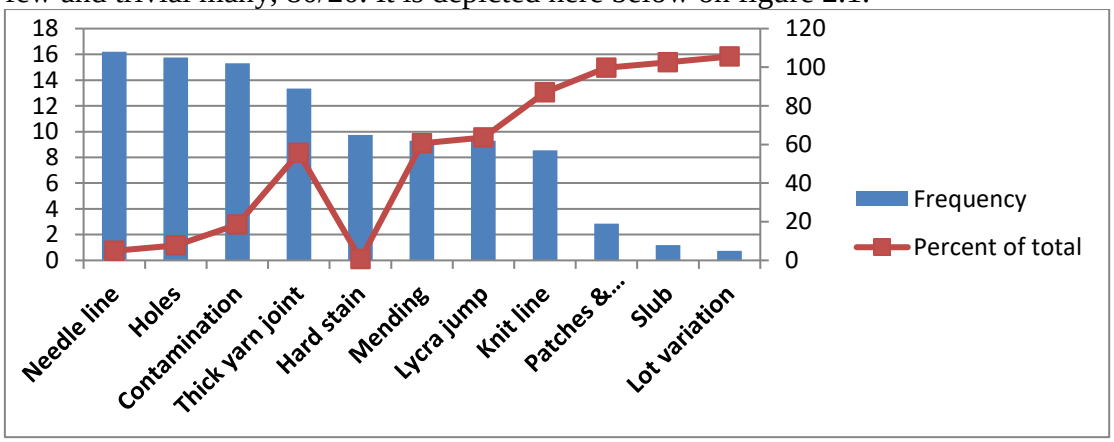

Fig.2.1: Pareto Analysis for Eleven Defects

Pareto technique defines that 80% of results come from the 20% consequences. In the above chart 80% non- acceptance due to 20% of defects like (needle line, holes, contamination, thick yarn joint).

3.3.1 Critical four defects (Needle Line, Holes, Contamination, Thick Yarn Joint)

Based on the Pareto's principle 80/20 analysis above, the critical four defects are identified and shown here below as per their emphatic order and tabulated on 2.5 below. This emphatic order is not merely checked by the data of the company but also direct observation and registering data has been made and cross checked data for agreement. And this revealed that are of the same emphatic order as shown below.

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Table 2.5: Rank of defects with their frequency

S/N	DEFECT TYPE	OBSERVED FREQUENCY OF DEFECTS	FREQUENCY (%)
1	Needle line	266	29
2	Hole	193	26
3	Contamination	50	6
4	Thick yarn joint	69	22
	Total	578	83

The significant defects are the point of analysis here after and they are described as follows with respective causes. Each defect is also sorted out based on Pareto analysis and most emphatic ones are considered

3. Results And Discussions

This progressive analysis and the discussion of the results of the four critical defects mentioned. This is produced from prioritizing four of them out of the eleven dominant defect using Pareto analysis. The steps followed is described here below.

3.1 Critical four defects type in frequencies

3.1.1 Needle Line Defect

Is a fault when a needle breaks down or needle hook bends then a vertical thread out may comes along with the fabrics.

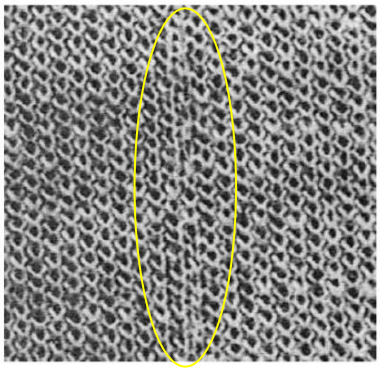

Fig 3.1 Needle Line Defect

Table 3.1. Needle Line defect data

S.N.	Defect Type	Frequency	Frequency (%)
1	Machine dust	49	22
2	Dry material	45	20
3	High yarn tension	41	18
4	Badly knot	31	14
5	Snarled yarn	12	6
6	Broken needle latch	11	5
7	Thick yarn	8	4
8	Double yarn	7	3
9	Worn out needle	7	3
10	Loose yarn tension	5	2
11	Worn- out sinkers	4	2
12	Two d/t needle gauge	4	1
	TOTAL	**226**	**100**

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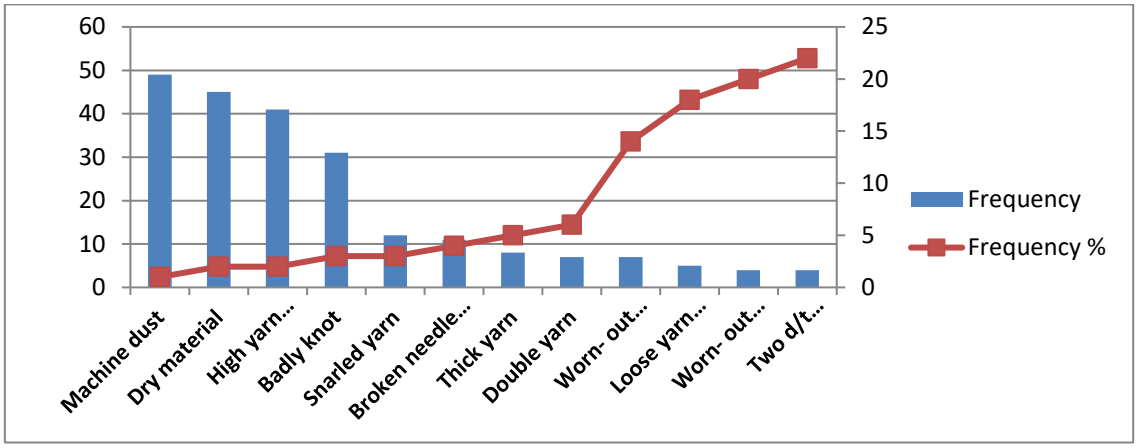

Fig. 3.2. Pareto Analysis for Needle Line

Based on the above analysis the following are found to be the significant ones and here after below mentioned four causes are to be considered for the needle line defect.

Table 3.2 Critical Causes for Needle Line

S/N	Causes of defects	Frequency	Frequency (%)
1	Machine dust	49	22
2	Dry material	45	20
3	High yarn tension	41	18
4	Badly knot	31	14
	TOTAL	**163**	**74**

At the first time, twelve possible causes (table 3.1) were identified. In those days, 226 needle line defects were observed during that period and computed 163 (74%) of the defects was caused by the four critical causes as listed in table 3.2.

3.1.2 Holes Defect

It is a fault when a yarn breaks or jumps during loop formation then it gives an impression of tear or cut on the fabric.

Fig. 3.3 Holes defect

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Table 3.3 Holes defect data

S/N	Defect Type	Frequency (%)	Frequency
1	Old yarn	16.6	32
2	Machine dust	16.4	31
3	Bent needle latch	14	27.7
4	Damage of cone clutch bearing	11.7	22.6
5	High yarn tension	10.5	20.4
6	Yarn is too dry	8.8	17.3
7	Rough ceramic of yarn guide	3	5.8
8	Wrong setting of yarn feeder	3	5.8
9	Loose yarn tension	2.4	4.1
10	Take-down tension (high & loose)	2.1	4.6
11	Double yarn	1.8	3.5
12	Thick yarn	1.5	2.9
13	Wrong setting of knob scale	1.4	2.1
14	Worn-out needles	1.2	2.3
15	Poor maintenance	1.1	2.7
16	Thin yarn	1.1	2.4
17	Worn-out sinkers	0.9	1
18	Mixing of two	0.7	1.1
19	Two d/t needle gauges	0.7	1.7
20	Cracked cone pipe	0.6	1.2
21	Improper creeling of yarn	0.5	1
	Total	**100**	**193**

The result depicted on table 3.4 is analyzed using Pareto analysis as follows and the following chart is meant to describe the result of the analysis.

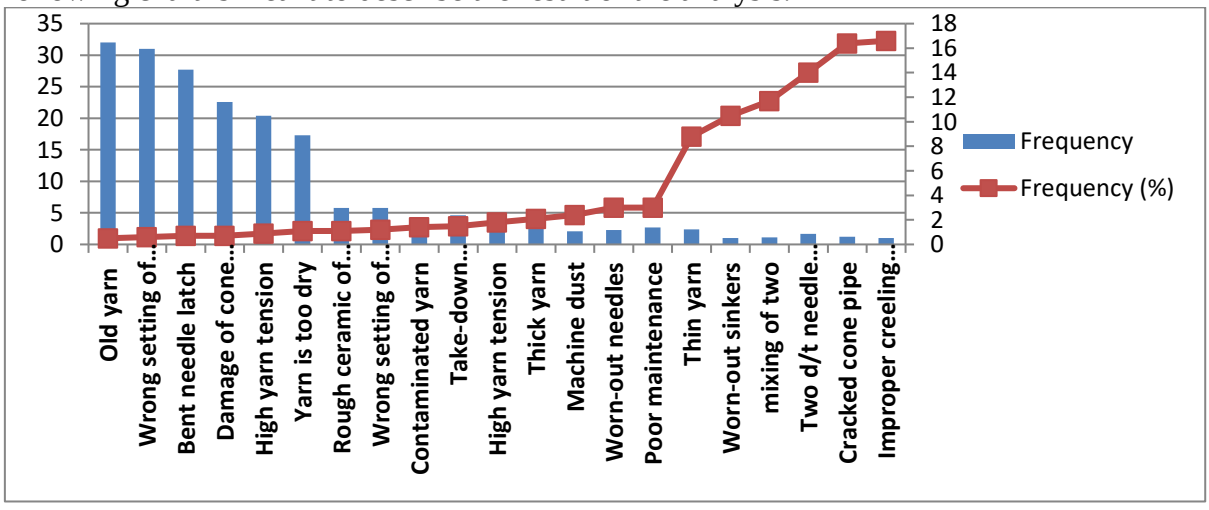

Figure 3.4: Pareto Analysis for Holes

Based on the above analysis the following are found to be the significant ones and here after the below mentioned six causes are to be considered for the hole defect.

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Table 3.4 Critical Causes for Hole

S/N	Causes of defect	Frequency (%)	Frequency
1	Old yarn	16.6	32
2	Wrong setting of yarn feeder	16.4	31
3	Bent needle latch	14	27.7
4	Damage of cone clutch bearing	11.7	22.6
5	High yarn tension	10.5	20.4
6	Yarn is too dry	8.8	17.3
	Total	**78**	**151**

The 193 hole defects were observed and out of which the 151 defects were resulted from the above six causes and they cover 78% therefore the company need to address these causes so as to minimize the occurrence of this defects by about 80%.

3.1.3 Contamination

It is the presence of unwanted and undesirable substance which leads to impure the quality of final textile product.

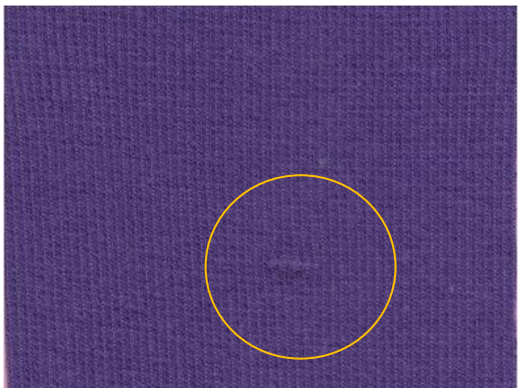

Fig 3.5: Contamination Defect

Table 3.5 Contamination defect data

S/N	Defect Type	Frequency	Frequency (%)
1	Lot mixing	10.8	21
2	Dead fibers	7.5	15.2
3	Contaminated yarn	7	14
4	Bad selvedge	5.6	11.6
5	Weft break	4.7	9.4
6	Miss pick	3.8	7.5
7	Broken end	2.4	4.4
8	Coarse end	2.2	4.5
9	Double end	1.2	2.3
10	Thick and thin places	1.3	2.7
11	Tight end	1	2.6
12	Pilling	1.3	2.8
13	Knot	1.4	2
	Total	**50**	**100**

The result depicted on table 3.5 is analyzed using Pareto analysis as follows and the following chart is meant to describe the result of the analysis.

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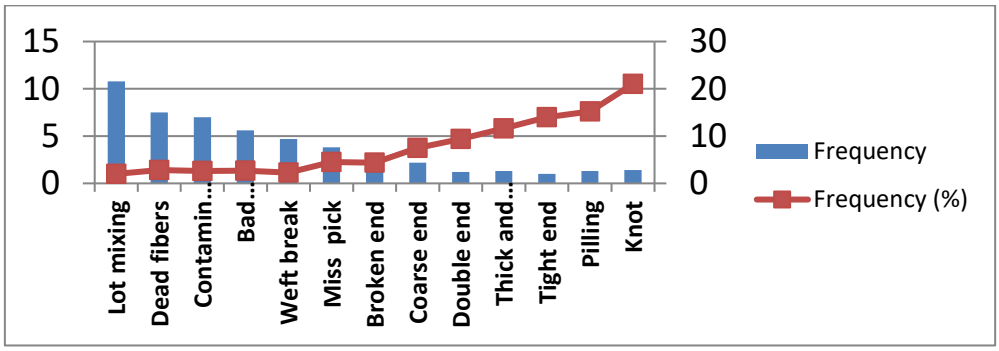

Figure 3.6: Pareto Analyses for Contamination

Based on the above analysis the following are found to be the significant ones and here after the below mentioned six causes are to be considered for the contamination defect.

Table 3.6 Critical Causes for Contamination

S/N	**Causes of defects**	**Frequency (%)**	**Frequency**
1	Lot mixing	21	10.8
2	Dead fibers	15.2	7.5
3	Contaminated yarn	14	7
4	Bad selvedge	11.6	5.6
5	Weft break	9.4	4.7
6	Miss pick	7.5	3.8
	Total	**78.7**	**39.4**

The six critical causes of contamination are identified out of the thirteen causes which are listed in table 3.6. The factory needs to address the above critical cause of the defects, and then it can minimize the frequency of this defect by about 80%.

3.1.4 Thick yarn joint

It is the malformation of cloth produced by knitting textile fibers which destroy the value, texture and finish of the cloth.

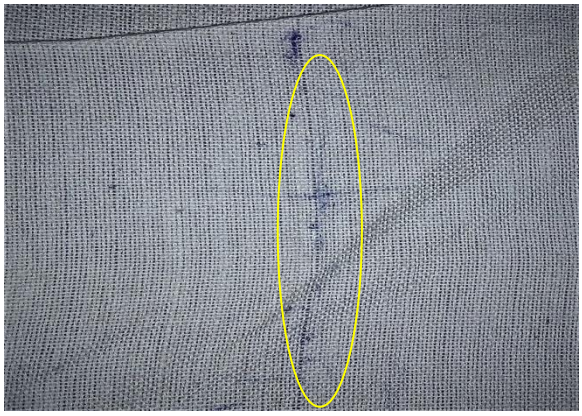

Fig 3.7 Thick Yarn Tension

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Table 3.7 Thick Yarn Joint defect data

S/N	Defects Type	Frequency	Frequency (%)
1	Foreign matter	24.2	35
2	Mixed count	23.5	34
3	Lack of spinning of cotton	9.7	14
4	Over twisting	6.7	9.7
5	Fiber entanglement	5	3
	Total	**69**	**100**

The result depicted on table 3.7. Is analyzed using Pareto analysis as follows and the following chart is meant to describe the result of the analysis.

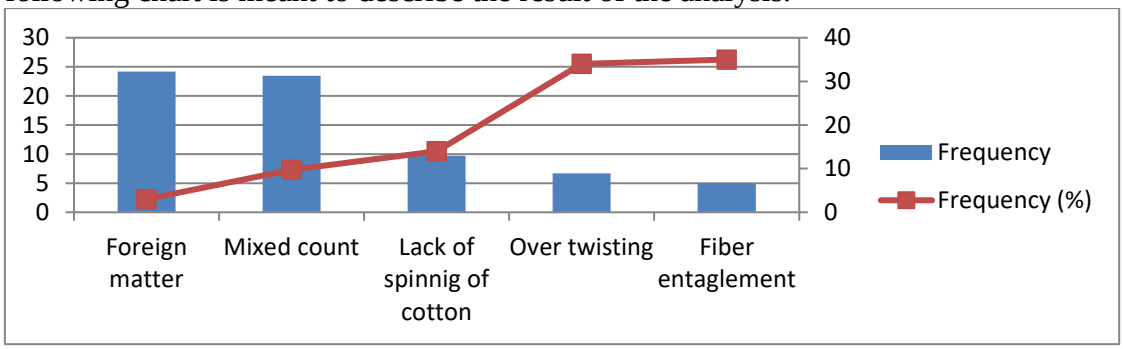

Figure 3.8 Pareto Analysis for Thick Yarn Joint

Based on the above analysis the following are found to be the significant one and here after the below mentioned three causes are to be considered for the thick yarn joint.

Table 3.8 Critical Causes for Thick Yarn Joint

S/N	Causes of defects	Frequency (%)	Frequency
1	Foreign matter	24.2	35
2	Mixed count	23.5	34
3	Lack of spinning of cotton	9.7	14
	Total	**57.4**	**83**

Firstly, possible causes of yarn variation are identified then after the three critical causes are sort out, as table 3.8 shows the critical causes have the weight of 57% (83 defects) to occur.

3.2 Suggestions to Reduce Four Critical Causes of Defects

After the reviewing all the critical defects, we give some suggestion to reduce the defects percentage:-

Table 3.9 Solutions Suggested for Needle Line

S. No.	Causes of defects	Solutions Suggested
	Machine dust	Provide instruction to operators clean the machine two times per day.
	Dry material	Material should be used moisture.
	High yarn tension	Tension of yarn should be adjusted properly.
	Badly knot	Thread knot should be given accurately. Extra knot edge is to be knotted.

Solutions is suggested to the management and employees for not repeating again and again in table 3.9

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Table 3.10 Solutions Suggested for Holes

S. No	Causes of Defects	Solutions Suggested
1.	Old yarn	Select good quality of yarn
2.	Wrong setting of feeder	Set the feeder correctly in proper guidance.
3.	Bent needle latch	Replaced the bent needle latch with the new one.
4.	Damage of cone clutch bearing	Maintain the damaged clutch if needed replaced it.
5.	High yarn tension	To avoid high yarn tension, the quality pulley should be set correctly.
6.	Yarn is too dry	Select moisture yarn.

Solutions are suggested for the holes defect so that it cannot be occurred in next time while manufacturing in table 3.10

Table 3.11 Solutions Suggested for Contamination

S.No.	Causes of Defect	Solutions Suggested
	Lot mixing	Yarn lot mixing in knitting should be avoided
	Dead fibers	Use of more suction fan can be fruitful
	Contaminated yarns	Yarn used should be free from contamination
	Bad selvedge	Selvedge should be taken care.
	Weft break	Check the setting of loose belt, brake motion etc.
	Miss pick	The sequence of yarn should be in a proper way.

Table 3.11 gives solutions to the problem of holes for the decrease in defect percentage.

Table 3.12 Solutions Suggested for Thick Yarn Joint

S.No	Causes of Defects	Solutions Suggested
	Foreign matters	Removal of foreign matters to be ensured during preparation of mixing.
	Mixed count	Different yarn count lot should be kept separately.
	Lack of spinning of cotton	Select a good spinning of cotton.

Table 3.12 shows thick yarn defect solutions, so it cannot be occurred in the time of manufacturing.

4. Conclusions

Based on the result discussed, the study found the below mentioned critical points on which the solution is required.

- According to the analysis of the data, the fabric rejection rate was found 7.92% in the section.
- Majority of the rejection rate comes from defects incorporating needle line, hole, contamination, thick yarn joint.
- The cleaning system they have already is not effective to reduce the dust in the section.
- The defect existence has influenced the company's financial performance by nearly 80%.
- The presence of defects in the section is inevitable and due to this existence in cloth defects, which is sell in minimum rate, and sometimes it occurs less profits to the organization.

- This study would easier for a section to rectify the key areas of defects causes; therefore the responsible entity can take recommended remedial action to overcome the critical defects.

4.1.1 Recommendations

This research has been carried out on the knitted fabric to improve its level of quality status.

Currently analyzed data indicates that rejection rate is very high when it is evaluated with the company's quality targets. To improve its quality of the product the study focused is reducing rejection rate. The factory need to address the critical causes of defects to improve its quality based on the following recommendations:

- The factory need to focus on the critical identified fabric defects and their respective causes to improve its quality.
- It is important to have vacuum sucker equipment over each knitting machine to have an effective cleaning system.
- The factory need to monitor machine operation, machine cleaning, yarn related fault and yarn storage to improve quality.
- The company needs to assist further research in the section periodically to reduce the rejection rate continuously.

4.2 Limitation of Present Work

This research is carried out in knitting plant of Active Clothing Pvt. Ltd. focusing on identifying defects causes of knitted fabric and this study had the limitation of time and resources not to implement the project in that section.

The aim of study was to evaluate defects of knitting on the productivity. This thesis tries to identify critical defects using Pareto data analysis in reducing the quality rejection rate of knitted fabric.

4.3 Scope for Future Work

In the future the company as well as researchers should work on

- Waste of materials
- Defects in yarns.
- Minimizing rejection of raw material by using Quality tools
- Effective utilization of defected fabric by marker planning.
- Defects of sewing
- Major and minor defects

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Entrepreneurship in Electronic Era and Its Importance

Dr. SUDHIR GODGHATE*

Abstract
The world is big and today it looks like a global village, this means no entry barrier and allows many entrepreneurs to explore the opportunities for business through innovation; Many Entrepreneurs have taken note of globalised trading and market opportunity. Practicing good Search Optimization Techniques, Learning to use Email Marketing, blog, social platforms and web based marketplace effectively will lead a business to success. The paper aims at to study entrepreneurship in electronic era and its importance.
Keywords: global village, entrepreneurs, Search Optimization, electronic era

Introduction
Entrepreneurship in today's era is facing change like never before. Numerous driving forces to this change include a rapidly expanding market place (Globalization) and increasing competition, diversity among consumer, and availability to new form of technology. Creativity and innovation are often key to success of entrepreneur, when the entrepreneur facing problems in the business and particularly when strategizing during the strategic planning and when design new product and service.
Three things that have become essential for daily life in India are English, Mobile Phones and Internet.The internet-based commerce has been stealing billions of dollars away from traditional retail outlets, and is becoming a significant component of global sales of a growing enterprise. Once we acknowledge that online entrepreneurship is becoming more and more significant in today's business world, it then becomes necessary to find a framework for systematicallydiscovering and evaluating the similarities and differences among new online ventures. The population of entrepreneurs may be homogenous but the subset of "online" entrepreneurs within the entrepreneurial universe must be further analyzed so that entrepreneurial research can produce meaningful results.
Digital technology has transformed the economy. Value creation for customers has shifted from the physical good to an economy that favors service, information and intelligence as the primary source of the value creation. At the centre of this economy transformation is e-commerce. Globalization and information technologies are radically changing the face of business and organizations. There is a growing interest in the use of e-commerce as a means to perform business transactions over the internet. In the past few years, the term of e-commerce is everywhere across the entire world. People define e-business in various ways and images that it has no standard definition. E-business or e-commerce is often interpreted as selling products over the internet. In its broader sense, ecommerce can be interpreted as the use of electronic transmission mediums to engage in the exchange, including buying and selling, of products and services requiring transportation, either physically or digitally, from location to location. Electronic commerce involves all sizes of transaction bases and it requires the digital transmission of transaction information.

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The information and communication technology has made available the various opportunities to all, particularly to businessmen and prospective businessman. From the last two decade we have witnessed the change in the way businesses are growing rapidly all over the world due to changing lifestyle of the people that really tasted the hidden opportunities available with internet. Businessmen particularly young and fresh graduates are playing with the internet, developing gadgets, apps and other innovations with the help of information and communication technology that has changed the way people are communicating with each other, businesses to connect with customer, customer's choice, networking with other, customer's buying method and saler's selling method.In such a situation the people who are looking for entrepreneurship opportunities are the real gainer. The entrepreneurs with the help of information and communication technology has made such a success in their business that within a few years they become billionaire and made an impact over businesses running with traditional way.

The basic concept of entrepreneurship lies in the making arrangement of various resources like Land, Labour, capital and managerial capabilities, converting them into the business output and making profit from it.With the evolution of information and communication technology, these entrepreneurs started using such technology in their business. Further growth in Information and communication technology towards Internet, websites, social networking sites, online marketplace forced such entrepreneurs to change their business strategy. Accordingly the way entrepreneurs and other businesses doing their business with the help of such changes, we started referring to it as e-commerce, e-business etc. and now as e-entrepreneurship.

E-Entrepreneurship

The term e-entrepreneurship refers to 'as starting a business or trading activity or giving new direction to existing one in an innovative manner with the help of trends in internet and other information and communication technology and creating digitized business environment'.

Thus shifting focus where the largest consumers are easily available is the new mantra for e-entrepreneurs. This requires innovation in business operation right from organizational structure to human resource, product development to tapping web marketplace and social media, applying'e' dimension, internet and other web based services like social platforms for sharing company and product information, making available online buying facilities, online payment facilities, online hiring etc. and all other thing related to a business or trade.

The dot com era

The evolution of dotcom, started changing business strategy and several new concept in the businesses were seen like amozon.com, travel.com, in India Naukari.com etc. but with the crash in the dotcom, poses new challenges to technology creator like Google, yahoo and other to present something new to users.

E-Business and E-Commerce

The dotcom crash disappointed many people and therefore everyone looking for new. In such an environment new networking concept has emerged that is called as online networking. Many businesses shift the focus towardsB2C. The scope has widened in all the areas of sharing knowledge and information, particularly in trade and commerce. The application of electronic/internet and information and communication technology in the business or in commerce has given new direction to the businesses as well as internet

users. This has not only changed the way businesses are placing themselves to the market but also changed the way of perspective of customers leads to online trends of **'e' word**that ise-business, e-commerce, e-governance, e-Marketing, e-learning, e-shopping etc.

Recent Trends in E-Entrepreneurship in India

In the last decade of 21st century, we have seen a real resurgence of entrepreneurial spirit, and more startup activity than ever before in India. It has been already well recognized that entrepreneurship is a valid engine for growth and job creation. The second decade of the century called as golden era of entrepreneurship and Startup Ecosystem in India because of quality and scale of startup companies by using Information and communication technology.

The e-commerce model, which is the simple extension of physical store, today is a proven one extended to M-Commerce, Social Commerce and E-Startups. In developed market almost 30% of retail sales happening online, startups have taking boom in the emerging market like India because of diverse and huge opportunities in every sector from tourism to foods, Hiring to shopping etc.

In a recent times several startups have reach the billions dollar threshold, Bansal'sFlipkart, Aditya Sharma's housing.com, stayzilla, Jombay, Zomato, InMobi, InfoEdge, Snapdeal, Jobang, Urban Trends, Ten On Ten, makemytrip.com, Finsec Law Advisors etc are amongst them.

Today's business environment in India is in more favor of startups, people from various fields, like corporate executives, government employee are leaving their job for starting their own business, Even college dropout, students and friends circle doing lot of interesting things around technology by giving shape to their idea to bring that to people. Thousands of Indians in Urban centers are giving up college courses and cushy corporate jobs, teaming up with school friends or classmates or spouses to startups.

In order to promote entrepreneurship and startups, the government of India announced multiple funds as well as special corpus in budget 2014, some of which includes;

- Credit enhancement facility for young start-up entrepreneurs from scheduled castes
- Start Up Village Entrepreneurship Programme for encouraging rural youth to take up local entrepreneurship programmes,
- Technology centre network to promote innovation, entrepreneurship and agro-industry,

Further, New Government creates Ministry of Entrepreneurship and skill development to produce more entrepreneurs and business men to boost job creation in India.

At the same time there are several challenges which need to be address, some of them are skilling the students, spreading same Fervor in smaller cities and rural areas, government support and academic reconstruction to promote startup or entrepreneurial activity.

On one hand, India being emerging market, entrepreneurs are the future of India and understanding the critical market like India is a biggest challenge for entrepreneurs as well as creates opportunities. Though big companies playing important role in economy, but can never generate more jobs, in the coming years therefore government is keen to promote skill development and entrepreneurship to address the menace of unemployment. On the other, as future prospects there is a wide scope to setup ventures in the areas of education, power, logistics, infrastructure, consumer goods etc.

Marketing and Customer Acquisition Strategy

The entrepreneurs are more techno savvy and playing with the latest gadgets and information technology. This resource plays important role in connecting large number of consumers who are always available with some kind of web. Connecting them, involving them into conversion and making them to involve in the promotion of their business is the new techniques adopted by entrepreneurs. Earlier marketing was limited to personal selling, advertising in print or television media or at exhibition or social gathering, now all these are converted into web based marketplace, social networking sites and mobile apps.Content marketing are the new strategies which includes social media, articles on a business's website, eNewsletters, case studies, videos and articles on other websites.Web promotion includes getting ranked in major search engine, LinkedIn group, YouTube, **Writing an e-book about the biggest issues about particular industry etc. are the new strategies adopted by such entrepreneurs.**

Hiring and Human Resource Strategy

The entrepreneurs and new startups are focusing more on sourcing, recruiting and managing talent who are ready to grow their startup team. Most entrepreneurs hire talent from leading engineering and b-school, some for the first time, others in bigger numbers than before. Flipkart, Jabong, Olacabs and TaxiForSureto new ones such as Limeroad.com, Zerodha, ZipDial and LocalBanya.com, are in queue to IIMs and IITs. They offer handsome pay than established one, work environment where employee can implement their ideas and can do new experiment, flat type of organization structure and more liberty than large corporations.

For the young graduates from engineering and management schools, the new venture/ startups are the first choice because, these companies place bigger responsibility, provide wide experience and good growth prospect and employee stock option schemes (ESOPS). Though selection process of these startups is extremely rigorous as they want candidates who have the risk appetite, handsome salary, joining bonuses, retainers, stock options and a percentage of the profits are major attraction for young graduates.

Legal issues

The entrepreneurs are known for their blossoming in an uncertain environment and make success despite risk, but the legal matters and compliance of it are the typical problems faced by them. Therefore it is important for all the entrepreneurs to have at least some basic legal knowledge and prevailing regulatory system in the country. The legal issues are related to incorporation (Private, Public, LLP, Partnership), **Tax Laws (**VAT, CST, TDS, TAN, Service Tax, Professional Tax, Advance Tax,**) and the Basics of Accounting (Provision of Law), Securities Laws (**processes required to raise new investment, Share valuation by independent valuer, those wishes to raise capital, Allotment of shares**) & Business Finance (SEBI),Employment &Labour Laws, Intellectual Property Law, Information Technology Law, Corporate Governance (composition of** directors on the board of new ventures**), Contract Law.**NavinRungta cofounder or eLagaan, has stated that "Using virtual office has been made difficult as multiple companies may not be allowed to share the same registered office address."

Work Environment and Organization Structure of Startups

The new entrepreneurs offer most challenging atmosphere and rewarding professional and personal experiences where everyone has the same goals and sensibilities. The employees are directly involved in the creation of something that made impact on people, which gives

a Sense of Ownership and Responsibility. The employee has to play multiple roles but ensure competencies through working without time barriers. The other motivations are endless perks, working from anywhere, etc. The organization structure of new started businesses has some sort of hierarchy, relatively flat organizational structure, which allows members of the team to accomplish much more in a shorter timeframe.

Women entrepreneurs

The 21st century has been recognized as the women's century, as women are now beginning to take prime position in business, and Indian women are not excluded. Women entrepreneurs have become important players in the entrepreneurial landscape. Although the number is still small as compared to the business owned by men, this is encouraging as it shows that women no longer adhere to the stereotype that only men can be a wage earner in the family.Besides numerous obligation assigned to women, including reproductive chores, such as childcare and doing household work, women can now find success their own e-business. Entrepreneurship has been a male-dominated phenomenon from the very early age, but time has changed the situation and brought women as today's most memorable and inspirational entrepreneurs.In almost all the developed countries in the world women are putting their steps at par with the men in the field of business. There is a great need to explore E-Entrepreneurship among women, that can highly fruitful for the economy. Moreover, this kind of entrepreneurship can be considered as a solution to the dilemma faced by women in managing and balancing between their career and family life. In view of the growing number of women in E- Entrepreneurship in India, it is important to conduct research involving factors influencing women to start as an E- Entrepreneur.

Importance of entrepreneurship in economic development

Entrepreneurs are now considered as a national asset to be cultivated, motivated & remunerated to the great extent.Entrepreneurship being an intangible factor is the moving force and development is the consequence. It has an important role in the context of a developing nation like India which is confronted with major socio-economic problems. Entrepreneurship can play an important role not only in the industrial sector of a country but in the farm and service sectors also.

India is being attacked by baffling problems of over population, unemployment, under-employment, poverty and the like. Entrepreneurship is consistently equated with the establishment and management of small business enterprises and setting up these units is the solution to these baffling problems.As all of us are aware with the truth of adaptability.In this world nothing is certain & to lead the life situation compels us to be adaptable according to the situation. So this SMART generation compels the businessmen to come online.

Have you listen the famous line.... ***see you online baa :] so we can say that the changes & the demand of the internet generation has given birth to E commerce & the emerging trends of E commerce has given birth to E entrepreneurship***

Conclusion

The world is big and today it looks like a global village, this means no entry barrier and allows many entrepreneurs to explore the opportunities for business through innovation; Many Entrepreneurs have taken note of globalised trading and market opportunity. Practicing good Search Optimization Techniques, Learning to use Email Marketing, blog, social platforms and web based marketplace effectively will lead a business to success.

Hence, there is urgent need of Government-Academia and Industry Participation in Promoting Startups and entrepreneurial skill among the students to boost the growth.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Occupational Stress among Security Guard

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Abstract
Occupational stress can be defined as the harmful physical and emotional response that occurs when the capabilities, response or needs of the worker. Occupational stress contributes not only to life stresses but has an impact on health among security guard. occupational stress among security guard was assessed in the present study .occupational stress of security guard has a strong impact on the physical health and their performance at job.hence the present focuses on occupational stress among security guard. the study was carried out in Cuddalore on the male and female security guard using multistage sampling technique total samples of 90 security guard were selected from the finding of the study it can be concluded that the security guard profession is very difficult. Security guard suffers from high stress and face problem. A female security guard has high occupational stress in comparison to the male security guard.
Keywords: Occupational Stress, Security Guard.

Introduction

Stress is the common phenomena being experienced by almost all individual**.** Occupational stress can be defined as the harmful physical and emotional response that occurs when the requirements of the job do not match the capabilities, resources or need of the work. Occupational stress is stress at work. it occur when there is disequilibrium between the demands of the workplace and an individual's ability to carry out and complete these demands. Occupational stress is often caused by an increased workload without the enhancement in the no of employees to take on the additional work.

Therefore, Occupational stress is considered or challenge for employers because high-level stress results in low productivity. In high level or special security situations that have dangerous duties or higher expectations also use specialized equipment. The profession of a security Guard. Involves physical as well as psychological stress. Occupational stress and workplace health have become issues of great concern over the last decade. Researchers on stress make it clear; to enter into the complex area of stress, especially into the area of occupational stress, is very difficult. Stress is an unavoidable consequence of modern living. In this juncture, the present study is undertaken to address specific problems of Security guard related to occupational stress. This throw light into the pathogenesis of various problems related to occupational stress among Security guard

The Scope of the Study

The study mainly intends to measure the depth of the amount of occupational stress and burnout one may experience on the other side Security guard working in an organization face physical as well as psychological stress due to the tedious work involved in their job.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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Occupational stress results from the interaction of the worker and the condition of work. Hence the present study was undertaken to assess the occupational stress among Security guard across gender.

Hypothesis

There exists no significant difference in occupational stress across gender among the Security guard.

Methodology

A total of 90 Security guards were selected from Cuddalore district. The data was collected purposely from two categories Male and female. Sampling technique adopted in the present study is multistage random sampling. Information was collected by direct interview through a questionnaire. The secondary data were collected from research publications, standard journal, existing literature on Google scholar, and internet.

Results and discussions

This paper also includes an analysis of data collected by tabular form along with interpretations. The information collected was analyzed for arriving at a proper conclusion on the topic.

Table-1: Percentage of Respondents who felt that they were Stressed

Category	% of Respondents
Stressed	94
Not stressed	06

Source: Computed from Primary Data

From table-1, it is indicated that majority of the respondents working as Security guard were stressed, whereas only a few respondents felt that they were not stressed.

Table-2: Causes of the Stress

Causes of Stress	% of Respondents
Work overload	20
Time management	07
Lack of support	07
Job difficulty	15
The inadequacy of role authority	04
Feeling inequality	07
Lack acceptability	05

Source: Computed from Primary Data

From table-2, it is inferred that major causes of stress among the Security guards are excess of workload (20%).

Hence it was found that employees felt that they facing severe work pressure, as they were expected to handle multiple roles and responsibilities. the employees suffer from stress because of lack of support from the management and colleagues.

Table-3: Various Attributes of the Stress

Various Attributes of Stress	% of Respondents
Communication gap	20
Lack of skills	07
Work-life imbalance	42
Work environment	10
Unmatched expectations	10
Economic status	06

Source: Computed from Primary Data

The table-3 depicts the various attributes related to stress; work-life imbalance is one of the major attributes which contribute to stress for an employee. This can be regarded as a factor building up stress because a lot of employees complained that they were unable to balance both the personal and professional fronts successfully.

Finding and Suggestion of the Study

Nobody is free from stress, everybody under the stress a little bit or more. Stress is not harmful but over stress is harmful and creates many diseases. The organization should identify the reasons for stress in occupational and need to find how far it has affected other employees. Occupational stress has become an essential factor in the worldwide due to competition among the nations to face an economic crisis.

Above 94% of the respondents believed that they face a high level of stress, which may be due to both professional and personal reasons. The respondents were overburdened with the workload in their workplace, the work-life imbalance is one of the major attributes which contributes to stress for an employee.

The researcher identified few initiatives for effectively handling stress. Meditation was found to be an integral part of life to reduce stress. take adequate steps to redesign jobs, which are taxing to employee's skill and their confidence to work effectively. undertake a stress audit at all in the organization to identify stress area improving the condition of the job and alleviating job stress.

Conclusion

The problem of stress is inevitable and unavoidable in the security guard the professional majority of the employees face severe stress-related ailments and a lot of psychological problems. Most security guards were not satisfied with their occupation because they considered it too difficult relative to the low salary they received for it. Female security guards have high occupational stress than male security guards as they have to face problems, psychological in nature along with physical problems.

In the age of highly dynamic and competitive world, man is exposed to all kinds of stressors that can affect him on all realms of life .this particular research was intended to study the impact of occupational stress on security guards. Although certain limitations were met with the study, every effort has been made to make it much comprehensive.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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A study on measuring brand equity of iphone among Employees and Employers in Coimbatore City

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Abstract
Living in an inter-connected world makes people feel safe and stay connected forever. This never-ending need of the connected-world demands providing the most effective means of communication with a perfect blend of technology. This is made possible by communication service providers which in-turn creates heavy and stiff competition among the providers. The benefit of this competition is a blessing in disguise to the public in the form of high-end quality, best service, technological advancements and low cost. Among the available communication devices, apple iphone is the most leading with tamper-proof software and advanced technologies.Almost all the smart phones in the industry uses android operating software whereas apple iphone stands unique with it iOS. Apple has created its own USP in many ways and hence this study. The following are the six dimensions on which this study evolves (i) Brand awareness, (ii) Preference Metrics, (iii) Financial Metrics, (iv) Output Metrics, (v) Local marketer perception metrics and (vi) Competitive metrics taken by the researchers. One hundred and forty questionnaires were issued to the respondents in the Coimbatore city who are employees and employers.The researcher adopted the convenient sampling method to collect data. The chi square test is adopted to find out if the socio economic factors influence the dimensions of brand equity of apple iphone or not. The researchers concluded that,to keep up with the expectations of the customers and to continuously improve their brand value in the markets, the company has to understand the requirementsof the customers and then design or customize the product to match the expectations. This action in the form of research and meticulous planning will not only result in the increase in sales of iphone but also will win the hearts of customers by providing them complete satisfaction.The company has to focus more on innovation and product category to cater to all income groups.
Keywords : *Brand equity, brand awareness, Brand awareness, Preference Metrics, Financial Metrics, Output Metrics, Local marketer perception metrics and Competitive metrics.*

Introduction

Living in an inter-connected world makes people feel safe and stay connected forever. This need to stay connected demands providing the most effective means of communication with a perfect blend of technology. This is made possible by communication service providers which in-turn creates heavy and stiff competition among the providers. The benefit of this competition is a blessing in disguise to the public in the form of high-end products, qualityservice, technological advancements and low cost. The reliability element at an affordable cost is the challenge that the communication sector faces. Public are in

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need of a reliableoperating system to stay safe and to exploit the advanced technologies available inthe field of communication.

The mobile phone industry being the fastest growing in the communications sector is evolving every day to keep pace with the tough competition and the technological developments. With extensive opportunities and enormous choices available, marketers of mobile phone are always under great pressure to create a product and build their brand to achieve the expected brand equity. Though there exists a huge market for mobile phones, sustenance needs deeper understanding of the customer's preferences which in turn will helps build a strong brand. The value of a brand does not lie in just creating a competitive or flagship product but has to match the needs of the customer in lines of their imaginations and expectation on the products finesse to technological features. The mobile industry of today has to plays a dual role by offering the best communication experience together with entertainment. With global market competition and China posing a great threat in the mobile phone industry, Marketers are left with no choice but to take efforts to be unique which would offer high brand equity. Brand loyalty is short- lived unless the service providers are on their toes with continuous innovation and creativity to match customers' needs and expectations.

The market of personal computers is seeing a decline in the wake of laptops as the desktops use has been limited only to reduce manual work and cut down wastage of paper.Though personal computers play a big role in research, educational fields and IT companies, the smart phone market has caught an edge over the personal computer by providing all the facilities of a laptop being handy, reliable and provide ease of operations.It gives every customer the feel of the world in their palms.

Among the available communication devices, apple iphone is the most leading brand with tamper-proof software and advanced technologies. Almost all the smart phones in the industry use android operating software whereas apple iphone stands unique with its iOS. Apple has created its own USP in many ways and made its product the most reliable. The hackers can easily hack or tamper with all other smart phones available in the market but not with the iphone, which has made iphone the most trusted brand among professionals. This trust has led to the success of the brand. The iphone though seems costly but is liked and bought not only by professionals but every other person who wants their data to be protected and their privacy to be in-tact.

The iphone has achieved a very high brand equity, where other brandsare struggling to break. Samsung is a tough competitor for apple which puts apple under pressure to sustain itself in the market. There are six major dimensions put into practice to measure the brand equity of iphones. The users are taking into consideration all the six dimensions before they decide on to buy the iphone. The following are the six dimensions (i) Variables, (ii) Brand awareness (iii) Preference Metrics (iv) Financial Metrics (v) Output Metrics (vi) Local marketer perception metrics and (vii) Competitive metrics.

Statement of the problems

The apple iphone are being used by all the people i.e. students, employees, employers, house wife and retired peoples. The iphone has more value than other branded mobiles and the iphone customers cherish the value with no compromise. There are very valid reasons behind that liking towards the iphone among the users i.e. employees and employers. Hence this study focuses on measuring the brand equity of iphones among employees and employers in Coimbatore city.

Objectives of the study

1. To present the socio economic profile of the sample respondents.
2. To find the variables which influence the brand equity of apple iphone?
3. To analysis the dimensions of brand equity of apple iphone.

Sampling Design

This study has used primary and secondary data. Primary data is collected from the sample respondent's directly using structured questionnaire. One hundred and forty questionnaires each were issued in Coimbatore city todifferent employees and employers. Prior to the issue of the questionnaire, the researcher had verified the employment status of the respondents to ensure data validation.Employees was taken both from government and private sectors. Sole proprietorship and partnership status were considered for employers. The researcher adopted the convenient sampling method. Out of one hundred and forty questionnaires, 138 questionnaires were collected back from the employees and out of one hundred forty questionnaires, 126 questionnaires were collected back from the employers. All the questionnaireswere duly filled by the sample respondents and all of them were taken for further analysis. Secondary data were collected from published articles, journals and magazines to frame the theoretical base.

Tools and techniques

The researchers have taken six dimensions to find the brand equity of iphone in the area of study. The researcher has used chi square test to find the socio economic variables that influence the brand equity dimensions. i.e. (i) Brand awareness ; (ii) Preference Metrics ; (iii) Financial Metrics ; (iv) Output Metrics ; (v) Local marketer perception metrics and (vi) competitive metrics. The researchers have taken three variables each for all dimensions. The five point likert scale is used to get the score. The chi square test is used to find out if the socio economic factors influence the dimensions of brand equity of apple iphone or not.

Hypothesis

H1: The gender of the sample employees does not influence the brand equity dimensions.
H2: The age group of the sample employees does not influence the brand equity dimensions.
H3: The monthly income of the sample employees does not influence the brand equity dimensions.
H4: The gender of the sample employers does not influence the brand equity dimensions.
H5: The age group of the sample employers does not influence the brand equity dimensions.
H6: The monthly income of the sample employers do not influence the brand equity dimensions

Analysis and interpretation

The socio economic factors presents the personal information of the sample respondents of the study.This present study has taken only employees and employers who are users of apple iphone. The reasons for selecting the employee and employer are mentioned in the sampling design of the study.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 1: Gender of the respondents

Gender	Employees		Employers	
	Number of respondents	Percentage	Number of respondents	Percentage
Male	81	58.70	97	76.98
Female	57	41.30	29	23.02
Total	138	100	126	100

Source: Survey data

The above table shows the gender of the sample respondents of the study. Out of one hundred and thirty-eight sample respondents who are employees, eighty-one (58.70%) respondents are male and remaining fifty-seven (41.30%) respondents are female. Majority (58.70%) respondents are male.

Out of one hundred and twenty-six sample respondents who are employers, ninety-seven (76.98%) respondents are male and remaining twenty-nine (23.02%) respondents are female. Majority (76.98%) of the respondents are male. In both the case majority of the respondents are males.

Table 2: Age group of the respondents

Age group	Employees		Employers	
	Number of respondents	Percentage	Number of respondents	Percentage
Up to 30 years	34	24.64	31	24.60
31 years to 45	36	26.09	49	38.89
Above 45 years	68	48.27	46	36.51
Total	138	100	126	100

Source: Survey data

The above table shows the age group of the sample respondents. Out of one hundred and thirty-eight respondents who are employees, thirty-four (24.64%) respondentscome under the age group upto 30 years. Thirty-six (26.09%) respondents are in the age group of 31 years to 45 years and remaining sixty-eight (48.27%) respondents are under the age group of 45 years and above. Majority of the respondents are above 45 years.

Out of one hundred and twenty-six sample respondents who are employers, thirty-one (24.60%) respondents are coming under the age group of up to 30 years. Forty-nine (38.89%) respondents are coming under the age group of 31 years to 45 years and remaining forty-six (36.51%) respondents are coming under the age group of 45 years and above. Majority of the respondents are between 31 years to 45 years.

Table 3: Monthly income of the respondents

Monthly Income	Employees		Monthly Income	Employers	
	Number of respondents	Percentage		Number of respondents	Percentage
Up to Rs. 50,000	18	13.04	Up to Rs. 1,00,000	27	21.43
Rs. 50,001 to Rs. 1,00,000	34	24.64	Rs. 1,00,001 to Rs. 2,00,000	46	36.51
Above Rs. 1,00,000	86	62.32	Above Rs. 2,00,000	53	42.06
Total	138	100	Total	126	100

Source: Survey data

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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The monthly income is taken separately for employees and employers. Out of one hundred and thirty-eight sample respondents who are employees, eighteen (13.04%) sample employeesmonthly income comes up to Rs. 50,000. Thirty-four (24.64%) sample employees monthly income is between Rs. 50,001 and Rs. 1,00,000 and remaining eighty-six (62.32%) sample respondents monthly income is above Rs. 1,00,000. Majority of the employees monthly income is above Rs. 1,00,000.

Out of one hundred and twenty-six sample employers, twenty-seven (21.43%) sample employers monthly income is up to Rs. 1,00,000. Forty-six (36.51%) sample employers monthly income is between Rs. 1,00,000 and Rs. 2,00,000 and remaining fifty-six (42.06%) employers as respondents are above Rs. 2,00,000. Majority of the employers monthly income is above Rs. 2,00,000.

Chi Square Analysis

The following table shows the chi square test result of the sample employees and sample employers. The five dimensions were taken separately, chi square value and probability value calculated and presented in the following table.

I - Brand awareness

Likert five-point scale is used to measure the level of brand awareness and to find the factors which influence the brand awareness. The following table presents the socio economic factors and level of brand awareness of employees.

Table 4: Socio economic factors and level of Brand Awareness - Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	1.638	2	0.517	Not Significant	Accepted
2	Age group	25.667	4	0.002	Significant	Rejected
3	Monthly Income	25.687	4	0.001	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of brand awareness of employees is 1.638, df – 2, P value – 0.517. The p value is greater than 0.05, so it is inferred that the gender factor does not significantly influence the level of brand awareness of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of age group of the sample employeesand level of brand awareness is – 25.667, df–4, p value – 0.002. The p value is less than 0.05, so it is inferred that the age group is significantly influencing the level of brand awareness of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income and level of brand awareness is 25.687, df – 4, P value – 0.001. The p value is less than 0.05, and it is inferred that the monthly income is significantly influencing the level of brand awareness of iphone. The hypothesis is rejected at 5% significant level.

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Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 5: Socio economic factors and level of Brand Awareness - Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	24.674	2	0.001	Significant	Rejected
2	Age group	2.574	4	0.092	Not Significant	Accepted
3	Monthly Income	11.687	4	0.027	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level brand awareness of employers is 24.674, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender factor is significantly influencing the level of brand awareness of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employers and level of brand awareness is – 2.574, df – 4, p value – 0.092. The p value is greater than 0.05, so it is inferred that the age group is not significantly influencing the level of brand awareness of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of monthly income and level of brand awareness is 11.687, df – 4, P value – 0.027. The p value is less than 0.05, so it inferred that the monthly income is significantly influence the level of brand awareness of iphone. The hypothesis is rejected at 5% significant level.

II – Preference Metris

Table 6: Socio economic factors and level of Preference Metrics - Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	24.604	2	0.001	Significant	Rejected
2	Age group	19.217	4	0.012	Significant	Rejected
3	Monthly Income	38.563	4	0.001	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of preference metrics of employees is 24.674, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender factor is significantly influencing the level of preference metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employees and level of preference metrics is – 2.574, df – 4, p value – 0.012. The p value is greater than 0.05, so it is inferred that the age group is significantly influencing the level of preference metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of monthly income of sample employees and level of preference metrics is 38.563, df – 4, P value – 0.001. The p value is less than 0.05, so it is inferred that the monthly income is significantly influence the level of preference metrics of iphone. The hypothesis is rejected at 5% significant level.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Table 7: Socio economic factors and level of Preference Metrics - Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	10.854	2	0.001	Significant	Rejected
2	Age group	3.688	4	0.108	Not Significant	Accepted
3	Monthly Income	24.681	4	0.002	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of preference metrics of employers is 10.854, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender category significantly influence the level of preference metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employers and level of preference metrics is – 3.688, df – 4, p value – 0.108. The p value is greater than 0.05, so it is inferred that the age group is not significantly influencing the level of preference metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of monthly income of sample employers and level of preference metrics is 24.681, df – 4, P value – 0.002. The p value is less than 0.05, and it is inferred that the monthly income has significant influence on the level of preference metrics of iphone. The hypothesis is rejected at 5% significant level.

III – Financial Metrics

Table 8: Socio economic factors and level of FinancialMetrics - Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	1.084	2	0.427	Not Significant	Accepted
2	Age group	28.641	4	0.012	Significant	Rejected
3	Monthly Income	38.563	4	0.001	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of level of financial metrics of employees is 1.084, df – 2, P value – 0.427. The p value is greater than 0.05, so it is inferred that the gender category is not significantly influencing the level of financial metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of age group of the sample employees and level of financial metrics is – 28.641, df – 4, p value – 0.012. The p value is less than 0.05,so it is inferred that the age group is not significantly influencing the level of financial metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employees and level of financial metrics is 38.563, df – 4, P value – 0.001. The p value is less than 0.05, so it is inferred that the monthly income is significantly influencing the level of preference metrics of iphone. The hypothesis is rejected at 5% significant level.

