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## CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	IMPACT OF EMPLOYEE DEMOGRAPHICS ON TRAINING; FOR IMPROVED SERVICE DELIVERY: A STUDY ON BANKING SECTOR <i>NITISH KULSHRESTHA, DR. L K SINGH, DR. SAROJ KUMAR DASH &amp; DR. SAVITA MOHAN</i>	1
2.	AN INDUCTIVE APPROACH TO IDENTIFYING THE JOB SATISFACTION FACETS AND JOB SATISFACTION LEVEL IN AN EXTREME ENVIRONMENT IN BANKING SECTOR EMPLOYEES IN NORTHERN REGION IN SRI LANKA <i>A. SARAVANABAWAN &amp; LIRONG LONG</i>	6
3.	AREA EFFICIENT APPROACH FOR 64-BIT MULTIPLICATION USING CONFIGURABLE DEVICES <i>DINESH KUMAR &amp; G.C. LALL</i>	11
4.	THE EVOLUTION OF TECHNOLOGY ACCEPTANCE MODEL: A LITERATURE REVIEW <i>INDER SINGH &amp; DEVENDRA KUMAR PUNIA</i>	15
5.	CONSUMER BEHAVIOUR ON FAST MOVING CONSUMER GOODS – A STUDY WITH REFERENCE TO PERSONAL CARE PRODUCTS IN MADURAI DISTRICT <i>K.MUNESWARAN &amp; DR. C. VETHIRAJAN</i>	22
6.	STUDY OF CHANNEL SATISFACTION OF VIDEOCON TELECOM SERVICES AND ITS COMPETITORS IN PUNJAB <i>RAZIA SEHDEV, DR. YUVRAJ BHATNAGAR &amp; PRANAV RANJAN</i>	28
7.	INTEREST FREE BANKING: A POTENTIAL SUBSTITUTE TO CONVENTIONAL BANKING IN THE CONTEMPORARY GLOBAL FINANCIAL SCENARIO <i>DR. FAROOQ A SHAH</i>	35
8.	A STUDY ON DIMENSION OF SMARTPHONE AND ITS INFLUENCE ON CONSUMER PREFERENCE <i>DR. S. A. SENTHIL KUMAR &amp; M. JAMAL MOHAMED ZUBAIR</i>	39
9.	CENTRALISED SYSTEM FOR e-PROCUREMENT- A NEW RISE IN PUBLIC SECTOR: A CASE STUDY <i>SHYNA K S &amp; SAYED MOHAMMED V V</i>	41
10.	EFFECT OF ELECTRONIC MOBILE MONEY TRANSFER ON FINANCIAL LIQUIDITY AND GROWTH OF MICRO AND SMALL ENTERPRISES: A CASE OF NAIROBI CITY, KENYA <i>DUNCAN MOMANYI NYANG'ARA, WILLIAM MACHANI NYANG'ARA &amp; KENNEDY O. MOENGA</i>	46
11.	CORPORATE SOCIAL RESPONSIBILITY IN BUSINESS: A CASE STUDY ON GRAMEEN PHONE LIMITED BANGLADESH <i>ARJUN KUMAR DAS, SUJAN KANTI BISWAS &amp; DR. KUNAL SIL</i>	52
12.	EFFECTIVENESS OF TRAINING EVALUATION PRACTICES – AN EMPIRICAL STUDY <i>DR. SHOBHARANI H. &amp; DR. MAMATHA S. M.</i>	58
13.	IMPACT OF LEARNING STYLES ON e-LEARNING ENVIRONMENT: AN EMPIRICAL STUDY <i>SHAKEEL IQBAL</i>	64
14.	THE EFFECT OF BOARD STRUCTURE ON FINANCIAL PERFORMANCE OF SRI LANKAN LISTED BANKS <i>RAVIVATHANI THURAISINGAM</i>	69
15.	DISAGGREGATED VOLATILITY - A CASE STUDY IN INDIAN STOCK MARKET <i>DR. NALINA K. B.</i>	74
16.	CUSTOMER SATISFACTION OF E-BANKING IN BANGLADESH WITH FOCUS ON DUTCH BANGLA BANK LTD.: THE CONTEXT OF TWENTY FIRST CENTURY <i>MOSAMMOD MAHAMUDA PARVIN &amp; MD. MASUDUL HASSAN</i>	83
17.	ENHANCING THE PERFORMANCE OF LEACH PROTOCOL IN WIRELESS SENSOR NETWORKS <i>NUTAN SINDHWANI &amp; ROHIT VAID</i>	91
18.	MULTI CRITERIA DECISION MAKING USING FUZZY TOPSIS <i>PRATHIBA PH &amp; KARTHIKEYAN R</i>	95
19.	MEASURING THE EFFECT OF CAPABILITY VERSUS USABILITY IN PURCHASE DECISION OF SMART PHONES <i>JITESH BISHT &amp; LAKSHMI SHANKAR IYER</i>	100
20.	AN IMPACT OF GREEN COMPUTING IN HAZARDOUS DEVICE MANUFACTURING & MAXIMIZE ENERGY EFFICIENCY <i>CHITHRA MOL C. R, R. VIJAYASARATHI &amp; THAMIL KUMARAN V. C</i>	107
21.	EFFECTIVE DYNAMIC ROUTING PROTOCOL: ANALYSIS OF VARIOUS SECURE DATA ROUTING PROTOCOL AND DATA AGGREGATION IN WIRELESS SENSOR NETWORKS <i>S.MOHAMED SALEEM &amp; P.SASI KUMAR</i>	115
22.	HEAT TRANSFER ENHANCEMENT IN AIR CONDITIONING SYSTEM USING NANOFLUIDS <i>R. REJI KUMAR, M. NARASIMHA &amp; K. SRIDHAR</i>	120
23.	e-COMMERCE: AN ANALYSIS OF CONCEPTUAL FRAMEWORK <i>ABU ZAFAR AHMED MUKUL &amp; SABRINA HOQUE CHOWDHUARY</i>	126
24.	e-COUNSELING FOR INSTITUTIONS OF HIGHER LEARNING IN GHANA: WHAT ARE THE REQUIREMENTS? <i>KEVOR MARK-OLIVER</i>	131
25.	TAX INCENTIVES AND INVESTMENT BEHAVIOUR: AN EMPIRICAL REVIEW OF THE TAX PAYERS PERCEPTIONS <i>OBARETIN OSASU &amp; DR. CHINWUBA OKAFOR</i>	135
26.	METHODS OF DATA SECURITY USED IN COMPUTER NETWORK <i>ZOBAIR ULLAH</i>	138
27.	CONSUMERS CHOICE OF RETAIL STORES WITH REFERENCE TO THEIR DEMOGRAPHIC INFLUENCERS <i>APEKSHA JAIN &amp; MANOJ KUMAR SHARMA</i>	141
28.	GRID COMPUTING: INTRODUCTION AND APPLICATION <i>ANUDEEP RANDHAWA, HEENA GULATI &amp; HARISH KUNDR</i>	143
29.	CONSUMER BEHAVIOR TOWARDS e-BANKING IN HDFC BANK <i>CHANABASAPPA TALAWAR</i>	147
30.	ROLE OF SMALL INDUSTRIES DEVELOPMENT BANK OF INDIA (SIDBI) IN THE PROMOTION OF ENTREPRENEURSHIP IN U.P. <i>DR. MOHD. SHOEB</i>	152
	<b>REQUEST FOR FEEDBACK</b>	158