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Table 9: Socio economic factors and level of Financial Metrics- Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	12.094	2	0.011	Significant	Rejected
2	Age group	20.630	4	0.008	Significant	Rejected
3	Monthly Income	19.680	4	0.001	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of financial metrics of employers is 12.094, df – 2, P value – 0.011. The p value is less than 0.05, so it is inferred that the gender category is significantly influencing the level of financial metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employers and level of financial metrics is – 20.630, df – 4, p value – 0.008. The p value is less than 0.05, so it is inferred that the age group is significantly influencing the level of financial metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employers and financial metrics is 19.680, df – 4, P value – 0.001. The p value is less than 0.05, so it is inferred that the monthly income has significant influence on the level of financial metrics of iphone. The hypothesis is rejected at 5% significant level.

IV – Output Metrics

Table 10: Socio economic factors and level of Output Metrics- Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	18.688	2	0.001	Significant	Rejected
2	Age group	28.018	4	0.012	Significant	Rejected
3	Monthly Income	10.571	4	0.011	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of output metrics of employees is 18.688, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender factor is significantly influencing the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employees and level of output metrics is – 28.018, df – 4, p value – 0.012. The p value is less than 0.05, so it is inferred that the age group has significant influence on the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employees and level of financial metrics is 10.571, df – 4, P value – 0.011. The p value is less than 0.05, so it is inferred that the monthly income has significant influence on the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

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Table 11: Socio economic factors and level of Output Metrics - Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	32.668	2	0.001	Significant	Rejected
2	Age group	16.084	4	0.002	Significant	Rejected
3	Monthly Income	35.690	4	0.001	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of output metrics of employers is 32.668, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender factor is significantly influencing the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employers and level of output metrics is – 16.084, df – 4, p value – 0.002. The p value is less than 0.05, so it is inferred that the age group is significantly influencing the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employers and financial metrics is 35.690, df – 4, P value – 0.001. The p value is less than 0.05, so it is inferred that the monthly income is significantly influencing the level of output metrics of iphone. The hypothesis is rejected at 5% significant level.

V – Local Market Perceptions

Table 12: Socio economic factors and level of Local marketer perception Metrics- Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	2.214	2	0.151	Not Significant	Accepted
2	Age group	22.641	4	0.002	Significant	Rejected
3	Monthly Income	1.914	4	0.178	Not Significant	Accepted

Source: Computed data

The calculated chi square value of gender and level of local marketer's perception metrics of employees is 2.214, df – 2, P value – 0.151. The p value is greater than 0.05,so it is inferred that the gender category is not significantly influencing the level of local marketers perception metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of age group of the sample employees and level of local marketer's perception metrics is – 22.641, df – 4, p value – 0.002. The p value is less than 0.05, so it is inferred that the age group is significantly influencing the level of local marketer's perception metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employees and local marketer's metrics is 1.914, df – 4, P value – 0.178. The p value is greater than 0.05, so it is inferred that the monthly income doesnot significantly influence the level of local marketers perception metrics of iphone. The hypothesis is accepted at 5% significant level.

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Table 13: Socio economic factors and level of Local marketer perception Metrics - Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	40.214	2	0.001	Significant	Rejected
2	Age group	11.684	4	0.002	Significant	Rejected
3	Monthly Income	2.647	4	0.081	Not Significant	Accepted

Source: Computed data

The calculated chi square value of gender and level of local marketer's perception metrics of employers is 40.214, df – 2, P value – 0.001. The p value is less than 0.05, so it is inferred that the gender factor is not significantly influencing the level of local marketer's perception metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of age group of the sample employers and level of local marketer's perception metrics is – 11.684, df – 4, p value – 0.002. The p value is less than 0.05, so it is inferred that the age group has significant influence on the level of local marketer's perception metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employers and local marketer's metrics is 2.647, df – 4, P value – 0.081. The p value is greater than 0.05, and it is inferred that the monthly income is not significantly influencing the level of local marketers perception metrics of iphone. The hypothesis is accepted at 5% significant level.

VI – Competitive Metrics

Table 14: Socio economic factors and level of Competitive Metrics- Employees

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	3.662	2	0.068	Not Significant	Accepted
2	Age group	2.947	4	0.182	Not Significant	Accepted
3	Monthly Income	24.621	4	0.011	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of competitive metrics of employees is 3.662, df – 2, P value – 0.068. The p value is greater than 0.05, so it is inferred that the gender factor is not significantly influencing the level of competitive metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of age group of the sample employees and level of competitive metrics is – 2.947, df – 4, p value – 0.182. The p value is greater than 0.05, so it is inferred that the age group is not significantly influencing the level of competitive metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of monthly income of sample employees and level of competitive metrics is 24.621, df – 4, P value – 0.011. The p value is less than 0.05, and it is inferred that the monthly income has significant influence on the level of competitive metrics of iphone. The hypothesis is rejected at 5% significant level.

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Table 15: Socio economic factors and level of Competitive Metrics- Employers

Sl. No.	Variables	Chi Square calculated value	DF	P Value	Result	Hypothesis
1	Gender	2.545	2	0.071	Not Significant	Accepted
2	Age group	12.633	4	0.002	Significant	Rejected
3	Monthly Income	18.664	4	0.008	Significant	Rejected

Source: Computed data

The calculated chi square value of gender and level of competitive metrics of employers is 2.545, df – 2, P value – 0.071. The p value is greater than 0.05, so it is inferred that the gender factor has no significant influence on the level of competitive metrics of iphone. The hypothesis is accepted at 5% significant level.

The calculated chi square value of age group of the sample employers and level of competitive metrics is – 12.633,df – 4, p value – 0.002. The p value is less than 0.05, so it is inferred that the age group has significant influence on the level of competitive metrics of iphone. The hypothesis is rejected at 5% significant level.

The calculated chi square value of monthly income of sample employers and level of competitive metrics is 18.664, df – 4, P value – 0.008. The p value is less than 0.05, and it is inferred that the monthly income is significantly influencing the level of competitive metrics of iphone. The hypothesis is rejected at 5% significant level.

Findings

The following are the findings of the study on the impact of socio economic factors arrived at through chi square test results.

1. The findingsof the study on the impact of gender shows male to be the dominant factor in both employees and employers category of respondents.
2. The age group classification was divided into three categories and it shows that majority of the employee's categoryfall under the age group of 45 years and above and employer's side majority of the respondents to be under the age group of 31 years to 45 years.
3. The income band was calculatedseparately for employees and employers as their income levels and life style are different. It was found that majority of the income levels of employees is above Rs. 1,00,000. Majority of the employers' monthly family income is above Rs. 2,00,000. This stands as evidence that the iphones are affordable only for high income group people. The low income group may hold the desire for an iphone but refrain due to the high cost of the product.
4. The employees' age group and monthly income shows a significant influence on the brand awareness of apple iphoneas the sample respondents are at 5% significant level. Gender is not constrained for brand awareness of apple iphone. The employers' gender and monthly income have significant influence on the brand awareness element of apple iphoneas the sample respondents stay at 5% significant level. Age group does not limit employers from being brand aware.
5. The employees' age group, gender and monthly income are significantly influencing the preference metrics of apple iphone and the sample respondents show 5% significant level. The employers' gender and monthly income are significantly influencing the

preference metrics of apple iphone and sample respondents' value are at 5% significant level. Employers' age group does not influence the preference which makes it clear that employers purchase iphone for ease and safe business transactions.

6. The employees' age group and monthly income are significantly influencing the preference metrics of apple iphone and the sample respondents are at 5% significant level. Gender of the employees does not influence the preference metrics. But the employers' gender, age group and monthly income are significantly influencing the preference metrics of apple iphone where the sample respondents stand at 5% significant level. It means that all the employers prefer apple iphone.
7. The employees' and employers' gender, age group and monthly income are significantly influencing the output metrics of apple iphone and the sample respondents are at 5% significant level. The employees and employers are expecting clarity in their output, which make them use iphones for their official and business purposes. The employees' gender and monthly income are significantly influencing the local market perception of apple iphone, as the sample respondent's shows 5% significant level. The employers' monthly income is also significantly influencing the perception metrics of apple iphone which shows the sample respondents at 5% significant level.
8. The employees' gender and age group have significant influence on the competitive metrics of apple iphone, where the sample respondents are at 5% significant level. But, as far as employers are concerned, only the gender factor has a significant influence on the competitive metrics of apple iphoneas the sample respondents show 5% significant level.

Suggestions

The suggestions arrived at by the researcher and those provided by the respondents during the data collectionprocess are given below;

- ✓ It is understood from the study that the iphones market is mostly tapped by people in the age group of 30 years and above and this brings the need for a product that would help tap the youth market. It would be very appropriate if apple could come up with a student specific version with built-in facilities to suit the different age groups and field of study.
- ✓ The cost-effective "common man version" can be adopted to satisfy the larger market and to develop the brand value.
- ✓ Today apple means high-end in the minds of the customers. It is perceived to be a product for tech freaks and professionals. To break into the minds of all, it is vital to devise an advertising theme to get into the minds of all types of customers creating a strong desire to purchase an iphone which would be worth an investment and can be made possible through available finance options.
- ✓ The availability of iphones online makes purchase of same much easier but at the same time puts the quality of the product at stake due to the possibility of duplicate products and chances of fraud. Therefore, the company should have a fool-proof distribution system and take stringent measure to avoid these issues.
- ✓ The company should freeze the exchange offer to Apple-to Apple only and not with / to any other brand. The existing users of apple should go for exchange offer onlywith the apple products. These exchanged products can be rolled out into to the market after quality check at a reasonable cost. This will not only expand the market but also satisfy the desire of the entire income group to own an iphone.

Conclusion

The present study is conducted to measure the brand equity of iphones in Coimbatore city.This study has taken six dimensions which influences the brand equity of the product. The existing studies might not have taken these six dimensions with employees and employers.The gender, age group and monthly income were taken to give more clarity about the brand equity. The manufacturers design a product to cater to different income level groups,which might not give them the desired results due to the consumer'spreferences, poor financial planning and/or financial commitment. Also, the advertisement limits the market reach by blocking the mind of the customers in the form of target groups. Inspite of the limitations of the target group advertisement, the student community form a good market for iphones which is the reflection of their love for the brand and the financial feasibility. Though the iphone falls under the high-end costly range of products, the employees and employers stand as a very prospective market for iphones. This strong trust and love that customers have on the brand pushes the company to invest a lot for research and development. And this requirement for R&D creates the need for data to be collected from the target market and this study will help as a feed for the company's R&D. The data will help the company customize the product to suit the target market which will give good results in terms of sales and in building the brand value. The study concludes that though the brand equity of apple iphones are high it is important for the company to be more innovative and strategic to cater to all types of customer, which is the edge of few top running brands in the markets.

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"Analyzing Technical Know How of Engineering Graduates"

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Dr.M.Prakash**

Abstract
The remarkable development in the country's economy, alongside the blast in designing and innovation based administrations has brought forth certain requests from working environments as far as employability abilities. Employability presumes the requirement for both specialized (hard) aptitudes and delicate abilities considering the regularly expanding rivalry for work in the present occupation advertise overwhelmed by the IT (Information Technology) businesses. As indicated by Smith and Comyn (2003) employability aptitudes are "abilities required not exclusively to pick up business yet additionally to advance inside a venture in order to accomplish one's potential and contribute effectively to big business vital bearings". At the end of the day, employability aptitudes allude to those abilities required both to land a position and furthermore to do well in that activity and suggest positive results for people and additionally for the associations they are utilized in. Other than their specialized aptitudes, the activity searchers are required to have a scope of different abilities together known as Soft Skills with the end goal to pro their meetings and furthermore to advance in their expert life once they are utilized. Delicate abilities, then again known as fundamental abilities, ingrained instincts or relationship building abilities, however basic for all, are critical for the new alumni who wish to land a position of their decision and who expect to climb the stepping stool of accomplishment in their expert life.This Paper centers around Identifying Technical Know How of Engineering Graduates of Bengaluru Region
Keywords: Technical Know How, Graduates Etc

Introduction

Designing Education in India has seen enormous development amid the previous decade. This sudden extension has prompted the issue of support of wanted quality in the growing designers. Bhattacharya (2011) feels, "Inward inspiration just can prompt accomplishment and upkeep of value. While TQM strategies can be attempted in instruction by taking comprehensive perspective of the framework, the basic parts of the framework, viz., staff improvement and the understudy assessment framework should be given need. Variables which would impact interior inspiration have additionally to be investigated". Designing alumni require open aptitudes in their expert profession. In the wake of graduating with a science qualification some of them seek after advanced education (the executives or specialized), some search for and take up a vocation and some others adventure into their very own business. Nonetheless, they can't prevail in any of these undertakings without having the vital English dialect capability and relational abilities.

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A designer's ability can be introduced as the total of information, aptitudes and know-how (Shakhgildian et al, 2002). Factors, for example, changing populace socioeconomics, globalization of economies, quickened development of innovation, and expanding business requests are adding to the developing deficiency of specialized administrators. As indicated by Vieth and Smith (2008) building supervisors should be supplanted every year at a rate of 20 percent in 2014 when contrasted with 6.2 percent in 2003 and this expansion sought after will make around 15,000 designing administration opportunities. Inside the following 10 years, we will encounter a more prominent than triple increment in administration turnover in designing and specialized associations, expanding the opposition for an inexorably rare asset. To stay focused all around, specialized endeavors should create pioneers inside (Vieth and Smith, 2008). This is a testing errand for any organization. In India, the quantity of designing schools is on increment. Anyway it doesn't make an interpretation of in to employability.

Literature Survey

Strategies for information procurement are a regularly developing marvel particularly in a quickened, associated world. Today, one fit-for-all learning conveyance and osmosis display is being tested each and every minute with developing desire to execute as new ability with current aptitudes can supplant even equipped experts who couldn't keep pace with evolving times. This is relevant to every single working proficient and thusly associations. The exponential level of progress requires working experts to remain side by side with the most recent aptitudes to perform superior to anything yesterday as organizations leave an innovation supported modernization venture. To keep up market authority, organizations look for experts with subject mastery and spurred to contribute enhancing their aptitudes, accomplish higher proficiency levels and viability. An association is balanced for remain focused by utilizing experts who contribute on expertise working to stay successful at work environment (Chang et al., 2016).

This has brought a need to present a stage for constant realizing where space specialists having the capacity to mentor through joint effort. Despite the fact that a plenty of decisions and alternatives are accessible to present day working experts to upgrade the expertise level and further enhance their insight regarding a matter, Massive Open Online Courses, prevalently alluded to as MOOCs, pulls in an expansive populace of working experts who are youthful, utilized, accomplished a dimension of instruction as of now, seek to develop in their profession and brisk to cross-use the quality of a learning network (Dillahunt et al., 2014). Seen as a disruptor, MOOCs is being considered as information enhancement instrument for working experts (Meister, 2013). Considered past ability building, millennial, the computerized locals of the present world, see MOOCs help setting up better social connections and notoriety among all partners at working environment, for example, associates, boss, end-clients, colleagues and even planned businesses (Bogdan et al., 2017). Working experts have demonstrated fondness towards MOOCs because of an assortment of reasons. Driving innovation associations like Amazon, Autodesk, AT&T, Deloitte, Google, Nvidia, Shazam, Intuit, Instagram and Yahoo (Bogdan et al., 2017) in a joint effort with MOOCs suppliers have offered particular courses to their workforce.

MOOCs has picked up mindshare from numerous experts and more up to date MOOCs suppliers like Coursera, edX, Khan Academy, FutureLearn, ESRI, NovoEd, Udemy, Udacity to give some examples, have come up to give such a learning stage having some expertise in their substance to fill the information holes of working experts and add to their

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Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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expert competency. The objective of the working experts is to abuse a savvy, inventive learning stage to furnish them with an upper hand in their work or organizations they are utilized or occupied with. With the innovation spread in created and creating economies, access to associated world their web and keen gadgets, it is unquestionably advantageous to share information and encounters in an organized shape which is consumable and implementable yet sparing your time, cash and exertion required to get enlisted to learn (Olsson, 2016). MOOCs is acceptably settling the conventional learning difficulties and helping the cutting edge working experts with its progressive learning model to empower and enable them. Experts in India do make reference to MOOCs offered by different colleges as a component of their instructive capability. Conspicuous IT organizations in India like Wipro Ltd., Google India, Infosys Ltd., Microsoft India and Infineon have employed ability holding on the web instruction capability (Anders, 2015). It isn't only the corporate world giving MOOCs to representatives, they additionally urge working experts to freely take such projects dependent on the necessities and enthusiasm of an individual (Sharma, 2017).

Research Methodology

Research Methodology			
Information Collected	Primary Sources	Secondary Sources	Websites
	Questionnaire Survey	News Journals	Engineering , AICTE
Respondents	Engineering Students	Academicians	HR's of Company
Sample Size	300	100	50
'Judgmental Sampling' as the sampling method, keeping in mind the convenience and proximity of the researcher.			
Tests Performed using IBM SPSS : Anova , Chi Square & Z Test			

Results & Discussion

Technical knowhow: Technical knowhow indicates one's competency in completing the task successfully. It also covers one's knowledge in terms of technical data, formulae, standards, technical information etc.

Question details	**Strongly Disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat Agree**	**Strongly Agree**
Engineering Programs help to develop the ability to design a system, component, or process to meet desired needs	30	30	40	100	100
Engineering Programs help to develop the ability to identify, formulate, and solve engineering problems	60	20	20	120	80

Engineering Programs help to develop the ability to apply knowledge of mathematics, science and engineering practically	40	40	20	140	60
Engineering Programs help to develop in-depth technical competence in a specific engineering discipline	25	25	50	80	120

Ratings

- Strongly Disagree = 1
- Somewhat disagree = 2
- Neither agree nor disagree = 3
- Somewhat Agree = 4
- Strongly Agree = 5

Descriptive Statistics

	N	nimu m	ximu m	Mean	Std. Deviation
Technical Know How Scores	300	20.00	100.00	74.5686	19.86693

Source: Researcher's Analysis

Above table indicate that mean score for Interpersonal Skills is 74.56 and standard deviation is 19.86. All 300 respondents are classified into three groups according to level of possessing Interpersonal Skills.

Technical Know How

- **H01.3:** There is no significant difference between mean scores of Technical knowledge for Bengaluru Region
- **H11.3:** There is significant difference between mean scores of Technical Knowledge for Bengaluru Region

To test above hypothesis z-test is applied

z-test for Technical Know How								
City	**Number of Respondents**	**Mean**	**SD**	**SE of diff of Mean**	**Difference of Mean**	**Calculated T-value**	**able T-value**	**Null Hypothesis**
Blore	300	74.58	21.8	2.45	0.03	0.01	1.96	Accepted

Above table indicate that calculated value (0.01) is less than table value (1.96). Therefore z-test is accepted and hence null hypothesis is accepted.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Conclusion: There is no significant difference between mean scores of Technical knowledge for Bengaluru Region

To test the hypothesis ANOVA was applied

ANOVA

Technical Know How Scores

	Sum of Squares	Df	Mean Square	F-cal	p-value
Between Groups	.045	1	.045	.000	.991
Within Groups	100252.504	253	396.255		
Total	100252.549	254			

Above table indicate that p-value (0.991) is greater than standard value 0.05. Therefore F-test is accepted. Therefore null hypothesis is accepted.

Conclusion: There is no significant difference in mean Technical know-how score of Bengaluru Respondents

Conclusion

Employability is far greater a test than joblessness. Industry pioneers feel that the "aptitudes" and "quality" of the workforce require a ton of enhancement. Tormented with issues like educational programs, absence of qualified personnel, low quality of substance, and not really successful examination framework, specialized foundations don't give flagging an incentive in the activity showcase. A divergence exists in the kinds of aptitudes instructed at universities and those that are requested in industry.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

A Study of Indian Tourism Industry during Pre and Post Recession Period

Dr. Pravin Sawant*
Mrs. Aarti Popkar**

Abstract
The Tourism Industry in India is vibrant and the country has become major Global destination. Tourism is one of the fastest growing sector gaining economic benefits. This paper attempted to find out the growth of foreign tourist arrivals to India and the foreign exchange earned through Tourism Industry. The growth of foreign tourist arrivals in India has shown a tremendous increase from 2.54 million in 2001 to 10.04 million in 2017. The Foreign exchange inflow from tourism in India has shown a boom of Rs. 15083 crores in 2001 to 177874 crores in 2017. India is experiencing a strong positive growth driven by high spending foreign tourist and promotional measures taken by Indian Government. It is revealed from our study that, after recession period also India has survived and one of the reasons for the same is the Tourism Industry.
Key Words: Indian Tourism Industry, foreign exchange, foreign tourist arrival, pre & post recession period.

1.1 Introduction

Tourism is travel for pleasure or business; also the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists, and the business of operating tours. According to the United Nations World Tourism Organization (UNWTO) defines tourism as a social, cultural and economic phenomenon which entails the movement of people to countries or places outside their usual environment for personal or business/ professional purpose. These people are called visitors (which may be either tourists or excursionists; residents or non- residents)

Tourism can be domestic or international, and international tourism has both incoming and outgoing implications on a country's balance of payments. Today, tourism is a major source of income for many countries, and affects the economy of both the source and host countries, in some cases being of vital importance.

1.2 Importance/ Contribution of Tourism Industry in the Indian Economy

India's Travel & Tourism sector ranks 7th in the world in terms of its total contribution to the country's GDP, shows a new report by the World Travel & Tourism Council (WTTC). According to the new data, Travel & Tourism generated INR14.1 trillion (USD208.9 billion) in 2016, which is the world's 7th largest in terms of absolute size, the sum is equivalent to 9.6% of India's GDP. Additionally, the sector supported 40.3 million jobs in 2016, which ranks India 2nd in the world in terms of total employment supported by Travel & Tourism. The sector accounts for 9.3% of the country's total jobs. India's Travel & Tourism sector was also the fastest growing amongst the G20 countries, growing by 8.5% in 2016. A further 6.7% growth is forecast for 2017. India's strong Travel & Tourism

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figures are predominantly generated by domestic travel, which accounts for 88% of the sector's contribution to GDP in 2016. Visitor exports, money spent by foreign travelers in India, only represents 12% of tourism revenues and in 2016 totaled INR1.5 trillion (USD22.8bn). This is 5.4% of the country's total exports, compared to a global average of 6.6%. Data from the UN World Tourism Organization (UNWTO) shows that India received only 9 million international arrivals in 2016, placing it 40th in the world, and a tenth of those received by top-ranking France. However, there is a lot of potential for India to grow their visitor exports. Over the past few months India has already starting to address this gap and made significant changes to visa facilitation, which will help to boost international arrivals. WTTC data suggests that visitor exports will grow by 5.4% in 2017.

1.3 Meaning of Global Recession

Global recession is an extended period of economic decline around the world. The International Monetary Fund (IMF) uses a broad set of criteria to identify the global recessions, including a decrease in per capita gross domestic product worldwide. According to IMF's definition, this drop in global output must coincide with a weakening of other macroeconomic indicators

Tourism suffered as a result of a strong economic slowdown of the late-2000s recession, between the second half of 2008 and the end of 2009, and the outbreak of the H1N1 influenza virus, but slowly recovered. International tourism receipts (the travel item in the balance of payments) grew to US$1.03 trillion (€740 billion) in 2011, corresponding to an increase in real terms of 3.8% from 2010. International tourist arrivals surpassed the milestone of 1 billion tourists globally for the first time in 2012, emerging markets such as China, Russia and Brazil had significantly increased their spending over the previous decade.

1.4 Impact of Global Recession on Indian Tourism Industry

Recession across the globe has hit the Indian tourism sector badly. The sector has suffered a considerable setback in the wake of global financial meltdown. Though no one likes or wants a recession, almost everyone appears (looking at WEF, Davos) reconciled to one in the United States. Meanwhile, politicians continue to downplay any fears of global repercussions, citing decoupling of the United States and other economies as a buffering factor. But what is the reality for countries like India? It would be naive to imagine that a recession in the United States would have no impact on India. The United States accounts for one-fourth of the world GDP and any significant slowdown is bound to have reverberations elsewhere. On the other hand,

Interdependencies between the US economy and emerging economies like India and China has reduced considerably over the last two decades. Thus, the effect may not be as drastic as would have been the case in the 1980s.

1.5 Literature Review

1) *Vandana Nigam & Surabhi Srivastava (2011),* conducted a study on " Impact of recession on Tourism Industry". The paper focuses on the impact of global economic meltdown on tourism in India as a whole with the case study of Lucknow city. It was found that, despite the major world economic degradation, Tourism is a one of the major industry in India which has minimum negative impact.

2*) P Srinivas Subbarao (2011) ,* in his research paper tittled " Global Financial crises – the challenges of Indian tourism & hospitality industry " it was concluded that, " tourism will survive this challenge as it has overcome a wide range of challenges since the 21st century

began. The tourism industry will have a rough ride the months ahead but those who think and act strategically and have the ability to adapt their business models quickly to the new realities will overcome this challenge."

3) "Impact of global economic recession on the Indian tourism industry" a research conducted by ***Lateef Ahmad Mir & Dr. Sangram Bhushan (2011)***. It was analysed and concluded that, the gloomy phase of 2008 global economic recession resulted in a remarkable negative impact on tourism industry of many economies of the world. India tourism also received the undesirable effect of the recession, but the magnitude was very low.

1.6 Objectives of the Study

1) To analyse the performance of Indian Tourism Industry during the period of global recession - pre and post era.

2) To know about number of foreign tourist arrival and foreign exchange earnings from tourism Industry in India.

3) To evaluate the impact of Number of foreign Tourist arrival on the Foreign exchange earnings.

1.7. Scope of the Study

The research paper titled "A study of Indian Tourism Industry during pre and post recession period" is only restricted to the global recession of 2008-09. It covers the number of FTAs and FEEs from tourism in India from 2000 to 2017.An attempt has been made to find out the impact of Number of foreign Tourist arrival on the Foreign exchange earnings

1.8. Research Methodology

The study is based on the secondary data which includes existing literature, the experience of the Authors and collected from official websites.

1.9 Data Analysis and Interpretation: Mean, Percentages and regression analysis has been used to find out the impact of number of foreign tourist arrival on the foreign exchange earnings.

Table No. 1. FOREIGN TOURIST ARRIVAL IN INDIA (IN MILLION) FROM 2000 TO 2017

YEAR	FTA's IN INDIA (IN MIILION)	PERCENTAGE CHANGE OVER PREVIOUS YEAR
2000	2.65	6.7
2001	2.54	-4.2
2002	2.38	-6
2003	2.73	14.3
2004	3.46	26.8
2005	3.92	13.3
2006	4.45	13.5
2007	5.08	14.3
2008	5.28	4
2009	5.17	-2.2
2010	5.78	11.8
2011	6.31	9.2
2012	6.58	4.3
2013	6.97	5.9
2014	7.68	10.2
2015	8.03	4.5
2016	8.80	9.7
2017	10.04	17.2

Source: Ministry of Tourism, Govt. of India.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table No. 2. TOP 10 INTERNATIONAL CHECK POSTS FOR FOREIGN TOURIST ARRIVALS (FTAS) IN INDIA IN 2017

S.No	International Check Posts (ICP)	FTA	Percentage Share
1	Delhi	2845076	28.35
2	Mumbai	1577669	15.72
3	Haridaspur	1173093	11.69
4	Chennai	718905	7.16
5	Bangluru	567945	5.66
6	Kolkata	459145	4.58
7	Cochin	341987	3.41
8	Dabolim	336251	3.35
9	Hyderabad	310924	3.10
10	Gede Rail	260953	2.60
	Total Top Ten	8591948	85.61
	Others	1443855	14.39
	Grand total	10035803	100.00

Source: Bureau of Immigration, Govt. of India

Table No 3.Top 10 Source Countries for Foreign Tourist Arrivals (FTAs) in India in 2017

Rank in 2017	Source Country	FTAs	Percentage (%) Share in
1	Bangladesh	2156557	21.49
2	United States	1376919	13.72
3	United Kingdom	986296	9.83
4	Canada	335439	3.34
5	Australia	324243	3.23
6	Malaysia	322126	3.21
7	Sri Lanka	303590	3.03
8	Russian Federation	278904	2.78
9	Germany	269380	2.68
10	France	249620	2.49
	Total top 10 Countries	6603074	65.80
	Others	3432729	34.20
	G.Total	**10035803**	**100.00**

Source: Bureau of Immigration, Govt. of India

International Journal of Management, IT & Engineering
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Table No. 4. FOREIGN EXCHANGE EARNINGS (FEEs), IN RS. CRORE, FROM TOURISM IN INDIA, 2000 TO 2017

YEAR	FEEs FROM TOURISM IN INDIA	PERCENTAGE CHANGE OVER PREVOIUS YEAR
2000	15626	20.7
2001	15083	-3.5
2002	15064	-0.1
2003	20729	37.6
2004	27944	34.8
2005	33123	18.5
2006	39025	17.8
2007	44360	13.7
2008	51294	15.6
2009	53700	4.7
2010	64889	20.8
2011	77591	19.6
2012	94487	21.8
2013	107671	14.0
2014	123320	14.5
2015	135193	9.6
2016	154146	14.0
2017	177874	15.4

Source: Ministry of Tourism, Govt. of India.

Table No. 5. SHARE OF INDIA IN INTERNATIONAL TOURISM RECEIPTS (ITRs) IN WORLD AND ASIA & THE PACIFIC REGION, 2000 – 2016

YEAR	INTERNATIONAL TOURISM RECEIPTS (IN US $ BILLION)		FEE's IN INDIA (IN US $ MILLION)	% SHARE & RANK OF INDIA IN WORLD		% SHARE & RANK OF INDIA IN ASIA & PACIFIC	
	WORLD	ASIA & PACIFIC		% SHARE	RANK	% SHARE	RANK
2000	475.3	85.3	3.46	0.73	36th	4.06	10th
2001	463.8	88.1	3.19	0.69	36th	3.63	12th
2002	481.9	96.5	3.10	0.64	37th	3.22	13th
2003	529.3	93.7	4.46	0.84	37th	4.76	9th
2004	633.2	124.1	6.17	0.97	26th	4.97	8th
2005	679.6	135	7.49	1.10	22nd	5.55	7th
2006	744.0	156.9	8.63	1.16	22nd	5.50	7th
2007	857	187	10.72	1.25	22nd	5.74	6th
2008	939	208.6	11.83	1.26	22nd	5.67	6th
2009	853	204.2	11.13	1.31	20th	5.45	7th

2010	931	255.3	14.19	1.52	17th	5.56	7th
2011	1042	289.4	16.56	1.59	18th	5.72	8th
2012	1117	329.4	17.73	1.59	16th	5.38	7th
2013	1198	360.2	18.44	1.54	16th	5.12	8th
2014	1252	359	20.23	1.62	15th	5.64	7th
2015	1196	349.5	21.07	1.76	14th	6.03	7th
2016	1220	366.7	22.92	1.88	13th	6.25	7th
2017	1332	389.5	27.31	2.05	13th	7.01	7th

Source: Ministry of Tourism, Govt. of India.

Table No. 6. SHOWING YEAR WISE TOURIST ARRIVALS (In Millions) & FOREIGN EXCHANGE EARNINGS (In Millions)

Years	Tourist Arrivals	Foreign Exchange earnings
2000	2650000	156260
2001	2540000	150830
2002	2380000	150640
2003	2730000	207290
2004	3460000	279440
2005	3920000	331230
2006	4450000	390250
2007	5080000	443600
2008	5380000	512940
2009	5170000	537000
2010	5780000	648890
2011	6310000	775910
2012	6580000	944870
2013	6970000	1076710
2014	7680000	1233200
2015	8030000	1351930
2016	8800000	1541460
2017	10350000	1778740

H0: Foreign Exchange Earning is not related to Tourist Arrivals

H1: Foreign Exchange Earning is positively related to Tourist Arrivals

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.965[a]	.931	.927	141829.02720	.448

a. Predictors: (Constant), tourist

b. Dependent Variable: FEE

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The correlation between Tourist arrival and Foreign exchange earnings is high at 0.965 and the R Square of 0.931 indicates that 93% of the variance in the foreign exchange earnings (dependent variable) be explained by the arrival of tourist (independent variable) so we can conclude that we have a "good" predictor for expected foreign exchange earnings when consideration is given to number of tourist arrivals.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4354824228779	1	4354824228779	216.491	.000[b]
	Residual	321847567314	16	20115472957		
	Total	4676671796094	17			

a. Dependent Variable: FEE
b. Predictors: (Constant), tourist

The ANOVA table indicates that the model can accurately explain variation in the dependent variable .we are able to say the model "accurately" explains variation, since the significance value of 0.000 informs us that the probability is very low that the variation explained by the model is due to chance. The conclusion is that changes in the dependent variable resulted from changes in independent variables. In this case, changes in number of tourist arrivals every year resulted in significant changes in foreign exchange earnings.

Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-557037	91752.964		-6.071	.000
	Tourist	.234	.016	.965	14.714	.000

a. Dependent Variable: Foreign Exchange Earnings

The null hypothesis is that there is no relationship i.e. the beta coefficient is not different from the p-value for beta coefficient of Tourist is .000, this value is significant at the 99% significance level. Thus we cannot accept the null hypothesis. In other words, we can claim that the foreign exchange earnings is positively related to number tourist arrivals

1.10 Findings

- India's Travel & Tourism sector ranks 7th in the world in terms of its total contribution to the country's GDP.
- The sector supported 40.3 million jobs in 2016, which ranks India 2nd in the world in terms of total employment supported
- The study reveals that, FTA % change in the year 2008 was 4 as compared to 14.3% in the previous year (2007) due to the setback suffered from the global crises further worsening the situation to -2.2 in 2009.
- It was observed that in the year 2010, FTA had increased to 5.78 as compared to 5.17 in 2009 which tells us that, country had recovered from global recession and did not get affected much.
- FEE, % change dropped to 4.7 in 2009 as compared to 15.6 in 2008 showing negative effect of recession but also recovered in the next following year (2010) to 20.8 which was almost 4 times more showing negligible impact of recession.

- It was found that, in the year 2017 FEE reached to 1,77,874 crore as compared to the year 2000 which was recorded as 15,626 crore.
- The Maximum tourist arrivals at the international check post are at Delhi and Mumbai i.e. 44% of the Tourist land at Delhi and Mumbai.
- The major foreign tourist arrivals are from Bangladesh and United States and it figure out 35 % out of the total foreign tourist arrivals.
- The study reveals that, % share and rank of India in the world in International Tourism Receipts (ITRs) was 0.76 and 36th respectively in the year 2000 as compared to 2.05% share and 13th rank in the year 2017.
- India's % share & rank in Asia and Pacific in ITRs was 4.06 and 10th respectively in the year 2000 as compared to 7.01 % and 7th rank in 2017. We can say that Indian tourism industry not only survived inspite of global recession but also recorded great progress.
- The correlation between Tourist arrival and Foreign exchange earnings is high at 0.965 and the R Square of 0.931 indicates that 93% of the variance in the foreign exchange earnings(dependent variable) be explained by the arrival of tourist(independent variable)
- The ANOVA table indicates that the model can accurately explain variation in the dependent variable .we are able to say the model "accurately" explains variation, since the significance value of 0.000 informs us that the probability is very low that the variation explained by the model is due to chance.
- The null hypothesis is that there is no relationship i.e. the beta coefficient is not different from the p-value for beta coefficient of Tourist is .000, this value is significant at the 99% significance level. In other words, we can claim that the foreign exchange earnings is positively related to number tourist arrivals

1.11 Conclusion

The global economic recession affected almost every economy of the world both developed and developing in different magnitudes. These effects were detected in greater amount and in greater number of economies compared to previous global recessions, because of the increased volume of world trade supported by liberalized trade policy of many developed and newly emerging market economies. The 2008 economic recession resulted in the remarkable reduction in the international tourist arrivals which resulted in the loss of employment, sale of goods and services, investment and income of those households which were directly or indirectly engaged in this profitable economic activity. The tourism and hotel service in India was no exception, but it was not impacted in the manner and magnitude as the other countries of the globe were affected by 2008 global economic recession. It is because time has changed and we should not look India as it was in 80's and 90'. It is now shielded by its growing Medical and Domestic tourism

1.12 Scope for Further Study

1) Impact of global recession on BRICS nations.
2) Global crises and its impact on top 5 tourist destinations of the world.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Managing the Swings of Seasonal Businesses

Dr. Reeta Arora*

Abstract
Seasonal businesses are the businesses that one can run for some months in a year and make swift money from its operations and then one can utilize the rest of months of the year to do something else for which one are passionate. Seasonality is known as one of the most typical features of the business. Seasonality demands have been a major problem for the many businesses and have a negative impact, such as, difficulties in gaining access to capital, low returns on investment and the inefficient use of resources. The phenomenon of seasonality imposes greater risks. It has been a challenge to make business during off season for most of the businesses. This research paper was therefore aimed to provide an eyeball guide for seasonality and to develop particular opportunities for different businesses to increase demand in low season. The study observed problems and key features of seasonal effects on the businesses. The objective of the study was to explore some innovative ideas for managing off season of businesses. Moreover, this paper made an attempt for recommendations or suggested some plans and strategies for the development of different seasonal businesses. The methodology of this work included secondary data collected from the different researches, research papers, journals, books and a text analysis of the different websites. To promote businesses, different marketing strategies and management vision are the strongest part to increase sales in off season as well as main season.
***Key words**: Seasonal business, Peak season, off season, Management.*

Introduction

Starting a seasonal business is one of the best traditions to earn extra money without establishing a business on a complete scale. One can do this business for a few months in the year and can have a break for the remaining year. If one is innovative and efficient to handle different business products, he can switch multiple businesses during the year and earn a lot of wealth. Seasonal businesses are easy to start and need very low investment. One can start a seasonal business even from home and can take considerable profits just by taking appropriate strategic decisions. There is no shortage of opportunities and ideas for seasonal businesses. Once one has finalized the business that he would invest in, he needs to execute his *seasonal business plan* efficiently.

Objectives of the Study

- To know the key features of seasonal businesses.
- To know the problems of seasonal variations in the businesses.
- To explore solutions and strategies for managing swings of seasonal businesses.
- To give suggestions and recommendations to manage the swings off seasonal businesses.

Research Methodology

Research methodology is an approach to systematically solve the research problem. Research methodology comprises of research design, data collection method, sampling,

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statistical technique, reliability and limitations. This paper is a literature overview of different strategies to manage the swings of seasonal landscape businesses. **The present study is descriptive in nature and is based on the secondary data collected from various websites, magazines, various text books, research papers and journals.**

Limitations and Scope for Further Study

This paper is based only on secondary data and descriptive in nature. Further research can be conducted on the basis of primary data through a questionnaire filled by those businessmen who operate seasonal businesses to know the depth of the different strategies in practices to manage seasonal businesses and the significance of these in present era of globalization.

What Is a Seasonal Business?

Seasonal business is a phenomenon that refers to the fluctuations in business that corresponds to changes in season. *This type of organization is a huge part of the business world, as there are currently* **more than seven million businesses nationwide.** Those who do seasonal businesses have the undesirable job of trying to maintain profitability throughout periods in which their business may experience significant slowdowns. The degree to which seasonality may have an effect on a business depends upon many different factors. Seasonal businesses are matchless in the reality that they are both easier and harder to run, depending on what angle you are looking at it. Every venture has its peak season and its troughs, but ventures that sell goods and services related to one particular time of year -- whether it is summertime or ski season or tied to a holiday or festival -- have only a contracted window to get customers' notice, feed them information and procure a deal. If you have a seasonal business, then you probably already spend a good part of the year considering what your best options are during the off-season. Are there methods to make some earning on the side with your business even when it's not peak season? Should you concentrate on another work completely during the off-season or concentrate on planning and provisions for the upcoming peak periods? One well-known challenge that any entrepreneur might confront is navigating seasonal variations in the businesses or industry. The swings in sales and business operations resulting from seasonality affect small business profits, cash flow, employment situation, scheduling and potential implications for small business viability. Sometimes these changes can put a business in danger.

Different businesses across industries may manage slowdowns of their business in different ways. Many entrepreneurs try to diversify product lines, hire temporary or contractual manpower or simply close down during the slow season. The key to do so successfully involves developing skills and smart practices that will allow the entrepreneur to remain profitable during off-seasons and periodic slowdowns. A seasonal variation can result from dips in customer demand or supply issues. Seasonal businesses derive most of their annual revenue in just a few months of a year. To make such businesses more sustainable and rise above general challenges, it is essential to go through the strategies to be followed by seasonal businesses nowadays.

Phases in a Seasonal Business

Seasonality in businesses is known as one of the most typical features of the business. Twelve calendar months can be categorized into four phases keeping into view seasonality in businesses:

1. Shoulder up
2. Busy

3. Shoulder down
4. And Slow

Seasonal businesses can offer more elasticity, creativeness and additional profits for entrepreneurs. All seasonal businesses practice a growth in revenues during their busy seasons that slowdowns in the slow season. Seasonal peaks and ditches present challenges that require strategic planning and fiscal carefulness. It turns out that many seasonal businesses concentrate on their business operations during their slowdown time as well. They look for innovative tactics to create more off-season revenue, or else they plan for the year in advance.

Problems and Challenges of Seasonal Businesses

Cash Flow

A seasonal business is not a conventional business. On one hand, seasonal businesses want to scale down expenses such as marketing, advertising, or salaries during the slowdown period, on the other hand, they may still have ongoing expenses like rental costs, maintenance expenses, shut down costs or a lease.

Hiring of manpower

Hiring and retaining part-time workers and other employees is challenging enough in seasonal businesses, but when enterprise only pay for them for some part of the year, creating a sense of loyalty among manpower is even more challenging.

Inventory Management

Storing surplus inventory for a whole year in seasonal businesses is not ideal for most businesses due to its storage expenses and carrying on costs. The subsequent year may not be perfect for most of seasonal businesses and if a seasonal business is of perishable merchandise, it's almost impossible to manage it.

Startup Capital

The initial outlay and other expenses to commence a seasonal business, discourage to would-be entrepreneur to start such type of business. From licenses or permits, to securing a site or structure of building, arranging finance for such type of businesses with a short life cycle of merchandise presents extra up-front financial requirements.

Weather Condition

Weather conditions are big challenge for seasonal businesses. If heavy rains, a storm or any natural calamity strikes at some stage in peak season of a seasonal business, estimated revenues and growth of such businesses may be negatively impacted.

Obtaining finance or Credit

For many seasonal businesses, accessing financial support is much more difficult when they most need of funds. During the quieter or slowdown periods, payment to suppliers, advances to suppliers, holding stock, maintenance of plants etc. require funds which have to be managed by taking loans from banks or financial institutions. But to get credit or arrange alternate solution in slowdown period in seasonal businesses is difficult job.

Customer relationships

Seasonal businesses serve customers for a very short span of time, attaching them to a particular brand may look unfeasible for coming season. For many seasonal businesses, their customers grow fainter entirely during the slowdown period of business. Therefore, it becomes challenging for seasonal businessmen to remain visible through the complete year and remind their customers of presence frequently.

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Managerial skill

Owning and managing a seasonal business requires creativity, diligence and good managerial skill. As such, forecasting is an extremely important component of seasonal businesses. To add to the challenge, there is no specific formula to rely on for accurate planning, controlling and looking forward in seasonal businesses. Any negligence during the peak season as well as slow down period will not only impact performance of business but survival as well.

Solutions and Strategies for Seasonal Business Challenges

Here are some solutions and strategies to be taken into consideration to outline the best course during the slowdown time of seasonal businesses, many of which will work for seasonal businesses with constant income.

Understand the cycles of Industry

Swift growth of an enterprise is not strange for business owner who's new to an industry and that can disguise a usual seasonal fluctuation, leading the entrepreneur to expect the vigorous sales will keep on. Base projections about seasonality on sales data of prior years are essential to understand peaks and troughs of the business. If the business hasn't been around that long, check with peers and industry trends to know a clear picture when most creative season begin and end. By analysing the trends and data from previous years, you can understand and plan more effectively in the future.

Know Market of Your Product

Entrepreneur must be sure that there's enough demand for his products or services that one can generate sufficient income during peak season. If he lacks knowledge, he should do some straightforward market research. Ask prospective customers if they would purchase from you at the prices you are expecting to charge. If so, what would they purchase, how much would they purchase and when? Find out also what competition you have to face and endeavor to set yourself separately. Market is dynamic, so information must remain up to date about market of your product. The key to navigating these fluctuations effectively is to understand market of your products.

Expand Your Database While the Season's Still Hot

During peak season of business, your website and location will be abuzz. Be aware of the opportunity that it is the *right time* to expand your database. Keep in mind, expanding this list is *so* much effortless when you have abundance of traffic, so while it may appear scary to add database expansion to your ever-expanding record of peak season to-dos, your off-season achievement hinges on your competence during this period.

Plan Your Peak Season

While slowdown in season sure is a challenge, the peak season offers abundance of opportunities as well. It should be kept in mind that any carelessness during the peak season will not only impact your performance but existence too. So don't overlook to take advantage of slow stretches to plan for the peak season and plan for how to manage the seasonal dips. Use slowdown periods to think of methods which can improve performance of the business for when it becomes active another time. Check and update your budgets, marketing and sales plans and your overall business plan to take full advantage of efficiency. Most of these documents become outdated to a certain extent quickly, especially if you do business in a segment that change rapidly.

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Manage the Impact of Seasonality on Manpower

Hiring, training and retaining good employees, as well as manager-level aptitude, are significant aspects for success. Temporary or fixed-term employees provide a cost-effective solution, but always leave you enough time to recruit the right people. Be clear about the length of the job and keep side by side of important issues like full-time and provisional schemes and developments surrounding the minimum wage. Just be sure to cope up with expectations of seasonal workers. Encouraging employees to come back next season with incentives and soft benefits can make an immense variation. Stay in touch with your best employees and let them know you'll be call them back next year.

Managing Inventory

In case of seasonal business, too much inventory on your shelves in slowdown periods will cost you very much. You must accurately estimate demand by using your market statistics/research. Spend every penny as if it were your last penny. Inventory management can assist you in minimizing wastage by allowing you to place order as you require them. You may also be able to manage favorable terms with your suppliers that will reconcile in slowdown periods. At the very least, following what's called a "Just-In-Time" approach to manage your inventory all through the busy season will facilitate you maintain your inventories small. This might require you to take strict control to you manage inventory, but you'll be able to avoid ending the peak season with too much inventory on your shelves.

Maintaining Relationships with Suppliers

Seasonal businesses have to bear the risk of turning away suppliers because of frequent cycles of infrequent orders followed by huge orders. Getting favorable conditions from suppliers can be a big job when purchasing within a limited time. Make an effort to ascertain good relationships with suppliers. Rather than waiting for the slowdown period to end, it is wise to take stock of your inventory instantly after your busy months when you have cash as well as time. This will facilitate suppliers to save storage space and warehousing costs, providing you with bargaining power in order to negotiate better payment conditions.

Manage for off-season expenses

During the peak season in seasonal business, it's simple to rationalize spending a little extra capital for the operations, but it's important to manage for your off-season expenses if you predict investing during the peak season. It takes patience, but it's of significance as revenues decrease when the season is ended. Budgeting includes more than your funds and resources, too. Many seasonal businesses cut their hours during the gap between season and off season and some shut their doors overall. Dropping some staff is another significant element of minimizing off-season expenses.

Be Creative about Staying in Touch With Customers

Customers should not vaporize during the off-season. Set apart a business by making a point of creating visibility throughout the year. Even if regular customers aren't much in touch during the off-season, they might still be just about. Seasonal businesses must repeatedly work harder to encourage themselves, often merely reminding customers they're nearby. To strike the ground running, you've got to leave sufficient time for your publicity and advertising to attract probable customers. Be creative about finding methods to stay in touch with them throughout the year. If any local newspaper or local cable channel, magazine is in your area, grab your ad spot on it. It's an effective technique to turn one-

time customers into repeat customers. Your business should think about leveraging Facebook, Twitter, LinkedIn, Pinterest etc. to keep on top of mind of customers all the year. Also, provide offers and discounts by means of these platforms to help continue interest, so consumers look ahead you're reopening.

Managing Cash Flow

Cash is like a king to run a business. Successfully managing cash flow can present a significant challenge for seasonal businesses because they obtain most of their revenue in a set stage, but may have outgoings at other stages. The lure can be to spend too much when cash is abundant, creating cash flow issues when revenue is down. Such unbalanced cash flow requires cautious planning and management. Take vital actions to make definite cash provisions for the rest of the year. It is even worthwhile to apply for business loans so that business operations can be maintained efficiently during the hectic months.

Gather Customer Reviews

During entire season of seasonal business and particularly as the season comes to an end, you should request your customers to review your products or services. By gathering customer stories and testimonials when they're still fresh, you'll have reviews that are more comprehensive and personal that'll resound with off-season customers. Make use of those reviews in all your off-season promotions during slowdown period. For an additional boost, request customers to submit pics and videos from their experiences with your business. The more interesting and informative contents you can obtain from your customers, the better your off-season marketing movement will be.

Make Sure you're Legal

Starting a seasonal business is both exciting and challenging. Even as a small seasonal business entrepreneur, you have to follow some of the laws and regulations that apply to large corporations. Review them and be aware of which of these laws may apply to your business. Unawareness won't stand up as a justification in court - nor will being a seasonal business. You cannot exercise someone else's name for your business without their permission, so make certain your business name is in fact original. Some businesses need a license to trade or must be registered, of course, while all businesses have legal responsibilities when issues of health, safety, insurance and employment come. If you lack satisfactory and sufficient legal knowledge, then you should seek professional advice.

Build Alternative Income Streams

For seasonal businesses, off-season periods can get actually slow and dull. There is a small staff to retain, bills to pay and just the cash reserves to rely upon above all. Hence, building alternative income streams is an initiative worth considering providing your income a much-needed accumulation while it may seem like a distraction from your primary business. Set up additional revenue sources to neutralize the off-season period and the revenue collected can go into strengthening it only. One of the clearest ways to shift into a new season is to insert products and services to satisfy the other seasonal requirements of your customers. Just don't let attention to the alternative income source, overtake a focus on the primary business.

Build a cushion

Researcher knows that it is sometimes easier to say than done, but luckily, it doesn't have to happen all at once. Some of the smartest seasonal business owners, the researcher knows, make it a practice of setting aside a little amount every month with the goal of having enough bank balance to pay for six months of operating cost. They feel like this is

the least amount requirement to keep their business on its feet. Otherwise, an emergency condition could potentially mop you out. If you don't have anything set aside today, it's time to start.

Suggestions and Recommendations

Seasonal businesses face many distinctive challenges and to overcome these obstacles and strengthening the bottom line, put these recommendations and suggestions into action and find ways to flourish all year round:

- Reviewing your revenues and expenditures from your previous busy season will help you determine where you fell short so you can make appropriate changes to your budget.
- Watch what your competitors are doing, get inspiration where you can get it, and see if anything's relevant and applicable to your business.
- Put into practice low-cost solutions to obtain more customers through the door in seasonal business.
- Create a buzz on social media by asking current customers to share their posts, experiences and reviews or feedback of your products.
- **Create an event & content marketing calendar especially for the quieter period for your business** which prompts an immense deal of seasonal business too.
- Use your cash flow projections to accurately assess money in the quieter months so have a realistic sense of how much money you'll have at the end of the year.
- Manage your employees' expectations and encourage them to take holiday in the quieter times. You can contract students who are free after exam to help out with busier times- a win-win situation for everyone.
- Find ways to bring in revenue all year by diversifying your business offerings like selling related or complementary products and services during slowdown period of business.
- **Go where the season is; keep**ing in mind that just because your business isn't in season at one site doesn't indicate that there isn't a demand somewhere else.
- Continue publishing blog posts and posting updates on all the channels to educate your customers. Doing so makes certain that people will keep in mind you when it comes time to do business again in the peak season.
- **Find ways** to reduce your expenditures by looking into hours of operation, staffing requirements, possibility of subletting etc. during the off-season.
- To widen your knowledge and expand network, attend events that give learning and networking prospects so you can get to know people and tendency in your industry.
- Assess your business' performance and plan for next season to determine which strategies should be continued.

Conclusion

Starting a seasonal business is a big achievement for so many entrepreneurs, but maintaining one is the big challenge. Entrepreneurs of seasonal businesses often face incomparable challenges when it comes to running and managing it. Swings in sales and business operations resulting from seasonality affect both business revenues and a region's employment situation. There are many different aspects that go into attaining success for a seasonal business and all of them rest on your niche. If there's one thing you should learn from this study is that your offseason period should not be wasted. Look hard at every

element, from inventory to staffing, maintaining relations with customers and suppliers, to avoid tying up cash unnecessarily during quiet months rather than chewing your knuckles in fear, take action and use above tips to improve your business during slowdown period. Businesses can use the offseason to organize and expand leads, create seasonal content and explore relevant niche markets that can fill the offseason void. The great thing about all of these suggestions and recommendations is that they can be mixed and matched according to the profile of your seasonal business and what best suits according to needs of your seasonal business.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Fuzzy Inventory Model for Deteriorating Items with Shortages using Penalty cost

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J. Jayanthi***

Abstract
In this paper, an inventory model for deteriorating items with shortages using penalty cost has been considered in a crisp and fuzzy environment. The optimum time, the optimal order quantity and the optimal total cost are determined in this inventory model. For uncertain parameters, trapezoidal fuzzy numbers are used. The working out of economic order quantity (EOQ) is conceded out through the defuzzification process by using graded mean integration method. To illustrate the results of this proposed model, we give an example and sensitivity analysis.
Keywords: Deteriorating items, Penalty cost, Trapezoidal fuzzy numbers, Defuzzification, Graded mean integration method.

1. Introduction

Nowadays, inventory plays a vital role in our worldwide economy. Inventory is nothing but a stock kept for future purpose. It may be in the form of raw materials, fulfilled parts, impartial parts, semi – finished goods or finished goods. There are four types of inventory items, namely (1) Deterioration items (2) Obsolescence items (3) Demolish or Pilferage items (4) No Obsolescence / Deterioration items. Deterioration is defined as a decay or damage in the quality of the inventory items. Foods, Drugs, pharmaceuticals, etc. are some examples of deteriorating items. Deterioration has been considered in many inventory researches in the last decades. Obsolete inventory is a term that refers to inventory that is at the end of its product life cycle. This stock has not been sold or consumed for an extensive stretch of time and isn't relied upon to be sold later on. This kind of stock must be poised down and can cause vast trouble for an organization. Obsolete inventory is also referred to as a lifeless inventory or surplus inventory. Amelioration which refers to items whose value or efficacy or quantity increases with time. No obsolescence/deterioration/amelioration is referred to the life cycle of some goods is indefinite in the environment. All these kinds have very short life cycle. If the rate of obsolescence, deterioration, or amelioration is not sufficiently low, its impact on model of such an inventory system cannot be ignored.
Recently in 2016, Nalini Prava Behera, and Pradip Kumar Tripathy [8] constructed a fuzzy EOQ model for time - deteriorating items using penalty cost. In this paper, a fuzzy inventory model for time-deteriorating items using penalty cost under the conditions of the infinite production rate are formulated and solved. Penalty cost is assumed to be linear and exponential. Fuzziness is introduced in the cost component of holding costs and set up

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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cost. Demand rate is also assumed to be fuzzy. In a fuzzy environment all related parameters are assumed to be trapezoidal. Representing these three costs by trapezoidal fuzzy numbers, the optimum order quantity is calculated using the signed distance method and graded mean integration method for defuzzification. Numerical examples have been given in order to show the applicability of the proposed model. Sensitivity analysis is also carried out to detect the shift in the variables of interest of the system. In 2015, Aaditya Pevakar and Nagare [1] analyzed an inventory model for timely deteriorating products considering penalty cost and shortage cost. In this paper they discussed in an inventory the utility of deteriorating products decreases with time. There are many products which are deteriorating and obsolete as time passes and they lose their economical value which causes loss to the wholesaler / retailer. This loss may be considered as penalty cost. The main objective of our paper is to develop an EOQ model for deteriorating items which deteriorate after some time considering the penalty cost and shortage cost with infinite production rate. The theoretical expression is obtained for optimum inventory level optimum cycle time.

Also, in 2015, Mishra, Gupta, Yadav and Rawat [7] derived an optimization of fuzzified economic order quantity model allowing shortage and deterioration with full backlogging and moreover, in 2015, Pevekar and Nagare [10] developed an inventory model for timely deteriorating products considering penalty cost and shortage cost. In 2014, Maragatham and Lakshmidevi [6] proposed fuzzy inventory model for deteriorating items with price dependent demand.

In 2012, Jaggi, Pareek Sharma and Nidhi [4] worked on a fuzzy inventory model for deteriorating items with time - varying demand and shortage. Dutta and Pavan Kumar [2] derived a fuzzy inventory model without shortage using trapezoidal fuzzy number with sensitivity analysis. Fujiwara and Perera [3] considered an EOQ model for continuously deteriorating products using linear and exponential penalty cost. In 1982, Kacpryzk and Stanicwski [5] asserted on a long-term inventory policy-making though fuzzy decision making models.

Park [9] coined that the fuzzy sets theoretic interpretation of economic order quantity. In 2009, Srivastava and Gupta [11] asserted that the EOQ model for time-deteriorating items using penalty cost. Yao and Lee [12] established that the fuzzy inventory with or without backorder for fuzzy order quantity with a trapezoidal fuzzy number. Zadeh [13] introduced the fuzzy sets. Zadeh and Bellman [14] opined that the decision making in a fuzzy environment. Zimmerman [15] using the fuzzy sets in operational Research.

Here we develop a fuzzy inventory model analytically using penalty cost with shortages. In the defuzzification process, we use the graded mean integration method. The annual total cost is derived and calculated as a function of six variables (ie) holding cost, set up cost, shortage cost, penalty cost, screening cost and reworking cost.

2 Methodology

2.1 Fuzzy Numbers

Any fuzzy subset of the real line R, whose membership function μ_A satisfied the following conditions, is a generalized fuzzy number $\tilde{A}$.

(i) μ_A is a continuous mapping from R to the closed interval [0, 1].

(ii) $\mu_A = 0, -\infty < x \leq a_1,$

(iii) $\mu_A =$ L(x) is strictly increasing on $[a_1, a_2]$

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

(iv) μ_A = w_A, $a_2 \le x \le a_3$

(v) μ_A = R(x) is strictly decreasing on [a_3, a_4]

(vi) μ_A = 0, $a_4 \le x < \infty$

where $0 < w_A \le 1$ and a_1, a_2, a_3 and a_4 are real numbers. Also this type of generalized fuzzy number be denoted as $\tilde{A} = (a_1, a_2, a_3, a_4 : w_A)_{LR}$; When w_A = 1, it can be simplified as $\tilde{A} = (a_1, a_2, a_3, a_4)_{LR}$.

2.2 Trapezoidal Fuzzy Number:

A trapezoidal fuzzy number $\tilde{A}$ = (a, b, c, d) is represented with membership function $\mu_{\tilde{A}}$ as:

$$\mu_{\tilde{A}}(x) = \begin{cases} L(x) = \frac{x-a}{b-a}, & when\ a \le x \le b; \\ 1, & when\ b \le x \le c; \\ R(x) = \frac{d-x}{d-c}, & when\ c \le x \le d; \\ 0, & otherwise \end{cases}$$

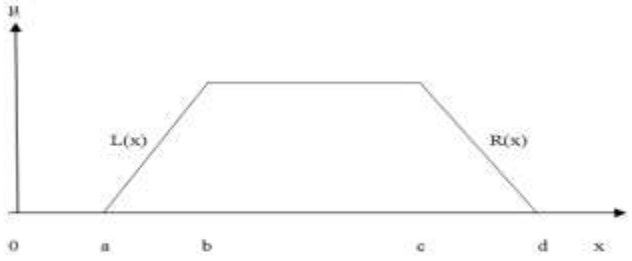

Fig.1: Trapezoidal Fuzzy Number

2.3 The Function Principle

Suppose $\tilde{A}$ = (a_1, a_2, a_3, a_4) *and* $\tilde{B}$ = (b_1, b_2, b_3, b_4) are two trapezoidal fuzzy numbers, then arithmetical operations are defined as:

1. $\tilde{A} \oplus \tilde{B}$ = ($a_1 + b_1$, $a_2 + b_2$, $a_3 + b_3$, $a_4 + b_4$)
2. $\tilde{A} \otimes \tilde{B}$ = (a_1b_1, a_2b_2, a_3b_3, a_4b_4)
3. $\tilde{A} \ominus \tilde{B}$ = ($a_1 - b_4$, $a_2 - b_3$, $a_3 - b_2$, $a_4 - b_1$)
4. $\tilde{A} \Phi \tilde{B} = \left(\frac{a_1}{b_4}, \frac{a_2}{b_3}, \frac{a_3}{b_2}, \frac{a_4}{b_1}\right)$
5. $\alpha \otimes \tilde{A}$ = $\begin{cases} (\alpha a_1, \alpha a_2, \alpha a_3, \alpha a_4), \alpha \ge 0 \\ (\alpha a_4, \alpha a_3, \alpha a_2, \alpha a_1), \alpha < 0 \end{cases}$

2.4 Graded Mean Integration Method

If $\tilde{A} = (a_1, a_2, a_3, a_4)$ is a trapezoidal fuzzy number then the graded mean integration representation method of $\tilde{A}$ is,

$$p(\tilde{A}) = \frac{a_1 + 2a_2 + 2a_3 + a_4}{6}$$

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

2.5 Notations and Assumptions

The mathematical model of this paper is developed on the basis of the following notations and assumptions.

2.5.1 Notations

c : holding cost per unit quantity per unit time
s : set up or ordering cost per order
r : shortage cost or stock out cost per unit quantity per unit time
q : order quantity per cycle
t : scheduling time period
z : order level
R : total demand over the planning time period [0, t]
μ : time period at which deterioration of product start.
S : screening cost per unit
γ : reworking cost per unit
θ : percentage of defective items
α & β : constants
TC : total annual cost for the period [0, t]
t^* : optimum time
q^* : optimal order quantity
TC^* : minimum total cost
$\tilde{c}$: fuzzy holding cost per unit quantity per unit time
$\tilde{s}$: fuzzy set up or ordering cost per order
$\tilde{r}$: fuzzy shortage cost per unit quantity per unit time
$\tilde{TC}$: fuzzy total cost for the period [0, t]
$\tilde{t}^*$: fuzzy optimum time
$\tilde{q}^*$: fuzzy optimal order quantity
$\tilde{TC}^*$: fuzzy minimum total cost

2.5.2 Assumptions

- Demand rate is uniform and finite.
- Lead time is zero.
- A single product is considered over a prescribed period of time.
- Shortages are allowed.
- Inventory is continuously reviewed.
- The replenishment occurs instantaneously at an infinite rate.
- Screening cost and reworking cost is constant.
- Holding cost, setup cost and shortage cost are taken as trapezoidal fuzzy numbers.
- q is the lot-size per cycle whereas z is the initial inventory level after fulfilling the back-logged quantity of previous cycle and q – z be the maximum shortage level.

3. Model Formulation

3.1 Proposed Inventory Model in Crisp Sense

From the above notations and assumptions, we obtain the total annual cost for the inventory model for deterioration items using penalty cost with shortages in crisp environment.

Here the penalty cost is taken as an exponential function. An exponential penalty cost

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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function $P(t)=\alpha\left(e^{\beta(t-\mu)}-1\right), t \geq \mu$ which gives the cost of keeping one unit of product in stock until age t, where μ be the time period at which deterioration of product starts and α and β are constants.

The cost due to the deterioration of the product delivered during the period t is given by $\alpha\left(e^{\beta(t-\mu)}-1\right)R\,dt$.

The penalty cost due to the deterioration of the product delivered during the time interval (μ, t) is given by $\frac{\alpha R}{\beta t}\left[\left(e^{\beta(t-\mu)}-1\right)-\beta(t-\mu)\right]$.

The total cost for the period (0, t) is given by,

TC (t) = carrying cost + set up cost + shortage cost + penalty cost + screening cost + reworking cost

$$TC(t)=\frac{cz^2}{2Rt}+\frac{s}{t}+\frac{r(Rt-z)^2}{2Rt}+\frac{\alpha R}{\beta t}\left[\left(e^{\beta(t-\mu)}-1\right)-\beta(t-\mu)\right]+SRt+\gamma\theta Rt \qquad (1)$$

By using a second order approximation of the exponential term $e^{\beta(t-\mu)}$ in TC (t), we get

$$TC(t)=\frac{crRt}{2(c+r)}+\frac{s}{t}+\frac{\alpha\beta Rt}{2}-\alpha R\mu\beta+\frac{\alpha\beta\mu^2 R}{2t}+SRt+\gamma\theta Rt \qquad (2)$$

and total cost in terms of 'q' is,

$$TC(q)=\frac{crq}{2(c+r)}+\frac{sR}{q}+\frac{\alpha\beta q}{2}-\alpha R\mu\beta+\frac{\alpha\beta\mu^2R^2}{2q}+Sq+\gamma\theta q \qquad (3)$$

where $z=\frac{rRt}{c+r}$ and $q=Rt$

Partially differentiating equation (2) with respect to t, we get

$$\frac{\partial TC}{\partial t}=\frac{crR}{2(c+r)}-\frac{s}{t^2}+\frac{\alpha\beta R}{2}-\frac{\alpha\beta\mu^2R}{2t^2}+SR+\gamma\theta R \qquad (4)$$

The optimum q^* and TC^* can be obtained by equating the first partial derivative w.r.t to 't' of TC to zero.

(i.e) $\frac{\partial TC}{\partial t}=0$ gives

Optimum period: $$t^*=\sqrt{\frac{(2s+\alpha\beta\mu^2R)\ (c+r)}{crR+\ \alpha\beta R(c+r)+2SR(c+r)+2\gamma\theta R(c+r)}} \qquad (5)$$

Optimal order quantity:

$$q^*\ =\ Rt^*=R\sqrt{\frac{(2s+\alpha\beta\mu^2R)\ (c+r)}{crR+\alpha\beta R(c+r)+2SR(c+r)\ +2\gamma\theta R(c+r)}}$$

$$\Rightarrow\quad q^*\ =\ \sqrt{\frac{(2Rs+\alpha\beta\mu^2R^2)\ (c+r)}{cr+\alpha\beta(c+r)+2S(c+r)\ +2\gamma\theta(c+r)}} \qquad (6)$$

Minimum total cost:

$$TC^*=\sqrt{(2Rs+\alpha\beta\mu^2R^2)\left[\frac{cr}{c+r}+\alpha\beta+2S\ +2\gamma\theta\right]}-\alpha\beta\mu R \qquad (7)$$

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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3.2 Proposed Inventory Model in Fuzzy Sense:

Here, we consider the model in fuzzy environment. Since the holding cost, set up cost and shortage cost are fuzzy in nature, we represent them by trapezoidal fuzzy numbers.

Let $\tilde{c}$: fuzzy carrying or holding cost per unit quantity per unit time
$\tilde{s}$: fuzzy set up or ordering cost per order
$\tilde{r}$: fuzzy shortage cost or stock out cost per unit quantity per unit time

Now we fuzzify the total cost given in (2), we have,

$$\tilde{TC}(t) = \frac{\tilde{c}z^2}{2Rt} + \frac{\tilde{s}}{t} + \frac{\tilde{r}(Rt-z)^2}{2Rt} + \frac{\alpha R}{\beta t}\left[\left(e^{\beta(t-\mu)} - 1\right) - \beta(t-\mu)\right] + SRt + \gamma\theta Rt \qquad (8)$$

By using a second order approximation of the exponential term $e^{\beta(t-\mu)}$ in $\tilde{TC}(t)$, we get

$$\tilde{TC}(t) = \frac{\tilde{c}\tilde{r}Rt}{2(\tilde{c}+\tilde{r})} + \frac{\tilde{s}}{t} + \frac{\alpha\beta Rt}{2} - \alpha R\mu\beta + \frac{\alpha\beta\mu^2 R}{2t} + SRt + \gamma\theta Rt \qquad (9)$$

and total cost in terms of 'q' is,

$$\tilde{TC}(q) = \frac{\tilde{c}\tilde{r}q}{2(\tilde{c}+\tilde{r})} + \frac{\tilde{s}R}{q} + \frac{\alpha\beta q}{2} - \alpha R\mu\beta + \frac{\alpha\beta\mu^2 R^2}{2q} + Sq + \gamma\theta q \qquad (10)$$

where $z = \frac{\tilde{r}Rt}{\tilde{c}+\tilde{r}}$ and $q = Rt$

Partially differentiate the equation (9) with respect to t, we get

$$\frac{\partial \tilde{TC}}{\partial t} = \frac{\tilde{c}\tilde{r}R}{2(\tilde{c}+\tilde{r})} - \frac{\tilde{s}}{t^2} + \frac{\alpha\beta R}{2} - \frac{\alpha\beta\mu^2 R}{2t^2} + SR + \gamma\theta R \qquad (11)$$

The optimum q^* and $\tilde{TC}^*$ can be obtained by equating the first partial derivative w.r.t to 't' of $\tilde{TC}$ to zero.

(i.e) $\frac{\partial \tilde{TC}}{\partial t} = 0$ gives

Optimum period: $$\tilde{t}* = \sqrt{\frac{(2\tilde{s} + \alpha\beta\mu^2 R)\ (\tilde{c}+\tilde{r})}{\tilde{c}\tilde{r}R + \alpha\beta R(\tilde{c}+\tilde{r}) + 2SR(\tilde{c}+\tilde{r}) + 2\gamma\theta R(\tilde{c}+\tilde{r})}} \qquad (12)$$

Optimal order quantity:

$$\tilde{q^*} = Rt* = R\sqrt{\frac{(2\tilde{s} + \alpha\beta\mu^2 R)\ (\tilde{c}+\tilde{r})}{\tilde{c}\tilde{r}R + \alpha\beta R(\tilde{c}+\tilde{r}) + 2SR(\tilde{c}+\tilde{r}) + 2\gamma\theta R(\tilde{c}+\tilde{r})}}$$

$$\Rightarrow \quad \tilde{q^*} = \sqrt{\frac{(2R\tilde{s} + \alpha\beta\mu^2 R^2)\ (\tilde{c}+\tilde{r})}{\tilde{c}\tilde{r} + \alpha\beta(\tilde{c}+\tilde{r}) + 2S(\tilde{c}+\tilde{r}) + 2\gamma\theta(\tilde{c}+\tilde{r})}} \qquad (13)$$

Minimum total cost:

$$\tilde{TC}* = \sqrt{(2R\tilde{s} + \alpha\beta\mu^2 R^2)\left[\frac{\tilde{c}\tilde{r}}{\tilde{c}+\tilde{r}} + \alpha\beta + 2S + 2\gamma\theta\right]} - \alpha\beta\mu R \qquad (14)$$

4. Numerical Example

4.1 Numerical Example in Crisp Sense

The annual demand of an item is 1000 units / year. Annual inventory holding cost is Rs. 20 per unit, set up cost is Rs. 30 per unit and shortage cost is Rs. 10 per unit / year. If there is

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Vol. 8 Issue 11(1), November 2018,
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

10 % defective items, then the duplicate cost for the defective items is Rs. 2 / unit and the screening cost is Rs. 5 / unit. Also, μ = 3 days, α = 10, β = 0.99. Optimum time, economic order quantity and total annual cost are determined.

Sol:

R = 1000 units / year
c = Rs. 20/ unit / year
r = Rs. 10 / unit / year
s = Rs. 30 / unit / year
θ = 10 %
S = Rs. 2 / unit
γ = Rs. 5 / unit
μ = 3 days
α = 10
β = 0.99

4.1.1 Optimum Time

$$t* = \sqrt{\frac{(2s+\alpha\beta\mu^2 R)\ (c+r)}{crR+\ \alpha\beta\, R(c+r)+2SR(c+r)+2\gamma\theta\, R(c+r)}}$$

t^* = 2.07 days

4.1.2 Economic order quantity

$$q^* = \sqrt{\frac{(2\,Rs+\alpha\beta\mu^2 R^2)\ (c+r)}{cr+\alpha\beta\,(c+r)+2\,S(c+r)\ +\ 2\gamma\theta\,(c+r)}}$$

= 203.94

4.1.3 Total annual cost:

$$TC* = \sqrt{(2\,Rs+\alpha\beta\mu^2 R^2)\left[\frac{cr}{c+r}+\alpha\beta+\ 2S\ +2\,\gamma\theta\right]}\ -\alpha\beta\mu\, R$$

= Rs. 1428.67

4.2 Numerical Example in Fuzzy Sense

Let

R = 1000 unit / year
$\tilde{c}$ = Rs. (16, 19, 21, 24) / unit / year
$\tilde{r}$ = Rs. (6, 9, 11, 14) / unit / year
$\tilde{s}$ = Rs. (26, 29, 31, 34) / unit / year
θ = 10 %
S = Rs. 2 / unit
γ = Rs. 5 / unit
μ = 3 days
α = 10
β = 0.99

4.2.1 Optimum Time

$$\tilde{t}* = \sqrt{\frac{(2\tilde{s}+\alpha\beta\mu^2 R)\ (\tilde{c}+\tilde{r})}{\tilde{c}\tilde{r}R+\alpha\beta R(\tilde{c}+\tilde{r})+\ 2SR(\tilde{c}+\tilde{r})+2\gamma\theta\, R(\tilde{c}+\tilde{r})}}$$

International Journal of Management, IT & Engineering
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= (1.48, 1.88, 2.21, 2.84)

Graded mean integration method

p ($\tilde{t}*$) = 2.08 days

4.2.2 Economic order quantity

$$q\tilde{*} = \sqrt{\frac{(2R\tilde{s}+\alpha\beta\mu^2R^2)(\tilde{c}+\tilde{r})}{\tilde{c}\tilde{r}+\alpha\beta(\tilde{c}+\tilde{r})+2S(\tilde{c}+\tilde{r})+2\gamma\theta(\tilde{c}+\tilde{r})}}$$

= (147.83, 188.35, 220.93, 283.73)

Graded mean integration method

p ($\tilde{q}*$) = 208.35

4.2.3 Minimum total annual cost:

$$T\tilde{C}* = \sqrt{(2R\tilde{s}+\alpha\beta\mu^2R^2)\left[\frac{\tilde{c}\tilde{r}}{\tilde{c}+\tilde{r}}+\alpha\beta+2S+2\gamma\theta\right]}-\alpha\beta\mu R$$

= (982.31, 1290.43, 1587.43, 2234.48)

Graded Mean Integration Method

p ($T\tilde{C}*$) = 1495.42

5. Sensitivity Analysis

Table 1

S.No	Demand (R)	For $\tilde{c}$ = Rs. (16, 19,21,24) $\tilde{r}$ = Rs.(6, 9, 11, 14) $\tilde{s}$ = Rs.(26, 29, 31, 34)			For $\tilde{c}$ = Rs. (16, 18,22,24) $\tilde{r}$ = Rs.(6, 9, 12, 14) $\tilde{s}$ = Rs.(26, 28, 32, 34)		
		$\tilde{t}^*$	$\tilde{q}^*$	$T\tilde{C}^*$	$\tilde{t}^*$	$\tilde{q}^*$	$T\tilde{C}^*$
1.	25	2.10	51.09	385.08	2.10	51.09	385.08
2.	50	2.09	101.51	755.22	2.09	101.51	755.22
3.	75	2.09	151.93	1125.32	2.09	151.93	1125.32
4.	100	2.08	208.35	1495.42	2.08	208.35	1495.42
5.	125	2.08	252.78	1865.51	2.08	252.78	1865.51
6.	150	2.08	303.17	2235.61	2.08	303.17	2235.61

6. Conclusion

In this paper, we develop an optimum time, optimal economic order quantity and optimum total annual inventory cost in the crisp sense as well as in the fuzzy sense. Carrying cost set up cost and shortage cost is taken as trapezoidal fuzzy numbers. Here we acquire the defective items in terms of percentage; screening and reworking costs are taken as constant and penalty cost is taken as an exponential function. This model is solved analytically by minimizing the total inventory cost. Finally, the proposed model has been verified by the numerical example along with the sensitivity analysis. In the future study, we will apply the fuzzy concept for all provisions in this predictable model.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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An application of TODIM for multi criteria decision making under Intuitionistic fuzzy environment

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Abstract
TODIM is a newly developed multi criteria decision making (MCDM) which consider the psychological behavior of the decision makers (DM's). Initially TODIM method is proposed to solve MCDM problems involving crisp numbers alone. In this paper, an extended TODIM method introduced to solve multi criteria decision making problem in a trapezoidal intuitionistic fuzzy environment where weights of both DM's and criteria are not known. First, the classical TODIM was discussed and then from the view of similarity degree, we can obtain the weight of the evaluation value given by the decision maker. The procedure for MCGDM problem with trapezoidal intuitionistic fuzzy numbers is explained. Finally, an example is illustrated to prove the effectiveness of the proposed method.
Key words: TODIM, Multi Criteria Group Decision Making (MCGDM), Intuitionistic Trapezoidal Fuzzy Numbers (ITFN)

1. Introduction

MCDM is widely used to make an optimal choice from alternatives based on several criteria. In real life situation it is impossible to express all the numbers in terms of crisp values. So fuzzy set theory came into existence. Zadeh [9] in 1965 introduced the concept of fuzzy sets. Attanssov [1] in 1986 extend the concept of fuzzy set of intuitionistic fuzzy sets. Later Attanssov and Gargov [2] introduced the concept of interval- valued intuitionistic fuzzy set. Zhang and Liu [10] used triangular fuzzy number to denote the membership and the non-membership degree. Also, they proposed the weighted arithmetic averaging operator and the approach to multi criteria group decision making with triangular intuitionistic fuzzy information was developed. Wang [7] gave the concept of intuitionistic trapezoidal fuzzy number and interval valued trapezoidal fuzzy numbers. Wang and Zhang [7] developed Hamming distance of intuitionistic trapezoidal fuzzy numbers, intuitionistic trapezoidal fuzzy weighted arithmetic averaging operator (ITFWAA), and intuitionistic trapezoidal fuzzy weighted geometric averaging operator (ITFWGA).

Several multi criteria decision making methods are proposed so far, one such is TODIM method. It was proposed by Gomes and Lima [3] with discrete data. Later it was extended by Fan et al [4] to the fuzzy environment. Krohling et al [5] presented the extension of TODIM to the interval valued intuitionistic fuzzy environment. Due to some complexity and the uncertainty, it is impossible to consider all the aspects of the problem. Therefore, the DM's provide us their knowledge and preference. It may be a bias one. In order to overcome this, a specific and considerable weight must be assigned to each DM's. Also, however, in a fuzzy environment, time, pressure, lack of data and limited information

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

DM's cannot provide a weight for each criteria. Quande Qin [6] proposed the TODIM based multi criteria decision making with triangular intuitionistic fuzzy numbers in which they have developed the model for assigning the weight vector of DM's for each alternative with respect to each criterion.

This paper is organized as follows: section 2, basic concepts of fuzzy set, intuitionistic trapezoidal fuzzy numbers and the operations on trapezoidal numbers were discussed. In section 3, the TODIM method and the extension of TODIM was discussed. Finally a numerical example was discussed.

2. Preliminaries

Definition 2.1: Let $\tilde{a}$ be an intuitionistic trapezoidal fuzzy number, its membership is given by

$$\mu_{\tilde{a}}(x)=\begin{cases}\frac{x-a}{b-a}\,\mu_{\tilde{a}}, & a\le x<b\\ \mu_{\tilde{a}}, & b\le x\le c\\ \frac{d-x}{d-c}\,\mu_{\tilde{a}}, & c<x\le d\\ 0, & Others\end{cases} \quad (1)$$

and its non-membership is given by

$$\gamma_{\tilde{a}}(x)=\begin{cases}\frac{b-x+(x-a_1)\gamma_{\tilde{a}}}{b-a_1}\,\mu_{\tilde{a}}, & a_1\le x<b\\ \gamma_{\tilde{a}}, & b\le x\le c\\ \frac{x-c+\gamma_{\tilde{a}}(d_1-x)}{d-c}\,\mu_{\tilde{a}}, & c<x\le d_1\\ 0, & Others\end{cases} \quad (2)$$

where $0\le \mu_{\tilde{a}}\le 1, 0\le \gamma_{\tilde{a}}\le 1$ and $\mu_{\tilde{a}}+\gamma_{\tilde{a}}\le 1, a,b,c,d\in R$.

Then $\tilde{a}=<([a,b,c,d],\mu_{\tilde{a}})[a_1,b,c,d_1],\gamma_{\tilde{a}})>$ is called a intuitionistic trapezoidal fuzzy number.

For convenience let $\tilde{a}=([a,b,c,d];\mu_{\tilde{a}},\gamma_{\tilde{a}})$

Definition 2.2: Let $\tilde{a}_1=([a_1,b_1,c_1,d_1];\mu_{\tilde{a}_1},\gamma_{\tilde{a}_1})$

$\tilde{a}_2=([a_2,b_2,c_2,d_2];\mu_{\tilde{a}_2},\gamma_{\tilde{a}_2})$ be two intuitionistic trapezoidal fuzzy numbers and λ>0, then

1. $\tilde{a}_1+\tilde{a}_2=([a_1+a_2,b_1+b_2,c_1+c_2,d_1+d_2];\ \mu_{\tilde{a}_1}+\mu_{\tilde{a}_2}-\mu_{\tilde{a}_1}.\mu_{\tilde{a}_2},\gamma_{\tilde{a}_1}.\gamma_{\tilde{a}_2})$
2. $\tilde{a}_1.\tilde{a}_2=\left([a_1.a_2,b_1.b_2,c_1.c_2,d_1.d_2];\ \mu_{\tilde{a}_1}.\mu_{\tilde{a}_2},\gamma_{\tilde{a}_1}+\gamma_{\tilde{a}_2}-\gamma_{\tilde{a}_1}.\gamma_{\tilde{a}_2}\right)$
3. $\lambda\tilde{a}_1=([\lambda\tilde{a}_1,\lambda\tilde{b}_1,\lambda\tilde{c}_1,\lambda\tilde{d}_1];\ 1-(1-\mu_{\tilde{a}_1})^{\lambda},\gamma_{\tilde{a}_1}{}^{\lambda})$
4. $\tilde{a}_1{}^{\lambda}=([\tilde{a}_1{}^{\lambda},\tilde{b}_1{}^{\lambda},\tilde{c}_1{}^{\lambda},\tilde{d}_1{}^{\lambda}],\mu_{\tilde{a}_1}{}^{\lambda},1-(1-\gamma_{\tilde{a}_1})^{\lambda})$

Definition 2.3: Let $\tilde{a}_1=([a_1,b_1,c_1,d_1];\mu_{\tilde{a}_1},\gamma_{\tilde{a}_1})$ and

$\tilde{a}_2=([a_2,b_2,c_2,d_2];\mu_{\tilde{a}_2},\gamma_{\tilde{a}_2})$ be two intuitionistic trapezoidal fuzzy numbers, then the normalized Hamming distance between $\tilde{a}_1$ and $\tilde{a}_2$ is defined as follows:

$$\begin{aligned}d(\tilde{a}_1,\tilde{a}_2)=\ & \frac{1}{8}\left(\left|\left(1+\mu_{\tilde{a}_1}-\gamma_{\tilde{a}_1}\right)a_1\right|-\left|\left(1+\mu_{\tilde{a}_2}-\gamma_{\tilde{a}_2}\right)a_2\right|\right.\\ &+\left|\left(1+\mu_{\tilde{a}_1}-\gamma_{\tilde{a}_1}\right)b_1\right|-\left|\left(1+\mu_{\tilde{a}_2}-\gamma_{\tilde{a}_2}\right)b_2\right| \quad (3)\\ &\left.+\left|\left(1+\mu_{\tilde{a}_1}-\gamma_{\tilde{a}_1}\right)c_1\right|-\left|\left(1+\mu_{\tilde{a}_2}-\gamma_{\tilde{a}_2}\right)c_2\right|\right)\end{aligned}$$

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

$$+\left|\left(1+\mu_{\tilde{a}_1}-\gamma_{\tilde{a}_1}\right)d_1\right|-\left|\left(1+\mu_{\tilde{a}_2}-\gamma_{\tilde{a}_2}\right)d_2\right|)$$

Definition 2.4 Let $\tilde{\alpha}_j=([a_j,b_j,c_j,d_j];\mu_{\tilde{a}_j},\gamma_{\tilde{a}_j})$ be ITFN set and $w=\{w_1,w_2,\dots\dots w_n\}^T$ be the weight vector of $\tilde{\alpha}_j$ satisfying $w_j\in[0,1]$ and $\sum_{j=1}^{n}w_j=1$, the weighted arithmetic interaction averaging operator of ITFN (ITFN-WAIA) can be defined as follows:

ITFN-WAIA$_w(\tilde{\alpha}_1,\tilde{\alpha}_2,\dots\dots\tilde{\alpha}_n)=\sum_{j=1}^{n}w_j\,\tilde{\alpha}_j$

When $w=(\frac{1}{n},\frac{1}{n},\dots\dots\frac{1}{n})^T$, ITFN-WAIA$_w(\tilde{\alpha}_1,\tilde{\alpha}_2,\dots\dots\tilde{\alpha}_n)=\frac{1}{n}\sum_{j=1}^{n}\tilde{\alpha}_j$ (4)

Definition 2.5 Let $\tilde{\alpha}_j=([a_j,b_j,c_j,d_j];\mu_{\tilde{a}_j},\gamma_{\tilde{a}_j})$ (j=1,2,…..n) be a collection of ITFNs, and let ITFWAA: $Q^n\to Q$, if

ITFWAA$\omega(\tilde{\alpha}_1,\tilde{\alpha}_2,\dots\dots\tilde{\alpha}_n)$=

(5)

$$\sum_{j=1}^{n}w_j\,\tilde{\alpha}_j=([\sum_{j=1}^{n}w_j\,a_j,\sum_{j=1}^{n}w_j\,b_j,\sum_{j=1}^{n}w_j\,c_j,\sum_{j=1}^{n}w_j\,d_j];1-\prod_{j=1}^{n}(1-\mu_{\tilde{a}_j})^{\omega_j},\prod_{j=1}^{n}(\gamma_{\tilde{a}_j})^{\omega_j})$$

where $\omega=(\omega_1,\omega_2,\dots\dots\omega_n)^T$ be the weight vector of $\tilde{\alpha}_j$ (j=1,2,…n) and $w_j>0,\sum_{j=1}^{n}w_j=1$, then ITFWAA is called the intuitionistic trapezoidal fuzzy arithmetic averaging operator (ITFWAA).

3. TODIM

TODIM is a discrete multi criteria method which processes the dominance degree of each alternative over others by establishing a multi criteria value based function based on the prospect theory. The ranking of alternatives can be obtained by taking the acquired dominance degree in to account. The steps of TODIM are as follows:

Step 1: Define the decision matrix$R=\{r_{ij}\}_{mxn}$ where r_{ij} are crisp numbers $i\in m,j\in n$.

Step 2: Calculate the relative weight w_{jr} of criterion c_j divided by the reference criterion c_r according to the expression $w_{jr}=\frac{w_j}{w_r}$, $j,r\in$ N, where $w_r=\max\{w_j;j\in N\}$.

Step 3: Calculate the dominance of each alternative A_i over each alternative A_k using the following expression:

$$\delta(A_i,A_k)=\sum_{j=1}^{n}\varphi_j(A_i,A_k) \qquad (6)$$

where

$$\varphi_j(A_i,A_k)=\begin{cases}\sqrt{\frac{w_{jr}}{\sum_{j=1}^{n}w_{jr}}.(r_{ij}-r_{kj})} & if\ (r_{ij}-r_{kj})>0\\ 0 & if\ (r_{ij}-r_{kj})=0\\ \frac{-1}{\theta}\sqrt{\frac{w_{jr}}{\sum_{j=1}^{n}w_{jr}}.(r_{ij}-r_{kj})} & if\ (r_{ij}-r_{kj})<0\end{cases}$$

(7)

The parameter θ denotes the attenuation factor of the losses, which can be changed accordingly.

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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

If $(r_{ij} - r_{kj}) > 0$ it represents a gain, $if\ (r_{ij} - r_{kj}) = 0$ it is nil, $if\ (r_{ij} - r_{kj}) < 0$, it represents a loss. The final matrix of dominance is obtained by summing up the partial matrices of dominance for each criterion.

Step 4: The overall prospect value of alternative A_i can be calculated by using the following normalization expression:

$$\xi_j = \frac{\sum_{k=1}^{m} \delta(A_i, A_k) - \min_{i \epsilon M}\{\sum_{k=1}^{m} \delta(A_i, A_k)\}}{\max_{i \epsilon M} \sum_{k=1}^{m} \delta(A_i, A_k) - \min_{i \epsilon M}\{\sum_{k=1}^{m} \delta(A_i, A_k)\}}$$

(8)

Where M={1,2,……m}, and N={1,2,…….n}.

Step 5: According to the global value ξ_j of the alternative A_i, sort the alternatives and select the most desirable one(s).

3.1: Determination of DM weights and criterion weights

In most of the multi criteria decision making problems, the weights of decision makers and criteria are not clearly defined. Some cases they assigned equally. But in practical, DM's may not be knowledgeable about all the criteria. In order to overcome this practical inconvenience, Q.Qin et al [6] in 2017 proposed the method for the determination of DM weights and criterion weights.

The method is as follows:

Suppose $\tilde{a}_{ij}^{k}$ (i=1,2,…..m; j=1,2,….n) is the evaluation values for alternative A_i with respect to criterion C_j provided by p DM's as $\tilde{a}'_{ij} == ([a_j, b_j, c_j, d_j]; \mu_{\tilde{a}_j}, \gamma_{\tilde{a}_j})$ It can be calculated by using the ITFN-WAIA operator in definition 2.4.

The degree of similarity between $\tilde{a}_{ij}^{k}(i = 1,2, \ldots..m; j = 1,2, \ldots \ldots n)$ and the mean value $\tilde{a}'_{ij} = ([a_j, b_j, c_j, d_j]; \mu_{\tilde{a}_j}, \gamma_{\tilde{a}_j})$ is defined as s$(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij})$;

$$s(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij}) = 1 - \frac{d\left(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij}\right)}{\sum_{k=1}^{p} d\left(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij}\right)}, (k = 1,2, \ldots..p; i = 1,2, \ldots..m; j = 1,2, \ldots \ldots n)$$

(9)

Where $d\left(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij}\right)$ represents the distance between $\tilde{a}_{ij}^{k}$ and $\tilde{a}'_{ij}$.

Then, the weight for DM D_k for the weight for alternative A_i with respect to the criterion C_j is defined as

$$\lambda_{ij}^{k} = \frac{s(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij})}{\sum_{k=1}^{p} s(\tilde{a}_{ij}^{k}, \tilde{a}'_{ij})}, (k = 1,2, \ldots..p; i = 1,2, \ldots..m; j = 1,2, \ldots \ldots n)$$

(10)

Aggregating the individual decision matrix $A^k = [\tilde{a}_{ij}^{k}]_{mxn}$ in to the group decision matrix $G = [\tilde{g}_{ij}]_{mxn}$ by using definition 2.5

To determine the criterion weights for the collective decision matrix $G = [\tilde{g}_{ij}]_{mxn}$, we denote the mean of evaluating under criterion C_j as $\tilde{g}'_{ij} = ([a_j, b_j, c_j, d_j]; \mu_{\tilde{a}_j}, \gamma_{\tilde{a}_j})$ which can be calculated by utilizing the ITFN-WAIA

Then, we can obtain the weight for the criterion C_j:

$$w_j = \frac{\sum_{i=1}^{m} d\left(\tilde{g}_{ij}, \tilde{g}'_{ij}\right)}{\sum_{j=1}^{n} \sum_{i=1}^{m} d\left(\tilde{g}_{ij}, \tilde{g}'_{ij}\right)}$$

(11)

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Where $d(\tilde{g}_{ij}, \tilde{g}'_{ij})$ denotes the distance between collective evaluation value $\tilde{g}_{ij}$ and the mean value $\tilde{g}'_{ij}$.

3.2: TODIM method for MCGDM with ITFNs

The steps involved in TODIM method for solving multi criteria group decision making with intuitionistic trapezoidal fuzzy numbers are as follows:

Step 1: Define the decision matrix $R^k = [\tilde{r}_{ij}^k]_{mxn}$ where r_{ij} are crisp numbers $i \in m, j \in n$.

Step 2: Obtain the weight vector $\lambda_{ij}^k = \{\lambda_{ij}^1, \lambda_{ij}^2, \ldots\ldots\ldots \lambda_{ij}^p\}$ of DM D_k for alternative A_i with respect to the criterion C_j using equations (9)-(10).

Step 3: Aggregate the individual decision matrix $R_k = \{\tilde{r}_{ij}^k\}_{mxn}$ in to group decision matrix $G = [\tilde{g}_{ij}]_{mxn}$ using equation (5)

Step 4: Determine the criterion weight $w=(w_1, w_2, \ldots\ldots w_n)$ using (10)-(11).

Step 5: Calculate the relative weight w_{jr} of criterion C_j to the reference criterion C_r which is expressed as

$$w_{jr} = \frac{w_j}{w_r} \qquad \text{where} \qquad w_r = \max\{\frac{w_j}{j} = 1,2, \ldots . n\}. \tag{12}$$

Step 6: On the basis of the classical TODIM method, the dominance of each alternative A_i over each alternative A_k under the criterion C_j can be obtained by

$$\varphi_j(A_i, A_k) = \begin{cases} \sqrt{\frac{w_{jr}}{\sum_{j=1}^n w_{jr}} . d(\tilde{g}_{ij}, \tilde{g}'_{ij})} & if\ (\tilde{g}_{ij} > \tilde{g}'_{ij}) \\ & if\ (\tilde{g}_{ij} = \tilde{g}'_{ij}) \\ \frac{-1}{\theta}\sqrt{\frac{w_{jr}}{\sum_{j=1}^n w_{jr}} . d(\tilde{g}_{ij}, \tilde{g}'_{ij})} & if\ \ (\tilde{g}_{ij} < \tilde{g}'_{ij}) \end{cases} \tag{13}$$

Step 7: The dominance degree matrix with respect to the criterion C_j can be constructed as

$$\varphi_j = [\varphi_{ik}^j]_{mxn} = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccccc} A_1 & A_2 & \ldots & \ldots & A_m \end{array} \\ \begin{pmatrix} \varphi_{11}^j & \varphi_{12}^j & \cdots & \cdots & \varphi_{1m}^j \\ \varphi_{21}^j & \varphi_{22}^j & \vdots & \cdots & \varphi_{2m}^j \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \ddots & \ddots & \vdots & \vdots \\ \varphi_{m1}^j & \varphi_{m2}^j & & & \varphi_{mn}^j \end{pmatrix} \end{array} \tag{14}$$

Where $\varphi_{ii}^j = 0$, k=1,2,…..m; j=1,2,…..n.

Step 8: The global dominance degree of each alternative A_i over each alternative A_k by

$$\delta(A_i, A_k) = \sum_{j=1}^n \varphi_j(A_i, A_k) \tag{15}$$

Step 9: By normalizing the global dominance degree matrix, we can obtain the global value for the alternative i according to the following expression:

$$\xi_j = \frac{\sum_{k=1}^m \delta(A_i, A_k) - \min_{i \epsilon M}\{\sum_{k=1}^m \delta(A_i, A_k)\}}{\max_{i \epsilon M} \sum_{k=1}^m \delta(A_i, A_k) - \min_{i \epsilon M}\{\sum_{k=1}^m \delta(A_i, A_k)\}} \tag{16}$$

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Step 10: Rank the alternatives and select the best one. The higher the value ξ_j, the better the alternative A_i.

4. Example

Let us suppose there is a risk investment company which wants to invest a sum of money in the best option. There is a panel with five possible alternatives to invest the money. The risk investment company must take a decision according to the following 4 attributes or criteria:

- Risk analysis
- Growth analysis
- Socio-political impact analysis
- Environment impact analysis

The five possible alternatives A_i (i=1,2,3,4,5) to be evaluated using the intuitionistic trapezoidal fuzzy numbers by three decision makers.

The procedure and computation results using extended TODIM method are summarized below:

Step 1: The decision matrices provided by three DM's are listed in tables 1-3.

Step 2: The DM weight vector of DM D_k for alternative A_i with respect to the criterion C_j can be calculated using eqs. (9) and (10) and listed in tables 4-6

Table 1: The ITFN decision matrix by DM D_1

	C_1	C_2	C_3	C_4
A_1	((0.5,0.6,0.7,0.8);0.5,0.4)	((0.1,0.2,0.3,0.4);0.6,0.3)	((0.5,0.6,0.8,0.9);0.3,0.6)	((0.4,0.5,0.6,0.7);0.2,0.7)
A_2	((0.6,0.7,0.8,0.9);0.7,0.3)	((0.5,0.6,0.7,0.8);0.7,0.2)	((0.4,0.5,0.7,0.8);0.7,0.2)	((0.5,0.6,0.7,0.9);0.4,0.5)
A_3	((0.1,0.2,0.4,0.5);0.6,0.4)	((0.2,0.3,0.5,0.6);0.5,0.4)	((0.5,0.6,0.7,0.8);0.5,0.3)	((0.3,0.5,0.7,0.9);0.2,0.3)
A_4	((0.3,0.4,0.5,0.6);0.8,0.1)	((0.1,0.3,0.4,0.5);0.6,0.3)	((0.1,0.3,0.5,0.7);0.3,0.4)	((0.6,0.7,0.8,0.9);0.2,0.6)
A_5	((0.2,0.3,0.4,0.5);0.6,0.2)	((0.3,0.4,0.5,0.6);0.4,0.3)	((0.2,0.3,0.4,0.5);0.7,0.1)	((0.5,0.6,0.7,0.8);0.1,0.3)

Table 2: The ITFN decision matrix by DM D_2

	C_1	C_2	C_3	C_4
A_1	((0.4,0.5,0.6,0.7);0.4,0.3)	((0.1,0.2,0.3,0.4);0.5,0.2)	((0.4,0.5,0.7,0.8);0.2,0.5)	((0.3,0.4,0.5,0.6);0.1,0.6)
A_2	((0.5,0.6,0.7,0.8);0.6,0.2)	((0.4,0.5,0.6,0.7);0.6,0.1)	((0.3,0.4,0.6,0.7);0.6,0.1)	((0.4,0.5,0.6,0.8);0.3,0.4)
A_3	((0.1,0.2,0.3,0.4);0.5,0.3)	((0.1,0.2,0.4,0.5);0.4,0.3)	((0.4,0.5,0.6,0.7);0.4,0.2)	((0.2,0.4,0.6,0.8);0.5,0.2)
A_4	((0.2,0.3,0.4,0.5);0.7,0.1)	((0.1,0.2,0.3,0.5);0.5,0.2)	((0.1,0.2,0.4,0.6);0.2,0.3)	((0.5,0.6,0.7,0.8);0.1,0.5)
A_5	((0.1,0.2,0.3,0.4);0.5,0.1)	((0.2,0.3,0.4,0.5);0.3,0.2)	((0.1,0.2,0.3,0.4);0.6,0.2)	((0.4,0.5,0.6,0.7);0.4,0.2)

Table 3: The ITFN decision matrix by DM D_3

	C_1	C_2	C_3	C_4
A_1	((0.6,0.7,0.8,0.9);0.4,0.5)	((0.2,0.3,0.4,0.5);0.5,0.4)	((0.6,0.7,0.9,1);0.2,0.7)	((0.5,0.6,0.7,0.8);0.1,0.8)
A_2	((0.7,0.8,0.9,1);0.6,0.4)	((0.6,0.7,0.8,0.9);0.6,0.3)	((0.5,0.6,0.8,0.9);0.6,0.3)	((0.6,0.7,0.8,1);0.3,0.6)
A_3	((0.2,0.3,0.5,0.6);0.5,0.5)	((0.3,0.4,0.6,0.7);0.4,0.5)	((0.6,0.7,0.8,0.9);0.4,0.4)	((0.4,0.6,0.8,1);0.5,0.4)
A_4	((0.4,0.5,0.6,0.7);0.7,0.2)	((0.2,0.4,0.5,0.6);0.5,0.4)	((0.2,0.4,0.6,0.8);0.2,0.5)	((0.7,0.8,0.9,1);0.1,0.7)
A_5	((0.3,0.4,0.5,0.6);0.5,0.3)	((0.4,0.5,0.6,0.7);0.3,0.4)	((0.3,0.4,0.5,0.6);0.6,0.2)	((0.6,0.7,0.8,0.9);0.4,0.4)

Step 3: Aggregate the individual decision matrices $R_k = \{\tilde{r}_{ij}^k\}_{mxn}$ in to group decision matrix G= $[\tilde{g}_{ij}]_{mxn}$ using equation (5) and are listed in table 5.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Step 4: The criterion weight vector can be determined using equation (11), $w = (0.273, 0.243, 0.264, 0.220)$

Step 5: Calculate the relative weight w_{jr} of criterion C_j to the reference criterion C_r, $w_{jr} = (1, 0.888, 0.967, 0.808)$

Step 6: The dominance of each alternative A_i over each alternative A_k under the criterion C_j can be obtained by equation (13) where θ is assumed to be 1 which are listed in table (8)-(11).

Table 4 :The weight matrix of DM D_1 for alternative A_i with respect to the criterion C_j

	C_1	C_2	C_3	C_4
A_1	0.370	0.301	0.365	0.368
A_2	0.377	0.395	0.396	0.366
A_3	0.344	0.372	0.378	0.235
A_4	0.471	0.349	0.363	0.365
A_5	0.414	0.380	0.480	0.228

Table 5 :The weight matrix of DM D_2 for alternative A_i with respect to the criterion C_j

	C_1	C_2	C_3	C_4
A_1	0.290	0.301	0.323	0.328
A_2	0.269	0.210	0.196	0.309
A_3	0.257	0.244	0.271	0.334
A_4	0.107	0.245	0.286	0.331
A_5	0.149	0.240	0.120	0.348

Table 6 :The weight matrix of DM D_3 for alternative A_i with respect to the criterion C_j

	C_1	C_2	C_3	C_4
A_1	0.341	0.399	0.312	0.304
A_2	0.354	0.395	0.409	0.325
A_3	0.400	0.384	0.351	0.432
A_4	0.422	0.406	0.351	0.304
A_5	0.438	0.380	0.399	0.425

Table 7: Group Decision Matrix

	C_1	C_2
A_1	((0.5050,0.6050,0.7050,0.8051);0.4391,0.3971)	((0.1398,0.2399,0.3399,0.4399);0.5324,0.2978)
A_2	((0.6085,0.7085,0.8085,0.9085);0.6411,0.2978)	((0.5185,0.6185,0.7185,0.8185);0.6429,0.2029)
A_3	((0.1399,0.2399,0.4143,0.5143);0.5369,0.4062)	((0.2139,0.3139,0.5139,0.6139);0.4393,0.4069)
A_4	((0.3315,0.4315,0.5315,0.6315);0.7521,0.1339)	((0.1406,0.3169,0.4169,0.5406);0.5374,0.3053)
A_5	((0.2288,0.3288,0.4288,0.5288);0.5441,0.2154)	((0.3139,0.4139,0.5139,0.6139);0.3398,0.3035)

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

	C_3	C_4
A_1	((0.4988,0.5988,0.7988,0.8988);0.2380,0.5934)	((0.3975,0.4975,0.5975,0.6976);0.1381,0.6930)
A_2	((0.4213,0.5213,0.7213,0.8213);0.6430,0.2061)	((0.5015,0.6015,0.7016,0.9016);0.3384,0.4952)
A_3	((0.5080,0.6080,0.7080,0.8080);0.4399,0.2973)	((0.3098,0.5098,0.7098,0.9098);0.4417,0.2967)
A_4	((0.1351,0.3065,0.5065,0.7066);0.2378,0.3985)	((0.5973,0.6972,0.7972,0.8972);0.1378,0.5919)
A_5	((0.2279,0.3279,0.4279,0.5279);0.6516,0.1433)	((0.5077,0.6077,0.7077,0.8077);0.3419,0.2944)

Table 8 : Dominance degree matrix φ_1 with respect to the criterion C_1

φ_1	A_1	A_2	A_3	A_4	A_5
A_1	0	-0.322	-0.299	-0.092	-0.171
A_2	0.088	0	0.17	-0.229	0.135
A_3	0.082	-0.621	0	-0.392	-0.128
A_4	0.025	0.063	0.107	0	0.072
A_5	0.047	-0.493	0.035	-0.264	0

Table 9 : Dominance degree matrix φ_2 with respect to the criterion C_2

φ_1	A_1	A_2	A_3	A_4	A_5
A	0	-0.61	0.017	0.019	0.03
A	0.149	0	0.132	0.13	0.119
A	-0.07	-0.54	0	-0.04	-0.05
A	0.019	-0.54	0.01	0	0.015
A	-0.12	-0.49	0.013	-0.06	0

Table 10 : Dominance degree matrix φ_3 with respect to the criterion C_3

φ_1	A_1	A_2	A_3	A_4	A_5
A	0	-0.43	-0.293	0.028	-0.117
A	0.114	0	0.036	0.14	-0.083
A	0.077	-0.137	0	0.104	-0.177
A	0.028	-0.531	-0.394	0	-0.216
A	0.031	-0.314	0.047	0.057	0

Table 11 : Dominance degree matrix φ_4 with respect to the criterion C_4

φ_1	A_1	A_2	A_3	A_4	A_5
A	0	-0.35	-0.48	0.039	-0.47
A	0.077	0	-0.17	0.038	-0.13
A	0.107	0.038	0	0.068	0.029
A	-0.17	-0.17	-0.31	0	-0.3
A	0.105	0.028	-0.13	0.066	0

Step 7: Using equation (15) the global dominance degree of each alternative A_i over each alternative A_k and are listed in table 12

Step 8: The global value for alternative A_i can be obtained according to equation (16) as follows:

$\xi_1 = 0, \xi_2 = 1, \xi_3 = 0.438, \xi_4 = 0.288, \xi_5 = 0.488$

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Step 9: Rank the alternatives in accordance with global value we get $A_5>A_1>A_3>A_4>A_2$. Therefore, A_5 is the best alternative.