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## IMPACT OF EMPLOYEE DEMOGRAPHICS ON TRAINING; FOR IMPROVED SERVICE DELIVERY: A STUDY ON BANKING SECTOR

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### ABSTRACT

*With the dawn of liberalization privatization and globalization in 1991, Indian financial markets were opened for newly formed private and foreign banks. These new generation banks brought the concept of lean organisations with higher implementation of information technology and introduced the word "Quality of Service". This gave a tough competition to the public sector banks the only Mantra for survival was "Customer Services". It became imperative for the banks to focus on "quality of the service delivery" by the employees. As all banking functions are interdependent employees deputed on various banking functions need to work in coordination with others, they need to carry right attitude and behaviour with both internal and external customers. Employee's training is a tool to develop the competency factors of employees to match the service benchmarks to enhance the customer satisfaction/delight as an output. The demographic profile of the employee plays an important role in the quality of services they are expected to deliver. Their age, gender, experience, and work motivation has direct bearing on what they can and what they will deliver to the customers. This research paper is based on measuring the impact of training on several demographic variables of the employees. The variables are classified into two important strata viz. "impact of training" is taken as -"Dependent variable" and Demographic variables of employee respondents as "Independent variables". A survey instrument was developed and administered to 398 employee respondents employed with both public and private sector banks in Agra region. Data collected was analysed by using one way ANOVA and Levene's test and Chi square test for establishing the relation between the employee demographics and training out comes. Results revealed that the association between bank of the respondent (public/private) and the overall impact of training is statistically significant. Whereas the association between gender, age, location of Bank's Branch, total experience of the respondents and overall impact of training is statistically not significant.*

### KEYWORDS

Customer Service, Impact of Training, Service Delivery, Service Quality, Training in Banking Sector.

### INTRODUCTION

Banking in its simplest form can be traced in Indian scriptures, where references about banking habits and regulation exist. In India our historical, cultural, social and economic factors have resulted in the development of various financial institutions, Indian money market being characterized by the existence of both the unorganized and the organized sectors. Indian banking scenario changed in the post independence era when the privately owned banks were merged to form State Bank of India in 1955. With the dawn of liberalization privatization and globalization under new EXIM policy in 1991, the Indian financial markets were opened for newly formed private banks and foreign banks. These new generation banks brought the concept of lean organisations with higher implementation of information technology and introduced the word "Quality of Service". This gave a tough competition to the public sector banks the only Mantra for survival was "Customer Services". Banking was no more an obligation on part of the banks but it was customer obliging banks by giving them business. It became imperative for the banks to focus on "quality of the service delivery" by the employees. In order to understand the service delivery quality of the employee, a scale of measurement should be in place, but Service being intangible it is difficult to measure it in absolute terms. Therefore training interventions are required to make employees quality conscious and self motivated to understand the customer needs better and serve them with a smile. The demographic profile of the employee plays an important role in the quality of services they are expected to deliver. Their age, gender, experience, and work motivation has direct bearing on what they can and what they will deliver to the customers. Training to the employees of the banks plays a major role in improving the skills knowledge, attitude and behaviour of the employees ultimately leading to improved delivery of services with customer satisfaction/delight as an output. However quantifying the impact of training on employee's service delivery was complicated and too subjective, various factors including their demographics has role to play in their learning outcomes and transfer of training to the job situation.

### LITERATURE REVIEW

With the increase in "Service Conscious" customers the body of knowledge about the expected service quality has also widened its scope. The importance of service delivery in banking sector being researched by the market researchers highlighted the importance of understanding the nature of customer