Table 12 : Global dominance degree matrix

φ_1	A_1	A_2	A_3	A_4	A_5
A	0	-1.714	-1.059	-0.007	-0.733
A	0.427	0	0.165	0.079	0.045
A	0.195	-1.263	0	-0.261	-0.331
A	-0.102	-1.177	-0.586	0	-0.429
A	0.057	-1.269	-0.038	-0.202	0

Table 13: Ranking of alternatives with different values of ɵ

δ	$\theta = 1$		$\theta = 1.5$		$\theta = 2$		$\theta = 2.5$	
	ξ	Ranking	ξ	Ranking	ξ	Ranking	ξ	Ranking
A_1	0	5	0	5	0	5	0	5
A_2	1	1	1	1	1	1	1	1
A_3	0.438	3	0.382	3	0.371	3	0.362	3
A_4	0.288	4	0.26	4	0.249	4	0.241	4
A_5	0.488	2	0.46	2	0.435	2	0.415	2

5. Conclusion

In this paper, TODIM method is extended to multi criteria group decision making problem under an intuitionistic trapezoidal fuzzy numbers in which the weight of criteria and DM's are not known. Based on the arithmetic operations on ITFNs and the distance between them, a novel approach to find the weights of criteria and the DM's were discussed. With the help of classical TODIM, we extend it to ITFNs by finding the dominance degree of each alternative, the global value of each alternative and finally rankings are assigned accordingly. To prove the effectiveness of the proposed method a real life risk investment company problem was discussed.

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International Journal of Management, IT & Engineering
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Impact of internet using college student

Shweta Sharma*

Abstract
The trend among teenagers was once spread through television or radio, is now living in an era where all information is available on the Internet makes the Internet a forum for distributing trend, many trend created by young people for the world's attention. The internet is the easiest to meet the needs in finding the information we want, news and a variety of necessary information can be found on the internet. **Objective:** To Study the various impact of internet using student of Patna College Patna. **Method**: The study was conducted at Patna college students based on primary data. The total sample size was 50 respondents were selected for the study by using simple random sampling method: **Results:** The results show that internet impact factors that influence the SNWs usage by Students. Being online helped them to get updated information of the current events, news, and different marketing offerings.
Keyword: *Internet, Social Media, Websites, Information, Students*

Introduction

The Internet has connected with society's, communication skills, languages, beliefs, behaviors, values in the society and its culture in a daily life communication and now creating relationships on the internet. Groups on social media are just an example of social interactions. The Internet is also developing a different cultures globally in the societies and internet added values in the people's life and the way we introduce each other and communicate for shared life, career and business values. The Internet removes the geographical barriers between people. Societies are getting inspired by each other and the biggest positives that slowly but definitely societies breaking the Superstition, conservatism and cultural egos.

Positive Effects

Internet search engines are the best information retrieval systems available. They bring any kind of information for internet users, from local restaurants to international news.

- The Internet provides some of the most effective means of communication among people, including online emailing and instant messaging.
- The Internet makes possible for business and companies to do transactions with their clients and customers.
- Thanks to the internet, people can take action and avoid adverse circumstances. For instance, hurricane, storms and accidents can be tracked through the internet.
- The internet has allowed the interchange of ideas and materials among scientists, university professors, and students, in addition to provide servers, resource centers and online tools for their research and scholar activities. Moreover, million of books, journals and other material are available through the internet because of the digitization of public domains material from libraries in the States and Europe. This action enables people to learn all new sort of thing

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Negatives Effects

- Illegal or inappropriate materials can be found in the internet.
- Some people in recent years have illegally downloaded music or other copyrighted material for free. This action has had a negative impact on the music industry and has led to several lawsuits.
- The addiction to online social networks can disturb a person's way of living and professional activity.
- Some criminals use the internet for spreading computer viruses or even intercepting credit card or bank details for spurious purposes

Practically Internet is building more powerful societies around the world. This is the biggest positive when it's about awareness and unity. But at the same time, the power of the internet is misused by the groups, communities, companies. And people are concerned about the privacy of their uses and this biggest negative impact of the internet on society. Globally connected online people are now more than a society. You can call it robotic society. Internet affects society as soon as it tries to meet the personal and business desires unethically. Society is influenced by educational resources, social media websites, web application, shopping sites, online business, internet marketing, research and automation of social skills positively and negatively. That's why the excessive use of informational resources on the internet without the basic knowledge of the best method to use technologies making societies physically and mentally unfit. That's the biggest negative impact of the internet on our society and especially for a new generation. Internet impact on society is now making economic, social, and political changes around the globe.

Rational of the study

Everyone wants to get out from the internet to able to spend some time with families, friends, and relatives with their moments. But most the of people are addicted to the internet. And it's losing the connection and bond of having a family, friends, and relatives. Without the practical internet and computer knowledge, it's tough to get even a computer operator job after an MCA degree. That's why schools around the world teaching students computer and internet skills. Even they are using the computer and the internet to teach.

Review of Literature

Social media sites have become common, giving people new ways to interact with each other and communicate with the world. Social networking became popular between 2004 and 2006, after facebook and myspace were created. Facebook, for example, has more than 500 million members and is still growing and about 85% of students who use facebook, figures are expected to grow because facebook users will continue to grow.

A study of S.L. Faisalv (2009) indicated that the emergence of online social networks and its expanding user base should not be ignored by academics. These are powerful tools; academics can use to cope up with the expectation of the students of new generation. As proposed by Mazman and Usluel (2009) an active participation of students is invited by the new education style, since technological development has given rise to new needs and expectations of students'. This need could be satisfied by the involvement of social networking websites

An explanatory study of Indian university students' use of social networking websites carried out by Shailja and Monica (2009) implies that Indian students are using SNWs for not only leisure and entertainment but for some meaningful and serious deliberations. The study also suggests that females are more cautious as far as internet usage is concerned and

future professionals will be active users of SNWs for their development. The study also indicates that in this global environment the virtual organization has to take note of the adaptability of students to this virtual social world and especially professional world. This also will help a smooth cross culture adoption process.

Objective of the Study

- To study the impact of internet using of college students.
- To identify influence of social networking site on knowledge upgradation and information flow among students

Method

Population: The study was conducted students of Patna College, Patna

Sampling: The simple random sampling method was used.

Sample Size: The sample size of 50 is taken for the purpose of research.

The sample and sampling techniques Random sampling or sampling probability sampling method is something that provides the same opportunity or opportunities to be taken to every element population.

This research uses descriptive quantitative research, data obtained from a population sample is analyzed according to the statistical methods used then interpreted Qualitative research was also described as a model that goes that occur in natural settings that allow researchers to develop the level of detail from high involvement in the actual experience

In this descriptive Research design a structured questionnaire has been used as the data collection instrument from a convenience sample of students of age ranging from 19 to 23. Technique used for analyzing first three objectives is frequency distribution and analysis of close & open ended questions.

Discussion & Findings

The data analysis shows that awareness for the social networking websites is utmost i.e. 96% and out of which 90% are the members of the Social Network Websites. This confirms the fact that SNWs is a wide application in today's generation.

Internet usage time

The survey conducted by the author of the 50 respondents said they have all been familiar with the internet and always use. They start waking up to sleep again did not seem to exist apart from the internet on their phones, they use the Internet in learning activities, recess school, after school, before bed even getting out of bed.

Impact of internet use

Internet for Social Media

Deviations social behavior is felt most noticeably at this time include less or do not want to hang out with peers. Students are more likely to confine or cool to enjoy interacting via social media than hanging out with friends around, they are more focused in the virtual world, regardless of what was happening around him,

Internet for Online Games

Some students lied to get into internet cafes (cafe) opens an online gaming site. For hours he takes the time to play this game. In addition to the time that should be used to help parents for students who need help parents even used ostensibly to the cafe to look for material assignment.

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Internet for Online Shopping

Many Students are internet using for online shopping from websites. In a recent survey of IDC themed ecommerce, found the fact that the number of new online shopping activity by 13.3 percent compared to the number of Indonesian Internet users as a whole.

Internet to learn and seek information

The internet is finding the information we want, news and a variety of necessary information can be found on the internet, the way in which it was very easy, simply by typing the name of a website address or search for it with the search engines

Internet to watch Youtube

Youtube is a website that provides a wide range of videos from the video clip to the movie, as well as videos made by users themselves youtube, youtube is one of the largest video service provider at this time, the negative effects can be used to search youtube porn videos, video- violent video, the video can broken person's name.

Internet to Access pornography

Pornography on Internet media in India thrives caused by the ease of use of the Internet itself, weak supervision and security, as well as the rise of online communities that participate in the spread of` pornography on the Internet media in India, Action porno already widely reported in the print and electronic media about sexual crimes caused by the internet, especially those that occur through social networking site facebook, the victims are usually women of school age, easily offender abducted, molested and even raped the victim

Internet to keep up with Technology

The trends in social media widely heard in the ears of society, keeping abreast of increasingly sophisticated technology is one of pleasure, especially for adolescents who happy to explore all the latest things they think are very attractive, whether it was spotted and just part of the trend or until lifestyle, moral decadence among students, who always seeks the fulfillment of material desires, has led some students to be rich in material but poor in spirit

Time spent of Social Network Websites. (SNW)

Face-book and orkut are the Social Network Websites most used by the management students followed by twitter, which confirms the worldwide usage pattern of SNWs. As is evident, maximum numbers are using SNWs for more than last two years. On an average, weekly usage of 10-15 hours is there of SNWs. These facts confirm the various findings by researchers across the globe. Also new social and professional contacts could be made through the SNWs.

Conclusion

In this, study impact of Internet using students of Patna College Patna. Almost every student is aware of the internet using websites and there are three prominent reasons—cost effectiveness, fast availability, and convenience, though these factors are motivation for the usage of all internet users, a fact confirmed students as well. These internet using sites have been widely accepted by students as a media which is most cost effective, convenient and prompt way of getting information of any kind is it offers, current affairs, education, events of all kinds or social issues. Students believe website and social media keep them updated on the current issues and also discussion of the current issues help them in sharing the views and thoughts of each other. This helps them in understanding a particular topic from all the angles. SNWs are definitely looked upon as a media for upgradation of

professional growth. The survey shows that the awareness about the use of SNWs for professional growth is less in junior class students. The higher class students do a better use of SNWs for professional growth. As far as the professional upgradation is concerned the survey indicates that it will be in the form of quick information of employment opportunities, reach of varied types of opportunities and insights from the current employees.

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International Journal of Management, IT & Engineering
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Some Issues in E-Learning

DR. JAYA MUKERJI*

Abstract
E-learning has created a new dimension in education which allows people to reach around the world and embrace diversity of opinions. It enhances learning that emphasizes collaborative, argumentative and reflective discourses. Also, a learner is able to access, discover and construct knowledge through a self-directed learning process. However, a feature of the online world is that it places before people a plethora of ethical dilemmas, made more complex by the apparent anonymity of the online experience. Schools and universities have been so absorbed in their efforts to bring technology into classrooms that the issue of values has been neglected. It is imperative to concentrate on the quality of understanding rather than on the quantity of information presented.
This paper attempts to throw light on the advantages of e-learning and at the same time point out to the issues cropping up because of its use and how this can be rectified to a certain extent by encouraging dialogues, critical thinking and meditation. It is necessary to look into e-learning with a holistic approach rather than in a limited and compartmental way. The real life situations are multi-dimensional and multi-disciplinary. Internet would not grow grains, weave clothes or construct houses. Perhaps the latest information on pest management, grain prices, and clothes design may be provided through internet and shared. Therefore, it is a means of information exchange but not a total solution.
Keywords: E-learning, Technology, Quality, Pest management, Holistic approach

Introduction
In today's fast changing scenario one needs to design a system to educate people to take up responsibilities towards development. This requires basic education, technical education, and comprehensive continuing education programmes, to upgrade skills in line with technological developments. It is here that e-learning becomes useful.
E-learning is an effective learning process created by combining digitally delivered content with (learning) support and services. It can be defined as the convergence of the internet and learning, or internet enabled learning. It focuses on the use of network technologies to deliver and facilitate learning anytime and anywhere. It emphasizes the delivery of individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, linking learners and practitioners with experts. E-learning includes independent, facilitated, or collaborative approaches to learning. Independent learning refers to each individual learner completing learning activities or modules on their own, in their own environment, on their own schedule. Facilitated learning is designed to be completed through interaction with instructors or coaches. There are several ways this can work, for example, a learner might complete a section of learning on-line then discuss key concepts via email with the instructor or with classmates. Collaborative learning relates to working with other learners in an on-line environment. For example, an email discussion with other learners on a particular topic or everyone posting to a bulletin board.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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E-learning has been broadly classified into two main delivery systems:-

A. Asynchronous Delivery System

B. Synchronous Delivery System

Asynchronous (not existing at the same phase) method, is devoid of any virtual class room interactions or time stipulations. Flexibility, time to reflect, situated learning and cost effective learning are its merits. In **Synchronous** method, members exist in the same time phase in a cyber class room. Motivation, good feedback, pacing and liveliness derived from regular interaction are its advantages.

Asynchronous Delivery System comprises of Web Forums, Digital Libraries, Newspapers, email etc. Synchronous Delivery System includes Chat, Application Sharing, Massively Multiplayer Online games or Multiplayer Universe.

After giving a brief sketch of the functioning and advantages of e-learning, it becomes imperative to look into the issues that come up as a result of its popularity.

1. Encouraging coherence and discipline in thinking

While access to multiple sources of information can enrich thinking, it can also undermine it, and educators have crucial responsibility to ensure that they foster the ability of learners to be able to concentrate, to retain coherence in constructing arguments, and to be able to think with discipline. To be able to engage in interdisciplinary modes of thought, learners must first have constructed basic disciplinary platforms on which to build. The distractions of ever expanding exposure to information and media has the potential to undermine the construction of these platforms, so educators will need to be better prepared than ever to help learners to develop them. What one needs to focus on is not on how to generate knowledge banks but on how to manage knowledge.

2. Navigating through ethical dilemmas

The online world places before people a plethora of ethical dilemmas, made more complex by the apparent anonymity of the online experience. For example, pornography comprises a significant proportion of the content accessible online. There are download sites which provide ready access to vast quantities of copyrighted material. The potential for disguising and stealing identities has grown considerably in the digital world. Unsubstantial gossip can travel around the world in seconds, often bringing great harm to individuals People who lack an effective, structured framework for considering such ethical dilemmas and making appropriate decisions to guide their actions will find the internet a place for self destruction. Here the role of the educators and the education system lies in not denying access to these environments to learners in the pretext that they will be saved from them, but to provide learners with the competence and knowledge that would enable them to navigate their way through these ethical dilemmas effectively and positively and thus help themselves and the societies of which they are members.

Also, the heightened audio-visual stimulation and rapidly shifting images affect the attention span of children and their readiness to undertake tasks that require a sustained application of mind and body. Hyperactivity in younger children is more visible. Also, there is the need for quick gratification and they start desiring particular kinds of consumer products, superficial hierarchies being established in their minds and they try to emulate new kinds of role models. If life style messages drawn from rapid technological advancements become deep-rooted, antagonisms may flare up as teenagers may feel restricted in the expression of their tastes. For instance, a boy whose parents restrict his

desire to buy what they consider as a wasteful cosmetic product may rebel and steal money to get what he wants.

A Knowledge Society creates shares and uses knowledge for the prosperity and well-being of its people. The concept of "Knowledge Society" is often confused with that of an "Information Society". Information is the codified result of observation, but knowledge entails the capacity to act. The concept of "Knowledge Societies" includes a dimension of social, cultural, economic, political and institutional transformation, and a more pluralistic and developmental perspective. It is regarded as a human process. As the status of information and knowledge are different in a knowledge-based society, the vision of what knowledge people need to acquire, and how they can acquire it, also needs to change. Knowing where knowledge is located and who has access to what kind of knowledge and why, are becoming increasingly important. Social skills and relationship factor become key skills for employment in the knowledge economy. Learning to operate the technology and building higher order skills, such as knowing and understanding what it means to live in a digitized and networked society and use digital technology in everyday life becomes crucial. It is here that dialogues, critical thinking and meditation prove helpful.

The networked social media provides a new ground for dialogue, and therefore should be conceived and investigated. The open, participative and social web actually requires a greater emphasis on higher order cognitive and social competencies that are realised predominantly through dialogues. The word 'Dialogue' derives from the Greek word *Dialogos*, which means through (*dia*) the word (*logos*) or through the meaning of the word. Dialogue is about minds unfolding. It refers to the quality of 'openness' in the sense that participants open themselves to hearing and reflecting upon what others have to say, to what they themselves are saying, and to the new insight and perspective they may gain as a result. Dialogue as a mode of discovering the truth begins with "not knowing". In not knowing, not identifying oneself with any point of view or ideology, not trying to convince each other of anything, all are prepared to investigate the truth together, there is just the observation of the issue taking place and gradually the subject starts taking shape. It involves openness, empathy, transparency and inquiry. A mind that is in a state of inquiry is capable of learning. When learning is suppressed by previous knowledge or by the authority or experience of another, then learning becomes mere imitation, and imitation causes a human being to repeat what is learnt without experiencing it. David Bohm, Professor of Theoretical Physics at Birkbeck College, London University, used the words 'Thinking Together' where thought includes not only intellect but also one's feelings, emotions, responses conditioned and biased by previous thought. It is the invisible aspects of human interactions in dialogue that move people to learn and change.

Digital dialogue games for collaborative thinking and knowledge building on the internet can prove useful. Highly interactive dialogue game tools, such as CoLLeGE (Computer based Laboratory for Language Games in Education), Academic Talk and Inter Loc (Collaborative Interaction through Scaffolding Locutions) have been designed and evaluated in Learning Technology Research Institute, London Metropolitan University, London U.K. (*Journal of Computer Assisted Learning*. Vol 23, Issue6, Article first published online 22 March 2007, Willey Online Library).

E-learning can help to promote critical thinking skills by offering tools to support active learning principles in teaching, constructivist approach and reflective learning in students. In active learning the student from being a passive receiver of information becomes an

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active part of the teaching process and comprehends the contents being taught. It aims to encourage students to take responsibility for their learning process and also to think and reflect about the teaching objective. A constructivist approach aims to encourage students to take ownership of the learning process and develop their own learning according to their own interpretation of events and their own experiences. This leads to better engagement in the learning process because students can relate better to the matter being taught. It also cultivates critical thinking as students have to make their own interpretation of the matter being taught in order to come to a conclusion. E-learning can support the development of this approach very effectively because it can help to meet the specificities of a much wider range of students than face-to-face teaching would; and because through e-learning tools, students can very effectively integrate the learning process into their own context. Reflective learning can be developed by allowing students to view and review teaching material in their own time. E-learning provides tools for students to reflect on their own contributions and amend these at different times according to their own needs. It prepares learners to think and discriminate between beliefs that rest on empirical evidence and those that do not. Also incorporating Benjamin Bloom's six aspects of cognitive and critical thinking in online courses can be useful too.

Meditation is a practice of training the mind in order to increase awareness of the present moment, reduce stress, promote relaxation and enhance personal and spiritual growth. The Mind is often referred to in Meditation circles as 'Monkey Mind' for its tendency to jump from one distraction to another. It is always chattering to itself – wanting this, not wanting that. An occupied mind is a petty mind, enclosed within the self-defensive walls of the ego. The unoccupied mind is the silent mind. Meditation begins with the total understanding of oneself and it is this which leads to the ending of all strife both inwardly and outwardly. Distractions still come but we don't get lost in them. There are courses online on meditation like Silva Life System Free Meditation Lessons Online, vedic.me etc.and also books on meditation which can be viewed by learners. Sometimes good thoughts are posted on social sites and these can be shared by viewers.

All said and done, it is necessary to look into e-learning with a holistic approach rather than in a limited and compartmental way. The real life situations are multi-dimensional and multi-disciplinary. Internet would not grow grains, weave clothes or construct houses. But perhaps the latest information on pest management, grain prices and clothes design may be provided through the internet and shared. Therefore, it is a means of information exchange but not a total solution. It is the daily living that one has to explore – the daily living with its agony, with its boredom, with its loneliness, with its fear, with its unseeable future. To do that one has to look within oneself and one cannot go within oneself, without understanding the outward movement of life, that is, understanding one's relationship to the world.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Financial Inclusion in India: Initiatives

Aanchal*

Abstract
Financial inclusion is an initiative with the aim of catering to the need of all the sections of the society. It is a process of penetrating the banking business so that unbanked population can avail the financial products and services. Its aim to provide them the financial products like saving, credits at the lowest affordable costs, greater financial literacy and consumer protection. Financial inclusion is possible only if the government as well RBI focussed on it. In this paper the efforts of government as well RBI have been explained.
Keywords:- Financial inclusion, Government, RBI.

Introduction
Financial inclusion is a process of penetrating the banking business in the all sections of the society, rural as well as urban. It is an initiative with the aim of providing unbanked population of India, all financial products and services. The special focus is on weaker sections of the society, low income groups etc. Its aim to provide them the financial products like saving, credits at the lowest affordable costs, greater financial literacy and consumer protection. During Eleventh five year plan (2007-2012), financial inclusion emerged underneath the inclusive growth theme. So in the 21st centuary, financial inclusion has gained a lot of importance.

Objectives of the Study
- To study about the initiatives taken by the Government & RBI for the development of financial inclusion.

Initiatives Taken For Financial Inclusion
Initiatives took for financial inclusion goes back to some actions taken in the early 1960's and 70's. In 1969, the nationalization of the 16 banks took place to provide banking services to rural population. In 1976, RRB Act came into existence. In 1992, NABARD introduced self-help group (SHG)- bank linkage programme . Initially, the focus was on providing credit rather than financial services like savings, insurance etc. In the same period, Micro finance institutions also emerged in the country. A Committee had been constituted in India on 22nd June, 2006 to enhance the financial inclusion. In January, 2008, the committee submitted its report regarding financial inclusion. National Rural Financial Inclusion Plan has been initiated by CFI with the objective to address the demand constraints. In 2014, the committee on comprehensive financial services for Small Business and Low-Income Households, RBI laid down four principles for sustainable financial inclusion which are- stability, transparency, neutrality and responsibility. Government and RBI have been taking various initiatives for the financial inclusion in India.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Initiatives Taken By the Government

Pradhan Mantri Jan Dhan Yojana (PMJDY):- *The scheme was launched under the initiative by our Hon'ble Prime Minister Narendra Modi on 28th August, 2014. Under this yojana , the initiative has been taken to provide access to at least one basic bank account to every citizen, financial literacy, insurance etc.The beneficiaries of this scheme got a Rupay Debit Card having inbuilt accident insurance cover of Rs. 1 lakh. In addition, life insurance cover of Rs. 30,000 is provided to those who for the first time opened a bank account between 15th Aug, 2014 to 26th Jan, 2015 and also meet the eligibility conditions of this scheme. PMJDY provides access to all the households urban as well as rural. Under this scheme, so far results are shown in the following table:*

Types of Banks	No. of beneficiaries at rural /semi urban bank branches	No. of beneficiaries at urban metro bank branches	No. of female beneficiaries	No. of total beneficiaries	Deposits(in crores)	No. of Rupay debit card issued
Public Sector Banks	14.45	12.30	14.09	26.75	66,952.07	21.44
Regional Rural Banks	4.57	0.84	2.98	5.42	15,429.54	3.74
Private Sector Banks	0.62	0.41	0.54	1.03	2,307.52	0.95
Grand Total	**19.64**	**13.55**	**17.61**	**33.19**	**84,689.14**	**26.14**

Source:- https://www.pmjdy.gov.in/account (All figures are in crores as on 07/11/2018)

Atal Pension Yojana:- This scheme was launched on 9th May,2015. It is the pension scheme that is focused on the unorganized sector workers with the aim of Minimum Investment, Maximum benefit during old-age. The subscriber whose age is between 18-40 years of age is eligible for this pension scheme. The subscriber also should have saving account in the bank.The subscribers who opted for this scheme before 31st Dec,2015 would also enjoy a co-contribution of 50% of total contribution or Rs. 1000 per annum w.e. is less

, for a period of 5 years (2015-16 to 2019-20). As on 15th May, 2018, APY scheme has surpassed 1 cr subscribers and has pension wealth of Rs. 13950 cr.

Stand Up India Scheme:- *Stand Up India scheme launched by GOI on 5th April, 2016. Under this scheme each bank branch has to provide bank loans between 10 lakhs and 1 cr to at least one SC or ST borrower and one woman borrower for setting up Greenfield enterprises. An SC/ST or women entrepreneur should have atleast 51% shareholding and controlling stake while incorporation of non individual enterprise. Till March 7, 2018, the loans sanctioned by public, private and regional banks stood at 51,888, 2,445 and 1,009 respectively in numbers.*

Pradhan Mantri Vaya Vandana Yojana:- *PMVVY is a scheme launched by LIC. This scheme is available for the individuals aged 60 years and above. This scheme is opened for subscription from May 4, 2017 to March 31, 2020. This scheme guaranteed return of 8% annually for 10 years. The subscribers have an option to choose on monthly, quarterly, half yearly and annually basis pension plans. It provides security against future fall in the interest income due to adverse market conditions. 2.23 lakhs subscriber subscribed under the Pradhan Mantri Vaya Vandana Yojana as of March, 2018. The difference between the return earned by LIC and fixed 8% return paid to subscribers will be borne by the government as subsidy. Further the government has increased the investment limit to Rs. 15 Lakhs to provide relief to its senior citizens.*

Pradhan Mantri Mudra Yojana:- *This scheme launched by Hon'ble Prime Minister on Apl 8, 2015. For achieving the purpose of financial inclusion, loans have been provided upto Rs. 10 lakhs to the non-corporate, non-farm small enterprises. Under the aegis of PMMY, these loans are classified as MUDRA loans. The three main products under MUDRA have been launched. These are 'Shishu' , 'Kishore' and 'Tarun' , covers loans upto Rs. 50,000 , Rs. 50,000-5,00,000 and Rs. 5,00,000-10,00,000 respectively. It helps in growth and development of micro and small entrepreneurs by providing them the funds.*

Achievement under PMMY Since inception

(* till 23/11/2018)

Financial Year	No. of PMMY loans sanctioned	Amt. sanctioned	Amt. disbursed
2015-16	3,48,80,924	1,37,449.27	1,32,954.73
2016-17	3,97,01,047	1,80,528.54	1,75,312.13
2017-18	4,81,30,593	2,53,677.10	2,46,437.40
2018-19*	2,37,94,505	1,29,419.86	1,22,951.52

Source:- http://www.mudra.org.in

Pradhan Mantri Suraksha Bima Yojana:- *Hon'ble Prime Minister launched this scheme on 9th May, 2015. Under the scheme, accidental insurance cover is provided to uncovered population at a premium of Rs. 12 per year. The scheme covers the people in the age group of 18 to 70 years with saving bank accounts. Under this scheme, risk coverage is Rs. 1 lakh for permanent partial disability and Rs. 2 lakh for accidental death and permanent total disability for the period from 1st June to 31st May. So the scheme provides insurance coverage to weaker sections of society and it server the goal of financial inclusion. It also ensures their family's financial security.*

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

(* till 31/07/2018)

PMSBY	2015-16	2016-17	2017-18*
Gross Settlement (in crores)	9.43	10.04	13.74

Source:- http://pib.nic.in/newsite/PrintRelease.aspx?relid=181641

Pradhan Mantri Jeevan Jyoti Bima Yojana:- *Pradhan Mantri Jeevan Jyoti Bima Yojana launched on 9th May, 2015 by our Hon'ble Prime Minister. It is a one year life insurance scheme that provides coverage for death. It covers the people in the age group of 18 to 50 years having saving bank account. It provides coverage of Rs. 2 lakhs for one year period (that can be renewed) at a premium of Rs. 330 per annum in the period from 1st June to 31st May. About 5.35 crore people had enrolled under this scheme and the total claims were nearly 1,02,849 till May 14,2018.*

Initiatives Taken By the RBI

Business correspondents & Business Facilitators:- *The RBI permitted banks to provide door-step delivery services especially , collects money from houses in rural areas & deposits them in the banks. They handover passbooks to the villagers. The number of banking outlets in villages has been increased with the introduction of business correspondents and business facilitators. The number went up to 589,849 as on Sep, 2016 from 67,694 in March, 2010.*

Basic Saving Bank deposit Accounts (BSBDAs):- *These are the accounts in which there is no need for minimum balance. The total number of BSBDAs has increased to 495.2 million in Sep, 2016 from 73.5 million in March, 2010.*

Relaxed Know Your Customer (KYC) requirements:- *With the motive to enhance financial inclusion, RBI relaxed the KYC requirement norms for opening of bank accounts. Consequently, small accounts can be opened with self certification. Further AADHAAR have been allowed as one of the document for KYC requirement.*

Priority sector lending guidelines:- *In April 2015, guidelines were revised on the recommendations of an internal working group set up by RBI. These recommendations are:*

- *Foreign banks with less than 20 branches required achieving the total priority sector lending of 40% of ANBC (Adjusted net bank credit) or CEOBE (Credit equivalent of Offbalance sheet exposure) w.e is higher, by 2020.*
- Educational loans (including vocational courses) up to Rs. 1 million made eligible for priority sector.
- For achieving priority sector targets, PSLC's introduced as a tradable instrument. Under this PSLC scheme banks that have overachieved the targets can sell their over achievement to under achieved PSLC banks without transfer of credit risks or underlying assets.

Use of extensive technology in banking:- With the use of extensive technology in banking, the BC-ICT recorded a considerable increase . For the quarter ended March 2010, there were 26.5 million transactions recorded that increased to 550.6 million in the quarter ended Sep, 2016. Kisan Credit Cards & General Credit Cards also rose to 46.4 million & 1.4 million in Sep, 2016 respectively.

Support to Micro Small Medium Enterprises:- RBI advised the banks to review their credit policies for providing timely financial support of MSME's. In Aug, 2015, RBI rolled

a program me named as "National Mission for Capacity Building of Bankers for Financing the MSME Sector" in collaboration with CAB, Pune.

Initiative of Financial literacy:- *In Jan 2016, guidelines regarding Financial literacy centre s have been revised. Financial literacy is of utmost importance to solve the demand constraint in financial inclusion. Banks have been advised to put in place stronger FLC architecture as approved by the Board under various policies. 1,384 FLCs were operational as on March, 2016. National Centre for Financial Education (NCFE) has been set up to implement National Strategy on Financial Education for the coordinate of financial inclusion and literacy at policies level. NCFE has also prepared financial education workbooks and in the process to include these workbooks in school curriculum.*

Conclusion

The vision for financial inclusion is possible only if focussed efforts be made on supply as well as demand side. Their is strong need for the development of digital technology that caters to the undeserved sectors of the society. So the goal of financial inclusion can be achieved only by the co-operation between various financial entities like rural co-operative societies, NBFCs, NGOs, MFIs etc. So the RBI and the government are focussed on how to make these institutions capable of catering to the need of underserved sections of the society.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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A comparative Study of crystalline morphology of polypropylene nucleated by normal and Hyper nucleating Agent through SEM & other physical properties

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Dr.R.S.SHELKE***

Abstract
In this Study characterization via SEM of the polypropylene with varying percent of nucleating agent in addition of coupling agent are evaluated. The blending of Nucleating agent with polypropylene found enhancement / improvement in the properties of polypropylene (PP) as compared to neat polypropylene material, shows significant changes in the some physical properties such as moisture content , melt flow index (MFI).It is also observed that nucleating agent very nicely miscible with polypropylene , Scanning electron microscopy provided the spherulitic morphology of neat polypropylene and the Blends showing the reduction of spherulites size with the incorporation of active ingredient , thus this blending helps the consumers for selecting the proper composition of nucleating agent with PP for their applications .
Key words: SEM, Polypropylene, nucleating Agent, Characterization, MFI, moisture content

Introduction

Now a day polypropylene has rising demand for packaging material, will be the major factor that has great impact on the growth of worldwide polypropylene market till 2021. The increasing demand of packaging material in food and beverage industries for display, sale and food distribution. This is also seen the rising demand by consumer for easy to open and transparent packaging in market that assist in the presentation and protection of food from oxygen and moisture [1].

In 2016, the injection moulding segment accounted for the major shares of the polypropylene market, mainly due to high demand of light weight material and its increased usage in packaging and electrical sector will contributes to the growth of this industry segment in the coming year. In India, the polypropylene market is projected to growth at CAGR of over 11% during 2017-2030. Numerous application area, rising commercialization and industrialization constitute major factor that promoting polypropylene market in India. Based on the consumption expenditure, given in the surging rate of development across the country, will see an enhanced usage of polypropylene.

Polypropylene is widely used thermoplastic, polymer produced from addition polymerization of monomer propylene. Polypropylene offer high resistance to temperature and provide higher mechanical strength , due to which it is preferred in various

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applications such as caps, batteries , pails , automotive component s , blow moulding extrusion , thermoforming and sheet extrusion . Such uses make it the second most traded polymer in the world after polyethylene. Over the next decade, growth potential for polypropylene market in a robustly growing huge economy like India is huge "Said Mr. Karan Chechi, Research Director with TechSci Research "[2]

Polypropylene is semi crystalline material containing crystalline region that at room temperature typically make up to 60 % of the total matter, the remaining is amorphous. As polypropylene is polymorphic polymer according to crystallization condition, it can crystallize into several crystalline forms. The thermodynamically stable is monoclinic alpha phase and it always form upon standard processing condition. A trigonal beta phase can be obtained via temperature gradient crystallization. An orthorhombic gamma phase form under high pressure or from low molecular weight fraction or copolymer [3].

Nucleating agent are chemical substance which on blended in plastic form nuclei for the growth of crystal in the polymer melt , in polypropylene a higher degree of crystallinity and more uniform crystalline structure is obtained by adding a nucleating agent. Nucleating agent increases the transparency of semi-crystalline polymer is also referred to as clarifying agent. Conventional nucleating agent belong to the oldest nucleating agent and hyper nucleating agent represent significant technological advance over the previous nucleating technologies, it allow for the for the fastest processing speed in molding and extrusion processes, in addition it reduces the isotropic shrinkage

Crystallization is process of the formation of solid crystal s from a uniform solution or melt. The crystallization process consists of two major event ie, Nucleation and crystal growth. Nucleation is the step where the solute molecules disposed in the solvent start to gather into cluster, on the nanometre scale, that becomes stable under the relevant operating condition. These stable clusters need to reach a critical size in order to become stable nuclei; such critical size is dictated by the operating condition. It is at the size stage of nucleation that the atoms changes in defined NAD periodic manner. [3]

When semi crystalline polymers crystallize from the melt, the lamellae organize from a primary nucleus to form complex micro structure, this continue to grow until they impinge on an adjacent spherulites structure at which point the growth ceases the rate of crystal growth is strongly dependent on temperature and polypropylene is relatively easy material to nucleate as rate of crystallization is low enough to allow the nucleating agent to have a direct impact on the nucleation density.

The first family of particulate nucleating agent is salt crystal for which Beck (1967) has suggested that carboxylic acid salt can be envisioned as suitable nucleating agent for polypropylene [4]

Adriane Gomes Simanke and their co worker are studied the influence of three nucleating agents from different generations on the crystallization behavior of propylene homopolymer was studied by differential scanning calorimetry (DSC) and atomic force microscopy (AFM). The amount of nucleating agent used varied between 1000 and 2200 ppm. The new generation nucleating agent, Hyperform HPN-68L, accelerates the crystallization more efficiently than the other nucleating agents tested. It was also possible to verify the effects of agglomeration and negative interaction between calcium stearate and sodium benzoate [11].

N. J. MACAULEY and others had investigated a large proportion of thin-gauge containers for the food packaging sector is produced via the thermoforming of extruded thermoplastic sheet (1-4). The production of high quality thermoformed parts is critically dependent on the standard of *ex*truded sheet feedstock used. One method of optimizing the properties of extruded sheet and those of the final thermoformed article is through the incorporation of nucleating agents (5-10). This paper discusses the influence of nucleating agents on the extrusion and thermoforming characteristics of polypropylene. The potential of white titanium dioxide pigment particles as a viable nucleation source for polypropylene is addressed. Evidence is also presented that suggests that nucleating agents may play an important role in controlling the extent of physical change taking place in extruded sheet as a direct result of post-production aging.[5]

Tetsuo Okada and his team investigated the crystallization behaviour in an isotactic polypropylene (PP)/liquid paraffin (LP) mixture loaded with a small amount of nucleating agent (NA) under a microscope. Three types of crystallization behaviour were observed, depending on the crystallization temperature and the composition: (1) connected nucleation (CN)-type crystallization which yields a unique network structure consisting of interconnected PP crystals; (2) aggregated nucleation (AN)-type crystallization; and (3) the familiar spherulites crystallization. The CN and AN types were never observed in binary mixtures of PP/LP and PP/NA. In contrast, the NA/LP mixture developed a network structure consisting of highly interconnected axialite-like crystals of NA. The crystallization mechanism in the ternary mixture (PP/LP[NA) was found to be controlled by the competitive kinetics of the NA crystallization *versus* that of PP; e.g., the network structure is created, when NA crystallization occurs and then small PP crystals grow densely along the fibrils in the axialite , NA crystals of nucleating agent on the structure.

A study of nucleating agent effects on the selected optical and mechanical properties of a semi crystalline homo isotactic polypropylene is presented. The results show that the type and concentration of the nucleating agents to be added, and the screw speed during the compounding process, were of vital importance. It was also noticed that the improvement in optical clarity due to the addition of the additive might not necessarily benefit the mechanical properties of injection molded Products.[14]

Experiment

In the present study, polypropylene is blended with nucleating agent and coupling agent, coupling agent is used as processing aid and antioxidant during blending of polypropylene with nucleating agent

Material Used

Polypropylene [35 MFI]; Density; 0.905gm/cc, Grade Repol AM350N, Nucleating agents: NA 11 & HPN20E .NA11; CAS No. 85209-91-2 manufactured by Amfine chemical corporation NJ 07604 and HPN20E Manufactured by Milliken and company. Coupling agent as antioxidant Irgofos 168 and Irgonox 1010.

International Journal of Management, IT & Engineering
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ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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Table 1: Experimental composition

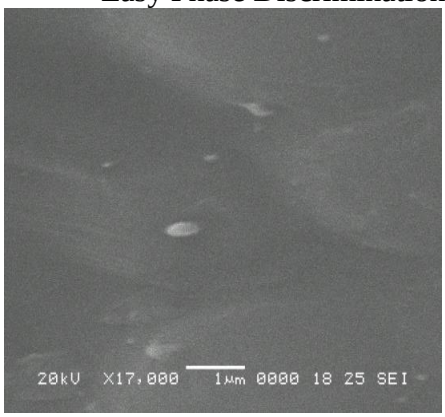
Blend Code	Polypropylene	Nucleating Agent	Primary antioxidant	Secondary antioxidant
Trail 1	100%	--	0.15%	0.1%
Trail 2	98.75%	1% (NA11)	0.15%	0.1%
Trail 3	96.75%	3% (NA11)	0.15%	0.1%
Trail 4	94.75%	5%(NA11)	0.15%	0.1%
Trail 5	98.75%	1%(HPN20E)	0.15%	0.1%
Trail 6	96.75%	3%(HPN20E)	0.15%	0.1%
Trail 7	94.75%	5%(HPN20E)	0.15%	0.1%

Scanning electron microscopic (SEM) pictures were taken to study the morphology of the composites The SEM Study is done for determining of effect of addition of nucleating agent on the polypropylene properties, SEM Analysis is done on UGC-DAC CSR Indore, Machine details & make F Model : JEOL JSM 5600 and other details.

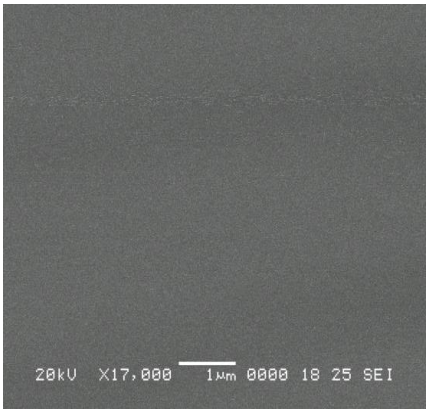
- Resolution:3.5nm
- Images: secondary electron image, backscattered electron images (composition, topography, shadow).
- Magnification : x18 to 300,000 (in 136 steps)
- Accelerating Voltage : 0.5 to 30 kV (53 steps)
- Specimen stage : Large size eccentric goniometry
- Displayed image : 640 x 480 pixel
- Image memory : 1280 x 960 pixels
- Evacuation system : one DP with one RP
- Optional Attachment : Energy Dispersive X-ray spectrometer (EDS)

EDS Model: INCA Oxford

- Qualitative and quantitative analysis (Analyser)
- Easy Phase Discrimination (Mapping)



Trail 1: Neat Polypropylene



Trail 2: PP & NA11(1%)

International Journal of Management, IT & Engineering
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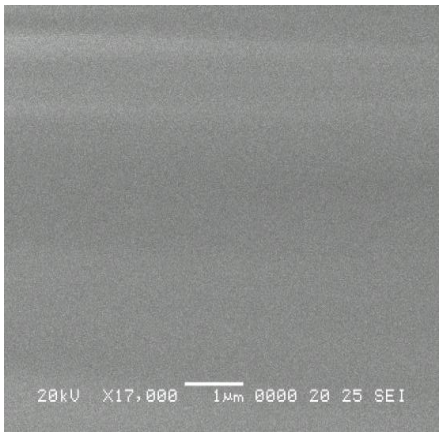
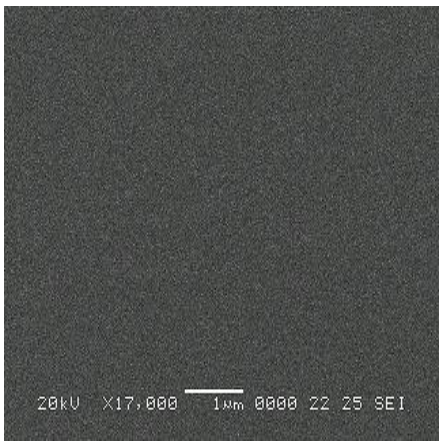


Trail 3: PP & NA11(3%)

Trail 4: PP & NA11(5%)



Trail 5: PP & HPN20E(1%)

Trail 6: PP & HPN20E (3%)

Trail 7: PP & HPN20E(5%)

Scanning electron microscopy provided the spherulitic morphology of neat polypropylene and the Blends showing the reduction of spherulites size with the incorporation of active ingredient ie NA 11 and HPN20E nucleating agent in varying percentage(1-5%) , Hence Change in Mechanical properties are observed , due to the clear compactness of blends are observed from the above Images .

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Other Physical Properties

Melt flow index is a measure of the flow of the polymer. It is defined as the mass of the polymer in grams, flowing in ten minutes through a capillary of a specific diameter and length by a pressure applied via prescribed weights and prescribes temperature. Melt flow rate is an indirect measure of molecular weight, with high melt flow rate corresponding to low molecular weight. At the same time, melt flow rate is a measure of the ability of the materials melt to flow under the pressure. Melt flow is inversely proportional to viscosity of the melt at the condition of the test, though it should be borne in mind that the viscosity for any such material depends on the applied force.

Test condition for Melt flow index is, applied Temperature: 230°C and weight: 2.16 Kgf. for Polypropylene and blends of PP & NA11 (1-5%), PP & HPN20E (1-5%).

Moisture content of the plastic is very important factor in plastic processing, appearance and properties of final plastic product. Injection moulding of too moist of plastic pellets results in processing problem and loss of quality of the final product

Table 2: Test Observation

Blend Code	Compounding	Moisture content value	Melt flow index Observation
Trail 1	PP	0.03%	9.48 gm/10 minutes
Trail 2	PP+NA11(1%)	0.05%	9.44 gm/10 minutes
Trail 3	PP+NA11(3%)	0.05%	8.94 gm/10 minutes
Trail 4	PP+NA11(5%)	0.05%	9.23 gm/10 minutes
Trail 5	PP+HPN20E(1%)	0.04%	8.91 gm/10 minutes
Trail 6	PP+HPN20E(3%)	0.03%	9.71 gm/10 minutes
Trail 7	PP+HPN20E(5%)	0.05%	9.21 gm/10 minutes

From the experiment the value of moisture content slight changes is observed when NA11 percent is increased from 1-5% as compared to value of polypropylene, similarly the value moisture content for blend of polypropylene with HPN20E percent from 1-5% is increased there is slight change is observed as compare to polypropylene.

The value of melt flow index value of NA11 combination shows the irregular changes ie in 3% of NA 11 with polypropylene shows decrease in value as compare to value of neat polypropylene as compare to 1% and 5% of NA11 combination blend of polypropylene , similarly the value of melt flow index value of HPN20E combination shows the irregular changes ie in 3% of HPN20E with polypropylene shows decrease in value as compare to value of neat polypropylene as compare to 1% and 5% of HPN20E combination blend of polypropylene.

Result, Discussion & Conclusion

From the images it is possible to say that the spherulites of PP were reduced with the incorporation additive unfortunately it is impossible to determine the size of the spherulites in the blend. The reduction in spherulites size is due to the nucleation effect of nucleating Agent of two type ie NA 11 & HPN20E. Smaller spherulites influence mechanical behaviour of polymeric materials by increasing impact resistance and elongation at break, reducing elastic modulus and yield stress.

From the observation it is observed that value of moisture content, for NA11 blend and HPN20E shows no drastic change in the value moisture content as compare to neat polypropylene.

From the observation ,value melt flow index value of blend of Polypropylene and NA11 and HPN20E in varying percent , value for MFI for 3% PP-NA11 & 3% PP-HPN20E show decrease in MFI value as compare to neat polypropylene , while the value of 1% PP-NA11 & % PP-HPN20E and 5% PP-NA11 & 5% PP-HPN20E show slight change as compare to the neat polypropylene.

Acknowledgements

The authors are grateful to UGC-DAE Consortium for Scientific Research, Indore (MP) for giving facilities of SEM.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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सतत् कृषि एवं सम्बद्ध क्षेत्र
(Sustainable Agriculture & Allied Sector)
पशुधन प्रबन्धन, मत्स्यन, रेशमकीट पालन, बागवानी एवं अन्य कृषि सम्बद्ध क्षेत्र

रेनू यादव (जे0आर0एफ0)*

सारांश (Abstract)
सतत्–कृषि से तात्पर्यकृषि की ऐसी रसायनमुक्त, विवेक पूर्ण, नवाचारी पद्धति से है जिसमें मृदीय संसाधनों का विवेकपूर्ण प्रयोग किया जाता है, जिससे वह वर्तमान आवश्कयताओं को पूरा करते हुये भविष्य की पीढ़ियों के लिये भी उपलब्ध रहे। स्वतंत्रता प्राप्ति के बाद हरितक्रान्ति एवं तकनीकी विकास के चलते देश में खाद्यान्नों में क्रान्तिकारी रूप में उत्पादन बढ़ता गया परन्तु आज के समय में कृषि के समक्ष बहुत बड़ा प्रश्नचिन्ह सवंहनीयता (Sustainability) का खड़ा हो गया है।

भारत एक कृषि प्रधान देश है और वर्तमान में लगभग 53% जनसंख्या प्रत्यक्ष–अप्रत्यक्ष रूप से कृषि एवं सम्बद्ध क्रियाकलापों में नियोजित है। परन्तु GDP में कृषि का हिस्सा निरन्तर घर रहा है। स्वतंत्रता के तुरन्त बाद जहॉ GDP में इस क्षेत्रक का हिस्सा 55% था वही वर्तमान में घटते–घटते 17.32% पर आ गया है जो विचारणीय मुद्दा है।

इसके अलावा प्रारंभ में जिस तीव्रता के साथ उत्पादन बढ़ रहा था अब वैसी वृद्धि नहीं हो रही बल्कि उत्पादन वृद्धि की सीमा स्पष्ट होने लगी है क्योंकि मृदा की उर्वरता अब और बढ़ने वाली नहीं। बल्कि अत्यधिक रसायनों, उर्वरकों के पयोग से इसमें अवनयन के लक्षण दृष्टिगत होने लगे हैं।

वर्तमान में कृषि में नवाचारों तथा अन्य उपयुक्त विकल्पों को अपनाने और विस्तार देने की जरूरत महसूस की जा रही है। क्योकि कृषि पर दबाव बढ़ता जा रहा है, इसलिये कृषि सम्बद्ध क्रियाकलापों के विकास पर ध्यान देने की आवश्यकता है। इसमें पशुधन प्रबन्धन, रेशमकीटपालन, बागवानी, मत्स्यन, जैविक कृषि जैसी अनेक रणनीतियॉ आती हैं। इन रणनीतियों के विकास से संवहनीयता को खतरा नहीं होता बल्कि इससे संवहनीयता प्राप्त की जा सकती है।

इस शोधपत्र का उद्देश्य कृषि में सवंहनीयता पर बल देना, देश की GDP में कृषि के ह्रासमान योगदान को बढ़ाने के उपाय सुझाना, कृषि सन्द्ध क्षेत्र में रोजगार सृजन पर विश्लेषण करना, कृषको को तात्कालिक लाभ के बजाय संवहनीय कृषि करने के लिये प्रोत्साहित करना है। इसके लिये, पशुधन विकास, बागवानी, रेशमकीटपालन, मत्स्यन की ओर प्रेरित करना है।

इसके लिये शोधार्थी ने इलाहाबाद की सोरांव तहसील को चुना है जिसमें 404 गॉवों में से निदर्शन विधि से '9' गॉवों को चयनित कर अध्ययन किया। अध्ययन के बाद ज्ञात हुआ कि सोरांव जो शहर से लगा है, में किसान अधिकाधिक लाभ को ध्यान में रखकर कृषि करते हैं, साल भर मे 3 के बजाय 4 फसलें उगाते हैं। सबसे ज्यादा सजिब्जयों (कद्दू, लौकी, बैगन, टमाटर खीरा), तरबूज, खरबूज, मूँग, उड़द की लाभकारी फसलें उगाने के लिए अत्यधिक उर्वरको, कीटनाशकों अतिसिंचाई का प्रयोग करते है, फसल चक्र, जैविक खेती, मृदासंरक्षण पर ध्यान नहीं देते और परती छोड़ने की प्रणाली नहीं अपनाते जिससे मृदा समस्याएँ (अपरदन, उर्वरता ह्रास) बढ़ने लगी हैं। अतः कृषि सम्बद्ध अन्य क्रिया–कलापों का विकास कर समस्या के समाधान की महती आवश्यकता है। जैसे–पशुधन प्रबन्धन, बागवानी, मत्स्यपालन तथा रेशम्कीटपालन। इन विकल्पों में उपयुक्त तकनीकी, पूँजी, कौशल एवं प्रबन्धक को अपनाना होगा। उपर्युक्त के संदर्भ में आकड़े प्रश्नावली, साक्षात्कार एवं पर्यवेक्षण से प्राप्त किया।

मुख्यशब्द–संवहनीयता, पर्यावरण अवनयन, मात्सिकी, प्रतिचयन, जलसिक्ती

प्रस्तावना
ऐसा विकास जिसमें भविष्य की पीढ़ियों की आवश्यकताओं ध्यान में रखते हुये वर्तमान पीढ़ी की आवश्यकताओ को पूरा किया जाता है, सतत विकास कहलाता है। (S.N. Lal)। इसी प्रकार सतत कृषि से तात्पर्य कृषि के लिये भूमि के विवेकपूर्ण प्रयोग से है। जिसमें उर्वरकों, कीटनाशकों, रोगनाशकों, सिंचाई, जुताई का सीमित प्रयोग हो जिससे मिट्टी की उर्वरता बनी रहे। क्योंकि अत्यधिक जुताई, अति सिंचाई एवं रासायनिक उर्वरकों का अत्यधिक प्रयोग करके मृदा

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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से अत्यधिक दोहन से अनेक समस्याएँ सामने आ रही हैं जैसे– लवणीकरण, क्षारीयता, अम्लीयता, जलसिक्ती, मृदा प्रदूषण, ऊसर, उर्वरता ह्रास आदि। इसके साथ ही मानव स्वास्थ्य पर भी बुरा प्रभाव पड़ रहा है।[‡]

रसायनों का प्रयोग करके भूमि से उत्पादन प्राप्त करने की एक सीमा होती है। जैसा कि माल्थस ने कहा था जनसंख्या में गुणोत्तर वृद्धि (2, 4, 8, 16, 32 .....) तथा कृषि उत्पादन में गणितीय वृद्धि (1, 2, 3, 4,) होती है। अतः एक समय के बाद जनसंख्या इतनी अधिक बढ़ जाने की संभावना होती है कि भुखमरी की स्थिति पैदा होगी[†] यदि भारत के सन्दर्भ देखें तो में जनसंख्या वृद्धि एवं खाद्यान्नोत्पादन समय के साथ असन्तुलित होता गया। प्रारंभ में तो खाद्यान्न उत्पादन में क्रांन्तिकारी वृद्धि देखी गई परन्तु धीरे–धीरे कृषि में असंवहनीयता के लक्षण प्रकट होने लगे।[§]हाल के अध्ययनों से ज्ञात हुआ है कि कृषि उत्पादन शीर्ष पर पहुँचकर घटने लगा है। हरितक्रान्ति के प्रभावों के चलते 2030 तक भारत को प्रतिवर्ष 40 मिलियन टन खाद्यान्न आयात करने की आवश्यकता होगी (लेस्टर ब्राउन एवं हल्केन)।

1972 ई0 में क्लब आफ रोम से सम्बन्धित विद्वानों मीडोज एवं मीडोज ने 'The Limits of Growth' नाम से एक पुस्तक प्रकाशित किया। इन्होने इसमें जनसंख्या एवं औद्योगिक वृद्धि दर, कृषि उपजों तथा विभिन्न संसाधनों की उपलब्ध्यता के विशद विश्वस्तरीय अध्ययन के आधार पर निष्कर्ष निकाला कि 2100 ई0 के पूर्व निरन्तर द्विगुणित होती जनसंख्या एवं औद्योगिक उत्पादन वृद्धि अचानक रूक जाएगी। जिससे औद्योगिक उत्पादन ठप हो जाएगार। परिणामस्वरूप उर्वरकों एवं कीटनाशक रसायनों की कमी से कृषि उत्पादन बहुत कम हो जाएगा। यदि औद्योगिक उत्पादन में कभी न भी हो तो, तो भी वायु एव जल प्रदुषण इतना अधिक हो जाएगा कि मानव को स्वच्छ जल और शुद्ध वायु नहीं मिल पाएगी और उसका अस्तित्व ही संदेहास्पद हो जाएगा।[*] अर्थात मीडोज एवं मीडोज का तात्पर्य यही था कि विकास संवहनीय होना चाहिए।

कृषि भारतीय अर्थव्यवस्था की आधार शिला है। देश की कुल GDP में स्वतंत्रता के समय कृषि एवं सम्बद्ध क्षेत्र का योग 55 प्रतिशत था जो अब 17 प्रतिशत रह गया है। यह क्षेत्र देश की 53 प्रतिशत आबादी को रोजगार प्रदान करता है। बजट में इस क्षेत्र पर एक महत्वपूर्ण धनराशि आवण्टित की जाती है। जैसे प्रथम पंचवर्षीय योजना में कृषि पर GDP का 31.1 प्रतिशत 5वीं योजना में 20.6 प्रतिशत 8वीं में 18 प्रतिशत।

परन्तु फिर भी समय के साथ कृषि एवं समबद्ध क्षेत्र की GDP में हिस्सेदारी का घटना चिन्ता की बात है। सम्बद्ध क्षेत्रों में पशुपालन, मत्स्यन, कुक्कुट पालन, रेशमकीट पालन, बागवानी आदि आते हैं। उपर्युक्त रणनीतियॉ कृषि को संवहनीय (Sustainable) बनाने में सहायक हैं क्योंकि इनका प्रबन्धन एवं विकास कर खेती पर पड़ रहे दबाव को कम किया जा सकता है तथा अतिरिक्त रोजगार एवं आय प्राप्त की जा सकती है।

उद्देश्य/प्रयोजनः– प्रस्तुत शेधपत्र में निम्नलिखित उद्देश्य निश्चित किए गाए है।

(1) कृषि की संवहनीयता में उत्पन्न खतरों को रेखांकित करना।

(2) इन खतरो से निपटने के उपाय ढूढना।

(3) पशुधन, मत्स्यन, रेशमकीट पालन, बागवनी में उपर्युक्त समस्या के समाधन की संभावनाएँ तलाशना (4) कृषि एवं सम्बद्ध क्षेत्र में सतत्, पर्यायवरण हितैषी एवं समावेशी विकास करने पर बल देना। (5) तात्कालिक लाभ के लिये मिट्टी कुप्रबन्धन की हानियों को उजागर करना।(6) अंततः GDP में इस क्षेत्र के योग बढ़ाने के हरसंभव उपाय बताना।

अध्ययन क्षेत्र– सोरांव इलाहाबाद की एक तहसील है जिसका आक्षांशीय विस्तार $25^{0}36'$, 29.7000''N तथा 81050' 58.8696'' E देशान्तरीय विस्तार है। सोरॉव की उत्तरी सीमा तथा पश्चिमी सीमा प्रतापगढ़ से तथा पूर्वी सीमा फूलपुर से मिलती है। जबकि दक्षिणी सीमा इलाहाबाद शहर से मिलती है। सोरॉव गंगापार मैदान (ट्रांस गंगा) में स्थित हैं जिसकी औसत उचाई 102 मीटर है।

विधितंत्र (Methodology):– सोरॉव में कुल 406 गॉव है जिनमें से शोधार्थी ने प्रतिचयन विधि के माध्यम से प्रत्येक 50 गॉव पर '1' गॉव का चयन कर कुल 9 गाँवों को चुना। और साक्षात्कार, प्रश्नावली तथा पर्यवेक्षण विधि एवं इन्टरनेट के माध्यम से सोरॉव में कृषि के स्वरूप तथा वहॉ पर सवंहनीय कृषि की आवश्यकता का गहन अध्ययन किया। प्रतिचयनित गाँव निम्नलिखित हैं जिनकी जनसंख्या की दी गई है[**]।

क्र.सं.	प्रति चयनित ग्राम सभा	जनसंख्या आकार
1.	अब्दलपुर	5054
2.	बेल्हा	1252

[*] गौतम अलका (2007), भारत का वृहद भूगोल, 292

[†] रावर्ट माल्थस (1789)

[‡] शोधार्थी

[§] सिं जगदीश एवं काशीनाथ (2009), आर्थिक भूगोल के मूल तत्व, 32

[**] जनगणना 2011

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

3.	धमापुर बलकरनपुर	541
4.	जजापुर	595
5.	लखनपुर करन	1173
6.	मुनौरपुर	1305
7.	रामनगर गन सियारी	4858
8.	Sanwagauhan Urfsinghgarh	2411
9.	व्जीराबाद	909

सारणी–II

भारतीय अर्थव्यवस्था में योगदान देने वाले तीनों क्षेत्र को का प्रतिशत योगदान[४४]

क्षेत्र	**प्रतिशत भाग**
1.0– कृषि क्षेत्र	17.32%
1.1– कृषि, वानिकी एवं मछली पकड़ना	17.32%
2.0– उद्योग क्षेत्र	29.02%
2.1– खनन, और उत्खनन	2.25%
2.2– विनिर्माण	16.57%
2.3– बिजली, गैस पानी की आपूर्ति एवं अन्य उपयोग सेवाएँ	2.46%
2.4– निर्माण	7.74%
3.0– सेवा क्षेत्र	53.66%
3.1– व्यापार होटल, परिवहन संचार, प्रसारण सम्बन्धी सेवाएँ	14.46%
3.2–वित्तीय, रियल स्टेट, प्रोफेशनल सेवाएँ	21.06
3.3 लोक प्रशासन, रक्षा एवं अन्य सेवाएं	14.14
वर्तमान मूल्यों पर कुल सकल वृद्धि	100.00%

उपर्युक्त सारणी से पता चलता है कि वर्तमान में भारतीय अर्थव्यवस्था का आधार सेवा क्षेत्र बन गया है। जबकि स्वतंत्रता के बाद के समय में कृषि का स्थान प्रथम था जो वर्तमान में तीसरे स्थान पर आ गया है, और कृषि तथा सम्बद्ध क्षेत्र का योगदान देश की G.D.P. में लगातार घटता जाना चिन्तनीय है।

सारणी–III

Area Statistics of Landuse/Land Cover Map ‡‡

Class	**Area (ha)**	**Area (%)**
Buid up land (Urbon/Rural)	5500.35	6.28
Current fellow land	17155.00	19.60
Double/ Tripple Crop land	30178.44	43.84
Gullied/Ravined	1539.20	1.75
Kharif Crop land	2828.00	3.23
Plantation/ Orchards	152.39	0.17
Robi Crop land	11270.98	12.87
Scrubland	4310.24	4.92
Water bodies	8468.65	9.67
Jaid Crop Land	3563.17	4.07
Other Waster land	2551.05	2.91
Total	87517.47	100

उपर्युक्त सारणी में स्पष्ट है कि इलाहाबाद का कुल क्षेत्रफल 87517.47 हेक्टेयर है जिसमें से परती क्षेत्र (17155.00 हेक्टेयर), Revines (1539.20 हेक्टेयर) पौधरोपण एवं बागान (152.39 हेक्टयर), झाड़ी क्षेत्र (4310.24 हेक्टेयर), जलीय भाग (8468.66 हेक्टेयर) तथा अन्य बेकार भूमियों (2551.15 हेक्टेयर) का कुल क्षेत्रफल लगभग 34176.53

†† जागरण जोश, हेमन्त सिंह
‡‡ स्रोत :www.ijmer.com

International Journal of Management, IT & Engineering
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हेक्टेयर है जो कुल क्षेत्रफल का 39.02 प्रतिशत है। यह क्षेत्रफल कृषि सम्बद्ध क्रियाओं का विस्तार करने के लिये बहुत पर्याप्त क्षेत्र है। चाहे पशुधन प्रबन्धन हो, मत्सयन हो, रेशमकीट पालन हो, बागवानी हो, इन सभी के विकास एवं विस्तार की इलाहाबाद में अपार संभावनाए हैं। क्योंकि इनके विकास के लिए किसी विशेष प्रकार की उपजाऊँ मिट्टी की आवश्यकता भी नहीं होती।

पशुधन प्रबन्ध और सतत् कृषि

पशुधन प्रबन्धन और सतत् कृषि में घनिष्ट सकारात्मक सम्बन्ध है। पशुधन प्रबन्धन से खाद्य सुरक्षा कुपोषण से मुक्ति, मानव कल्याण एवं पशु कल्याण की दशाएँ पैदा होती है। इससे अतिरिक्त आय, जीविका के अधिक अवसर सृजित होते है।[§§] साथ ही पशुधन प्रबन्धन कृषि का वह स्वरूप है जिसमें पर्यावरण मैत्री क्रियाएं की जाती है। रसायनों, उर्वरकों आदि का प्रयोग नहीं होता। इसमें बेकार पड़े चारागाहों, Forage, कृषि अवशेषों का प्रयोग करके मांस, दूध, एवं दुग्ध उत्पाद तथा अण्डें का उत्पादन किया जाता है। साथ पशुओं की अन्य गौण भूमिकाऐं भी होती हैं जैसे मालढुलाई, खेती में जुताई, गोबर की खादें उत्पन्न करना आदि। जो छोटे किसानों की अर्थव्यवस्था को संचालित रखने में महत्वपूर्ण होती है। गरीब किसानों में प्रोटीन अल्पता की समस्या पशुधन प्रबन्धन से सुलझायी जा सकती है। वहीं दूसरी ओर औद्योगिक कृषि के अन्तर्गत पशुओं का महत्व कम होता है। पर्यावरण अवनयन (जैसे जलवायु परिवर्तन, जल प्रदूषण, मृदा प्रदुषण, वायु पदूषण), साथ ही छोटे किसानों के बेकार होने की समस्याएँ पैदा होती हैं। जबकि पशुधन प्रबन्धन की रणनीति बेहद पर्यावरण हितैषी होने के साथ ही इसके लिये उपजाऊँ भूमि की जरूरत भी नहीं है। बल्कि बेकार पड़ी भूमियाँ जैसे (बंजर, जलसिक्त क्षेत्र, लवणीय क्षेत्र आदि) में भी इसकों आसानी से किया जा सकता है बल्कि उन क्षेत्रों को अनुकूल उपयोग संभव होगा। देश में बहुत बड़ा क्षेत्र इन रूपों में अनुत्पादक बेकार पड़ा है जिसका सर्वथा बेहतर उपयोग संभव होगा।

इस प्रकार पशुधन प्रबन्धन खाद्य सुरक्षा, की ऊँची संभावना रखता है साथ पर्यावरण हितैषी तथा मानव एवं पशु कल्याण को बढ़ाने वाला है। जरूरत है इसके बेहतर प्रबन्धन की। पशुओं की नस्लें सुधारना पशुधन प्रबन्धन को संस्थागत रूप देना भी कारगर हो सकते है।

मत्स्यन और सतत् कृषि

मत्स्यन सतत् कृषि के लक्ष्य को प्राप्त करने का एक कारगर विधा है। इलाहाबाद जिले में 8468.65 हेक्टेयर (लगभग 9.67%) क्षेत्र जलीय भाग के अन्तर्गत आता है। जहाँ पर मत्स्यपालन की अच्छी संभावनाएँ है। यहाँ पर मात्सिकी का विकास कर के फसली खेती पर दबाव कम किया जा सकता है जो स्वयं में कृषि की सवंहनीयता चुनौतियों को कम करने में सहायक होगा क्योंकि कि मत्स्यपालन के विकास से पोषण की अतिरिक्त पूर्ति होगी साथ ही इसमें हजारों को जीविका मिलेगी, और मत्स्यपालन में अवांछनीय रसायनों आदि का प्रयोग न होनें से यह पर्यावरण मैत्री है। मात्सियकी से स्वयं अनेक सम्बद्ध उद्योगों का विकास होता है। खाद्य आपूर्ति बढ़ती है। विदेशी मुद्रा अर्जन का स्रोत भी बन सकता है। (शोधार्थी)

लेकिन मात्सियकी के विकास में भी कुछ चुनौतियाँ आती है। जैसे मात्सिकी संसाधनों एवं उनके मूल्यांकन का सटीक डाटा, स्थाई प्रौद्योगिकी का विकास, अधिक उत्पादन, मछआरों का कल्याण आदि। अतः इसमें मजबूत प्रबन्धन, संस्थागत रूप देने, क्षमता का पूर्ण उपयोग, प्रौद्योगिकी उन्नयन, विविधीकरण लाने की आवश्यकता है[***] अगर यह सब सम्भव होता है तो फसली कृषि के माध्यम से मृदा के अत्यधिक शोषण पर लगाम लगेगा।

रेशम कीट पालन और संवहनीय कृषि

रेशमकीट पालन कृषि सम्बद्ध एक कुटीर उद्योग है जिसका सर्वाधिक महत्व जीविका के माध्यम सृजित करने में है क्यों कि यह एक श्रम गहन उद्योग है। इसमें कृषि (रेशम उत्पादन) तथा उद्योग दोनों क्रियाएँ आती हैं रेशम कीट पालन का परिकपक्वन काल छोटा होता है। संसाधनों का पुनः चक्रन शीघ्र होता है, तथा यह छोटे एवं सीमान्त सभी किसानों के लिये उपयोगी है। इसीलिये यह उद्योग तेजी से लोकप्रिय हो रहा है। इलाहाबाद जिले में एक महत्वपूर्ण क्षेत्र लगभग (34176.5 हेक्टेयर) 37.3% क्षेत्र छिटपुट रूप में ऐसा है[†††] जहॉ रेशम कीट पालन को किया जा सकता है। जो अपने आप में बहुत बड़ा क्षेत्र है। इससे फसलों के अन्तर्गत खेती में किसी भी कीमत पर अधिक से अधिक उत्पादन की प्रवृत्ति पर लगाम लगेगा जिससे कृषि संवहनीयता बढ़ेगी।

बागवानी और सतत् कृषि

बागवानी एवं संवहनीय कृषि में धनात्मक सम्बन्ध है। बागान से भी खाद्यसुरक्षा एवं पोषण को बेहतर रूप में उपलब्ध कराते हैं। बागवानी के अन्तर्गत फल सब्जियाँ, संगधित एवं सजावटी फूलों की खेती मसाले आदि आते हैं। इलाहाबाद की जनवायु दशाएँ। (उष्ण, खिलीधूप वाली) बॉगवानी के अनुकूल है।[‡‡‡] यहॉ आम, केला, नीबू, ताड़, अदरक, हल्दी, गेंदे, अमरूद तथा विभिन्न प्रकार की सब्जियों की खेती करके, आजीविका को बढ़ाया जा सकता है। पोषण की स्थिति

[§§] FAO: University of Winder Star Center for Animal welfaler the Brooke
[***] www. krishisewa.com
[†††] www.ijmer.com
[‡‡‡] हुसैन माजिद : कृषि भूगोल, 2004

International Journal of Management, IT & Engineering
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सुदृढ. की जा सकती है। गरीबी कम की जा सकती है। तथा खेती के परम्परागत असंवहनीय प्रवुत्तियों पर नियंत्रण किया जा सकता है। सोरॉव में इसके विकास एवं सम्वर्धन की बहुत पर्याप्त संभावनाएं है। क्योंकि इन उत्पादों की एक तो इलाहाबाद शहर में अत्यधिक मॉग है, दूरी कम है तथा यातायात एवं संचार के पर्याप्त साधन है, और कुम्भ मेला के मद्देनजर सड़क चौड़ीकरण इसमें और भी महत्वपूर्ण होता जा रहा है। व्यावसायिक शिक्षा का अभाव, किसानों का पूर्वाग्रही दृष्टिकोण, नवाचारों की कमी, निम्न आय इन उपरोक्त कृषि सम्बद्ध पद्धतियों के विकास में प्रमुख बाधाएँ हैं। (शोधार्थी)

निष्कर्ष सुझाव एवं नियोजन

उपयुक्त विवेचन एवं विश्लेषण से स्पष्ट होता है कि इलाहाबाद जनपद में पशुधन प्रबन्धन, मात्सिकी रेशमकीटपालन, बागवानी के विकास की पर्याप्त विभव हैं। और इनके समुचित विकास एवं संर्वधन करके यहॉ की कृषि के स्वरूप को संवहनीय बनाया जा सकता है। साथ ही अतिरिक्त आय, पोषण एवं खाद्य सुरक्षा, जीविकोपार्जन में वृद्धि (महिलाओं एवं युवाओं में) के लाभों को प्राप्त किया जा सकता है। इसके लिये निम्नलिखित सुझावों पर ध्यान देना चाहिए–

1. उपर्युक्त क्रियाओं पर बेहतर प्रबन्धन अपनाना होगा।
2. यथासंभव इन्हें संस्थागत रूप देना होगा।
3. व्यावसायिक शिक्षा को इण्टरमीडियट स्तर तक अनिवार्य करना चाहिए ताकि इच्छुक युवा भटकाव से बचकर इन क्षेत्रों में रोजगार के लिए कुशल हों।
4. नवाचारों के प्रसार के प्रयास।
5. विशेषीकरण पर बल।

इन उपर्युक्त सुझावों को ध्यान में रखकर इलाहाबाद में छोटे–छोटे फार्मों पर इनके विकास पर बल दिया जाना चाहिए। साथ ही इन क्षेत्रों को उन क्षेत्रों में अपनाना जहॉ की मिट्टी उतनी अनुपजाऊँ नहीं है या समस्या ग्रस्त है इससे कृषि के अन्तर्गत क्षेत्रों में कमी भी नही होगी बल्कि इसके क्षेत्र लगभग 34176.53 हेक्टेयर है जो जिले का लगभग 39.02 प्रतिशत है। यद्यपि पशुधन प्रबन्धन, बागवानी, रेशमकीट पालन तथा मत्स्यन जैसी विधियों में अभी और शोध एवं विकास (R&D) की आवश्यकता है। साथ ही इन्हें कृषि–जलवायु परिस्थितियों को ध्यान में रखकर अपनाने में महत्वपूर्ण परिणाम प्राप्त किए जा सकते है, तथा इससे छोटे एवं सीमान्त किसान विशेष रूप से लाभान्वित होंगे क्योंकि इससे जिले में हजारों की संख्या में रोजगार पैदा होंगे।

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Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

A Study On The Intricacies Of Balancing Effective Inventory Management And Meeting Customers'Demand In Service Sector – A Study Of Fast Food Industry In Muscat

Dr. HKS Kumar Chunduri*

Abstract
Customers of fast food business no longer look for a commodity. They come with the expectation of an experience when they dine out and hence it becomes necessary for such businesses to try and package their products in such a way that customers remember not just the food but the experience around the food. With competition constantly surging and customers' appetite for a different kind of experience always growing, fast food businesses have started realizing that they have to be not only unique, but offer an interesting and different kind of experience. This study tries to analyse how attention paid on inventory management in case of such business houses could ultimately lead to meeting customer demands. Satisfying customer demands would result in enriching customer experience which in turn would lead to customer satisfaction ultimately resulting in customer retention.
Keywords: Fast food business, service sector, inventory management, customer demand, experience, satisfaction and retention

Fast food industry being highly competitive requires each business to be very competitive in order to survive in the field in the long-run. In order to be effective every fast food business should ensure that it is not only prompt in accepting, handling and delivery of orders from its customers who have varied expectations but also have on their menu card food varieties that are unique and tasty. Another aspect requiring their utmost attention would be having in place an efficient and effective inventory management system. Nevertheless this should not make one wrongly perceive that customer satisfaction and experience are any less important.

Customers of fast food business no longer look for a commodity. They come with the expectation of an experience when they dine out and hence it becomes necessary for such businesses to try and package their products in such a way that customers remember not just the food but the experience around the food.

With competition constantly surging and customers' appetite for a different kind of experience always growing, fast food businesses have started realizing that they have to be not only unique, but offer an interesting and different kind of experience. This could be achieved by focusing attention on other aspects beyond just food and beverages served. In short they also ensure that the fast food restaurant environment, technology and service are excellent. Also perhaps arranging for special events would help provide a more solicitous and complete experience to their customers. This expectation is true of younger customers who are more interested in experiences instead of things. Every visit to a fast food joint makes them crave for a novel experiences and show their eagerness in ensuring that they

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do not miss out on any such experience. Thus to attract and retain such young customers, fast food businesses are compelled to work towards an "experience economy" by adopting many diverse strategies.

It is to be noted that every aspect discussed above has a certain well-defined and specific role to play in influencing the success or failure of the fast food industry. As such, each of such factors has a definite role to play in ensuring the success of the fast food business.

Review of Literature

Customer demand in service industry which influences customer satisfaction has been defined as the degree to which service performance meets or exceeds the customer's expectations (Kumar, 2012; Lombard, 2009; Santouridis & Trivellas, 2010). Hui and Zheng (2010) defined satisfaction as an evaluative judgment of a specific transaction resulting from perceived quality.

On the other hand, Danesh, Nasab and Ling (2012) defined customer retention as "the future propensity of a customer to stay with the service provider". According to them, customer satisfaction is not the only variable that influences the retention of customers.

Ramakrishnan, (2006) defined customer retention as the marketing goal of preventing a customer from switching to another competitor. Edward and Sahadev (2011) stated that "customer retention indicates customer's intention to repurchase a service from the service provider". They used customer retention as a measure of the customer's intention to stay loyal to the service provider. For them, service quality and customer satisfaction are important antecedents of customer retention.

Objectives of the Study

- To know the influence of service quality dimensions on customer demand leading to customers satisfaction in the fast food industry in Muscat
- To know the influence of quality of food on customer satisfaction
- To analyse the influence of service quality dimensions on customer retention,
- To know the influence of customer experience on customer satisfaction and
- To analyses the influence of customer satisfaction on customer retention**.**

Methdology

The research design of this study is descriptive in nature. The sampling technique adopted in selecting respondents for the customer satisfaction survey is convenience sampling. The sample size is limited to 150 respondents belonging to the two genders, of different ages and with different educational and occupational backgrounds in Muscat city of Sultanate of Oman.

Food Inventory Management Techniques

It cannot be denied that the most important investment with respect to fast food business is the investment made in carrying stock of food and beverages. Primarily the inventory of such business consists of all the ingredients, items or raw materials which are required to prepare the dishes on the menu card apart from ensuring that there is a proper and accurate tracking of inventory in stores in order to keep a check on the use of each ingredient, item or raw material with respect to preparation of the various dishes on offer. Apart from this as margin of profit starts reducing on account of increasing level of expenses, the business would be compelled to identify ways of reducing the various types of recurring costs.

Inventory is viewed as the hardwiring of any fast food business. The planning done with respect to such inventory helps to maintain a place for all items held in stock in an organised, systematic and well connected manner. So much of attention needs to

be given in planning inventory management as one small slip of adding a wrong ingredient or not adding an ingredient could lead to a big change in the business. Sometimes it may also so happen that about 10% of food is wasted before hitting a plate which means that 10% of the revenue may not be realized on account of such an inventory system thereby leading to a loss of revenue.

It should be noted that the primary objective of food inventory management is keeping a track of such inventory is to avoid a loss thereby increasing profitability of the business. Thus the specific aspects on which attention needs to be paid include the supplies that come into the business, the supplies that go out of the kitchen and what remains in stock.

Without having an exact idea about the above mentioned numbers, the fast food business will not be able to understand where the supply or money put into business is disappearing. Yet another aspect on which focus needs to be had is whether the food so prepared was sold to satisfy customers or not.

In order to make the food inventory management system more effective the business should be able to attribute or apportion each and every kilogram of stock of inventory held to a price point. It should also make an allowance for the indispensable losses of the industry like spillage, employee mistakes, remedying customer complaints, staff meals and theft. The following are the important levels of inventory which should be borne in mind.

Sitting Inventory

Sitting inventory refers to the amount of product (in terms of rupees) held in stock. This of course would depend upon the level of fast food business. This can either be indicated in terms of physical quantity or in terms of rupees. It is also important to ensure that it is consistently maintained in only one of the two measures.

Depletion

Depletion refers to the amount of product either in physical quantity or in rupees that is used during a particular pre-determined period of time. Depletion can be calculated on the basis of sales made daily, weekly or monthly. Sales reports are generated using the data from Point of sales.

Sales reports provide a summary of all transactions that have been made during the selected time frame. Sales reports show details regarding net sales; gratuity, tips, total guests, and table turn time, and a breakdown of all service types and payment methods. In short they help one to scan through and have an in-depth analysis of the various pertinent sales metrics.

From such an analysis, business can scale down to gaining additional insight into aspects relating to orders, payments, shifts, cash drawers, and house accounts.

Usage

Usage refers to the physical quantity or amount of inventory in terms of rupees of sitting inventory divided by the average depletion in a set period. The formula is as given below:

Usage = Sitting Inventory ÷ Average Depletion (during a given time frame)
= Usage Variance

Variance

Variance is defined as the difference between the product cost and the usage amount cost.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Ways of Managing Food Inventory

The following are the different methods that could be employed by a fast food business to manage its inventory

Automated Inventory Management

The most effective and fool proof way to manage inventory would be to install a POS inventory management software system which would help in recording actual usage, a metric which business operators can compare against their theoretical usage for a better picture into how their inventory moves through the restaurant.

The biggest advantage of such POS software is that it would serve as an accurate measure of tracking inventory. However it should be noted that it is unavailable for all POS platforms. In fact very few POS software has been able to integrate inventory management into the system thereby providing only limited application.

Par Inventory Sheets

A par inventory sheet is actually a tool which could be used to manage inventory especially by food businesses. It helps managers to set levels with respect to quantity of how much inventory is to be held for each and every item in stock, which is called as the par level.

Such limits when set provide them inputs for placing orders again and again for each item held in stock. The already prepared par inventory sheet acts as a guide to what and how much of inventory should be ordered of course keeping in mind, the levels of sitting inventory, how fast previous inventory moved through the restaurant, and any upcoming events are likely to have additional stocking of inventory.

The biggest advantage of this par inventory sheet is that it is based more on intuition and requires some simple forecasting to arrive at the quantities for which an order has to be placed to replenish the stock on hand. However as this does not give importance to cost and variance and focuses only on usage, it could lead to over ordering which ultimately may result in theft and wastage.

Wing It

Wing it though not an acceptable way of dealing with inventory management is often made use of by fast food businesses. This refers to a situation where a fast food restaurant orders for certain inventory purely on the basis of a manager's gut feeling or on the basis of walk-in of customers. Winging it as an inventory management strategy unfortunately puts the business at high risk of theft, high variance between cost and usage, inaccurate reporting which ultimately affect the profitability of the business.

Satisfying Customer Demand Leading To Customer Experience Thereby Customer Satisfaction

All efforts put in towards having in place an effective inventory management system, is to ensure that it leads to a pleasant customer experience which in turn would lead to customer satisfaction and customer retention. Thus inventory management could be seen as a strategy that could be used towards achieving the above objectives in a smooth manner.

The following tables show the results with respect to the survey conducted to know the influence of service quality dimensions on satisfying customer demand resulting in customer satisfaction, quality of food being a factor of customer satisfaction, influence of service quality dimensions on customer retention, customer experience influencing customer satisfaction and customer satisfaction influencing customer retention.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Data Analysis

The demographics of the customers covered by the survey are as given below.

Table 1: Demographics of the customers covered by the survey

Gender	**Percent**	**Education**	**Percent**
Male	56%	Schooling	12%
Female	44%	Graduate	74%
Age	**Percent**	Post Graduate	14%
Less than 20	14%	**Occupation**	**Percent**
20– 30	18%	Salaried	48%
30 – 40	24%	Business	28%
40 – 45	22%	Professional	24%
45- 50	12%	**Nationality**	**Percent**
50 – 60	6%	Expatriates	44%
More than 60	4%	Nationals	56%

Hypothesis 1: Customer satisfaction is influenced by service quality dimensions

Table 2: Regression results for customer satisfaction being influenced by service quality dimensions

Independent variables	**Customer satisfaction**		**P value**	**Result**
	B	**t value**		
Tangibles	0.361	6.321	<0.000**	Significant
Reliability	0.134	8.312	<0.000**	Significant
Responsiveness	0.284	10.10	<0.000**	Significant
Assurance	0.167	8.544	<0.000**	Significant
Empathy	0.121	4.989	<0.000**	Significant

Note. *The tabulated value of t = 1.96; **significant at P < 0.01, R^2= 0.331

The regression results show that the independent variables i.e., service quality dimensions have a significant and positive influence on customer satisfaction. Therefore, hypothesis 1 is accepted. According to these findings, the value of R^2 (0.331) means that 33.1% of customer satisfaction of customers can be explained by the service quality dimensions such as tangibility of services, reliability of services, responsiveness, empathy and assurance given by fast food restaurant employees.

Hypothesis 2: Customer Satisfaction depends upon the quality of food served

Table 3: Regression results for customer satisfaction being influenced by quality of food served

Independent variables	**Customer satisfaction**		**P value**	**Result**
	B	**t value**		
Food Quality	0.382	10.34	<0.000**	Significant

Note. *The tabulated value of t = 1.96; **significant at P < 0.01, R^2= 0.664

The results of the regression analysis show that 66.4% of customer satisfaction depends upon the quality of food served to customers.

Hypothesis 3: Customer retention is influenced by service quality dimensions

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Table 4: Regression results for Customer retention being influenced by service quality dimensions

Independent variables	Customer satisfaction		P value	Result
	B	t value		
Tangibles	0.361	6.321	<0.000**	Significant
Reliability	0.134	8.312	0.101**	Rejected
Responsiveness	0.284	10.10	<0.000**	Significant
Assurance	0.167	8.544	0.090**	Rejected
Empathy	0.121	4.989	<0.000**	Significant

Note. *The tabulated value of t = 1.96; **significant at P < 0.01; R^2= 0.321

The regression analysis performed to test the relationship between tangibles, responsiveness and empathy has shown that there is a significant and positive influence of these dimensions on customer retention. On the other hand, it shows that reliability and assurance have no influence on customer retention. Therefore, the hypothesis is partially supported.

Hypothesis 4: Customer experience has a positive influence on customer satisfaction.

Table 5: The regression results among customer satisfaction and customer retention

Independent variables	Customer satisfaction		P value	Result
	B	t value		
Customer experience	**0.366**	**4.822**	**<0.000****	**Significant**

Note. *The tabulated value of t = 1.96; **significant at P < 0.01; R^2= 0.521

With the help of the linear regression test it has been proved that customer experience has a positive influence on customer satisfaction.

Discussions

The aim of the study was to examine the relationship between inventory management and the influence of the same on customer experience leading to customer satisfaction thereby improving customer retention. The various service quality dimensions and quality of food served influence customer satisfaction as well as the relationship between the dimensions of service quality and customer retention. The study had presumed that both service quality dimensions and quality of food exert a positive influence on customer experience leading to customer satisfaction, which in turn would positively affect customer retention.

Suggestions

In order to be more effective perhaps fast food business houses should train their staff on how to ensure effective inventory management. They can also start working on daily sales metrics in order to be able to make timely adjustments to the restaurant's inventory planning and provision deliveries. This would make them more effective in handling customer demands. They should also avoid "wing it" as an inventory management strategy and start focusing attention on carrying "just in case inventory".

Conclusion

In conclusion, the study found a significant relationship between service quality and food quality and customer satisfaction. In addition, service quality has a positive influence on customer retention. Similarly, customer satisfaction has a positive influence on customer retention and mediates the relationship between service quality and customer retention. The results of this study suggest that service quality not only enhances customer satisfaction, but also leads to customer retention**.**

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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Spitting: A Socio–Environment Problem in India

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Prakanshi**

Abstract
Now-a-days we are all aware about Swachh Bharat Abhiyan. It is a campaign in India that aims to clean up streets, roads and infrastructures of India's cities and villages. It was launched on 2nd Oct 2014. The objective of Swachh Bharat Abhiyan include eliminating open defecation through the construction of household – self and community – self toilets and establishing an accountable mechanism of monitoring toilet use. The mission aims to achieve an Open Defecation Free (O. D. F.) India by 2nd Oct 2019. In 2018 (present day) this campaign is about to cross its 4th year. In these last 4 years, efforts on large scale are made to eradicate open – defecation & urination, Garbage management with many awareness programmes. Consequently, according to Government's new data 19 states of India have become Open – defecation Free and 90% people have toilets.
In Swachh Bharat Abhiyan, we talk about clean India, but we always ignore some severe aspects of cleanliness like spitting. Spitting on public places, roads, streets, offices is one of the growing concern of sanitation. Spitting is responsible for many communicable diseases. It is not only the threat to hygiene but also an anti – social and anti – environment act.
In India spitting anywhere is a normal thing, there is no restriction to spit yet and this is dangerous and quite alarming. This research paper is moving around spitting problem in India and in Varanasi District of U. P. And this paper also focuses on causes, consequences and measures adopted for this problem. Along with above mentioned issues this paper also analyzes the impact of spitting on society, health and environment.
Keywords:- Spitting, India, Socio – environment, Swachh Bharat Abhiyan, Communicable diseases.

Introduction
Spitting is the Act of ejecting saliva from the mouth. It is also considered as an anti – social and anti – environment act in many parts of the world . On the other hand, In some parts of the world, it is socially acceptable, Also it is accepted as an act to express their anger with the other person. But mostly , It is commonly believed that it is most possible to transmit infectious diseases from one person to another person through saliva like Tuberculosis, Influenza and common cold. Spitting in public places is not only the issue of cleanliness but it is also a major threat to public health. This is a particular concern which has been identified as it is known that infectious diseases transmitted via droplets released when an infected person spits, coughs, or sneezes and the related bacteria spread in the air. So, in this way, the act 'Spitting' may be proved dangerous for public health.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

In India Spitting is a common act for civilians, because there is no anti-spitting rule in most parts of India. For this 'spitting' act many causes are responsible like Paan - Gutkha, Spitting-Habit, Reckless attitude of people etc. In the above causes Paan - Gutkha is main drive for spitting because Paan is taken as a token of hospitality and also resembles the status of most of the people, as Pan stains can be seen on roads, in public building and on streets. Therefore, Spitting also represents the hygienic behaviour of people. 'Swachh Bharat Abhiyan' is a campaign in India that aims to clean India by 2019 and it is running since 2014. It is India's largest public campaign for cleanliness and hygiene. The objectives of this campaign are eliminating open defecation and urination through construction of toilets and establishing an accountable Mechanism of monitoring toilet usage. To achieve these objectives, at large-scale, awareness programmes were conducted by the government, media, NGOs, film industry and also by many private institutions. Even the Prime minister of India called this campaign - "Satyagrah se Swachhagrah" in reference to Gandhi's campaign "Satyagrah". Because of all Awareness Programmes this campaign influenced the civilians towards changes in their attitude for maintaining cleanliness at domestic and social level.

Along with eliminating open- defecation and constructing toilet, this campaign also include garbage-management by door to door garbage collection and cleaning of roads, streets, buildings, Historical places throughout the country. At present time every Indian is aware about Swachh Bharat Abhiyan in spite of literacy level, rural or urban background and economic status. The way, this campaign influenced society, is commendable. Despite this, spitting is also a very important factor for society & environment which is not included in the objectives of this campaign, but it needs to be included. So that, people can also understand the problem of spitting like other sanitation issue and become aware of its consequences. Because it is necessary to first understand this 'problem' as a problem and then eradicate the problem. India is the country with the largest number of patients of TB (Tuberculosis). In spreading of TB, spitting anywhere is among one of the many causes. In reference, The Global TB Report statistics for India for 2017 give an estimated incidence figure of 2.80 million cases of TB for India. And the government of India has set the goal of ending T.B. in India by 2025. Without tackling every cause responsible for TB, it is difficult to get rid of TB totally. To achieve this goal, government has to consider spitting as a problem like Swachh Bharat Abhiyan, the issue of spitting should also be started as public campaign.

Objectives of the Study

1. History of Spitting in India and around the world.
2. To know the causes responsible for spitting.
3. To know the view of community about spitting.
4. To learn about communicable diseases spread due to spitting openly.
5. To know that people are aware about these communicable diseases or not.
6. To know the measures to be adopted for 'STOP SPIT' at government or private level.

Hypothesis

1. Most of the people spit openly.
2. Most of the people are unaware about the consequences of spitting.
3. Paan- Gutkha is the main cause responsible for spitting.
4. Psychological conditions are also responsible for spitting.

International Journal of Management, IT & Engineering
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Methodology

This study was conducted at Assi Ghat Area of Varanasi District in Uttar Pradesh. Because it is a place which is famous among one of the Ganga ghats of Varanasi and attract tourists for its religious importance. And people from all over India and the world, come here to see the beauty of Ganga ghat. So the Universe of the study is all localites and tourists with age above 15, who visit Assi Ghat. To complete the objectives of study, primary data has been collected from 150 respondents which was selected through simple random sampling. In this study Questionnaire is used to assess socio – environmental aspect of spitting in India.

The collected data is analyzed and interpreted using SPSS [Statistical Package for the Social Sciences] such as mean, percentage and frequency distribution, whatever required.

History of Spitting

In World

The History of Spitting in the world and also in India is gloomy. In 19th century, American government moved a step forward against many communicable diseases that were affecting population at large scale. In this series in 1889, a report named 'Attention to the communicability of Tuberculosis' was presented by a group of New York physicians, in this report they presented many aspects of TB and other diseases and also recommended many measures to prevent the spread of the diseases. In this report, first time, spitting was declared as a serious issue, responsible for transmission of many diseases. Approaching this report the New York Department of Health began a war against spitting , after a decade, this traditional habit of Americans was transformed into a public Health threat.

All the health departments throughout the United States followed New York's efforts and focused on the connection between spitting and the spread of disease. In doing so, New York passed the nation's first spitting ban in 1896 and by 1910, nearly 150 American cities, many small towns, and 13 states had banned spitting .Along with this a big change was seen in people's attitude about spitting ,now Spitters started using spittoons openly to spit in US and western Europe.

Singapore was the less developed country during 50s and early 60s. There were many issues of unhygiene like urination, littering, spitting at public places, unawareness towards cleanliness etc. And there was no strict law against above issues. But a big change was seen when Lee Kuan Yew became Singapore's First Prime Minister, he changed the whole scenario of Singapore. He had a vision to develop Singapore as a modern, vibrant and developed nation and he proved it as Singapore had to given up it's bad habits like spitting, littering and urinating in public places. For this he made and implemented some strict laws that included sanctions along with imprisonment. To insure the better implementation of that laws he involved educating, monitoring and finally catching offenders in the act.

So in this way many countries identified the problem of spitting and emphasized on eliminating the problem by adopting various measures.

In India

In India the history of spitting is quite uncertain. If we see back in our history we find that somewhere 'Spittoons' were used for spitting in reign of Mughals, they were fond of chewing paan but they had a good habit of spitting it into spittoons. The reason behind

using spittoons could have been anything but by doing this; they were indirectly protecting themselves from many diseases. Spittoons is still seen in some homes of India, where the aged people use spittoons placed near their beds. In 1918 when the epidemic was dilated, the use of spittoons in the west was seen in a large number. Mostly spittoons could be seen at the time of kings where kings and their courtiers had been using the spittoons to spit out 'Paan' or other excretions.

In the South, Madras government enacted the Health Act 1939, under which there was a rule of some fine against spitting at public places. But the fine remained only at documents and could not be enforced. Like Madras Government, Tamil Nadu government enacted the Prohibition of Smoking and spitting Act in 2002, but implementation had been poor as far as spitting is concerned. The Karnataka Municipal Corporations (Amendment) Act, 2013 empowers the corporations to fine offenders Rs.100/- for the first time and Rs.200/- subsequently. Public spitting and nose-blowing were banned in Kerala through an order in 2006, based on a High Court directive. The "Andhra Pradesh Prevention of Disfigurement of Open Places and Prohibition of Obscene and Objectionable and Advertisements Act, 1997" prohibits spitting at public places but it cannot be implemented very gracefully. West Bengal has the prevention of Spitting in public Act, 2003 with Rs.200/- fine, but it remains on paper.

Therefore, many states of India launched Anti-spitting law but these laws can't be implemented properly so that spitting problem is same as it was.

Spitting: Worldwide Scenario

In developed countries like United States, Singapore, there are strict rules against spitting at public places. Because of strict law the civilians of these countries are very serious and obeying about cleanliness of their country. They know if they do any anti-cleanliness thing at public places they will be penalized or can be arrested. Despite of this, there are some places where spitting is a competitive sport, with or without projectile in the mouth. Some has been described below –

Cherry pit spitting

It is the act of spitting or ejecting the pit of a cherry from one's mouth with great speed so it can cover a great distance. Spitting cherry pits is a favourite sport in Germany, France and some other European countries. A cherry pit is a very small in size like a front tooth and becomes very slippery when it is removed from the cherry, so it is easy to spit.

Cricket spitting

It is a sport where contestants place a dead cricket (an insect) in their mouth and then spit it as far as they can. The contestants who can spit the cricket farthest, is declared the winner. It is developed in 1996 in west Lafayette, Indiana, as a competition.

Kudu dung spitting

It is a sport practiced by the Afrikaner community in South Africa. In the competition, small and hard pellets of dung (body waste of animals) from the kudu antelope (Animal) is ejected from mouth with the farthest distance, whosoever 'dung' will reach farthest he will be the winner. This sport was developed in 1994 in South Africa. Above these sports are very strange. For these competition there is no concept of anti – spitting or spreading diseases.

International Journal of Management, IT & Engineering
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Spitting: Indian Scenario

Spitting in public places has been a part of people's lifestyle in India. India is yet to take a strong stand on it. . In India there is a mentality of people to clean their homes and least bothered about the public places. They shift this responsibility on government and think what can they do? In India many laws have been enforced stating spitting in public places is an offensive act and the offender will be penalized. But due to lack of firm regulation these offenses have been continued. There are other aspects of spitting in India for example in rural parts of North India, it is a custom that mother spits on the side of her children as an act to prevent their children from an evil eye or 'nazar'. Behind it there is mother's excessive love for their children.

Shopkeepers, sometimes, use spitting gesture on the cash proceeds from the first sale of the day, which is customary believed to ward – off 'nazar' from the business. And in Photostat shop, the shopkeeper use their spit to turn the pages for photocopy, it is not a custom but just a bad habit and it seems very unhygienic.

To 'stop spit' Maharashtra Government has taken a stand and approved a more stricter Anti-spitting Law to take action against this old but disgusting habits that seems to have incorporated in the people's life in India. Under this Law, the first time offender will have to pay Rs.1000/- and will be made to do any odd jobs for a day like sweeping the floor at the government hospitals or offices. A second time offender will have to pay out Rs.3000/- and be forced to perform community service for three days. A third time or more, an offender has to pay Rs.5000/- in fine and five days of community service. This effort of Maharashtra Government is commendable.

In Madhya Pradesh, if anyone is caught dirtying the roads and walls of Madhya Pradesh's city Indore by spitting, there, his/her name will be broadcasted on the radio or will be mentioned in the local newspaper. To maintain its cleanest city tag, the Indore Municipal Corporation (I. M. C.) has decided to publicly shame people and discourage others from spitting. Considering that spitting is a serious health hazard, the municipal corporation will also charge a fine of Rs.200/- or more on habitual offenders. Besides the above measures, the corporation has appointed a special inspecting team who will keep an eye on the places which are highly prone to Paan and Gutkha spits and requested all the vehicle owners to install a small bin in their vehicle and refrain from spitting on roads. It has also ask all the roadside local shops especially the Paan shops to place spittoons in or out their shops.

Uttar Pradesh Chief Minister banned paan-gutkha and other tobacco products in all government offices. The authorities in Shahjahanpur district have caught divine help to solve spitting problems. For this tiles of Hindu gods and goddesses have been put up in the corners and staircases of administrative offices in the district to stop people from spitting paan juice and gutkha. Such tiles can be seen along the stairs of Vikas Bhawan, which is center of the local administration. According to an article, the Municipal Corporation of Varanasi is planning to take a good move towards clean Varanasi. Municipal Commissioner says that " there is no ban on chewing Banarasi Paan, but people must enjoy it responsibly without spitting and throwing the wrappers in public places." For this purpose, Municipal Corporation has planned to fine people up to Rs.500/- for each paan spit and Rs.100/- for littering public places with mahua leaf/wrappers. There are lot of plans to stop spitting but without

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proper implementations and regular monitoring, above plans will not be prove much effective.

Data Analysis

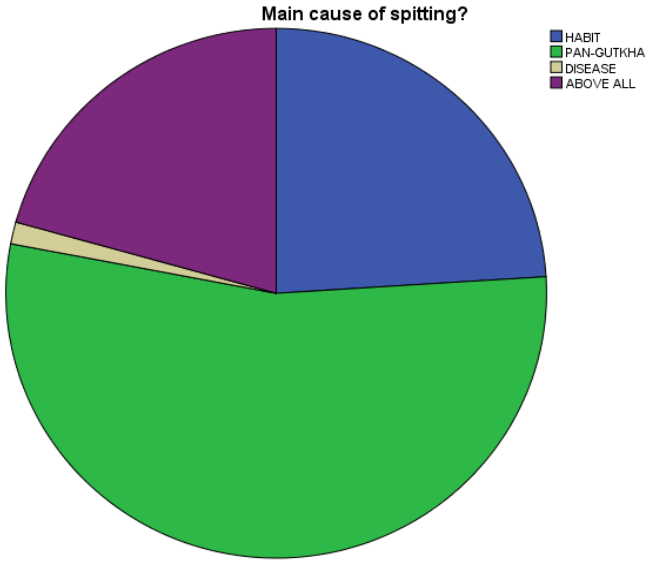
Table – 1 → is spitting a problem?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	125	83.3	83.3	83.3
	NO	25	16.7	16.7	100.0
	Total	150	100.0	100.0	

There is majority of people (83.3%) who consider spitting as a problem, not even a problem but now-a-days it is dangerous for Society, Environment and health. Not only in Varanasi but also in all over U. P. , it is growing as an issue of sanitation and hygiene, which should be noticed by government and civilians.

Table – 2 → Main cause of spitting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HABIT	36	24.0	24.0	24.0
	PAN - GUTKHA	81	54.0	54.0	78.0
	DISEASE	2	1.3	1.3	79.3
	ABOVE ALL	31	20.7	20.7	100.0
	Total	150	100.0	100.0	



There is a big question why people spit and what are the causes ? As it can be seen above that 54% people consider Paan-Gutkha as a main cause of spitting. All we know, Varanasi is known for it's Banarasi Paan and stains of Paan are found in every corners. 'Habit' is also a cause of spitting. Because there is no restriction on spitting, so every person has become habituated to spit anywhere.

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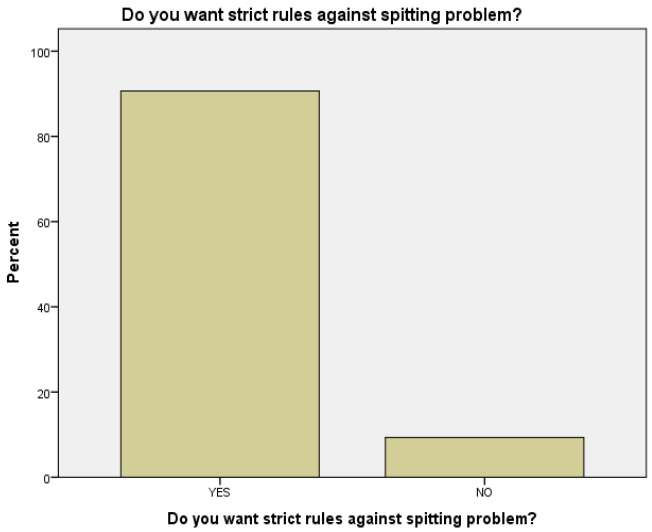
Table – 3 → Awareness about diseases transmitted by spitting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	COMPLETELY	51	34.0	34.0	34.0
	PARTIALLY	52	34.7	34.7	68.7
	NOT AT ALL	47	31.3	31.3	100.0
	Total	150	100.0	100.0	

There is a main role of spitting in transmission of communicable diseases like Tuberculosis, Influenza, Pneumonia etc.. As we can see 31.3% are unaware about diseases transmitted by spitting and 34% of respondents are aware about communicable diseases but even they spit because they are habitual in the absence of strict legislation.