demographics and its impact on the service delivery in Indian banks (Sureshchander et al,(2003); Gudep& Elango,(2006); Rajanish& Snageetha,(2005); Navdeep & Mohit,(2005)). Research studies also revealed that retaining current customers is a major challenge before the Indian banks. It was also observed that this is a far more difficult task than attracting new customers. Nadir Khan et al. (2012) studied the impact of On-Job Training on Performance of Telecommunication Industry. It discusses that the importance of training and its output, which is very necessary for individual performance and over all organizational performance. The research showed that employees know the importance training and relate it with their Productivity. They also agree with the positive impact of Training over Organizational Performance. A. Dunstan Rajkumar & S. Rita (2011) study was conducted to study the training and development among the employees working in one of the private banks. The study was necessitated as there was seldom study conducted to identify the indicators ensuring the field of training and development to meet out the challenges in the development of individual, group and organizational domains in the leading banks. The debate about the significance of the human capital to an organization is continuous improvement and prosperity. This has encouraged an increasing focus on the relationship between individual and an organizational development. The proposition that organizational development is shaped by the development of human resources has resulted in a renewed interest in developing the potentials of individuals as a means of fulfilling organizational goals. Sulu Babaita ISIAKA (2011) focused on the motives for training and management development using the Nigerian Banking Industry as a case study. The results of the analysis showed that banks see training and management development as important factors, as well having motives for investing in Training and management development. These motives include- new technology; productivity; responding to skills deficiencies; moral duty; new hire request; and staff request. Oluseyi A. Shadare (2010) investigated the influence of workers' training programmes on conflict reduction among industrial workers in Nigeria. This is for the purpose of ascertaining the relevance of workers' training programmes, as an alternative approach to human capital formation and conflict reduction among industrial workers in Nigeria. Haslinda, A and Mahyuddin, M. Y (2009) examine the effectiveness of training and development in the public sector using training evaluation framework and transfer of training elements. The findings of this study suggest that public service employees were evaluated at all five levels of evaluation, namely, the reaction, learning, behaviour change, results and transfer of training levels. Agarwal P and Nidhi (2007) studied the Effectiveness of Training Programme in Public Sector Bank –SBI, reflected that the employees who were given adequate computer training or education felt no fear of VRS. However, the employees who were not given any computer training or education felt the fear of VRS. Gulzar Jiwani (2006) Evaluated whether the training programme has facilitated the process of acquisition of knowledge, skills, attitude and whether this acquired knowledge and skills in turn has helped them in actual application of learning and has enhanced their performance. Solé, Eguiguren, Llinàs-Audet & Pons, (2006) in their study revealed that training is really important and "should be considered as a strategic factor of the organisation that drives the development of profiles, of aptitudes that facilitate adaptation to lasting changes in work, and that stimulate the process of learning to learn". Shishupal Singh Badhu and Karunesh Saxena (1999), Role of Training in Developing Human Resources is another work of relevance. In this, the authors concluded that an organization should have well-defined training policy as well as training manual and training should be made an ongoing process. Regarding the executive development programmes the authors have concluded that, these programmes have been found to be useful in improving the productivity, efficiency and effectiveness of managers. Despite being implementation of self service technologies ,like I-Banking, M-Banking, ATM's etc, the role of an employee cannot be undermined a pinch of warmth and care given by the service employee cannot be replaced by any technological implementation , the element of human touch makes the difference in quality of service . Therefore the training of the employees has an important role in improving the customer's banking experience.

## NEED OF THE STUDY

The present research study is valid against the backdrop of the competitive market conditions which has led banks to transform their human resources through training interventions to improve the service delivery challenges for retention and satisfaction of the customers. Banking industry may have been invaded by the self service technology of E-Banking, ATMs Plastic Money but the enchantment of human touch still plays an important role in success or failure of the financial institution. The success of the training programmes in bringing the desired change in skills, knowledge, and attitude of human resources is associated with the demographics of the trainees. It is against this background, this study envisages the statistical relation between the demographic profile of the employee and training outputs for designing effective training interventions for improved customer service delivery.

## OBJECTIVES OF THE STUDY

The following research objectives were formulated for this study:

- To study the role of Bank employees in effective Service Delivery in banking sector.
- To study the association of the demographic variables of the employee and training outcomes in banking sector.

## SCOPE OF THE STUDY

The scope of the study is limited to the survey of bank employees of four selected banks two from Public sector banks namely State Bank of India (SBI) & Punjab National Bank (PNB) and two from Private sector banks namely ICICI Bank & HDFC Bank operating in Agra Region (covering Eight Districts namely Agra, Mathura, Firozabad, Etah, Mainpuri Hathras, Aligarh, Khurja) of State Uttar Pradesh in particular.