Table – 4 → Do you want strict rules against spitting?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	136	90.7	90.7	90.7
	NO	14	9.3	9.3	100.0
	Total	150	100.0	100.0	



Because of Swachh Bharat Abhiyan, every person wants strict rules against spitting and to adopt the desired changes towards this problem. In the survey the question was asked that 'Do you want strict rules against spitting?' the answers were as follows- 90.7% of respondents replied in Yes, only 9.3% replied in No. It shows that now people are aware and sensitized, and the credit goes to Swachh Bharat Abhiyan.

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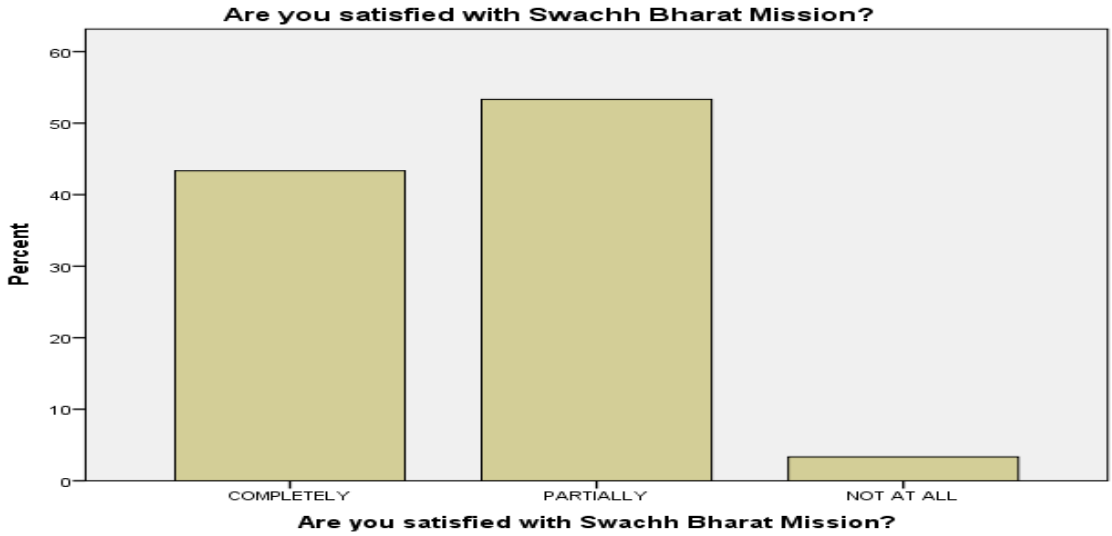
Table – 5 → Does habit of spitting represent human behaviour?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	IN A PERTICULAR SITUATION	58	38.7	38.7	38.7
	ALWAYS	83	55.3	55.3	94.0
	NEVER	9	6.0	6.0	100.0
	Total	150	100.0	100.0	

Every act of a person represents his human behavior. Similarly spitting is also an act which represent a human's behavior. When the question 'Does the habit of spitting represent human behaviour?' was asked the following answers came- 55.3% of respondents believed that when a person spits anywhere with any cause, it always denotes his social behavior, hygienic behavior and also his personal behavior. In other side 38.7% of respondents believe that it does not represent human behaviour whereas sometimes circumstances provoke a person to spit.

Table – 6 → Are you satisfied with Swachh Bharat Mission?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	COMPLETELY	65	43.3	43.3	43.3
	PARTIALLY	90	53.3	53.3	96.7
	NOT AT ALL	5	3.3	3.3	100.0
	Total	150	100.0	100.0	



Today each person knows about Swachh Bharat Abhiyan. This mission has influenced everyone by changing their sanitation habits and thinking. Now India is moving towards Clean India, but still complete satisfaction with this mission is only 43.3% and 53.3% of respondents are partially satisfied. So there is a need of more efforts to make India as Clean India.

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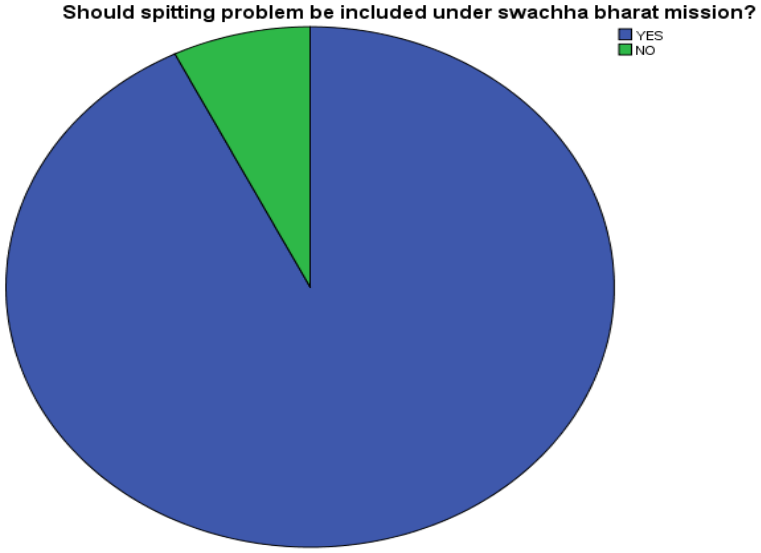
Table – 7 → Should spitting problem be included under Swachh Bharat Mission ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	139	92.7	92.7	92.7
	NO	11	7.3	7.3	100.0
	Total	150	100.0	100.0	



Swachh Bharat Abhiyan only focuses on sanitary issues like open defecation and urination, waste management with awareness programmes. Spitting is also a issue which should be included in Swachh Bharat Abhiyan and 92.7% of respondents agreed with it, only 7.3% of respondents disagreed with it.

Table – 8 → Can spitting problem be solved?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	62	41.3	41.3	41.3
	NO	30	20.0	20.0	61.3
	PARTIALLY	58	38.7	38.7	100.0
	Total	150	100.0	100.0	

There is a question in every mind that can this problem be solved? In answer this question 41.3% of respondents replied in Yes and 38.7% replied partially and 20% of respondents replied in No. So It is clear that it is a big challenge for government and civilians to solve this problem.

Conclusion

As we see above that there is a dissatisfactory condition towards Spitting. People are not aware about their own health related to hygiene condition in India. For every problem they only blame government, but never realize their mistakes and unawareness. Spitting is an issue of unhygiene and improper awareness, but it also can not be ignored as it leads to effect a health, environment and social issues. If we talk about Clean India, then we should also consider this issue under Swachh Bharat Abhiyan. Now India is also moving towards solution of this problem as like in foreign countries, but implementation of any programme is very important than making a rule against

spitting. And implementation is possible when awareness programme will be held on large level to identify the exact problem. There is no one who can stop a person from chewing Paan-Gutkha, but proper arrangements for spitting like placing spittoons at every place can be done. After then civilians should be promoted to use spittoons, as at government and private level efforts were made to aware civilians to use the green and blue dustbin for garbage under Swachh Bharat Abhiyan. If every person will be affirmed towards their habits in maintaining their society and environment, all problems will be solved automatically.

For solving problem of spitting government should make spittoons compulsory for vehicles and in absence of spittoons they should be penalized like the way they are being penalized for not wearing helmet, seat-belt etc.

Because of Swachh Bharat Abhiyan people are made aware about cleanliness issues and they are gradually moving towards adopting cleanliness habits. During data collection some people complaint about spitting problem and also suggested for solution of this problem. Some are below-

- Spittoons must be compulsory on Paan shop and for vehicles.
- There should be spittoons on public places and tourist places.
- Habitual spitters should be penalized if they spit out on public places.
- Surveillance should be kept through CCTV cameras.
- Spitting should be seriously taken under Swachh Bharat Abhiyan.
- Awareness programmes are to be held at regular basis.

If above measures are adopted by government and followed by public strictly, then there is a way to get rid of the problem of spitting and health hazards because of spitting openly.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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A Study of Right to Life under Indian Constitution

Dr. Sangh Sen Singh*

Abstract
A legislature in India right to life is an important contribution to the field of law, but many times they have constricted their development Group. Life and freedom is strengthened, and once prosperous India can excel in the global community. Only one person has the right to protect the livelihood of the standard. The court in Durgapur Projects Ltd. V. Shankar "decent housing" extended to include the right to live. The standard of living of the petitioner was entitled. The right to live in a civilized society, to be sure, food, water, decent environment, education, treatment and understanding of the right to housing. This is known as a fundamental human right in any civilized society. Universal Declaration of Human Rights and Convention or under the Constitution of India inserted in all civil, political, social and cultural rights cannot be applied without these basic human rights. A person's right to life under the control of their due diligence of the people who have to work with the public authorities may be affected due to neglect.
Keywords: Right to Life, Life and Freedom, Livelihood, Education, Environment, Human Right, Fundamental Right, Cultural Rights.

1.0 Introduction

The right to life is undoubtedly the most fundamental of all rights. Life' in Article 21 of the Constitution is not merely the physical act of breathing. It does not connote mere animal existence or continued drudgery through life **(Baxi, Upendra, 1980).** It has a much wider meaning which includes right to live with human dignity, right to livelihood, right to health, right to pollution free air, etc. Right to life is fundamental to our very existence without which we cannot live as human being and includes all those aspects of life, which go to make a man's life meaningful, complete, and worth living **(Bhat, P. Ishwara., 1996).** It is the only article in the Constitution that has received the widest possible interpretation. Article 21 of the Constitution, "life" is not only the physical act of breathing. The mere animal existence or life is communicated through continuous hard work. The right to health, right livelihood, right to live with human dignity, which includes a very broad sense, free air, and the right to pollute **(Bhagwati,P.N, 1985).** Livelihood under Article 21 so as to include the word "life" as an explanation of the question again for the first time before the Supreme Court in **Sant Ram** came to the idea. Speaking through court Sinha, Chief Justice, the language of art, worked on it. Fundamental Rights are a bunch of rights as set out in a charter of rights contained in Part III of Constitution of India. Fundamental Rights guarantee certain civil liberties to all people, citizen or alien, enabling them to lead their lives with dignity, in peace and harmony and to the fullest **(Paranjape, N.V, 1975).**
Of all the available fundamental rights, the most fundamental is the Right to Life.
Article 21 of the Constitution lays down that the constitution guarantees the right to life and personal liberty to every person, citizen or alien and cites specific provisions in which

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these rights are to be applied and enforced. Article 21 guarantees the protection of life and personal liberty to every individual and states that, "No person shall be deprived of his life and personal liberty except according to procedure established by law" **(Chaturvedi, S. D, 1978).**

The meaning of the word life includes the right to live in fair and reasonable conditions, right to rehabilitation after release, right to live hood by legal means and decent environment. The expanded scope of Article 21 has been explained by the Apex Court in the case of **Unni Krishnan v. State of A.P.** and the Apex Court itself provided the list of some of the rights covered under Article 21 on the basis of earlier pronouncements and some of them are listed below:

(1) The right to go abroad.
(2) The right to privacy.
(3) The right against solitary confinement.
(4) The right against hand cuffing.
(5) The right against delayed execution.
(6) The right to shelter.
(7) The right against custodial death.
(8) The right against public hanging.
(9) Doctors assistance

Article 21 assures the right to live with human dignity, free from exploitation. Both the Central Government and the State Government are therefore bound to ensure observance of the various social welfares and labour laws enacted by Parliament for the purpose of securing to the workmen a life of basic human dignity in compliance with the directive principles of the state policy.

2.0 Right to Environment and Right to life

Environment and life are interrelated. The existence of life on earth depends on the harmonious relationship between ecosystem and environment. The existence of life on earth, ecology and environment depending on the harmonious relationship **(Chaturbedi, M, N, 1984).** Especially-Homo interaction with nature is very close. People at the center of concerns for sustainable development and a healthy and productive life in harmony with nature, you are entitled to be sure. Life, livelihoods, culture and society, are fundamental aspects of human existence - hence their maintenance and enhancement is a fundamental human right **(Errabbi, B, 1981)**. Destruction of environment and thereby of the natural resources, is therefore, a violation or leads to the violation of human rights - directly by undermining the above aspects of human existence, or indirectly by leading to other violations of human rights **(Ayres, Clarence, 1995).**

2.1 Judicial Interpretation to Right to Life and Environment:

The right to healthy environment has been incorporated, directly or indirectly, into the judgments of the court. Link between environmental quality and the right to life was first addressed by a constitutional bench of the Supreme Court in the Charan Lal Sahu Case. In 1991, the Supreme Court interpreted the right to life guaranteed by article 21 of the Constitution to include the right to a wholesome environment.

3.0 Right to Personal Dignity and Right to Life

According to the Oxford Dictionary 'Life' is a condition that distinguishes animals and plants from inorganic matter, including the capacity for response, growth, reproduction, functional activity, and continual change preceding death **(Krishnaji, N., 1997).**

Employment, education, health, freedom from hunger the professions, social security and the economic and social rights of all people to a dignified existence. The most important way to ensure that from the point of view of Subalterns and to ensure that the minimum requirements are important **(Kuznets, Simon, 1955).** Human dignity, the right to rest and leisure, personality development, social security, the right recommendations and Articles 38 and 39 of the Constitution, Universal Declaration of Human Rights by the comfort of a temporary basic human rights. Air 1995 Supreme Court 922 "Consumer Education and Research Centre V. Union of India," the right to life, health and strength of workers, to enable a person to live with human dignity, requiring a minimum of protection are included **(Bansal, V.K., 1987).** But is it really what we see nowadays around us. **Union minister Arun Jaitley** recently said, "Nobody has the right to take the law in their own hands. If someone does do that, it should be condemned and the person should be arrested and prosecuted. We are the world's largest democracy. We have an element of tolerance and mutual respect. There is no justification which can be done for violence." Article 21 and Article 21 A of the Indian constitution are to be protected as they are the broadest fundamental right. The Supreme Court in the case of **Maneka Gandhi vs. Union of India** held that right to life embodied in Article 21 of the Indian Constitution, is not merely a physical right but it also includes within its ambit, the right to live with human dignity. In the case of **Francis Coralie vs. Union Territory of Delhi** it was held that right to live includes the right to live with human dignity with bare necessities of life such as: Adequate nutrition, Clothing, Shelter over the head and facilities for: Reading Writing, and Expressing oneself in diverse form **(V. Parabrahma Sastri, 2005).** Any person footpaths, pavements or public street or a public purpose or earmarked reserves the right to encroach and erect a structure or any place else there, even though the distribution of wealth and resources of the constitutional duty to provide adequate facilities and opportunities for the protection of life and on their heads for settlement building, to the right to life meaningful, effective and efficient **(Malik, M.S., 2001).**

4.0 The Right to Water under the Right to Life

In India, where the right to water is not enshrined as a fundamental right in the national Constitution, courts at both state and federal level have interpreted Article 21 of the Constitution, the right to life, as encompassing the right to safe and sufficient water and sanitation.

In 1990, for example, The Kerala High Court in **Attakoya Thangal v. Union of India** recognized the fundamental importance of the right to water.

In this case, the petitioners claimed that a scheme for pumping up ground water for supplying potable water to the Laccadives (now known as the Lakshadweep Islands) in the Arabian Sea would upset the fresh water equilibrium, leading to salinity in the available water resources and causing more long-term harm than short-term benefits.

The **Kerala High Court**, in its judgement, requested deeper investigation and monitoring of the scheme and the judge clearly recognised the right of people to clean water as a right to life enshrined in Article 21, observing that:

"…the administrative agency cannot be permitted to function in such a manner as to make inroads into the fundamental right under Art 21. The right to life is much more than a right to animal existence and its attributes are manifold, as life itself. A prioritization of human needs and a new value system has been recognized in these areas. The right to sweet water

and the right to free air are attributes of the right to life, for these are the basic elements which sustain life itself."

5.0 Right to Livelihood under Right to Life

It is the Fundamental right of every citizen under Article 21 of this country to live with human dignity, free from exploitation and practice any profession to support his livelihood. The magnitude and contents of the components of this right would depend upon the extent of economic development of the country **(Marks, Stephen P., 2005.).** For example and with all due respect, we have a great example in form of our Prime Minister, had it not been a right to practice his livelihood as desired by him from being a tea vendor to the honourable Prime Minister of India. The word life in Article 21 of Constitution of India includes the right to livelihood. In case of **Oliga Tellis v. Bombay Muncipal Corporation** also popularly known as Pavement Dwellers Case in this case the Chief Minister of Maharashtra had made announcement that all pavement dwellers in the city of Bombay will be evicted forcibly and deported to their respective places outside the city. The announcement was made on the apparent justification that it was a very inhuman existence during the monsoon season.

6.0 Right to Good Health under Right to Life

This right as provided under Article 21 ensures that the basic requirements which must exist in order to enable a person to live with human dignity and medical treatment, and no State has the right to take any action which will deprive a person of the enjoyment of these basic essentials **(Gopalkrishnan, N.S, 1989).** Which means failure on a part of a government hospital to provide timely medical treatment is violation of Article 21 of the Indian Constitution but same does not extend to private hospital facilities. The human right to health means that everyone has the right to the highest attainable standard of physical and mental health, which includes access to all medical services, sanitation, adequate food, decent housing, healthy working conditions, and a clean environment **(Pogge, Thomas, 2002).** The Constitution of India on the right to health care the Constitution incorporates provisions guaranteeing everyone's right to the highest attainable standard of physical and mental health. Article 21 of the Constitution guarantees protection of life and personal liberty to every citizen **(Ravallion, Martin. 1997).**

7.0 Right to Shelter under Right to Life

In various cases, the Supreme Court has enlarged the meaning of life under Article 21 of the Constitution to include within its ambit, the right to shelter. In some of the cases upholding the right to shelter, the Court looked at differentiating between a mere animal-like existence and a decent human existence, thereby bringing out the need for a respectable life **(Rodrik, D. 2007)**. Right to shelter therefore includes adequate living space, safe and decent structure, clean and decent surrounding, sufficient light, pure air and water, sanitation and other civil amenities like roads so as easy to access to daily avocation. In view of importance of the right to shelter the mandate of constitution and obligation under the Universal Declaration of Human Right, The court held that it is the duty of state to provide housing facilities to Dalit's and tribes, to enable them to come into the mainstream of national life **(Sinha, Dipa, 2006).** "Shelter for a human being, therefore, is not a mere protection of his life and limb. It is home where he has opportunities to grow physically, mentally, intellectually and spiritually. Right to shelter, therefore, includes adequate living space, safe and decent structure, clean and decent surroundings, sufficient light, pure air and water, electricity, sanitation and other civic amenities like roads etc. so

as to have easy access to his daily avocation **(Tilak, Jandhyala B.G.2002).** In PC Gupta Vs State of Gujarat and Ors, in 1994, the Court went further holding that the Right to shelter in Article 19(1) (g) read with Articles 19(1) (e) and 21 included the right to residence and settlement. Protection of life guaranteed by Article 21 encompasses within its ambit the right to shelter to enjoy the meaningful right to life. The right to residence and settlement was seen as a fundamental right under Article 19(1) (e) and as a facet of inseparable meaningful right to life as available under Article 21.

8.0 The Right against Solitary Confinement and Right to Life

The Indian socio-legal system is based on non-violence, mutual respect and human dignity of the individual. If a person commits any crime, it does not mean that by committing a crime, he ceases to be a human being and that he can be deprived of those aspects of life which constitutes human dignity **(World Economic Forum. 2008).** Solitary Confinement in a general sense means the separate confinement of a prisoner, with only occasional access of any other person, and that too only at the discretion of the jail authorities. In strict sense it means the complete isolation of a prisoner from all human society.

In the case of **Ajab Singh & Anr. v. State of Uttar Pradesh & Ors,** the court said that: We do not appreciate the death of persons in judicial custody. When such deaths occur, it is not only to the public at large that those holding custody are responsible; they are responsible also to the courts under whose orders they hold such custody.

The court further said that the State of Uttar Pradesh is responsible in public law for the death and must pay compensation to the petitioners for the same. They shall also pay to the petitioners the costs of the writ petitions, quantified at Rupees ten thousand.

9.0 Conclusion

Deprivation of livelihood would not only denude the life of its effective content and meaningfulness but it would make life impossible to live. And yet such deprivation of life would not be in accordance with the procedure established by law, if the right to livelihood is not regarded as a part of the right to life. 'Right to life' and 'personal freedom' of the modern name for what traditionally has been known as a 'natural right.' It is necessary for the development of the human personality is right primitive. The importance of affirmed rights of every human being needs no emphasis and, therefore, to deter breaches thereof becomes a sacred duty of the Court, as the custodian and protector of the fundamental and the basic human rights of the citizens. Article 21 of the Indian Constitution guarantees, among other things, life, liberty, privacy and human dignity. The Indian judiciary magnificently has broadened the horizon of Article 21 by providing the widest possible interpretation to include various facets of life under this provision. Life should be protected, but the protection should not result as a forced burden for terminally ill patients. In exceptional situations terminally ill patients should be allowed to die with dignity.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Impact of Financial Literacy on Mutual Funds: With Special Reference to Working Women

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Abstract
A mutual fund is an investment vehicle made up of a pool of money collected from many investors for the purpose of investing in securities such as stocks, bonds, money market instruments and other assets. Mutual funds are operated by professional money managers, who allocate the fund's investments and attempt to produce capital gains and/or income for the fund's investors. Financial literacy has turned out to be progressively essential over the previous decades. There is a developing conviction that the individual would need to end up increasingly self-reliant now a days. 21st century working women appear to be competent and will never compromise on anything, regardless of whether it is wellbeing or security for herself, as well as her family (Dr. Sarita Bahl, 2012). Many researchers have perceived that the women don't portray themselves of being confident or financially literate about investing in Equity Markets. Women don't have enhanced portfolios. Women are generally not considered as regular investors in equity markets.
Key Words: Financial Literacy, Working Women, Mutual Funds

Introduction

The development and growth of Indian economy and the extension of financial markets through Privatization, Liberalization and Globalization have laid a route to a plenty of financial avenues. However, insufficient financial illiteracy impacts the judicious decision making process of the individuals. Subsequently, the people are not ready to pick the most reasonable investment alternative that beats the rate of inflation existing in the economy and give them a net gain.

Investment is a financial resource obtained with a thought, that the investment will fetch income in future. The measure of investments made in various sectors, is the most essential factor for the development of an individual (Jane Cowdell, Mark Billings, 2001). There are distinctive thought processes of interests in different avenues by the investors. The investors set aside a part of their savings to meet the future needs.

Mutual funds give small or individual investors access to professionally managed portfolios of equities, bonds and other securities. Each shareholder, therefore, participates proportionally in the gains or losses of the fund.

Financial literacy has turned out to be progressively essential over the previous decades. There is a developing conviction that the individual would need to end up increasingly self-reliant now a day. Increased competition and progressively complex financial products and services leave numerous individuals ill-equipped to adapt to the refined decisions they

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may need to make. In the meantime, individuals are living longer and they have to make a more prominent arrangement for retirement, insurance and healthcare protections to cover unusual happenings, where government is never again ready to give the sort of safety net that was accessible before. Given this, people must have fundamental abilities to settle on reasonable financial related choices to empower them to be more responsible for their own conditions and to have a protected financial future.

Hogarth J. M. (2006), in his study said that financial literacy include: (1) being educated, knowledgeable, and educated on the issues of overseeing cash and resources, investing, banking, credit, taxes, insurance, and expenses; (2) understanding the essential ideas underlying the administration of cash and resources (e.g., the time value of cash in investments, and pooling of risks); and (3) utilizing that information and understanding to plan, execute, and assess monetary decisions.

Women have generally been viewed as home makers and their primary job is to take care of the home needs instead of financial decision making (Ranjani K.S, 2011). Especially 21st century women appear to be competent and will never compromise on anything, regardless of whether it is wellbeing or security for herself, as well as her family (Dr. Sarita Bahl, 2012). Plethora of researches on working women investors agree that they are passive investors and they are unlikely to take even minimum risk when selecting investment avenues which are mainly centered on family issues.

Many researchers have perceived that the women don't portray themselves of being confident or financially literate about investing in Mutual Funds. Women don't have enhanced portfolios. Women don't survey and contrast their performance of the investments especially on equity and market benchmarks on a persistent premise. Women are generally not considered as regular investors in Stock markets.

Literature Review

Jacob Hudson, 2000 perceive that many assumptions in security market stem from the idea of logical investment decision conduct from capitalists. It has been seen that this isn't the situation every time though. A contemporary research identifies the abstract feature in financial decision making and therefore challenges the orthodox models. Also Demographic aspects like age, marital status, income level, level of education etc. play an important part in the investment decision.

According to Ranjith, V.K., 2002 the higher aged investors tend to invest more and bother less about risk. Also people with regular income and graduates actively participate in stock market. The speculators' perception regarding the investment decisions is also confined to financial accomplishment of the organization.

Rajarajan, V., 2003 represented the actual relation between demographic aspects and the risk tolerance ability of investors in India. The relation between income, age and the risk tolerance ability of the investors are too high. The most risk groups included the salaried investors.

Warren et al., 1990 tried to establish life style and analytical profiles of capitalists based on the value and kind of investment funds. The authors expressed that in an extensive market, demographic aspects solely may not be adequate to serve as a basis for dividing individual investors. This research was based on the opinion polls which were mailed to 600 households. Many distinguished studies were conducted to find if the patterns of investment differed according to life style and demographic facets. It was evident from the results that life style aspects not only assist to distinguish between speculator behaviour

kind as active or passive, but also was successful in distinguishing between small and big investors in specific investments viz; Stocks and Bonds.

Cecily.S and R. Rangarajan, 2012 expressed that an Investor spends his savings in return for benefits. Numerous financial specialists would prefer not to go out on a limb of capital market unpredictability and lean towards mutual funds as the best endowment option .They reasoned that the expansion in the statistics of investors working in mutual fund segment and its constant development in fund mobilization is driven just by more speculators favoring mutual fund ventures.

A Mutual Fund is a trust organization that collects the reserve funds of various speculators who share a typical financial objective. The cash accordingly gathered is then put into various capital markets, for example, offers, debentures and different securities. (Milgrom, P & Holmstrom, B 1987). There is critical requirement for a thorough self-administrative regime for mutual funds in India, with regards to disparity in its size, constitution, regulation of assets and advancement in the capital sector (Anagol 1992).

Panda, J & Sahu, R.K (1993) discovered that 5-6 % of the total economic savings of the citizens of India was from the Mutual Funds, 11-12% from bank deposits & under15 % from share market capitalization. The research advocated that mutual funds should establish appropriate programs bearing savings prospective, growth possibilities of investment companies, national priorities and policies in mind.

The analysis of Shome (1994) focused on development schemes, studied the accomplishment of the mutual fund sector from April 1993 - March 1994 with BSE SENSEX as market proxy. The analysis disclosed that regarding schemes, the average ROI on mutual funds was narrowly lesser than the market returns whereas standard deviation was greater than the market. The analysis also discovered that performance of a fund and its size are not related.

Jain, P. K & Sondhi, H. J. (2005) have analyzed seventeen public and nineteen private sector mutual fund equity ventures. The standard returns for the comprehensive period (1993-2002) were lesser than the returns on 364 day T Bills and greater than the BSE 100 indication. According to Jain and Sondhi, the Alliance Equity fund rated the best performer & Canbonus and LIC Dhanvikas the poor performers. They identified that most of the sample ventures gained better returns when compared to the market. Due to its demand, Fund Administration Policies, intensively scrutinized choice of stock and time management, the Private Equity ventures had predominant performance. Despite of greater investor credence corresponding with higher security, more than ¾ of the public sector ventures could not achieve returns. Also the funds didn't perform consistently.

Hema.S, 2007 investigated different investment options which are accessible to women speculators. They predominantly choose bank deposits among the different options. The real purpose behind selecting this speculation is generally attributable to security measures. Other than bank deposits, life coverage policies and bullion are the other investment options favoured by them. However, few respondents are keen on putting resources into shares and mutual funds though they don't have much knowledge about shares.

Soundaravalli.S.V. and Jeyakumari.J, 2016 communicate about the changing demeanour of venture among ladies. Women have ordinarily been more reluctant with regards to monetary ventures. They are substantially more mindful about mutual funds. They like to put resources into Mutual assets as a result of its security and its consistent returns.

Investment in shared assets has turned into a simple route for the female working speculators in view of its portfolio investments.

Yajulu Medury and Puneet Bhushan, 2013 presumed that females are more orthodox and go for risk free options. The authors likewise found that noteworthy gender orientation discriminations happen in investment choices for medical coverage, mutual funds, and fixed deposits among employees because male and female investors' approaches are discrete.

Research Gap

The present investigation tries to bridge the gap by analyzing the influence of financial literacy among working women on mutual funds in Bangalore city. This investigation likewise makes an endeavour to incorporate financial proficiency and different statistical and financial elements of the working women respondents like age, education, income per month, employment structure, risk taking ability.

Need For the Study

Financial literacy has turned out to be progressively essential over the previous decades. There is a developing conviction that the individual would need to end up increasingly self-reliant now a days. In this present study the researcher attempts concentrate on the current financial literacy of working women especially in Bangalore city. This study has examined the relationship between demographic profiles of the working women respondents and their financial literacy on mutual funds. This study also tries to find if there is any impact of financial literacy of working women on their investment decisions.

Though Indian women are more independent and aware of their legal rights, such as right to work, equal treatment, property and maintenance of assets, a majority of women still remain unaware of these rights. There are various other factors that affect their quality of life such as age of marriage, extent of literacy, role in the family and so on. In many families, women do not have a voice in making any decisions while in several other families, the women may have a dominating role. The result is that the empowerment of women in India is highly unbalanced and with huge gaps. Those who are economically independent and literate live the kind of life that other women tend to envy about. This inequality is also a cause for worry because balanced development is still not taking place.

Statement of the Problem

The present-day women who are similarly employed, through their qualification know about different parts of investments and accordingly they invest in different investment avenues, for example, shares, mutual funds, debentures, insurance and bank deposits.

The goal-oriented women investors have loads of thoughts at the top of the priority list for captivating an investment decision. The fundamental needs which an investor endeavors to satisfy incorporate security, profit accumulation, comfort factor, tax effectiveness, life cover, returns, effortlessness, simplicity of withdrawal. Despite the fact that an assortment of investment alternatives is accessible, many individuals still rely upon the banking system to safeguard their savings. It is possible that, they are ignorant of the other investment avenues that are accessible in the market, or, they consider those options are as a hazard.

In this study an attempt has been made by the researcher to comprehend the awareness among women on mutual funds, the variables rousing them to invest into these choices, perception of women with regards to investment market, issues looked by them while making investment decisions.

Objectives of the Study

1. To identify the current awareness level of working women towards mutual funds.
2. To find the relationship between financial literacy and investment behavior on mutual funds of working women with reference to demographic variables.

Hypothesis

1. There is significant influence of Financial Literacy of working women towards mutual funds investments.
2. There is significant impact of financial literacy on investment behavior of working women with reference to demographic variables such as age, annual income, educational qualification and marital status on mutual funds.

Research Methodology

A system of models, procedures and techniques used to find the result of a research problem is known as Research Methodology (Panneerselvam, 2010).

Research Design

For this study Exploratory and Descriptive research design methods have been used, wherein researcher has explored the financial literacy level of working women investors and then described the impact of financial literacy level on mutual funds of working women investors.

Sources of data collection

For this study both the types of source of data primary and secondary will be used. The secondary information was collected from various books, magazines, journals, newspapers, web sites, research projects, reports published by Government and private research firms at national and international level. Speeches and lectures of officials of various governmental authorities and policy makers around the world were also used as secondary data sources.
For primary data collection a structured Questionnaire was used as a research instrument.

Sampling Technique

For the current study, nonprobability Simple Random Sampling technique is used.

Sample Size

Sample size of 562 working women investors in Bangalore is considered for the study. During data collection, proper care was taken to collect the data in such a way that it covers the entire city of Bangalore.

Tools for Analysis

The Primary data collected are analyzed using the SPSS (Statistical Package for Social Sciences, version -20) computer package. The Statistical tools used for obtaining results are as follows:

1. Simple percentage analysis – This tool is used to describe the primary data related to age, marital status, income level, highest level of education.
2. T-Test- This tool is used to find out if the dependent and independent are statistically significant.
3. Analysis of variance – This tool identifies the influence of independent variables on the dependent factors.

Data Analysis

Age wise distribution of the respondents

Age of the respondents is a standout amongst the most vital qualities in decision making process especially for finance decisions. Age demonstrates the obligation in the family. It impacts the savings and investment behavior of the respondents. The investor's psychology

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

is chosen by the age of the respondents. The following table shows the distribution of age groups of the respondents.

Table 1.1: Age-wise classification of respondents

AGE	FREQUENCY	PERCENTAGE	CUMMULATIVE PERCENT
Below - 30 yrs	117	20.82%	20.82%
30-40 yrs	242	43.1%	60.92%
41-50 yrs	124	22.06%	85.98%
Above 50 yrs	79	14.06%	100%
Total	562	100%	

[Source: Computed from Primary Data]

Table 1.1 clearly depicts that maximum working women investors of almost 43.1% belong to the age group of 30-40 years, which is followed by the age group 41-50 years of about 22.06%, whereas, 20.82% respondents represent the age group of below 30 years. Finally, a minimum of 14.06% represent the age group of above 50 years category.

Marital status wise distribution of the respondents

Marital status plays a critical job in investment and decision making process. The attitude and perception of an individual can likewise contrast by the marital status of the individual especially for women since marriage makes individuals progressively capable and developed in understanding and giving the reactions to the questions inquired. Marriage plays an important role in women's life especially because even though women are working even now in many families husband will be the financial decision maker. The below table shows the distribution of marital status of the respondents.

Table 1.2: Marital status- wise classification of respondents

MARITAL STATUS	FREQUENCY	PERCENTAGE	CUMMULATIVE PERCENT
Married	428	76.16%	76.16%
Unmarried/ Staying single	134	23.84%	100 %
Total	562	100 %	

[Source: Computed from Primary Data]

Table 1.2 clearly depicts that maximum working women investors of almost 382 respondent's i.e 76.16% are married and the rest 180 respondents i.e. 23.84% are unmarried or staying single. The present sample unit is dominated by the married women respondents.

Educational Qualification-wise distribution of respondents

Education is a standout amongst the most essential characters that may influence the individual's perception and attitude and also understanding things, which impacts the investment behaviour, the risk bearing capacity and confidence level of the respondents. Table 1.3 shows the educational background of the working women respondents.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 1.3: Educational qualification of the respondents

Educational Qualification	Frequency	Percent	Cumulative Percent
Higher secondary	12	2.14	2.14
Bachelor's Degree	204	36.3	45.38
Master's Degree	243	43.24	81.68
Professional Degree	103	18.33	100
Total	**562**	**100.0**	

[Source: Computed from Primary Data]

Table 1.3 clearly depicts that 2.14% of the working women respondents have done their higher secondary, whereas 36.3% respondents have completed their Bachelor's degree, the majority of 43.24% of the respondents have done Master's degree and finally 18.33 have completed their professional degree. It is very clear that the sample unit is dominated by working women respondents who have cleared their bachelor's degree.

Annual income wise distribution of the respondents

Annual income is one of the statistic factors, which decides the investment pattern among the working women respondents. A woman can settle on choice all alone dependent on the salaries she gets. She does her savings only when she in earning her income. The below table obviously delineates the annual income of the working women respondents.

Table 1.4: Annual income of the Respondents

Annual Income	Frequency	Percent	Cumulative Percent
Less than 2 lakhs	53	9.43%	
3 – 6 lakhs	177	31.49%	40.92%
6 – 9 lakhs	216	38.43%	79.35%
Above 10 lakhs	116	20.64%	100%
Total	562	100%	

[Source: Computed from Primary Data]

From the above table 1.4 it is found that 9.43% of the working women respondents earn less than 2 lakhs as annual income, 31.49% of the women respondents earn within 3lakhs to 6 lakhs as annual income, 38.43% of the women respondents earn between 6 lakhs to 9 lakhs, and finally 20.64% of the working women respondents earn more than 10 lakhs annually. Hence the dominating sample unit among the annual income category is the respondents who earn income within 6 lakhs to 9 lakhs annually.

Analysis Pertaining To The Objective

The present literacy level of the investors towards different financial avenues is acquired through Likert's five point scale. For analyzing this situation a Parametric T-test has been used, which are presented in the following tables.

Awareness of Investors on Mutual Funds

H1: There is significant influence of Financial Literacy of working women towards Mutual Funds.

The following table clearly depicts the working women investor's financial awareness towards Mutual Funds.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Table 1.5: Analysis to find awareness on Mutual Funds

Mutual funds	N	Mean	Std. Deviation	d. Error Mean	T	Sig. (2-tailed)	Rank
NAV calculation	562	2.4168	1.27241	.05564	-10.481	.000	4
Liquidate holdings	562	2.7610	1.27841	.05590	-4.276	.000	2
Mutual fund schemes	562	2.5124	1.17499	.05138	-9.490	.000	3
Complaints to SEBI	562	2.7648	1.38276	.06046	-3.890	.000	1

[Source: Computed from Primary Data]

From the above table it is inferred that the four variables integrated to Mutual Funds awareness listed above in the table 1.5 possess the mean ranging from .05138 to .06046 where knowledge of Mutual Funds option has highest mean value. It is also evident that the standard deviation varies from 1.17499 to 1.38276, the T-test values range from -3.890 to -10.481. All the four variables are significant with respect to test value 3. The ranking analysis also revealed that the working women investors are only slightly aware in the method of Net annual value calculation of Mutual fund, slightly aware of the liquidity facilities allowed to investors by Mutual funds, fees and other expenses payable on Mutual fund schemes and the complaints to be sent to SEBI which will take the matter to the concerned Mutual funds and follow up with them until they are resolved.

Influence of Demographic Variable over Financial Literacy and Investment Behavior of Working Women towards Mutual funds

After reviewing National and International journals regarding investor's behaviour the researcher considered Age, Marital Status, Educational Qualification and Annual Income as Independent variables. The factors of Awareness, Investment Behaviour are considered as Dependent variables. The influence of independent variables on the dependent factors is identified through one way analysis of variance and the results are presented below.

Influence of Age over financial literacy on Mutual funds

The perceptual contrast among the four age categories of financial working women investors on financial literacy over equity is evaluated in the accompanying one-way ANOVA.

H2: There is significant influence of age over financial literacy of working women towards Mutual funds.

Table 1.6: One-way ANOVA table showing the Influence of age on Financial Awareness

		Sum of Squares	DF	Mean Square	F	Sig.	Mean
Mutual Funds	Between Groups	27.160	3	8.803	5.543	.002	2.6487
	Within Groups	819.993	559	1.682			1.7660
	Total	847.153	562				

[Source: Compiled from Primary Data]

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From the ANOVA table 1.6 mentioned above it is inferred that the financial awareness especially on Mutual Funds with F value 5.543 and with P value of 0.002, are statistically significant since the P value is less than the benchmarked 5% or 0.05, which propels us to reject the null hypothesis and accept the alternate hypothesis that states that, there is significant influence of age over awareness level of working women towards Mutual Funds. The investors in the age group 31years to 40 years (Mean = 2.6487) are somewhat aware of Mutual funds than the investors in the age group above 50 years (Mean = 1.7660). Hence the working women investor's age categories influence on investment awareness and bahaviour pattern on Mutual Funds.

Impact of Financial Awareness on Mutual Funds investment behavior with special reference to Marital Status.

H3: There is significant influence of Marital Status over awareness level of working women towards Mutual Funds.

Table 1.7: One-way ANOVA table showing the Influence of Marital Status on Mutual Funds

		Sum of Squares	DF	**Mean Square**	F	**Sig.**	**Marital Status**	**Mean**
Mutual Funds	Between Groups	8.527	3	2.859	1.863	.167	Married	3.5632
	Within Groups	837.629	559	1.633			Unmarried	2.4306
	Total	846.156	562					

[Source: Compiled from Primary Data]

From the ANOVA table 1.7 mentioned above it is inferred that the financial awareness of working women on Mutual Funds with reference to marital status, with F value 1.863 and with P value of 0.167, are not statistically significant since the P value is greater than the benchmarked 5% or 0.05. This implies that the working women investor's Marital Status does not make any difference among their behavioral aspects on investments on Mutual Funds. The mean comparison indicates that the investors who are married (Mean = 3.5632) are extremely aware of Mutual Funds Instruments than the investors who are unmarried (Mean =2.4306).

Influence of Highest level of educational qualification on Awareness over Mutual Funds

The perceptual difference among the four highest level of education of investors on their awareness level over the instruments is estimated in the following one way analysis of Variance Table.

Table 1.8: One-way ANOVA table showing the Influence of educational qualification on Financial Awareness on Mutual Funds

		Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**	**Mean**
Mutual Funds	Between Groups	1.576	3	.633	.231	.764	2.5432
	Within Groups	854.578	559	1.535			2.2754
	Total	856.154	562				

[Source: Compiled from Primary Data]

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From the ANOVA table 1.8 mentioned above it is inferred that the financial awareness of working women on Mutual Funds with reference to educational qualification, with F value .231 and with P value of 0.764, are not statistically significant since the P value is greater than the benchmarked 5% or 0.05. This implies that the working women investor's educational qualification does not make any perpetual difference among their behavioral aspects on investments on Mutual Funds. The mean values indicates that the women investors who has done their Master's degree (Mean = 2.5432) are highly aware of Mutual Funds than the investors whose highest level of education is Higher secondary (Mean =2.2754) are less aware of Mutual Funds.

Influence of Annual Income on Financial Literacy over Mutual Funds

The perceptual difference among the four ranges of Annual income of investors on their Awareness over Mutual Funds is estimated in the following one-way ANOVA test.

Table 1.10: One-way ANOVA table showing the Influence of Annual Income on Financial literacy over Mutual Funds

		Sum of Squares	Df	Mean Square	F	Sig.	Mean
Mutual Funds	Between Groups	62.561	3	14.786	9.978	.000	2.9753
	Within Groups	784.552	559	1.850			2.4301
	Total	847.113	562				

[Source: Compiled from Primary Data]

From the ANOVA table 1.10 mentioned above it is inferred that the financial awareness of working women on Mutual Funds with reference to Annual Income, with F value 9.978 and with P value of 0.000, are statistically significant since the P value is less than the benchmarked 5% or 0.05. The mean comparison indicates that the investors whose annual income is between 5 to 10 lakhs (Mean = 2.9753) are extremely aware of Mutual Funds than the investors whose annual income is above 10 lakhs (Mean = 2.4301) are less aware of Mutual Funds.

Major Findings

1. The age wise distribution of the respondents depicts that the dominant age group investors belongs to the age group of 30-40 years being 43.1% , followed by the married investors who constitute 76.16%. The highest level of education of working women investors is Master's degree being 43.24%. The salaried employees being the highest number of employees among the working women respondents are 32.3%. The working women respondents who have their annual income from five to ten lakhs being 38.43% % dominate the respondents. 47.2% of the respondents invest the highest percentage of income being 11% to 15%.
2. The mean comparison indicates that the investors in the age group 41years to 50 years (Mean = 2.65) are moderately aware of Mutual Funds than the investors in the age group above 50 with less awareness (Mean = 1.77) on Mutual Funds.
3. The working women investors of the age group of 41 – 50 years prefer investments with less risk and capital appreciation. Unmarried women investors prefer low risk investments. Low risk investments are preferred by investors who have completed higher secondary education. Working women with a professional degree, who earn

salary and whose annual income is between one to five lakhs prefer maximum returns on investment avenues.

4. With regard to age of investors and their financial literacy level, the T-test found that a significant association between these two variables.
5. It is evident from the T-test that Awareness of Demat a/c, Online tools and awareness on Tax Exemption are statistically significant since their significant values are less than 0.05 and only one factor i.e., Knowledge on Mutual Funds options is not statistically significant.
6. ANOVA Analysis says that there is a significant influence of age over awareness level of working women towards Mutual Funds. Hence the working women investor's age categories influence on investment awareness and bahaviour pattern.
7. ANOVA Test also implies that the working women investor's Marital Status makes a perpetual difference among their behavioral aspects on investments on Mutual Funds. The mean comparison indicates that the investors who are married (Mean = 3.56) are extremely aware of Mutual Funds Instruments than the investors who are unmarried (Mean =2.43).
8. ANOVA Test also implies that the working women investor's educational qualification makes a perpetual difference among their behavioral aspects on investments on Mutual Funds. The mean values indicates that the women investors who has done their Master's degree (Mean = 2.5432) are highly aware of Mutual Funds than the investors whose highest level of education is Higher secondary (Mean =2.2754) are less aware of Mutual Funds.
9. The mean comparison indicates that the investors whose annual income is between 5 to 10 lakhs (Mean = 2.97) are extremely aware of Mutual Funds than the investors whose annual income is above 10 lakhs (Mean = 2.43) are less aware of Mutual Funds.

Suggestions

1. Policy makers and regulatory authorities should emphasis more on financial education to the college students as there is a low level of literacy prevalent amongst the age group below 25 years. Due to lack of financial literacy, they may misallocate the private wealth, which may restrict them to achieve their financial objectives in long run. Since college students are the most vulnerable to be trapped in debt, Policy makers can design financial education material focused on Personal finance.
2. With respect to retirees or the investors having the age of 50 years and above, this group should be targeted with an objective to learn them the importance of retirement planning as a part of financial planning so that these investors can teach the importance of retirement planning to their children, if they have not done yet. In line with the same, the awareness of future retirees about the need to assess the financial adequacy of their current public or private pension schemes and to take appropriate action when needed should be encouraged.
3. There is a need to start the financial education program at an earlier stage in the life cycle of people as that will ensure that the habit of savings and proper money management and investment is ingrained into them right from their childhood.
4. There is a need to consider including financial education/ money management as a specific subject in the syllabus at the primary and secondary school level.
5. To empower the investors on the subject of financial literacy, the issue of financial literacy should be taken either as a policy perspective or as a pragmatic perspective

For Investors

6. Investors should start showing interest in financial education. Women should start taking more initiative in financial matters and should be more assertive in family financial matters.
7. The development of financial skills and knowledge should ideally begin at home and be continued in school, college, workplace levels and the community as a whole. It should be easily and widely accessible to all sectors of the community at all stages of the lifecycle.
8. The NGOs working for social up-liftment of women must ensure that the financial education should be provided to them for their economic up-liftment.

For Financial Education Providers

9. Should provide the financial education as an information and instruction not as an advice. Further, it should be provided in fair and unbiased manner.
10. Companies should also emphasis on developing financial literacy of the community by providing financial education to various masses as a part of Corporate Social Responsibility.

Conclusion

Working women are happy and satisfied with investment companies which try to identify their needs, provide them with latest news and schemes and also have excellent distribution network. For promoting and coordinating financial Literacy, the national, regional, local public and private initiatives should reach the population and raise awareness of the population about the need to improve their understanding of financial risks and ways to protect against financial risks through adequate savings, insurance and financial education. Detailed awareness on the regulations and provisions available with SEBI regarding the investment avenues should be provided to working women investors. Women instead of their preference only towards traditional investment avenues like Government bonds, Insurance and Fixed deposits can also prefer to invest in modern investment avenues like Mutual Funds.

Working women investors are satisfied if there is transparency in operation by the investment companies which assists the investors to make a decision on the particular investment according to their likes and dislikes. Technological development and online investment portals make the working women investors highly satisfied.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Overview Of Digital Signal Processing

PADMAVATHI K*
DR. PRASENJIT CHOWDHURY**

Abstract
Computing requirement for mission critical applications – onboard and defense are increasing [1-2, 23, 36-38, 40, 55, 63] day by day. Ground based mission critical applications require features of security, bug fixation, update of system, reusability of system, performance improvement, and extension of life cycle. Space based mission critical applications: particularly for space-based DSP applications, require features for reuse of the existing hardware, modification of existing hardware - fully or partially, remote update [44], reliability [54, 175, 192] etc. FPGAs used in harsh environments in SPACE are required to be radiation hardened or radiation tolerant as they are susceptible to high energy particle induced faults [29, 31]. These applications are faced with ever stringent operational constraints of performance, power, cost and reliability. Space-based scientific research missions in the future will require dramatic increase in satellite and ground system capabilities [23, 25, 28]. Data processing capabilities need to increase by 1-3 orders relative to existing systems [14, 21] for performing and achieving high level processing functions in real-time [13, 39, 161,162]. This has to be envisioned by the designer in strategic plans for space and ground missions.
Keywords : Computing, Communication , Current technologies, Satellites

1.1 Introduction

Computing requirement for mission critical applications – onboard and defense are increasing [1-2, 23, 36-38, 40, 55, 63] day by day. Ground based mission critical applications require features of security, bug fixation, update of system, reusability of system, performance improvement, and extension of life cycle. Space based mission critical applications: particularly for space-based DSP applications, require features for reuse of the existing hardware, modification of existing hardware - fully or partially, remote update [44], reliability [54, 175, 192] etc. FPGAs used in harsh environments in SPACE are required to be radiation hardened or radiation tolerant as they are susceptible to high energy particle induced faults [29, 31]. These applications are faced with ever stringent operational constraints of performance, power, cost and reliability. Space-based scientific research missions in the future will require dramatic increase in satellite and ground system capabilities [23, 25, 28]. Data processing capabilities need to increase by 1-3 orders relative to existing systems [14, 21] for performing and achieving high level processing functions in real-time [13, 39, 161,162]. This has to be envisioned by the designer in strategic plans for space and ground missions. For example, a communication satellite once designed needs to be reused with an objective for utilization in different applications, from mission to mission [28]. It is difficult to plan and foresee future

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functionalities at the time of design and mission launch, but such requirements are likely to become quite essential in the near future. Mission costs of such space systems are significantly high, so the design architecture of space-based systems [22, 36] will need to have features for modular design, reduced design cycle, reuse of components, update of systems, bug fixation, extension of life cycle, enhancement of algorithms, performance improvement, and reliability. When a bug is found in a satellite that is already placed in orbit, the capability of reprogram ability and reconfiguration is necessary to save the entire mission, otherwise it will risk substantial amount of money and time. Satellite application cost depends largely on parameters like volume and mass requiring compact designs which can give one mission, many application features, saving significant amount of money.

Modern Communication satellites will have more digital subsystems [38, 40] compared to earlier satellites. This will require higher data rate and processing capabilities for multimedia type of high-volume data [39, 40, 47]. In the modern communication paradigm, onboard system handles signals in the digital domain and carries out processing namely switching and bandwidth allocation using DSP techniques [48, 49]. It signifies that onboard signal processing will be very important [18]. When a mission is launched one cannot estimate the DSP load and capabilities, so it requires post deployment update in the system. In addition, once such a base system is created, to enhance the specification of next mission, reuse of hardware platform is important from design - time point of view. Looking to the importance of adaptive requirements, cost efficiency and high-performance operations [12, 15] within mission critical systems, it requires mechanisms which allow post design reuse, reprogrammable and reconfigurable components of the digital systems [44].

Secrecy is required for ground mission critical systems. One is for design's intellectual property, layout of circuit and the other is for data. Data secrecy is taken care by cryptographic algorithms [196, 201, 202] implemented in the hardware and software. This need for design secrecy is a new trend. There are invasive and noninvasive attacks on hardware and software. These attacks find the secret key of crypto algorithm within the software. Special sophisticated invasive attack finds out the circuit details, which are confidential or proprietary. Possible countermeasure provides solution to prevent them [198, 200].

Current technologies to design space and ground systems are based on Application Specific Integrated Circuits (ASICs) as they provide the solutions for low power, reliable, mass production, optimized performance, and radiation hardening [2]. It has a weakness of high Non-Recurring Expenditure (NRE) and longer time to design, i.e. from concept to silicon, because in ASIC, the chip is manufactured only after completion of application's design and its validation. ASICs do not cater to the need of post design optimization. In space-based system the number of units required are also limited, which further leads to an exponential increase in the cost for ASIC based solution. The design time for ASICs for specific missions are an issue, as now a day's lots of satellites are launched in different application segment but an ASIC chip is generally targeted for single task or application. An ASIC chip is not reconfigurable because once an application has been etched in the silicon, it cannot be changed and that part of hardware cannot be reused for other applications.

In order to combat these limitations of ASICs, Field Programmable Gate Arrays (FPGAs) [29, 31-33] are designed and made available to designer. FPGAs are general purpose

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silicon that can be customized by the designer for implementing almost any digital system. The very same device can be used, or even reused for wide range of applications. Some FPGAs use technologies that make them reconfigurable. In an FPGA, the application of the device is defined by an on-chip memory called configuration bits that can be freely altered by the designer. Early FPGAs were originally devised to implement simple logic functions, but FPGAs [128, 129, 130] today are able to implement entire system on a chip (SOC) [161]. Other benefits of FPGAs are scalable architecture, parallelism of algorithm, fine granularity to work at bit, digit, byte, word level, generic application portability, and remote upgradability.

There are three types of FPGAs: One Time Programmable (OTP), Reconfigurable and Dynamic reconfigurable. ACTEL [31, 32] offers its RTAX series of FPGAs which are radiation hardened devices used in space segments of applications. Radiation hardened devices are required because radiation in space may alter the logic of the device and malfunction may happen, may cause a mission critical space application to fail. But the ACTEL RTAX family FPGAs offer very limited feature of programmable gate array architectures as they are only One Time Programmable (OTP). Onboard programming is not feasible, i.e. once they are programmed, they cannot be erased and reused, since they are based on anti-fuse technology which has several inherent drawbacks. First, a device cannot be altered after it is programmed, and additional devices have to be programmed with an intention to physically replace the installed devices. Second, available anti-fuse gate arrays have much smaller gate count than SRAM configurable gate arrays [98, 99, 100]. The SRAM based FPGAs [33-34, 129, 130] are available in high density of logic blocks with special and unique features of programmability and reconfigurability [131-134].

The principles of reconfiguration of FPGAs are:

1.1.1 CONCEPT OF STATIC RECONFIGURATION

Static reconfiguration is sometime called as *compile time reconfiguration* [213]. It is the simplest and most common approach for implementing applications with reconfigurable logic. Static reconfiguration observed a relatively slow rate of hardware changes. In this static implementation strategy, each application consists of one configuration, and the main objective is to improve the performance.

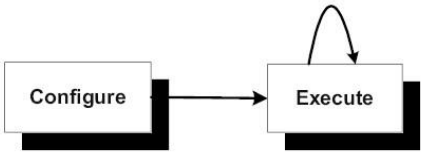

Figure: 1.1 Principle of Static Reconfiguration

There is only a one system-wide configuration, and prior to commencing an operation, the reconfigurable resources are loaded with their respective configurations. Once the operation starts, the reconfigurable resources will remain unchanged in this configuration, throughout the operation of an application. Hence the hardware resources remain static throughout the life of the application (or design). This is depicted in Figure 1.1.

1.1.2DYNAMIC RECONFIGURATION

Unlike static reconfiguration that allocates logic for the whole duration of an application, a dynamic reconfiguration (sometimes called *run time reconfiguration*) [20, 24, 50, 52, 118] uses a dynamic allocation scheme to re-allocate the hardware at run-time. This is an

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advanced technique for a flexible realization of the time versus space trade-off in a design. When reconfiguration overhead can be ignored, system performance is enhanced by using highly optimized circuits that are loaded and unloaded as per need, dynamically during the operation of the system which is shown in Figure 1.2. Hence system flexibility is maintained while functional density of design is also increased.

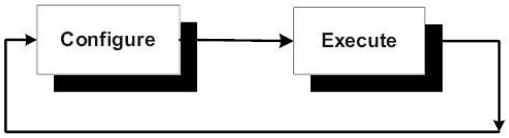

Figure: 1.2 Principle of Dynamic Reconfiguration

Here a concept of virtual memory has been extended into virtual hardware, giving rise to dynamic reconfiguration. Therefore, instead of reducing the number of configurations that are mapped, we swap them in and out of the actual hardware, when they are required making the physical hardware much smaller than the sum of the resources required by all of the configurations. There are two major design problems in this approach, partitioning and data transfer across partitions. The first is identifying non-overlapping time slices to divide the algorithm into time-exclusive segments that do not need to (or cannot) run concurrently. This is referred to as temporal partitioning. Since no CAD tools support this high-level step, it requires tedious and error prone user involvement. The second problem is to co-ordinate the behavior among different configurations, i.e. the management of transmission of intermediate results from one configuration to the next. There are two main architectures - Course grained and Fine grained. Course grained has smaller number of larger, more powerful logic blocks. Coarse grained architecture implementation is faster due to easy routing. Fine grained approach is opposite, and consists of large number of smaller logic blocks. The advantage is good utilization of resources and easy conversion to ASIC.

Partial reconfiguration can result in power and area savings. It requires an intelligent system to manage reconfiguration in order to save power and meet timing constraints in real time systems. The main advantages of Dynamic Partial Reconfiguration are in power, size, cost reduction, hardware reuse, obsolescence avoidance and application portability.

1.1.3PARTIAL RECONFIGURATION

There may be a situation where, either the configuration does not occupy the full reconfigurable hardware, or only a part of a configuration requires modification. In both of these situations, full reconfiguration approach mentioned above is not required, and a partial reconfiguration of the reconfigurable resources works well. In partially reconfigurable architectures [213], the underlying programming layer operates like a RAM device. By using addresses to specify the target location of the configuration data, selective reconfiguration of the reconfigurable resources is made possible. Quite often, the undisturbed portions of the reconfigurable resources may continue execution, allowing the simultaneous operations of computation and reconfiguration. When the configurations do not require the entire area available within the array, additional configurations may be loaded into the otherwise unused areas of the hardware. Partially runtime reconfigurable architectures can allow for complete reconfiguration flexibility such as the Xilinx 6200 [99], or may require a full column of configuration information to be reconfigured at once as in Xilinx VII Pro, or as in the Xilinx Virtex FPGA [100]. New generation FPGAs like Virtex 4 [57] onwards offer 2D configuration in rectangular blocks.

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Partial Reconfiguration (PR) allows the capability to reconfigure a section of an FPGA. True advantage arises when the PR is done during runtime; also known as *dynamic reconfiguration.* Dynamic Reconfiguration [117, 131] allows the reconfiguration of a section of an FPGA and the remainder FPGA continues operating without any loss of data. It consists of two types of Regions (1) Static - which keeps operating and (2) Reconfigurable - which can be reconfigured with a new module with different functionality.

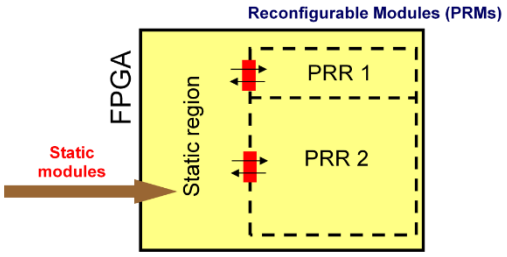

Figure: 1.3 Partial Reconfigurable Module Layout

Here, PRR – Partial Reconfiguration region

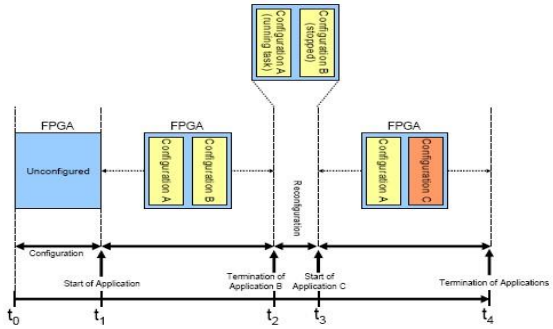

Figure: 1.4 Run-time Partial Reconfigurable Timing Diagram (Courtesy: Xilinx)

Partial reconfiguration Scenarios: It is demonstrated in Appendix – A [66, 67, 69, 105] and tools & partial reconfiguration flow are explained in Appendix – B.

Reconfiguration helps in bug fixing/ hardware update

When bugs are identified in a design, they can be fixed easily by downloading a newer correct implementation of the application in the FPGA. This operation can be done without removing the device from the system where it is deployed and also without redesigning the hardware. The capability of bug fixing through reconfiguration [1] enables enormous cost savings.

Reconfiguration helps to enhance performance

Adapting or changing the algorithm after observing results post deployment offers immense opportunity to improve performance of design implemented in a FPGA through the use of reconfiguration features. New features can also be added to extend the set of services [1], the applications offered when the system is already deployed in the field.

Reconfiguration allows reducing the weight and cost: (As per the requirement)

Reconfiguration can become an active part of the application itself. The same FPGA device can be reprogrammed to implement different functions in different instants of time. As a result, multiple functions can be implemented within a single device, this saves space and mass in addition to supporting multi-mission goal [1].

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Reconfiguration also helps in improving secrecy

There are possibilities of invasive and noninvasive attack to find out design of layout in the designed ASIC. In case of FPGAs, the designed systems can be re-layout again if it is found that it has been attacked.

This unique feature can be effectively used in defense to combat invasive/no-invasive attacks.

By exploiting FPGA's programmability feature, designers can focus all their effort into application development, letting someone else, i.e. FPGA manufacturer, to deal with complex task of developing and fabricating a correctly functioning silicon device. As designers have the knowledge about the resources of FPGA before starting an application, they can develop the algorithm which allows utilizing the resources optimally available. A designer can significantly reduce the design time for their applications by exploiting the FPGAs reprogrammable design features. Each satellite is generally a unique example of its own specification. It is conceived and manufactured for a single organization, for one specific goal or objective. The cost and time required for a new ASIC for each satellite are often not justified or feasible.

FPGAs provide: reconfigurable architectures, low cost solution, rapid development, less turnaround time, fine and coarse granularity for parallelism as additional benefits in each new generation beyond the expected larger capacity and faster speed.

Current FPGAs offer significant advantages with respect to ASICs in many possible scenarios, as discussed above. Hence the feature of reprogram ability of the FPGAs enables the designer to incrementally enhance the specifications of the ongoing mission through remote programming using telecommand channel. This also allows the designer to fix the bug to extend mission life for continued services to the user. This unique feature of counter measure for secrecy through reconfiguration can be effectively used defensively to combat invasive/non-invasive attacks. For these reasons, FPGAs provides alternative choice for space and defense mission critical applications.

FPGAs available from Xilinx are with special features listed above. These make them viable solution for space and ground-based mission critical application requirements discussed before. It requires studying the design techniques and designing tools. This enables to utilize static/dynamic reconfiguration for mission critical applications offering all the benefits to the designer by electing SRAM based FPGAs.

1.2MISSION CRITICAL PROBLEMS

But for successful adoption of all these advantages of FPGAs over ASICs, FPGA based systems also need to match the same reliability levels [1, 2, 192], especially for mission critical applications. Most FPGAs with latest extensive/special features of reconfigurability are Static–Random Access Memory (SRAM) based. These SRAM based FPGAs are particularly sensitive to upsets by energetic radiation particles and thus they cannot be used right away in mission critical applications, especially space borne ones [53, 55]. It is required to make them fault tolerant.

1.2.1FAULT TOLERANCE

FPGAs and digital circuits in general require special attention towards their dependability. For mission-critical applications in particular [1, 198, 199], *dependability* is specified as the ability to tolerate faults induced by the environment that could lead to a failure of the entire system. Here, a *fault* is defined as the misbehavior of an internal component of the system. A misbehavior activated by the operation of the faulty system, can be propagated

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to the outputs of this component, becoming an *error*. Finally, if the error is propagated and produces misbehavior of the system outputs, this is called a *failure*. In mission-critical applications, some faults and errors could be accepted but, failures must either be detected or signaled to help bring the system back into a safe state. In some cases, faults can be masked not allowing them to propagate further into failures, as if they did not happen at all. This concept is called as fault tolerance, intended as the capability of guaranteeing that the system will be, or will be brought, always in a safe state. There are many strategies and methods to tolerate faults and errors. But, to implement them effectively and efficiently, failure modes have to be studied and mitigation techniques [56, 60, 64,70] are evolved.

For satellites in space, high reliability is required. As radiation is present in space environment, there is need for radiation tolerant devices. Devices must hold up in the most harsh and unexpected environmental conditions so that it can avoided to compromise the mission.

Some of the commonly used terms for describing phenomenon experienced in these harsh environments are described below.

In harsh environment of space radiation Single Event Effect (SEE) [115] occurs and they are classified as shown in Figure 1.5.

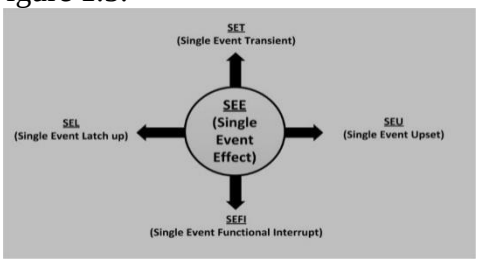

Figure: 1.5 Single Event Effects

Single Event Latchup (SEL): Low Impedance, High Current Path from VDD to VSS, parasitic of the transistor activates in a device causing internal shunt.

Single Event Upset (SEU) [53]: Bit flipping in memory or logic. High energy particle strikes a critical node creating a potential that can cause a bit flip as shown in Figure 1.6.

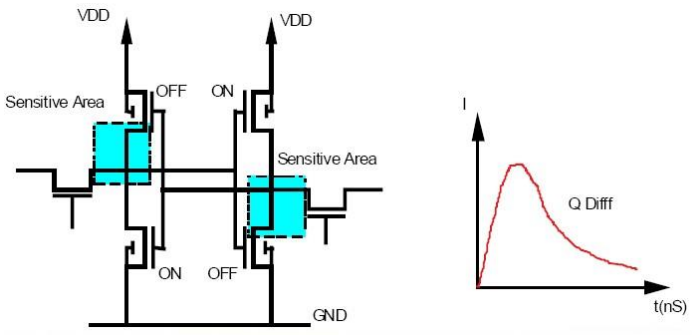

Figure: 1.6 SEU Sensitive Area In Transistor Circuits

Single Event Transient (SET): A single transient briefly fluctuates somewhere in design, Transient Effects as shown in Figure 1.7. There is a need to consider the effects of SETs below the .25u node. It is described by a voltage amplitude and duration.

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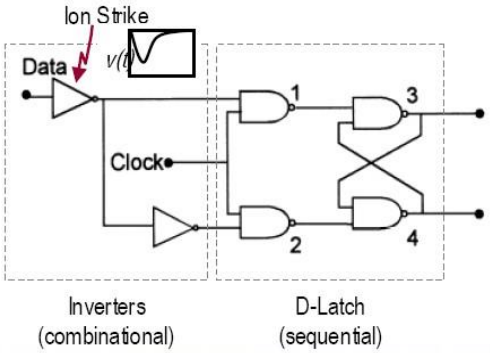

Figure: 1.7 SET Sensitive Area In Transistor Circuits

Single Event Functional Interrupts (SEFI): SEU in dedicated control logic.
Three SEFIs have been observed:

- Power on Reset (POR): Global reset of internal logic; Configuration lost. It can be monitored by the programming DONE pin.
- SMAP – Select MAP: Loss of configuration port access. It can be detected by Reading and writing to FPGA.
- JCFG – JTAG: Loss of configuration port access. It can be detected by Readback and compare to known CRC.

All of the above listed SEFI are corrected by toggling programming configuration bit file or restarting the device. Following resources of FPGAs are susceptible to SEE as shown in Figure 1-8.

- Configuration Memory Cells: CMCs represent the vast majority of the FPGA sensitivity.
- Data Path Logic, Flip Flops, Block RAM Memory–Look Up Table (LUT) Memory, Half Latches.

In FPGAs, 90% of the total transistors used are for routing. Even the most highly utilized design uses <10% of the total transistors/Frame. SEUs in CMC can modify the logic or change the routing. The upsets of CMCs can be detected using Readback of configuration memory [57-58].

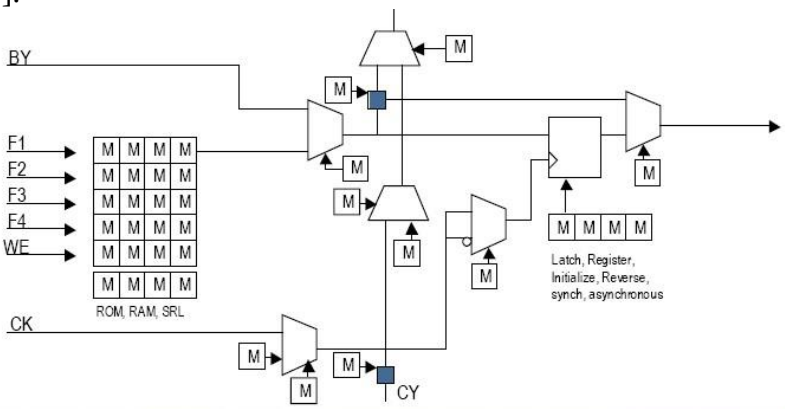

Figure: 1.8 FPGA CLB [71] Showing Areas of Probable SEE

Failure modes: SEU, SET, SEFI cannot be prevented, but only mitigation of their effects is possible.
If full SEU/SET mitigation is required, following approach is feasible:

- Triplicate design inside device (TMR) [68]

- Correct errors as they occur through configuration scrubbing
- TMR and configuration scrubbing are often used together

Triplication Technique is called TMR (Triple Module Redundancy) [65]: Logic is triplicated inside the FPGA. Single Point Failures are eliminated. TMR analysis includes throughput logic, feedback Logic with voters and output voting. Even I/O is also triplicated. This has two problems: It does not work in multiple SEUs. Secondly it requires 3 times resources of Logic and I/O Pins.

Solution to TMR is configuration scrubbing. "Scrubbing" refreshes configuration memory through reconfiguration. It repairs SEUs by continuously reconfiguring part of the device. It essentially erases any SEUs, but does not address the problem of erroneous operation from time of SEU to the time of scrubbing i.e. scrubbing has to be at least 10x faster than worst-case SEU rate. There are two approaches of scrubbing [59, 135]: (1) Readback, compare, repair (closed-loop scrubbing) and (2) Continuous reconfiguration (open-loop scrubbing). The issue is to find a mechanism for detecting the occurrence of SEU that affects the operation system function. The other problem is that not all resources can be scrubbed such as SRL16s, LUT RAM, BRAMs. The data cannot be scrubbed. It can use multiple BRAMs or Error Detection and Correction (EDAC) algorithm. Vast majority of routing bits don't need to be scrubbed. The solution to these is a fault monitoring circuit where SEU detection and correction can be used by incorporating system inside FPGAs.

SEU Mitigation Applications

Many mitigation examples are discussed in [56, 59, 60, 70-73]. Before deciding how to mitigate SEU, following questions need to be asked:

- What is the System Duty Cycle?
- Is operation continuous?
- Scheduled non-operation intervals?
- How critical is the FPGA in the System?
- What are the ramifications of a logic error?
- Error Handling: Which is more important? Detection, Correction or Mitigation.
- What is the Reliability (Error) Specification?

Based on all above, we can find following possible solution to SEU mitigation.

Applied Mitigation: Imaging, data Processing

Full reconfiguration only: Not all designs need special SEU mitigation. Low Duty-Cycle Applications where board will see frequent power cycles or resets. FPGA is frequently reconfigured. There is no mechanism for error detection.

Read back: Reconfiguration fabric is programmed by loading configuration bit file into the device which is loaded into CMCs. This actually sets the routing/interconnects in the internal logic. Read back is a process which reads the content of CMCs with in FPGAs and compares it with its original data existing in external ROM/PROM/Flash RAM.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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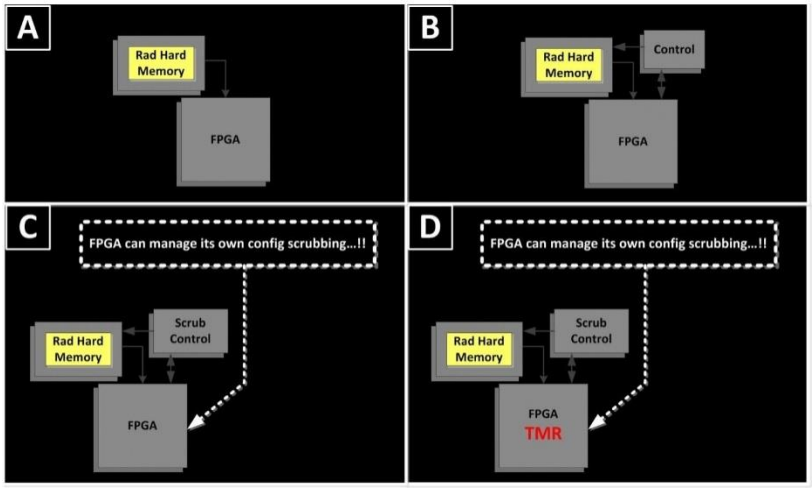

Figure: 1.9 Applied Mitigation Technique on FPGA

(A) Imaging, data Processing (B) Read back with full Reconfiguration (C) Just Scrubbing (D) TMR + Scrubbing

Applied Mitigation: Read back with full Reconfiguration: If errors are detected, device is fully reconfigured. These are applications that can tolerate errors if they are detected.

Applied Mitigation: Just Scrubbing: Scrubbing drastically increases Mean Time Between Failure (MTBF). Continuous operation (except for SEFI) readback/error detection can be incorporated into scrub controller

Applied Mitigation: TMR + Scrubbing: Single FPGA with TMR and Scrubbing. Continuous, uninterrupted operation (except SEFI) read back is employed for error detection. Scrub controller detects and handles SEFIs used in critical data processing applications (communications, navigation). TMR + Scrubbing is the most common mitigation strategy for numerous missions like Satellite-based DSP modules (Image Processing, GPS Transceivers).

Applied Mitigation: PCB-level redundancy, SEFI Mitigation: Figure 1.10 illustrates PCB and FPGA-level TMR with integrated scrub controllers and external voter. It is for continuous, uninterrupted operation. Here error detection is through TMR. Scrubbing + 2 levels of redundancy to mitigate SEFI, it can be used for critical Control Functions (GPS, Pyro, Propulsion, etc.).

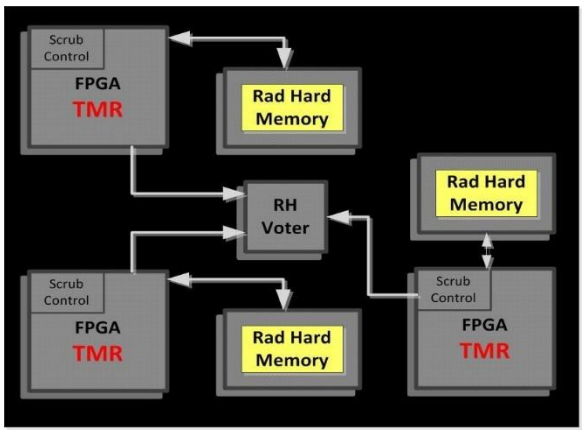

Figure: 1.10 PCB-Level Redundancy, SEFI Mitigation

Board-Level Redundancy Example: Mission to Space/Deep Space Network

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
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It is for mission-critical systems. SEU and SEFI mitigation provided by multi-FPGA redundancy to utilize the Common Off the Shelf (COTS) FPGAs for space application, provision for fault tolerant mechanism is required. The above mentioned SEU mitigation methods have the trade-off of hardware resources, time to design, requirement of software like TMR Tool etc. Here to overcome this self-healing SEU, monitor system is proposed based on partial reconfiguration feature of FPGAs.

1.2.2SELF HEALING SYSTEM

Self-healing systems are an intelligent system [27, 37, 41, 128] which has features of updating the configuration of digital system implemented in the FPGAs based on input or feedback of the existing system. For this, it requires feature of partial reconfiguration. The intelligence to the system is provided by the microprocessor. It can either sit inside the FPGA or it can be outside the FPGA. Here the system can make choice of reconfiguring the device fully or partially based on the input/feedback. The inputs can be through software decision or external hardware interrupts. The configuration bit files can be stored in the ROM/PROM/FLASH RAM. It can also be stored in computer or it can be loaded form server through ethernet connectivity. Today's new generation FPGA development platform allows to configure through external buses like PCIe. The system is connected to computer system through RS-232 for hyper terminal. It helps in manually managing the configuration or display of the current status of system. Here it is designed using Xilinx ISE and EDK 13.1 on Virtex 5 Platform. The block diagram of the same is shown in Figure 1.11 below. In this test pad, Xilinx Microblaze is used as an intelligent unit taking decision of loading of the configuration bit files either fully or partially. As shown in Figure 1.12 of SoC Test pad platform, the user design can be configured as partial reconfigurable modules. Their configuration bit files can be stored in compact flash. As and when required the processor will read the compact files through SysACE and load into the device through ICAP (Internal Configuration Access Port) [54] to reconfigure the functionality of the user design in device. The details about tools and methods are explained in Appendix –A and B.

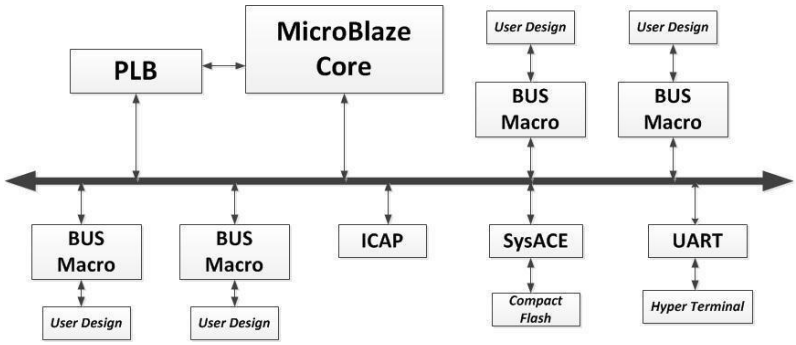

Figure: 1.11 SoC Test Pad Platform

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
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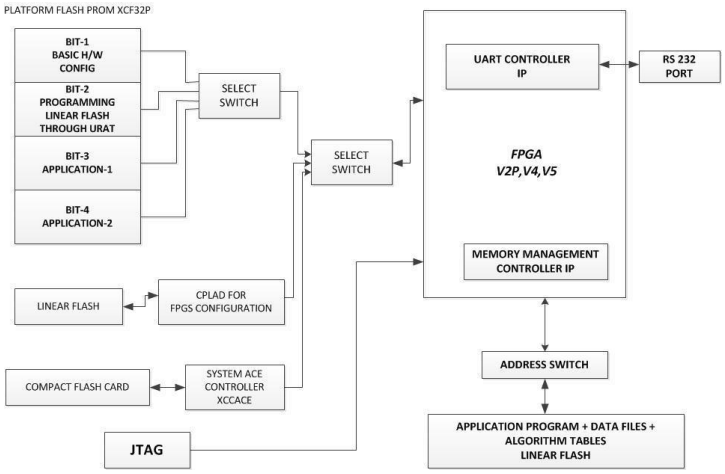

Figure: 1.12 SoC Test Pad with Various Configuration Bit File Loading Mechanism

1.2.3COUNTERMEASURES FOR SIDE CHANNEL ATTACKS

Security is one of the concerns in ground-based mission critical applications. Cryptographic algorithms are used for the purpose of security. Cryptographic algorithms are generally designed to resist at least thousands of years of crypto analysis. But when they are implemented with either software or hardware, unexpected details can usually leak additional information. It is this information which may enable the attackers to break the cryptographic systems within days.

Side-Channel Attack: SCAs are non-invasive attacks based on information that can be retrieved from encryption device. Such information is either the plaintext to be encrypted or the cipher-text resulting from the encryption process [75]. Encryption devices have additional output and often additional inputs. The outputs are timing information (time that operation take), radiation of various sorts, power consumption statistics and more. Often the device has unintentional inputs such as voltage that can be modified to cause predictable outcomes. The attacks can be mounted quickly and can be implemented using readily available hardware with relative low cost.

The amount of time required depends on the type of attack.

SCA Classification: Power Analysis Attacks

In these attacks the power consumption of devices, especially cryptographic modules, is studied by the attackers. Power analysis attacks require close proximity to the device in order to measure the power consumption of the device. There are two types of power analysis: simple power analysis (SPA) and differential power analysis (DPA) [90].

SPA: The attacker directly observes the device's power consumption. The amount of power consumed by the device varies depending on the data processed on and the instructions performed during different parts of an execution. A power trace is a set of power consumption measurements during a cryptographic operation. By examining power traces, it is possible to determine the characteristic details of a cryptographic device and the algorithm being used.

DPA: It exploits characteristic behavior using statistical analysis to extract hidden information from a large sample of power traces obtained during controlled cryptographic computations [77]. The attacker does not need to know the details about how the algorithm is implemented as in SPA. The secret key is obtained bit by bit. It is based on the different

amount of power consumption that the algorithm needs to manipulate a certain bit (if it is zero or one) during a specific time.

So many of the countermeasures that have been proposed in literature to prevent power analysis-based attacks, can be classified into masking, current or power signature flattening and balancing, non-deterministic processing, and circuit level solutions. A masking technique proposed by Kocher et. al. [90] was to add noise into power lines during measurements to force the adversary to acquire many more samples to significantly delay a successful attack. Another well-known method is to mask the computation method or intermediate result (data masking [88]) by adding some arbitrary values or function operations combining randomly with the actual data to distract an attack. A random value is used with the actual secure computation to confuse the attacker so that wrong data values are predicted [80, 82, 93]. A similar method is to divide the standard *sbox* table into many different tables, using random values for computations in Table masking [83] technique and the Duplication Method [85]. Some specific critical instructions can be masked with secure special instructions as described in [92]. To mask actual computations inside a system, a constant execution path or a piece of code to always yield the same result can be added [79, 90] as a distraction. One of the better methods is to complicate prediction of instructions my executing them out-of-order. Here a Non-deterministic processor [87] is implemented to use random selection circuitry to execute random issuing of independent code segments during runtime. Irwin et. al. [86] presents a software and hardware technique for non-deterministic processors, which inserts an additional pipeline stage to perform random operations without modifying the effective data. A random register renaming technique [87] is proposed for the nondeterministic processor designed in [87], by using a logic circuit to rename the internal registers randomly, depending on the availability, to hide information leaks from secret key computation. Muresan and Gebotys [89] proposed a current flattening technique to flatten the power wave of a processor, while a constant power dissipating logic for any bit transitions is used in the secure coprocessor [94], designed for AES-based biometric applications. But the coprocessor area cost is 3X and power cost is 4X. A signal suppression technique is proposed by Ratanpal et. al. [91]; where a special circuitry is designed to suppress the current dissipated by the processor.

Although many researchers have mentioned that the insertion of dummy instructions (No Operations) could be a solution to protect systems from side channel attacks [78, 90], though none seem to have been implemented. Many dummy operation insertion techniques are proposed for ECC cryptosystems to create a constant execution path [79, 84]. Clavier et. al. [81] proposed an improved DPA attack called Sliding Window DPA (SW-DPA), to bypass the dummy instruction insertion technique.

As opposed to previous methods, Randomized Instruction Injection Method (*RIJID)* [95]provides a generalized solution with little human intervention compared to the masking methods [80, 82, 83, 85, 93], allowing the processor to take care of masking. On a Simple scalar processor, the additional area cost is just 1.98% compared to the area cost of constant logic chips [94], with an average energy cost of 27.1% and an average runtime cost of 29.8% compared to current flattening [89], for six industry standard benchmarks. *RIJID* confuses the adversary without flattening the current [90], but scrambling the patterns in the power wave. It can be applied to any vulnerable segment (and is not algorithm dependent like masking techniques [83, 93]). Dummy instruction insertions can be eliminated using simple time shifting [81], whereas *RIJID* injects real instructions at

random places a random number of times. Hence the adversary will observe different power profiles on different tries. RIGID offers: (1) For the first time, a hardware/software based randomized instruction injection technique is implemented to insert random real instructions at random places to scramble the power dissipated by the processor and (2) A simple mathematical formulation is introduced (called *RIJID Index*) based on cross correlation that measures the scrambling. The limitations of RIGID approach [95] are: (1) *RIJID* needs compiler support (2) *RIJID* is proposed as a design time technique, since *RIJID* needs hardware changes and (3) An assumption that the system is self -contained with memory on chip.

Looking to this, a novel approach of inserting hardware modules of various sizes, power at random interval at random places of FPGAs to countermeasure the Side channel attack is proposed. Here the power consumption of hardware module of different sizes is varying. The modules are inserted at random interval of time. This is done at run time using partial reconfiguration feature of FPGAs. The hardware modules are pre-generated and stored in external memory. These modules are dynamically loaded during run time while cryptographic algorithms are running on the system.

1.3MOTIVATIONS

The underlying motivation for this research can be seen as expansion of the scope of FPGA architecture from robust design and debug to (a) modular and reconfigurable approach to fault tolerance and reliability, then (b) security, and further towards (c) handling large applications like co-processors and soft-core processors as test cases.

- Commercial of The Shelf (COTS) FPGAs are SRAM based and are susceptible to SEUs, which may lead to failure of mission. Though there are mitigation techniques existing as discussed earlier, but they are suffering from trade off of hardware resource utilization, time to design and special software tools requirements etc. SEU failures are classified as *temporary* - that can be eliminated through scrubbing, and *persistent* - that cannot be corrected even through repeated scrubbing attempts. A widely quoted [51] research had recommended combination of scrubbing and TMR to handle SEU events comprehensively. But this increases the resource allocation quite drastically, by triplication of circuit to reduce risk through voting mechanism, and yet need scrubbing controllers too. There needs to be a lower overhead way to handle both - temporary and persistent SEU, for most applications.
- As FPGA use invades mission-critical applications, fault tolerance needs to handle motivated attempts to cause failures, especially hackers by affording cryptography features. Studies have expanded the scope of cryptography focus from main band, to side band information like power dissipation signatures to reverse engineer security features. It is new trend of attacking it, to identify the design ported on it [198, 199]. Cryptographic algorithms are used for the purpose of security. It takes thousand years to crack cryptographic algorithms through cryptoanalysis, implementing them with either software or hardware usually leaks additional information which may enable the attackers to break the cryptographic systems within days which is known as side channel attack [191]. So, there is requirement of countermeasure which is applicable to any software/hardware based noninvasive side channel attacks. The solution has to be low cost in terms of hardware utilization. This has to be independent of data value and cryptographic algorithm.
- FPGA is a way out for low volume custom design, more common for mission critical applications, including space applications. This has led to custom solutions where

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VIRTEX series FPGA from Xilinx are quite popular. In addition, there is need for **Unified device independent FPGA architectures**, not just for design, but integrating fault tolerant, reliability and robust security solutions.

- Space and defense applications need to respond to large and increasing computing data, and its processing in parallel to improve performance. There is additional need for flexibility for enhancements in performance of the systems through circuit improvements, and even after mission deployment in many applications like satellites [26]. Next generation FPGA devices offer such features [154-156]. There is a need to carry out an extensive research and evaluation to exploit special features in terms of programmability, modularity and reconfigurability of the modern FPGAs.
- Current literature to evaluate secure and fault tolerant FPGA architectures uses shift registers, small combinatorial circuits and small memory arrays. The robustness of such FPGA architecture needs to be tested for larger test cases that include ALUs, MACs, and medium sized co-processor implementations.

1.4.1.1MBU HANDLING

Handling Multiple Bit Upsets (MBUs) is a challenge, which can lead to unrecoverable cascading failures, eventually requiring periodic power-down reset in mission-critical applications. These are generally handled through aggressive scrubbing to avoid accumulation of MBU that would otherwise overwhelm the voting mechanism of TMR approach. The proposed Re-PAM-DSP architecture resorts to a parallel detect and scrubbing approach for multiple functional units to extend the capacity of a generic architecture proposal from SEU handling to MBU handling with additional flexibility to adjust scrub rates for each functional block for further optimization of latency and power consumption overheads.

1.4.1.2EXTENSIVE TEST CASES

A large body of published research uses [3-6, 8-9, 14, 26-27] circuit blocks like shift registers, small memory arrays or combinatorial cells as test cases. The research results presented in this thesis investigate all features of proposed Re-PAM-DSP architecture with a more realistic co-processor with a soft-core processor design that includes a more realistic sampling of mission-critical application functional blocks like ALU, multipliers, counters, shifters and MACs.

1.4.1.3 APPLICATION INDEPENDENT SCA

- Published literature has already demonstrated need to protect against Side Channel Attacks to protect detection of encryption key and algorithm from power consumption signature. Methods like RIJID have demonstrated ability to mask these through inserting dummy instructions as discussed. But these solutions require compiler support, knowledge of specific algorithm and an assumption that the system can be contained in the chip memory. This approach violates the earlier goal for a unified solution space independent of application and architectural specifics.
- The research in this thesis presents SCA modules that are inserted at random time interval. This is done at run time using partial reconfiguration feature of FPGAs. The hardware modules are pre-generated and stored in external memory. These modules are dynamically loaded during run time while cryptographic algorithms are running on the system. In addition to being application independent implementation, it shows *more than 50X more difficulty in key decode ability.*

1.4.1.4UNIFIED SCALABLE ARCHITECTURE

Significant literature is published over the years to resolve drawbacks of each generation of FPGA. Prominent among them is proposal, and eventual deployment of an Internal Configuration Access Port (ICAP) [54, 57, 58] for scrubbing of SEU errors. Although ICAP has many advantages, the greatest limitation is its proprietary applications for FPGA solutions rolled out by Xilinx Corp. The thesis explores a generic architecture that is modular and independent for any application in future.

Viable integration of the features in a single Re-PAM-DSP architecture is also tested for a more realistic co-processor and soft-core processor test cases (elaborated later in this section).

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Mahatma Gandhi's Perspective On The Development Of Rural Women: An Indian Perspective

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Abstract
Gandhiji thought of the significance of women power and their responsibility in shaping the pathway of history and progress. Mahatma Gandhi alleged that women are indistinguishable in all compliments to men and could ingest responsibilities with compatible dexterity and proficiency. Gandhiji had observed the men and women as two faces of the same coin and synchronize each other. Gandhiji saw himself not as a prophet but as a practical optimist. Empowerment of woman has been the crucial point of government policy since 1990s. Economic and political empowerments are the double processes operated through governmental effort. Gandhi encourages parallel views exhorting women to understand their might and endeavor as a collectively for social revolution. Now-a-days woman play a fundamental responsibility as income earner. It also changes their individuality and living standards. In the sophisticated countries of the planet there is a phenomenal augment in the number of self-employed women. Women constitute half of the human population on the globe. It is the contractual obligation of the democratic state to promote and strengthen woman's studies through teaching, research, extension, information dissemination and advocacy. Mahatma Gandhi was in the frontage position in championing the ground-work of women and about their right to equal opportunity along with men in every bubble of nation's life.
Keywords: Rural development**,** Empowerment, Employment, Population, Democracy.

Introduction

Gandhiji found the only way of bringing hope of good living to the rural people by making the village the central place in the economic programme rural development as outlined by Ganhji contained self-sufficiency, inter-dependence for other wants and development of Village Industries. He wanted to bring about rural reconstruction with sound scientific and spiritual values. In India, as experimental confirmation demonstrates that the women contribute extensively to run family businesses, which fallout in unpaid endeavor and dexterity. Gandhiji believed that India's salvation depends on the sacrifice and enlightenment of her women. Any tribute to Mahatma Gandhi, the Great Soul, would be an empty one, if we were to take no cure for our own guidance from his words and from his life; for him ideas and ideals had no value if they were not translated into action. He saw man and women as equals, complementing each other. And he saw himself not as a visionary, but as a practical idealist. Gandhi believed women could do much to transform India on all levels. He believed that equal rights for women and men were necessary but not sufficient to create a more just social order. In a letter written to RajKumari Amrit Kaur from Wardha on 20-10-1936, Gandhi writes, "If you women only realize your dignity and privilege, and make full sense of it for mankind, you will make it much better than it is. But man has delighted in enslaving you and you have proved willing slaves till the slave and holders have become one in the crime on degrading humanity. Gandhi further said: "I

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began work among women when I was not even thirty years old. There is not a woman in South Africa who does not know me. But my work was among the poorest. Gandhi was totally opposed to gender discrimination. Gandhi did not like Indian society's preference for a boy and a general neglect of a girl child. In fact, in most cases she is not allowed to be born. If born her survival is not ensured. If somehow she survives she is subjected to neglect. She does not get respect and the status she deserves equal to that of a boy. Gandhiji preached and practiced sharing of housework by both men and women of the family. He encouraged women to do intellectual work and men to help in cooking, cleaning and caring, conventionally 'women's chores'

Gandhiji and Empowerment of Women

Gandhian strategy of rural reconstruction was based on village swaraj and swadeshi movement. The basic principle of village swaraj as outlined by Gandhiji are trusteeship, swadeshi, full employment, bread labour, selfsufficiency, decentralisation, equality, Nai Talim etc. Thus the idea of ideal village of Gandhian dream was a comprehensive one, encompassing the economic, social, political and educational dimensions. Gandhi was not only a great political leader but a passionate lover of humanity. An implacable enemy of all injustice and inequalities, he was a friend of the lowly and the downtrodden. Harijans, women and the poor commanded his most tender attention. He had almost an instinctive understanding of women and their problems and had a deep abiding sympathy for them.

Gandhi's great sense of justice made him work towards emancipation for all those oppressed and suppressed sectors of society including women. He declared in the February 1925 edition of Young India. Gandhi's goals were numerous: not only was he striving to achieve independence for India but he laboured tirelessly to bring about social change. The one injustice that hurt him the most was the branding of millions of people in the country as 'untouchables'. This was a special problem for women in the lower-scheduled castes. In an attempt to gauge the extent of Gandhi's impact as a social reformer for both men and women, the Smt. Nathibai Damodar Thackersey University carried out a survey approximately covering the years from the Champaran Indigo Planters Movement of 1917 to the Quit India struggle of 1942. Almost inevitably most of the participants felt that Gandhi had had an enormous effect on their hves and according to the survey, one respondent, a non-Gandhian, who became a convert to his ideology simply because of his contact with Gandhi, confessed that but for Gandhi's influence he would never have taken a realistic approach to the problem of poverty.

According to Rajkumari Amrit Kaur, of all the factors contributing to the awakening of women in India none has been so potent as the field of nonviolence which Gandhiji offered to women in his "war" against British domination of India. It brought them out in their hundreds from sheltered homes, to stand the furnace of a fiery trial without flinching. It proved to the hilt that woman was as much able as man to resist evil or aggression. Gandhiji's approach to rural industrialization and entrepreneurship development was evolved over a period of time. Our success in its implementation was less than desirable. However, it should not lead us to believe that we must get rid of this as a burden of 'Gandhian Legacy'.

Gandhiji Views on Rural Women's

Gandhi's political ideologies, stalwartly anchored in humanitarian values, were an indication of his spiritual self. His personal philosophies of life shaped to a great extent his

political strategies, with which he determined the direction of travelling Indian on the path to freedom.

Women under his auspices took a milestone step towards re-establishing their identity in the society. Gandhi's inspiring ideologies boosted their morale and helped them to rediscover their self-esteem. He comprehended that there were deep-rooted customs hindering the development of women and woman's freedom from such shackles was necessary for the liberation of the nation. Gandhi observes a woman 'as strong reservoir of energy', which could be put to use to bring light to the dark comers of the nation. In his opinion, "It is worth considering carefully in what way the country can avail itself of the services of hundreds of widows of rural India, young and old". Gandhi expected great things from women in the areas of work concerning purity of life, removal of untouchability, proliferation of khadi, communal harmony and Swadeshi. In Gandhi's views, women can never be considered to be the weaker sex. In fact, women for Gandhi were embodiments of virtues like knowledge, humility, tolerance, sacrifice and faith. The doctrine of ahimsa as preached by Gandhi integrated the virtue of suffering as is evident in the woman. Therefore, Gandhi visualized a critical role for women in establishing non-violence.

Gandhian Legacy the Contemporary Women's Movement

In India and elsewhere, there are healthy movements of Gandhi's followers, and there are more moribund Gandhians who speak in Gandhi's name but also subvert the power of his theory and practice by failing to be open to new movements. Feminists and other women are engaged in many forms of action that Gandhi may not have anticipated. We have much to learn from Gandhi's theory and practice, but not to the exclusion of modern ideas and movements. Mahatma Gandhi's vision of Swaraj in all its facets and from different perspectives has permeated the discourse on India's contemporary history. As the most towering figure in India's freedom struggle Gandhi's role will remain unchallenged. All over the world the imprint of his moral philosophy as a workable political ideology has been particularly indelible. Yet Mahatma Gandhi's positions on social, political and economic matters are transparently evolutionary, a continuing examination of reality, the human condition and truth. From feminist ideas in a text book to spinning the charkha for swaraj he always came up with a constructive proposal to bring women out of their traditional mental fetters and into a better more dignified life. But Gandhi revealed a deep understanding of the pulse of society, and reflected its rhythm. He offered spinning and the salt agitation as nonviolent ways for women to join the political movement for swaraj. He saw it as right as well as possible for women at that time in history. By 1940, he had provided modifications to his earlier more generalized approach to women's contribution to public life.

Gandhi's Perspective on the Strength of the Women

Perhaps due to the overriding importance given to female chastity in the Indian society, the Mahatma emphasizes once again on female chastity and purity. His solution for the helpless woman under sexual assault to die before the violation takes place is a very traditional view of what women should do when they are sexually assaulted. It is akin to hara-kiri or jouhar. In the days of armed sexual assaults and gang or group sexual assaults on women, the Gandhian solution is inadequate. According to Gandhi, woman as powerful, crucial, multi-task-oriented personalities are well appropriate for the competitive world of gigantic business. Women have been managing important portfolios, be it on the political

scenario or economic development. In the present day the World is considering such examples in plenty. Progressively women are having the final say in the boardroom, they head corporations and women entrepreneurs have evolved a new style of leadership. Gandhi gave the traditional role a new dynamism, he had undaunted faith in the chastity and transparency of woman. He was sure that the "Dazzling purity" of a woman could disarm even the most beastly of men. In Gandhi's philosophy, the women of India found a new identity. His words and deeds have inspired thousands of women and will continue to do so, in their struggle against injustice and inequality.

Gandhian perspective on Rural Women

Gandhi sincerely felt that a strengthened and economically sound rural economy would revitalize Indian economy because India lives in villages. Where 75% of the population are agriculturalists. He preached, hence "The gospel of rural minedness."21 A rural economy of self-contained villages alone could be the basis of a non-violent, and to be rural minded you have to have faith in Woman has been suppressed under custom and law for which man was responsible and in the shaping of which woman had no hand. According to Prof. Madhukishwar, "Gandhi's terminology, in its exaggerated idealization of women as "Sisters of mercy and Mothers of entire humanity" reveals the bias of a benevolent patriarch". Gandhi saw that the low status of women was the result of prejudices arid adverse traditions, which were centuries old. Gandhi wanted to have an ideal society of his own imagination and his economic ideas are a part and parcel of his philosophical and sociological ideas. He was interested in the growth of human beings and more significantly the growth of the deprived and unprivileged group of people. Gandhiji understood that this realization comes from how the boy has learnt to treat a female from his surroundings at home and at school. At home, he has been observing throughout his life, a mother following the instructions of a dominating father, a sister being scolded for not looking after him properly or not carrying out the household jobs properly in her mother's absence.

Gandhi on Khadi and Village Industry

Gandhiji suggested the third alternative, the 'Sarvodaya' social order, which believes "that every individual has a personality which when properly developed, has a contribution to make to society." In the economic field "decentralized commodity production ensures the producer the product of his labour." Where the producer is ensured of the fruits of his labour, there is no exploitation and there is no violence. If Indian civilization is to make its full contribution to the building up of a stable world order, it is this vast mass of humanity that has to be made to live again. We have to tackle the triple malady which holds our villages fast in its grip: (i) want of corporate sanitation; (ii) deficient diet; (iii) inactivity. Villagers are not interested in their own welfare. Considering the useful contribution the Khadi Sector is making to the country's economy, particularly in the field of rural employment, the Government of India thought it fit to ensure its continuation even by subsiding its product. The selling price of Khadi is slightly higher than that of mill made cloth because it is handspun and hand woven. The wage component in the Khadi cloth is higher than in the mill cloth. According to Gandhiji village economy cannot be completed without the essential village industries such as hand-grinding, hand pounding, soap-making, paper-making, match-making, tanning, oil-pressing etc. The village industries give employment to millions of people and provide an outlet for the creative skill and resourcefulness of the people.

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Gandhi's Perspective on Economic Equality

Gandhi believed that untouchability was a sin against God and man. It was "like poison slowly eating into the very vitals of Hinduism". It degraded both the untouchables and the touchable. The solution to Indian basic problems lies in the practice of non-violence. Gandhiji opposed capitalism as it resulted in exploitation of human labour. He believed that nature produced enough for the satisfaction of the people's wants and there would be no pauperism and starvation if everybody took only that much that was sufficient to him. In connection with 'Economic Liberation', Gandhi felt that men and women had different vicinity of work. In his opinion, women could take to economic activities to supplement the income of her families like spinning, which he believed to be a good option accessible to the women. In the social realm, Gandhi envisaged a critical role for women in doing away with the forces of communalism, caste system and untouchability. Mahatma Gandhi admitted that untouchability was an old institution; but as it was an evil, it could not be defended on this ground. He held that if some shastras had given sanction to it, it was a sin committed by Hinduism; this sin must be removed.

Gandhi's Perspective on Village Sanitation

The village worker will thus be a living embodiment of industry. He will master all the processes of khadi, from cotton- sowing and picking to weaving, and will devote all his thought to perfecting them. Divorce between intelligence and labour has resulted in criminal negligence of the villages. Often one would like to shut one's eyes and stuff one's nose; such is the surrounding dirt and offending smell. If the majority of Congressmen were derived from our villages, as they should be, they should be able to make our villages models of cleanliness in every sense of the word. The task of rural sanitation is no easy one, it means nothing less than raising the village Bhangi to the status of an ideal Bhangi. The whole subject is unexplored; the profession, far from being a dirty one, is a purifying, life-protecting one. Only we have debased it. We have to raise it to its true status. An ideal Indian village will be so constructed as to lend itself to perfect sanitation. It will have cottages with sufficient light and ventilation built of a material obtainable within a radius of five miles of it. The cottages will have courtyards enabling householders to plant vegetables for domestic use and to house their cattle. The village lanes and streets will be free of all avoidable dust. It will have wells according to its needs and accessible to all.

Village sanitation, domestic cleanliness, personal hygiene and health care have the first place and also full scope, the underlying idea being that this done there can be no disease."

Conclusion

Gandhiji concept of rural women is uplift of the common man. A common man is developing is uplift of the life village have developed. He realised the need for integrated rural development and believe that education and health. It can be said without an idea of doubt that Mahatma Gandhi experimented in all these three fields a century ago and shown the way for the empowerment of women and the improvement of the status of women in the country. No other man in the entire history of India or in the world had such godly ideas about women. The power of non-violence is located in the spirit of the human being and the Mahatma indubitably is the greatest architect of this spirit and spirituality, he is the greatest sculptor of this spirituality called non-violence. The critics argue that Gandhiji's ideals of swadeshi, voluntary curtailment of one's wants, trusteeship, self-sufficient villages, and use of manual labour in preference to machines sound obsolete these days, particularly in the weeks of India's new economic policy characterized by privatization,

liberalization, and globalization. He is the noblest of all nobles and the bestowal of the Nobel on him will only be a recognition which is widely known and recognized. Gandhiji says that, whole globe is family who extend the love and affection and fraternity with humanity. Gandhiji's sublime vision gives us a rare insight into the future of mankind! Gandhlji belongs to the future and not the past. He is not dead; his message is eternal and shall live as long as sun shines in the vast open skies.

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

सामाजिक तनाव में मीडिया की भूमिकाः एक नूतन विमर्श

अंशुमान सिंह*

बीसवीं सदी की समाप्ति तक दुनिया में सशक्त मीडिया माध्यमों का तीव्र गति से विस्तार हुआ है। इस विस्तार का ही परिणाम है मीडिया की शक्ति आम जनता के हाथ में आ गई है। मीडिया के बदलते आयामों को देखकर ऐसा प्रतीत होता है कि मौजूदा समय बदलाव का समय है। संप्रेषण के ऐसे नए तरीके और नए माध्यम सामने आए हैं जो पूरी तरह हमारे जीवन का हिस्सा बन गए हैं। लोगों को और विभिन्न स्थानों को जोड़ने वाला सोशल मीडिया ऐसा ही एक माध्यम है जिसे हमने जीवन के एक अटूट हिस्से के रूप में अपनाया है। आज यदि लोकतंत्र के चौथे स्तम्भ कहे जाने वाले मीडिया की भूमिका पर बात की जाये, तो समाज में मीडिया की भूमिका पर कई तरह के सवाल वर्तमान में उठाये जा सकते हैं, अतीत में इसी मीडिया के पीठ थपथपा सकते हैं, तो भविष्य के लिये एक नई सोच जागृत करने का प्रयत्न कर सकते हैं। जब भी मीडिया और समाज की बात की जाती है तो मीडिया को समाज में जागरूकता पैदा करने वाले एक साधन के रूप में देखा जाता है, जो की लोगों को सही व गलत करने की दिशा में एक प्रेरक का कार्य करता नज़र आता है। वर्तमान परिपेक्ष्य में भय, भूख, भ्रष्टाचार व महंगाई से त्रस्त जनता का "अन्ना हजारे" के आंदोलन को देशभर में व्यापक जन समर्थन मिलना मीडिया के कारण ही संभव हो सका है अर्थात् यह भी कह सकते हैं कि "जनलोकपाल" पर लोगों को एकजुट करने में मीडिया ने महत्वपूर्ण भूमिका अदा की है, लेकिन दूसरी ओर इसी का दूसरा पक्ष यह भी है कि भ्रष्टाचार के कई मुद्दों पर मीडिया घरानों की कई प्रमुख हस्तियों के नाम आने के बाद मीडिया की किरकिरी को भी इस जन आंदोलन में मीडिया ने जनता का साथ देकर दबाने का प्रयास किया है।

आज आतंकवाद, नक्सलवाद जैसी गंभीर समस्याओं से देश जूझ रहा है, लेकिन इससे निपटने के लिये आमजनों को क्या करना चाहिए, सरकार की क्या भूमिका हो सकती है, सहित कई मुद्दों पर मीडिया आज मौन रूख अख्तियार किये हुये है। लेकिन वहीं दूसरी ओर आतंकी गतिविधियों से लेकर नक्सली क्रूरता को लाइव दिखाने में भी यह मीडिया पीछे नहीं है, यहां तक की आज सर्वप्रथम किसी खबर को दिखाने की होड़ में मीडिया के समक्ष आतंकी व नक्सली हमला के तुरंत बाद ही हमला करने वाले कमाण्डर व अन्य आरोपियों के फोन व ई–मेल तक आ जाते हैं। न्यूज चैनलों से लेकर अखबारों में आतंकियों व नक्सलियों के इण्टरब्यू छप जाते हैं। लेकिन गौर करने वाली बात यह है कि बार–बार व प्रतिदिन इस समाचार को दिखाने व छापने से फायदा किसका होता है, आमजनता का, पुलिस का, नक्सली व आतंकी का या फिर मीडिया घरानों का। निश्चित रूप से इसका फायदा मीडिया व इन देशद्रोही तत्वों (आतंकी व नक्सली) को होता है, जिन्हें बिना किसी कारण से बढ़ावा मिलता है, क्योंकि कि बार–बार इनको प्रदर्शित करने से आमजनों व बच्चों में संबंधित लोगों के खिलाफ खौफ उत्पन्न हो जाता है और ये असामाजिक तत्व चाहते भी यही हैं। इसलिये आज जरूरी है कि मीडिया और इसको चलाने वाले ठेकेदारों को यह तय करना होगा, कि मीडिया ने सामाजिक सरोकारों को दूर करने में कितनी कामयाबी हासिल की है, यह उन्हें खुद ही देखना व समझना होगा।

बीसवीं सदी की समाप्ति तक दुनिया में सशक्त मीडिया माध्यमों का तीव्र गति से विस्तार हुआ है। इस विस्तार का ही परिणाम है मीडिया की शक्ति आम जनता के हाथ में आ गई है। मीडिया के बदलते आयामों को देखकर ऐसा प्रतीत होता है कि मौजूदा समय बदलाव का समय है। संप्रेषण के ऐसे नए तरीके और नए माध्यम सामने आए हैं जो पूरी तरह हमारे जीवन का हिस्सा बन गए हैं। लोगों को और विभिन्न स्थानों को जोड़ने वाला सोशल मीडिया ऐसा ही एक माध्यम है जिसे हमने जीवन के एक अटूट हिस्से के रूप में अपनाया है। आज यदि लोकतंत्र के चौथे स्तम्भ कहे जाने वाले मीडिया की भूमिका पर बात की जाये, तो समाज में मीडिया की भूमिका पर कई तरह के सवाल वर्तमान में उठाये जा सकते हैं, अतीत में इसी मीडिया के पीठ थपथपा सकते हैं, तो भविष्य के लिये एक नई सोच जागृत करने का प्रयत्न कर सकते हैं। जब भी मीडिया और समाज की बात की जाती है तो मीडिया को समाज में जागरूकता पैदा करने वाले एक साधन के रूप में देखा जाता है, जो की लोगों को सही व गलत करने की दिशा में एक प्रेरक का कार्य करता नज़र आता है। वर्तमान परिपेक्ष्य में भय, भूख, भ्रष्टाचार व महंगाई से त्रस्त जनता का "अन्ना हजारे" के आंदोलन को देशभर में व्यापक जन समर्थन मिलना मीडिया के कारण ही संभव हो सका है अर्थात् यह भी कह सकते हैं कि "जनलोकपाल" पर लोगों को एकजुट करने में मीडिया ने महत्वपूर्ण भूमिका अदा की है, लेकिन दूसरी ओर इसी का दूसरा पक्ष यह भी है कि भ्रष्टाचार के कई मुद्दों पर मीडिया घरानों की कई प्रमुख हस्तियों के नाम आने के बाद मीडिया की किरकिरी को भी इस जन आंदोलन में मीडिया ने जनता का साथ देकर दबाने का प्रयास किया है।

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

भारत जैसे एक जीवंत लोकतंत्र में एक स्वतंत्र और नियंत्रण–मुक्त प्रेस की आवश्यकता वास्तव में जरूरी है। जब से हमारे संविधान निर्माताओं ने भारतीय संविधान निर्धारण करने की शुरुआत की, तब भारत सरकार के दृष्टिकोण पर मीडिया की भूमिका पर गर्मजोशी से बहस हुई। संविधान निर्धारण के दौरान, भारत में मीडिया की स्थिति को लेकर एक भ्रम की स्थिति बनी हुई थी या भाषण और अभिव्यक्ति की स्वतंत्रता के मौलिक अधिकार के तहत एक लेख या प्रेस की स्वतंत्रता के लिए, जैसा कि अमेरिकी संविधान का मामला था, में एक अलग प्रावधान करने की आवश्यकता थी। मसौदा (संविधान प्रारूप) समिति के अध्यक्ष डॉ. अम्बेडकर ने महसूस किया कि स्वतंत्र प्रेस के लिए अलग प्रावधान करने की कोई आवश्यकता नहीं थी, बल्कि उन्होंने तर्क दिया कि "प्रेस केवल एक व्यक्ति या नागरिक के बारे में वर्णन करने का एक अन्य तरीका है", इस प्रकार प्रेस का अधिकार अनुच्छेद 19 (1) (ए) के तहत भाषण और अभिव्यक्ति की स्वतंत्रता के अधिकार का हिस्सा बन गया।

मीडिया की स्वस्थ लोकतंत्र के निर्माण में महत्वपूर्ण भूमिका होती है। यह लोकतंत्र का आधार है। मीडिया संसार में तथा हमारे चारों ओर घटित होने वाली सामाजिक, आर्थिक व राजनीतिक गतिविधियों के प्रति हमें जागरुक करता है। यह वह दर्पण है जो हमें जीवन के कड़वे सत्य और कटु वास्तविकताओं को हमें दिखाता है या दिखाने का प्रयास करता है। लोकतंत्र का एक बड़ा साधन निर्वाचन है और मीडिया पिछले कुछ व''र्षों में अति सक्रिय हुआ है।

यहां सवाल यह उठता है कि मीडिया की आजादी को कैसे आंका जाए। भारत के संविधान में अनुच्छेद 19 (1) के तहत अभिव्यक्ति के अधिकार की गारंटी दी गई है। प्रेस की स्वतंत्रता उसी का हिस्सा है, इसलिए इसकी अलग से चर्चा नहीं है। आखिर मीडिया की आजादी का मतलब क्या है? क्या सिर्फ सरकार के नियंत्रण से बाहर रहने को हम उसकी आजादी मान लें? आमतौर पर मीडिया को सरकार नियंत्रित नहीं करती। लेकिन क्या मीडिया सरकार और कॉरपोरेट जगत के स्वार्थ के लिए काम करता है?

दरअसल, मीडिया पर आज जो सवाल उठ रहे हैं, उसके लिए शायद कुछ स्थितियां जिम्मेदार हैं। अगर मीडिया के दबाव में काम करने की बात पर विचार करें तो यह साफ होना अभी बाकी है कि आखिर वह दबाव किस तरह का है, और क्या उसका असर विषय–वस्तु पर भी पड़ रहा है! मीडिया के कवरेज को लेकर आज सबसे ज्यादा सवाल राजनीतिकों की ओर से उठाए जा रहे हैं। कुछ राजनेता अपने अंदाज में मीडिया को चलाना चाहते हैं। अगर मीडिया उनके पक्ष में सकारात्मक खबरें दिखाता है तो उसे वे अच्छा कहते हैं और ऐसा नहीं होने पर मीडिया को कठघरे में खड़ा करने लगते हैं।

आज प्रिंट और इलेक्ट्रॉनिक, मीडिया के दोनों माध्यमों के सामने अपनी विश्वसनीयता बचाने की बहुत बड़ी चुनौती है। इंटरनेट के जमाने में इनकी लोकप्रियता में कमी आई है। प्रिंट और इलेक्ट्रॉनिक मीडिया की भूमिका और उन पर निर्भरता लगातार कम होती जा रही है। आज भारत में दस प्रतिशत से ज्यादा लोग इंटरनेट का इस्तेमाल करने लगे हैं और इसका दायरा धीरे–धीरे और बड़ा हो रहा है। इंटरनेट के जरिए लोगों के पास खबरें जल्दी पहुंच जाती हैं। इस मामले में सोशल मीडिया भी काफी अहम भूमिका निभा रहा है। दूसरी ओर, एशिया से ज्यादा पश्चिमी देशों में समाचार पत्रों की हालत खराब है। जहां पश्चिमी देशों में अखबारों के प्रसार में कमी आई है, वहीं एशिया में बढ़ोतरी हुई है।

मीडिया के कवरेज में काफी बदलाव आया है। कई बार ऐसा लगता है कि मीडिया व्यक्ति–केंद्रित हो चुका है। कुछ नाटकीयता और अतिरंजना के साथ कार्यक्रम परोस कर दर्शकों को लुभाने की कोशिश की जा रही है। ऐसा लगता है कि मीडिया अपनी सामाजिक जिम्मेदारी से भाग रहा है। सामाजिक खबरें कम दिखाई देती हैं। आजकल टीवी चैनलों पर नेता ही दिखाई देते हैं। टीवी पर नेताओं के भाषणों और बयानों से ही समाचार के वक्त भरे रहते हैं, वहीं अखबारों में विज्ञापन ज्यादा और खबरें कम दिखाई देती हैं। मीडिया की पहुंच का विस्तार हुआ है, पर यही बात कवरेज के बारे में नहीं कही जा सकती। वह गांवों के लोगों की समस्याओं से अछूता नजर आता है।

मीडिया सरकारी प्रस्तावों, योजनाओं,कार्यक्रमों व नीतियों के बारे में लोगों के बीच सूचना देने और जागरूकता बढ़ाने का कार्य करता है जैसे कि जनता के प्रति शासन क्या कर रहा है या क्या करना चाहता है वहीं दूसरी तरफ जनता से संबन्धित मुद्दों,समस्याओं और जनमानस कि चिंताओं को सरकारी प्रतिनिधियों तक प्रभावी रूप से पहुंचाने में मीडिया कि अहम भूमिका है। मीडिया अपने प्रसारण एवं प्रकाशन द्वारा विकास के परिवर्तन अभिकर्ता के रूप में कार्य करता है। लोकनीतियों को विशेष दिशा, प्रारूप और आकार देने में मीडिया कि खासी भूमिका हमेशा रही है। समाज में मीडिया कि भूमिका सूचना प्रद एवं शिक्षा प्रद दोनों पहलुओं में अत्यंत महत्वपूर्ण होती है, जो कि जनसहभागिता को बढ़ते हुए लोकतान्त्रिक/शासन व्यवस्था को प्रभावी व कुशलता प्रदान करने में सहायक सिद्ध होती है। पूर्वाग्रहों से मुक्त समाज कि समस्याओं पर राय व विश्लेषण करके एक संतुलित चेतना का विकास करते हुए मीडिया का कार्य अत्यंत ज़िम्मेदारी से भरा है। मीडिया का दायित्व है विभिन्न वर्गों में आपसी समझ एवं समंजस्य विकसित करना और एक समृद्ध संस्कृति कि स्थापना करना। निर्धन, शोषित व दबे कुचले लोगों कि सशक्त आवाज उठाना एवं उनके हितार्थ, व्यवस्था को सोचने के लिए विवश करना, मीडिया को नजर अंदाज नहीं करना चाहिए। इस प्रकार नीति निर्धारण में जनसहभागिता के लिए जनता एवं नीति निर्धारकों के बीच मीडिया एक सेतु का कार्य करता है।

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

वर्तमान समाज में मीडिया की अपनी प्रारम्भिक भूमिका से भटकाव नजर आता है। ऐसा भी नहीं है कि मीडिया ने सामाजिक सरोकारों को एकदम से अलग कर दिया है लेकिन लगातार मीडिया की भूमिका कई मामलों में संदिग्ध सी लगती है। मीडिया को समाज के प्रति अहम उत्तरदायित्व को नजर अंदाज करने का दुस्साहस नहीं करना चाहिए। मीडिया को निष्पक्ष और निर्भीक अंदाज में अपने समाजिक उत्तरदायित्व को निभाना चाहिए जिसमें उसे बेबाक ढंग से तथ्यों को प्रस्तुत करना चाहिए न कि पूर्वाग्रह से ग्रसित होकर उनमें निर्णायक भूमिका अदा करनी चाहिए। लेकिन क्षुद्र स्वार्थों के चलते आज मीडिया कि निष्पक्षता सवालों के घेरे से बाहर नहीं है। शासन तक समाज की आवाज पहुंचाने में मीडिया उसका प्रतिनिधि होता है। लेकिन क्या आज वाकई मीडिया जनता की आवाज हैं? आज शोषितों की आवाज कौन उठा रहा है? आम जन मानस के गंभीर मुद्दों व ग्रामीण पृष्ठभूमि की समस्याओं के ऊपर राजनेताओं की बयानबाजी, घोटालों, क्रिकेट मैचों, सेलिब्रिटी की निजी जिंदगी या सेक्स संबंधी समाचारों को तवज्जो दी जा रही है। जिससे मीडिया की सामाजिक उत्तरदायित्व के प्रति प्रतिबद्धता पर प्रश्नचिन्ह लग रहे हैं।

समाज को सही दिशा देना मीडिया का उत्तरदायित्व है। इसमें मीडिया को समाज के सकारात्मक पहलूओं को प्रमुखता से सामने लाना चाहिए लेकिन आज के दौर में मीडिया में अधिकतर नकारात्मक खबरों को अहम स्थान मिलता है । सकारात्मक समाचारों का प्रतिशत कम होता जा रहा है इससे समाज में असंतुलन जैसा भान महसूस होता है। हमारे जैसे लोकतान्त्रिक प्रणाली में नकारात्मक खबरों कि बहुतायत से देश में ऐसा लगने लगता है की जैसे मूल अधिकार और राज्य के नीति निर्देशक तत्व सही मायने में सिकुड़ते जा रहे हैं। सरकारी और गैर सरकारी एजेंसियों द्वारा लोक हित में किए जा रहे निर्णय, कार्य, और पहल को मीडिया द्वारा जन जन तक सकारात्मक रूप में पहुंचाने में ही सामाजिक उत्तरदायित्व के प्रति मीडिया कि सार्थकता है। लेकिन जनसाधारण का सकारात्मक दृष्टिकोण बनाने के सामाजिक उत्तरदायित्व से मीडिया भटकता नजर आ रहा है।

निष्कर्ष

पिछले कुछ वर्षों में टीवी की खबरें न ही उतनी उदासीन हैं और न ही पहले की तरह तटस्थ है, जैसा कि उत्कृष्ट पत्रकारिता के गुरुओं के द्वारा निर्धारित की गयी थी। खबरों के प्रसारण का प्राचीन तरीका अब बेहद उबाऊ, विनम्र और ऊर्जा विहीन हो गया है। आधुनिक खबरों का एक खुद का दृष्टिकोण होना बहुत ज़रूरी है। जबकि प्राचीन पत्रकारिता के विचार संपादक की सोच या ओपिनियन पोल पर आधारित होते थे। टी आर पी की चूहा दौड़ ने तथ्यों की लगातार विवेचना करने के प्रमुख सिद्धांत को अनदेखा कर दिया है। नई पत्रकारिता का नया मंत्र है स्पीड यानि गति। कोई भी खबर केवल कुछ पलों तक ही जीवित रहती है। हर पल में एक नई खबर होनी चाहिए। यहाँ एक विरोधाभास भी है। यह अक्सर देखा गया है कि लोगों का ध्यान आकर्षित करने के लिए किसी ख़ास खबर को, जिसमें दर्शकों की अधिक रूचि की सम्भावना होती है, इतनी बार दिखाया जाता है कि वह अपना मूल स्वरुप और उद्देश्य खो देती है। मीडिया को सामाजिक सरोकार के उद्देश्यों की पूर्ति एवं सामाजिक उत्तरदायित्व के प्रति प्रतिबद्धता में आगे आना चाहिए ताकि सही मायने में सुदृढ लोकतंत्र की स्थापना हो सके। मीडिया की समाज में अमिट छाप होती है। अव्यवस्था, अशांति और अराजकता के माहौल में मीडिया की सामाजिक जिम्मेदारी और भी बढ़ जाती है उसे समाज में शान्ति, सद्भावना व एकता कायम करने में सकारात्मक पहल पेश करना चाहिए। यदि मीडिया समाज के प्रति अपने उत्तरदायित्व को समझते हुए सामाजिक सरोकार के मार्ग पर चलता है तो वह समाज प्रगतिशील होता है, लेकिन यदि दुर्भाग्यवश मीडिया समाज के प्रति अपनी जिम्मेदारी को ताक पर रखकर सामाजिक सरोकार से मुंह फेर लेता है तो समाज व देश को दलदल में फँसने से कोई नहीं रोक सकता। अव्यवस्था, अशांति और अराजकता के माहौल में मीडिया की सामाजिक जिम्मेदारी और भी बढ़ जाती है उसे समाज में शान्ति, सद्भावना व एकता कायम करने में सकारात्मक पहल पेश करना चाहिए। मीडिया के दुरूपयोग का फिल्मी अंदाज हम फिल्म 'पीपली लाईव' में देख सकते हैं। वर्तमान परिवेश में यह कहना असंगत न होगा कि आज मीडिया जगत में प्रोन्नति और सफल कैरियर बनाने का आसान तरीका अपने स्वाभिमान और ज्ञान को ताक पर रखकर मीडिया घराने का दरबारी बनना भर से है। इस प्रवृत्ति को हटाने के लिए व मीडिया नियमन के लिए एक उन्नत तंत्र की आवश्यकता है।

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

मुंशी प्रेमचंद का जीवन परिचय

अनुप कुमार यू. जी. सी. नेट (हिंदी)*

धनपत राय श्रीवास्तव (31 जुलाई 1880 - 8 अक्टूबर 1936), जिन्हें उनके कलम नाम मुंशी प्रेमचंद से जाना जाता है, एक भारतीय लेखक थे जो अपने आधुनिक हिंदी के लिए प्रसिद्ध थे। वे भारतीय उपमहाद्वीप के सबसे प्रतिष्ठित लेखकों में से एक हैं, और उन्हें बीसवीं शताब्दी के शुरुआती दौर के हिंदी लेखकों में से एक माना जाता है। उन्होंने कलम नाम "नवाब राय" के तहत लिखना शुरू किया, लेकिन बाद में "प्रेमचंद" में बदल गए। मुंशी एक मानद उपसर्ग है। एक उपन्यास लेखक, कहानीकार और नाटककार, उन्हें लेखकों द्वारा "उपनिषद सम्राट" ("उपन्यासकारों के बीच सम्राट") के रूप में संदर्भित किया गया है। उनके कामों में एक दर्जन से अधिक उपन्यास, लगभग 250 लघु कथाएँ, कई निबंध और कई विदेशी साहित्यिक कृतियों का हिंदी में अनुवाद शामिल हैं।

जीवन रेखा

मुंशी प्रेमचंद का जन्म 31 जुलाई 1880 को वाराणसी (बनारस) के पास स्थित लमही में हुआ था और उनका नाम धनपत राय ("धन का स्वामी") रखा गया था। उनके पूर्वज एक बड़े कायस्थ परिवार से आते थे, जिसके पास आठ से नौ बीघा जमीन थी। उनके दादा, गुरु सहाय राय एक पटवारी (गाँव के भूमि रिकॉर्ड-रक्षक) थे, और उनके पिता अजायब राय एक पोस्ट ऑफिस क्लर्क थे। उनकी माँ करौनी गाँव की आनंदी देवी थीं, जो संभवतः उनके बडे जी की बेटी में चरित्र आनंदी के लिए भी उनकी प्रेरणा थीं। धनपत राय, अजायब

लाल और आनंदी की चौथी संतान थे; पहले दो लड़कियां थीं जो शिशुओं के रूप में मर गईं, और तीसरी एक लड़की थी जिसका नाम सुग्गी था। उनके चाचा, महाबीर, एक अमीर ज़मींदार, ने उन्हें "नवाब" ("राजकुमार") उपनाम दिया। "नवाब राय" धनपत राय द्वारा चुना गया पहला कलम नाम था।

जब वे 7 वर्ष के थे, धनपत राय ने लमही के पास स्थित लालपुर के एक मदरसे में अपनी शिक्षा शुरू की। उन्होंने मदरसे में एक मौलवी से उर्दू और फ़ारसी सीखी। जब वह 8 वर्ष के थे, तब उनकी माँ का लंबी बीमारी के बाद निधन हो गया। उनकी दादी, जिन्होंने उन्हें पालने का जिम्मा लिया था, की जल्द ही मृत्यु हो गई। प्रेमचंद अलग-थलग महसूस

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International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

करते थे, क्योंकि उनकी बड़ी बहन की शादी पहले ही हो चुकी थी, और उनके पिता हमेशा काम में व्यस्त रहते थे। उनके पिता, जो अब गोरखपुर में तैनात थे, ने पुनर्विवाह किया, लेकिन प्रेमचंद को अपनी सौतेली माँ से बहुत कम स्नेह मिला। सौतेली माँ बाद में प्रेमचंद की रचनाओं में एक आवर्ती विषय बन गई ।

एक बच्चे के रूप में, धनपत राय ने कल्पना में एकांत की मांग की, और पुस्तकों के लिए एक आकर्षण विकसित किया। उन्होंने एक टोबैकोनिस्ट की दुकान पर फ़ारसी-भाषा की काल्पनिक महाकाव्य तिलिस्म-ए-होशरूबा की कहानियाँ सुनीं। उन्होंने एक पुस्तक - व्यापारी के लिए किताबें बेचने का काम लिया, इस प्रकार उन्हें बहुत सी किताबें पढ़ने का अवसर मिला। उन्होंने एक मिशनरी स्कूल में अंग्रेजी सीखी, और जॉर्ज डब्ल्यू। एम। रेनॉल्ड्स के आठ-खंड द सीक्रेट्स ऑफ लंदन के रहस्य सहित कई रचनाओं का अध्ययन किया। उन्होंने गोरखपुर में अपनी पहली साहित्यिक रचना की, जो कभी प्रकाशित नहीं हुई और अब खो गई है। यह एक कुंवारे व्यक्ति पर प्रहार था, जिसे एक निम्न-जाति की महिला से प्यार हो जाता है। यह चरित्र प्रेमचंद के चाचा पर आधारित था, जो उन्हें कथा साहित्य पढ़ने के लिए प्रेरित करते थे; द फार्स को संभवतः इसके बदले में लिखा गया था। अपने पिता के 1890 के दशक के मध्य में जामिया में तैनात होने के बाद, धनपत राय ने एक दिन के विद्वान के रूप में बनारस के क्वीन्स कॉलेज में दाखिला लिया। 1895 में, उनकी शादी 15 साल की उम्र में हुई थी, जबकि अभी भी नौवीं कक्षा में पढ़ते हैं। लड़की एक अमीर जमींदार परिवार से थी और प्रेमचंद से बड़ी थी, जो उसे झगड़ालू और अच्छी नहीं लगती थी। उनके पिता का 1897 में लंबी बीमारी के बाद निधन हो गया। वह मैट्रिक परीक्षा को दूसरे डिवीजन (60% से कम अंक) के साथ पास करने में कामयाब रहा। हालांकि, केवल प्रथम श्रेणी वाले छात्रों को क्वीन्स कॉलेज में फीस रियायत दी गई थी। इसके बाद उन्होंने सेंट्रल हिंदू कॉलेज में प्रवेश मांगा, लेकिन अपने अंकगणितीय कौशल के कारण असफल रहे। इस प्रकार, उसे अपनी पढ़ाई बंद करनी पड़ी। फिर उन्होंने बनारस में एक वकील के बेटे को पाँच रुपये मासिक वेतन पर कोच बनाने का काम प्राप्त किया। वह अधिवक्ता के तबेले के ऊपर एक मिट्टी की कोठरी में रहते थे, और अपने वेतन का 60% घर वापस भेजते थे। प्रेमचंद ने इन दिनों के दौरान बहुत कुछ पढ़ा। कई ऋणों की रैकिंग के बाद, 1899 में, वे एक बार अपनी संग्रहित पुस्तकों को बेचने के लिए एक पुस्तक की दुकान पर गए। वहाँ, वे चुनार के एक मिशनरी स्कूल के प्रधानाध्यापक से मिले, जिन्होंने उन्हें रुपये 18 के मासिक वेतन पर एक शिक्षक के रूप में नौकरी देने की पेशकश की। उन्होंने रुपये 5 की मासिक फीस पर एक छात्र को ट्यूशन देने का काम भी संभाला।

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

1900 में, प्रेमचंद ने सरकारी जिला स्कूल रुपये 20 के मासिक वेतन पर एक सहायक शिक्षक के रूप में नौकरी हासिल की। तीन महीने बाद, उन्हें प्रतापगढ़ के जिला स्कूल में स्थानांतरित कर दिया गया, जहाँ वे एक प्रशासक के पद पर बने रहे । धनपत राय ने पहली बार छद्म नाम "नवाब राय" के तहत लिखा था। उनका पहला लघु उपन्यास 'देवस्थान रहस्या' ("भगवान के निवास का रहस्य") है, जो मंदिर के पुजारियों और गरीब महिलाओं के यौन शोषण के बीच भ्रष्टाचार की पड़ताल करता है। यह उपन्यास 8 अक्टूबर 1903 से फरवरी 1905 तक बनारस स्थित उर्दू साप्ताहिक अवाज-ए-खल्क में एक श्रृंखला में प्रकाशित हुआ था। साहित्यिक आलोचक सिगफ्रीड शुल्ज कहते हैं कि "उनकी अनुभवहीनता उनके पहले उपन्यास में काफी स्पष्ट है", जो अच्छी तरह से संगठित नहीं है, एक अच्छे प्लॉट का अभाव है और इसमें रूढ़ चरित्रों की विशेषता है। प्रकाश चंद्र गुप्ता इसे "अपरिपक्व कार्य" कहते हैं, जो "जीवन को केवल सफेद या काले रंग में देखने की प्रवृत्ति" दिखाता है । प्रतापगढ़ से, धनपत राय को प्रशिक्षण के लिए इलाहाबाद में स्थानांतरित कर दिया गया था, और बाद में 1905 में कानपुर में तैनात किया गया। वह मई 1905 से जून 1909 तक लगभग चार साल तक कानपुर में रहे। वहाँ उनकी मुलाकात उर्दू पत्रिका के संपादक मुंशी दया नारायण निगम से हुई। ज़माना, जिसमें उन्होंने बाद में कई लेख और कहानियाँ प्रकाशित कीं।

प्रेमचंद ने गर्मी की छुट्टी के दौरान अपने गाँव लमही का दौरा किया, लेकिन कई कारणों से रुकने का आनंद नहीं पाया। उन्हें लिखने के लिए अनुकूल माहौल का मौसम नहीं मिला। साथ ही, उसे अपनी पत्नी और उसकी सौतेली माँ के बीच झगड़े के कारण घरेलू परेशानी का सामना करना पड़ा। प्रेमचंद ने गुस्से में अपनी पत्नी को डांटा, उसके बाद उसने फांसी लगाकर आत्महत्या करने की असफल कोशिश की। निराश होकर, वह अपने पिता के घर गई, और प्रेमचंद ने उसे वापस लाने में कोई दिलचस्पी नहीं दिखाई। 1906 में**,** प्रेमचंद ने एक बाल विधवा, शिवरानी देवी से शादी की**,** जो फतेहपुर के पास एक गाँव के जमींदार की बेटी थीं। उस समय इस कदम को क्रांतिकारी माना गया था, और प्रेमचंद को बहुत सारे सामाजिक विरोध का सामना करना पड़ा था। उनकी मृत्यु के बाद, शिवरानी देवी ने उन पर एक किताब लिखी, जिसका शीर्षक 'प्रेमचंद घर में' ("प्रेमचंद इन हाउस") था।

1905 में, राष्ट्रवादी सक्रियता से प्रेरित होकर, प्रेमचंद ने ज़माना में भारतीय राष्ट्रीय कांग्रेस के नेता गोपाल कृष्ण गोखले पर एक लेख प्रकाशित किया। उन्होंने राजनीतिक स्वतंत्रता प्राप्त करने के लिए गोखले के तरीकों की आलोचना की, और इसके बजाय बाल गंगाधर तिलक द्वारा अपनाए गए अधिक चरमपंथी उपायों को अपनाने की सिफारिश की।

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

प्रेमचंद की पहली प्रकाशित कहानी **'दुनी का अनमोल रतन'** ("दुनिया में सबसे कीमती गहना") थी, जो 1907 में ज़माना में दिखाई दी थी। इस कहानी के अनुसार, आजादी पाने के लिए सबसे कीमती 'गहना' खून की आखिरी बूंद थी। प्रेमचंद की आरंभिक छोटी कहानियों में से कई में देशभक्ति से भरपूर, भारतीय स्वतंत्रता आंदोलन से प्रभावित थी।

1907 में प्रकाशित प्रेमचंद का दूसरा लघु उपन्यास प्रेमा, "बाबू नवाब राय बनारसी" नाम से प्रकाशित हुआ था। यह समकालीन रूढ़िवादी समाज में विधवा पुनर्विवाह के मुद्दे की पड़ताल करता है। नायक अमृत राय युवा विधवा पूर्णा से शादी करने के लिए सामाजिक विरोध को खत्म कर देते हैं, जिससे उनकी समृद्ध और सुंदर मंगेतर प्रेमा का त्याग हो जाता है। प्रकाश चंद्र गुप्ता के अनुसार, "कई मायनों में अपने भविष्य की महानता के बीज होते हुए भी, उपन्यास अभी भी युवा है और उस अनुशासन का अभाव है जो पूर्ण परिपक्वता लाता है"।

1907 में, प्रेमचंद के एक और लघु उपन्यास, 'किशना' को बनारस के मेडिकल हॉल प्रेस द्वारा प्रकाशित किया गया था। 142 पन्नों का यह काम, जो महिलाओं के आभूषणों के शौक पर व्यंग्य करता है, अब खो गया है। साहित्यिक आलोचक नोबत राय ने ज़माना में इस काम की आलोचना की, इसे महिलाओं की परिस्थितियों का मज़ाक बताया।

अप्रैल-अगस्त 1907 के दौरान प्रेमचंद की कहानी 'रूठी रानी' ज़माना में धारावाहिक रूप में प्रकाशित हुई थी। इसके अलावा 1907 में, ज़माना के प्रकाशकों ने प्रेमचंद का पहला लघु कहानी संग्रह प्रकाशित किया, जिसका शीर्षक 'सोज़-ए-वतन' था। संग्रह, जिसे बाद में प्रतिबंधित कर दिया गया था, इस में चार कहानियां शामिल थीं, जिन्होंने भारतीयों को राजनीतिक स्वतंत्रता के लिए उनके संघर्ष में प्रेरित करने की कोशिश की।

प्रेमचंद नाम

1909 में, प्रेमचंद को महोबा स्थानांतरित कर दिया गया, और बाद में हमीरपुर में स्कूलों के उप-उप निरीक्षक के रूप में नियुक्त किया गया। लगभग इसी समय, 'सोज़-ए-वतन' पर ब्रिटिश सरकार के अधिकारियों की नज़र पड़ी, जिन्होंने इसे राजद्रोही कार्य के रूप में प्रतिबंधित कर दिया। हमीरपुर जिले के ब्रिटिश कलेक्टर ने प्रेमचंद के घर पर छापा मारने का आदेश दिया, जहाँ सोज़-ए-वतन की लगभग पाँच सौ प्रतियां जला दी गईं। इसके बाद, उर्दू पत्रिका ज़माना के संपादक, मुंशी दया नारायण निगम, जिन्होंने धनपत राय की पहली कहानी "दुनी का अनमोल रतन" प्रकाशित की थी, ने छद्म नाम "प्रेमचंद" की सलाह दी थी। धनपत राय ने "नवाब राय" नाम का इस्तेमाल बंद कर दिया और प्रेमचंद बन गए।

1914 में, मुंशी प्रेमचंद ने हिंदी में लिखना शुरू किया (हिंदी और उर्दू को एक ही भाषा हिंदुस्तानी का अलग-अलग रजिस्टर माना जाता है, जिसमें हिंदी संस्कृत और उर्दू से

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

इसकी शब्दावली को फारसी से अधिक प्रभावित करती है)। इस समय तक, वह पहले से ही उर्दू में एक फिक्शन लेखक के रूप में प्रतिष्ठित थे। उनकी पहली हिंदी कहानी सौत दिसंबर 1915 में सरस्वती पत्रिका में प्रकाशित हुई थी और उनका पहला लघु कहानी संग्रह सप्त सरोज जून 1917 में प्रकाशित हुआ था।

गोरखपुर

उन्होंने 1916 से 1921 तक गोरखपुर में निवास किया था। अगस्त 1916 में, एक प्रचार पर प्रेमचंद को गोरखपुर स्थानांतरित कर दिया गया। वे गोरखपुर के नॉर्मल हाई स्कूल में सहायक मास्टर बने। गोरखपुर में, उन्होंने बुकसेलर बुद्धी लाल के साथ एक दोस्ती विकसित की, जिसने उन्हें स्कूल में परीक्षा रटना किताबें बेचने के बदले में उपन्यास पढ़ने के लिए उधार लेने की अनुमति दी। प्रेमचंद अन्य भाषाओं में क्लासिक्स के उत्साही पाठक थे, और इनमें से कई कार्यों का हिंदी में अनुवाद किया।

1919 तक, प्रेमचंद ने लगभग चार सौ पृष्ठों के चार उपन्यास प्रकाशित किए थे। 1919 में, प्रेमचंद का पहला प्रमुख उपन्यास सेवा सदन हिंदी में प्रकाशित हुआ था। यह उपन्यास मूल रूप से बाज़ार-ए-हुस्न शीर्षक से उर्दू में लिखा गया था, लेकिन कलकत्ता के एक प्रकाशक द्वारा पहली बार हिंदी में प्रकाशित किया गया था, जिसने अपने काम के लिए प्रेमचंद को रुपये 450 की पेशकश की थी। लाहौर के उर्दू प्रकाशक ने प्रेमचंद को रुपये 250 का भुगतान करते हुए, बाद में 1924 में उपन्यास प्रकाशित किया। उपन्यास एक दुखी गृहिणी की कहानी कहता है, जो पहले एक शिष्टाचार बन जाती है, और फिर शिष्टाचार की युवा बेटियों के लिए एक अनाथालय का प्रबंधन करती है। इसे आलोचकों ने खूब सराहा और प्रेमचंद को व्यापक पहचान दिलाने में मदद की।

1919 में, प्रेमचंद ने इलाहाबाद से बीए की डिग्री प्राप्त की। 1921 तक, उन्हें स्कूलों के उप निरीक्षकों में पदोन्नत किया गया। 8 फरवरी 1921 को, उन्होंने गोरखपुर में एक बैठक में भाग लिया, जहां महात्मा गांधी ने असहयोग आंदोलन के तहत लोगों को सरकारी नौकरियों से इस्तीफा देने के लिए कहा। हालांकि, प्रेमचंद शारीरिक रूप से अस्वस्थ थे और दो बच्चों और एक गर्भवती पत्नी का समर्थन करने के लिए, इसके बारे में 5 दिनों तक सोचा और अपनी पत्नी की सहमति से अपनी सरकारी नौकरी से इस्तीफा दे दिया ।

वापस बनारस

अपनी नौकरी छोड़ने के बाद, प्रेमचंद ने 18 मार्च 1921 को गोरखपुर को बनारस छोड़ दिया, और अपने साहित्यिक जीवन पर ध्यान केंद्रित करने का निर्णय लिया। 1936 में उनकी मृत्यु तक, उन्हें गंभीर वित्तीय कठिनाइयों और पुरानी बीमारी का सामना करना पड़ा।

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

1923 में, उन्होंने "सरस्वती प्रेस" नाम से बनारस में एक प्रिंटिंग प्रेस और प्रकाशन गृह की स्थापना की। वर्ष 1924 में प्रेमचंद की रंगभूमि का प्रकाशन हुआ, जिसमें एक अंधे भिखारी ने सूरदास को अपना दुखद नायक बताया। शुल्ज़ ने उल्लेख किया है कि रंगभूमि में, प्रेमचंद एक "शानदार सामाजिक क्रॉलर" के रूप में सामने आते हैं, और हालांकि उपन्यास में कुछ "संरचनात्मक दोष" और "बहुत अधिक संपादकीय स्पष्टीकरण" शामिल हैं, यह प्रेमचंद की लेखन शैली में एक "चिह्नित प्रगति" दर्शाता है। शुल्ज के अनुसार, यह निर्मला (1925) और प्रतिज्ञा (1927) में था कि प्रेमचंद ने "संतुलित, यथार्थवादी स्तर" के लिए अपना रास्ता ढूंढ लिया, जो उनके पहले के कामों को पार करता है और अपने पाठकों का ध्यान केंद्रित रखने का प्रबंधन करता है। भारत में दहेज प्रथा से निपटने वाला एक उपन्यास निर्मला को पहली बार उपन्यास के रूप में प्रकाशित होने से पहले नवंबर 1925 और नवंबर 1926 के बीच चंद नामक पत्रिका में प्रसारित किया गया था। प्रतिज्ञा ("स्वर") विधवा पुनर्विवाह के विषय से निपटा है । 1928 में, प्रेमचंद के उपन्यास गबन ("गबन"), मध्यम वर्ग के लालच पर ध्यान केंद्रित करते हुए प्रकाशित किया गया था। मार्च 1930 में, प्रेमचंद ने हंस नाम से एक साहित्यिक-राजनीतिक साप्ताहिक पत्रिका लॉन्च की, जिसका उद्देश्य भारतीयों को ब्रिटिश शासन को प्रेरित करने के लिए प्रेरित करना था। पत्रिका, जो राजनीतिक रूप से उत्तेजक विचारों के लिए प्रसिद्ध है, लाभ कमाने में विफल रही। प्रेमचंद ने तब जागरण नामक एक अन्य पत्रिका को संभाला और संपादित किया, जो बहुत नुकसान में रही। 1931 में, प्रेमचंद मारवाड़ी कॉलेज में शिक्षक के रूप में कानपुर चले गए, लेकिन कॉलेज प्रशासन के साथ मतभेद के कारण उन्हें छोड़ना पड़ा। फिर वे बनारस लौट आए, और मर्यादा पत्रिका के संपादक बन गए। 1932 में, उन्होंने कर्मभूमि नामक एक और उपन्यास प्रकाशित किया। उन्होंने स्थानीय स्कूल के काशी विद्यापीठ के प्रधानाध्यापक के रूप में संक्षिप्त रूप से कार्य किया। स्कूल के बंद होने के बाद, वह लखनऊ में माधुरी पत्रिका के संपादक बने।

बंबई

हिंदी फिल्म उद्योग में अपनी किस्मत आजमाने के लिए प्रेमचंद 31 मई 1934 को बंबई पहुंचे। उन्होंने प्रोडक्शन हाउस अजंता सिनेटोन के लिए एक पटकथा लेखन की नौकरी स्वीकार की थी, रुपये 8000 का वार्षिक वेतन उनकी वित्तीय परेशानियों को दूर करने में मदद की । वह दादर में रहे, और फिल्म मजदूर ("द लेबर") की पटकथा लिखी। मोहन भवानी द्वारा निर्देशित फिल्म में मजदूर वर्ग की खराब स्थितियों को दर्शाया गया है। फिल्म में मजदूरों के नेता के रूप में प्रेमचंद ने खुद एक कैमियो किया था। कुछ प्रभावशाली व्यवसायी बॉम्बे में इसकी रिलीज पर रोक लगाने में कामयाब रहे। फ़िल्म को

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

लाहौर और दिल्ली में रिलीज़ किया गया था, लेकिन इसके बाद मिल मालिकों द्वारा मालिकों के खिलाफ खड़े होने के लिए प्रेरित करने के बाद इसे फिर से बॉम्बे में प्रतिबंधित कर दिया गया था।

1934-35 तक, प्रेमचंद का सरस्वती प्रेस पर, रुपये 4000 का भारी कर्ज था, और प्रेमचंद को जागरण का प्रकाशन बंद करने के लिए मजबूर होना पड़ा। इस बीच, प्रेमचंद बॉम्बे फिल्म उद्योग के गैर-साहित्यिक व्यावसायिक माहौल को नापसंद करने लगे थे, और वह बनारस लौटना चाहते थे। हालांकि, उन्होंने प्रोडक्शन हाउस के साथ एक साल का अनुबंध किया था। अंततः एक वर्ष पूरा होने से पहले 4 अप्रैल 1935 को उन्होंने बॉम्बे छोड़ दिया। बॉम्बे टॉकीज के संस्थापक हिमांशु रॉय ने प्रेमचंद को वापस रहने के लिए मनाने की कोशिश की, लेकिन सफल नहीं हुए।

पिछले दिनों

बंबई छोड़ने के बाद, प्रेमचंद इलाहाबाद में बसना चाहते थे, जहाँ उनके बेटे श्रीपत राय और अमृत कुमार राय पढ़ रहे थे। उन्होंने वहाँ से हंस प्रकाशित करने की योजना भी बनाई। हालाँकि, अपनी वित्तीय स्थिति और अस्वस्थता के कारण, उन्हें बनारस स्थानांतरित करना पड़ा। 1936 में, प्रेमचंद को लखनऊ में प्रगतिशील लेखक संघ के पहले अध्यक्ष के रूप में चुना गया। 8 अक्टूबर 1936 को, कई दिनों की बीमारी के बाद और पद पर रहते हुए भी उनका निधन हो गया।

गोदान अपान्यस (द गिफ्ट ऑफ़ ए काउ, 1936), प्रेमचंद के अंतिम पूर्ण किए गए काम को आमतौर पर उनके सर्वश्रेष्ठ उपन्यास के रूप में स्वीकार किया जाता है, और उन्हें सर्वश्रेष्ठ हिंदी उपन्यासों में से एक माना जाता है। इसमें नायक, होरी, एक गरीब किसान, ग्रामीण भारत में धन और प्रतिष्ठा का प्रतीक एक गाय के लिए तरसता है। शुल्ज के अनुसार, "गोदान एक अच्छी तरह से संरचित और अच्छी तरह से संतुलित उपन्यास है, जो पश्चिमी साहित्यिक मानकों द्वारा लिखा गई साहित्यिक आवश्यकताओं को जल्दी से पूरा करता है।" रबींद्रनाथ टैगोर जैसे अन्य समकालीन प्रसिद्ध लेखकों के विपरीत, प्रेमचंद को भारत के बाहर बहुत सराहना नहीं मिली। । सीगफ्रीड शुल्ज का मानना है कि इसका कारण उनके काम के अच्छे अनुवादों का अभाव था। इसके अलावा, टैगोर और इकबाल के विपरीत, प्रेमचंद ने कभी भारत से बाहर यात्रा नहीं की, विदेश में अध्ययन किया या प्रसिद्ध साहित्यकारों के साथ घुलमिल गए। 1936 में, प्रेमचंद ने कफ़न ("कफन") भी प्रकाशित किया, जिसमें एक गरीब आदमी अपनी मृत पत्नी के अंतिम संस्कार के लिए पैसा इकट्ठा करता है, लेकिन इसे खाने-पीने पर खर्च करता है। प्रेमचंद की अंतिम प्रकाशित कहानी क्रिकेट मैचिंग थी, जो उनकी मृत्यु के

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

बाद 1938 में ज़माना में आई थी। प्रेमचंद को पहला हिंदी लेखक माना जाता है जिनके लेखन में यथार्थवाद प्रमुखता से **था**। उनके उपन्यासों में गरीबों और शहरी मध्यवर्ग की समस्याओं का वर्णन है। उनके काम एक तर्कसंगत दृष्टिकोण को दर्शाते हैं, जो धार्मिक मूल्यों को कुछ ऐसा मानते हैं जिससे शक्तिशाली पाखंडी कमजोर लोगों का शोषण कर सकते हैं। उन्होंने राष्ट्रीय और सामाजिक मुद्दों के बारे में सार्वजनिक जागरूकता पैदा करने के उद्देश्य से साहित्य का इस्तेमाल किया और अक्सर भ्रष्टाचार, बाल विधवा, वेश्यावृत्ति, सामंती व्यवस्था, गरीबी, उपनिवेशवाद और भारत के स्वतंत्रता आंदोलन पर आधारित विषयों के बारे में लिखा।

उन्होंने मिंटो-मॉर्ली सुधार और मोंटागु-चेम्सफोर्ड सुधारों को अपर्याप्त माना, और अधिक से अधिक राजनीतिक स्वतंत्रता का समर्थन किया। उनके कई शुरुआती कार्यों, जैसे कि ए लिटिल ट्रिक और ए मोरल विक्टरी, ने उन भारतीयों पर व्यंग्य किया जिन्होंने ब्रिटिश सरकार का साथ दिया। उन्होंने अपनी कुछ कहानियों में विशेष रूप से सरकारी सेंसरशिप के कारण ब्रिटिशों का उल्लेख नहीं किया, लेकिन मध्ययुगीन युग और विदेशी इतिहास की सेटिंग्स में उनके विरोध को खारिज कर दिया। वह स्वामी विवेकानंद की शिक्षाओं से भी प्रभावित थे।

1920 के दशक में, वे महात्मा गांधी के असहयोग आंदोलन और सामाजिक सुधार के लिए संघर्ष के साथ प्रभावित थे। इस अवधि के दौरान, उनके कार्यों ने गरीबी, ज़मींदारी शोषण (प्रेमश्रम, 1922), दहेज प्रथा (निर्मला, 1925), शैक्षिक सुधार और राजनीतिक उत्पीड़न (कर्मभूमि, 1931) जैसे सामाजिक मुद्दों से निपटा। प्रेमचंद किसान और श्रमिक वर्ग के आर्थिक उदारीकरण पर केंद्रित थे और तेजी से औद्योगिकीकरण का विरोध कर रहे थे, जिससे उन्हें लगा कि किसानों के हितों पर चोट और श्रमिकों का उत्पीड़न के। रंगभूमि (1924) जैसे कामों में देखा जा सकता है।

भारतीय साहित्य पर प्रेमचंद का प्रभाव नहीं पड़ सकता। जैसा कि दिवंगत विद्वान डेविड रुबिन ने द वर्ल्ड ऑफ़ प्रेमचंद (ऑक्सफ़ोर्ड, 2001) में लिखा है, "प्रेमचंद का संबंध गंभीर लघुकथा की शैली और गंभीर उपन्यास के साथ-साथ हिंदी और उर्दू दोनों में है। सौंप दिया गया था कि उसने इन भाषाओं में समय-समय पर यूरोपीय कथाओं की तुलना में उच्च स्तर की यथार्थवादी कथाओं के एक काल्पनिक स्तर से काल्पनिक कथाएँ उठाईं; और दोनों भाषाओं में, वह, एक अप्रतिष्ठित गुरु बने रहे।

अपने अंतिम दिनों में, उन्होंने जटिल नाटक के लिए एक मंच के रूप में ग्राम जीवन पर ध्यान केंद्रित किया, जैसा कि उपन्यास गोद।न (1936) और लघु कहानी संग्रह कफन (1936) में देखा गया था। [30] प्रेमचंद का मानना था कि सामाजिक यथार्थवाद हिंदी

International Journal of Management, IT & Engineering
Vol. 8 Issue 11(1), November 2018,
ISSN: 2249-0558 Impact Factor: 7.119
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साहित्य के लिए रास्ता था, जैसा कि "स्त्री गुणवत्ता", समकालीन बंगाली साहित्य की कोमलता और भावना के विपरीत था। [४६]

विरासत

31 जुलाई 2016 को, गूगल ने प्रेमचंद के 136 वें जन्मदिन के सम्मान में एक गूगल डूडल दिखाया।

कार्यों की सूची

रूठी रानी और प्रेमा
मानसरोवर
मनोवृत्ति और लांछन
घर जमाई
मंगल सूत्र
दूध का दाम और दो बैलों की कथा
चमत्कार और बेटी का धन
बेटों वाली विधवा और मा
बड़े घर की बेटी
कंकाल
रहस्य
कायाकल्प
गुप्त धन
मुक्ति मार्ग
मंदिर और मस्जिद
क्षमा
कवच
कर्बला
वरदान मंत्र
बड़े भाई साहब
सती
आत्माराम

अनुवाद

प्रेमचंद ने कई अहिंदी कृतियों का हिंदी में अनुवाद किया। इनमें रतन नाथ, धर ससर, लियो टॉल्स्टॉय, चार्ल्स डिकेंस (द रिचर्ड डबल्डिक की कहानी), ऑस्कर वाइल्ड (कैंटरविले),

जॉन गैल्स्वर्थी (स्ट्रिफ़), सादी, गाइ डी मौपासेंट, मौरिस मैटरलिनक (साइटलेस) और हेंड्रिक वैन लून के लेखन शामिल थे। (मैनकाइंड की कहानी)

फिल्म पटकथा: मजदूर मजदूर (1934)

नाटकों: कर्बला, प्रेम की वेदी, रूहानी शदी, संग्राम

निबंध: कुच्छ विचार (दो भाग), क़लाम त्याग अर तलवार

आत्मकथाएँ: दुर्गादास, महात्मा शेखसादी (सादी की जीवनी)

बच्चो की किताब: जंगल की कहनियाँ, कुट्टे की कहानी, राम चरचा

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