## RESEARCH HYPOTHESES

The hypotheses developed for the research are:

- H<sub>01</sub>: There is no significant relationship between the type of bank (public/private) and the overall impact of training.  
 H<sub>02</sub>: There is no significant relationship between the gender of the respondent and the overall impact of training.  
 H<sub>03</sub>: There is no significant relationship between "age of the respondents" and the impact of training.  
 H<sub>04</sub>: There is no relationship between the Location of Bank's Branch (rural/semi-urban/urban) and the impact of training.  
 H<sub>05</sub>: There is no relationship between the total experience of the respondents and the impact of training.

## SAMPLE SIZE AND NATURE OF RESPONDENTS

The sampling units of analysis for this study were 425 Employees respondent of 04 banks (2 Public sector and 2 Private sector banks) namely State Bank of India and Punjab National Bank, in Public sector, ICICI Bank and HDFC Bank in Private sector Banks in Agra Region ,who had attended the Bank's training programmes in Between 2009 -2012 and must have completed minimum three years of working experience . A two stage cluster sampling technique was employed. In stage one, sample members were selected on the basis of pre-specified criteria. In stage two, random sampling was done so as to give every unit an equal opportunity of representation in the data. Data from a total number of 425 employees was collected through self administered questionnaire. After checking the consistency, researcher has selected only 398 respondent data for further study and analysis. A total of 17 questionnaires were filled incomplete and 10 questionnaires were wrongly entered. Finally, 398 respondent's data have been used in the research framing. So the sample size of the study is 398.

## RESEARCH METHODOLOGY

### SOURCES OF DATA COLLECTION

Research data was collected primarily from primary source. The primary data was collected through a self administered questionnaire administered to the sample employee respondents by meeting them in their respective bank branches with prior appointment. In addition to this, personal interviews were also conducted to understand the respondents' attitudes towards Training aspects in the selected banks. Bulletins from banking staff colleges' journals and magazines were referred to focus on the contemporary issues in the banking areas.



**METHOD OF RESEARCH**

A structured questionnaire was designed to measure the association of demographic variables with the impact of training for the improved service deliveries in the banks. The questionnaire was developed to measure the attitudes of the respondents' from four selected banks (two Public and two Private Banks) operating in Agra region. In order to test the hypothesis developed for the study, the researcher had applied both Chi-square test and Levene's F-test depending on the scale of the independent and dependent variables. Frequency distributions of the employee demographics in terms of type of bank, gender, age, total work experience and branch location were designed. The four banks that were considered for this research study are State Bank of India (SBI), Punjab National Bank (PNB) and ICICI Bank and HDFC Bank. Suggestions were offered to improve the quality of service delivery as a result of training implications in the four selected banks.

**FREQUENCY DISTRIBUTIONS**

To compare the demographic profile of the employees employed in public sector and private sector banks respondents were asked to indicate their age group, type of employment, total experience and their status in the employment. Table 1 shows the details about demographic characteristics of the respondents in terms of frequencies and percentages.

Gender		Male		Female		Total
Banks		Public	Private	Public	Private	
Age	20-34	12 (8.2%)	68 (66.7%)	17 (18.1%)	33 (60.0%)	130 (32.7%)
	35-44	52 (35.4%)	34 (33.3%)	36 (38.3%)	22 (40.0%)	144 (36.2%)
	45-54	70 (47.6%)	0 (0.0%)	40 (42.6%)	0 (0.0%)	110 (27.6%)
	Above 55	13 (8.8%)	0 (0.0%)	1 (1.1%)	0 (0.0%)	14 (3.5%)
<b>Total</b>		<b>147 (100.0%)</b>	<b>102 (100.0%)</b>	<b>94 (100.0%)</b>	<b>55 (100.0%)</b>	<b>398 (100.0%)</b>
Type of Employment	Permanent	137 (93.2%)	84 (82.4%)	87 (92.6%)	45 (81.8%)	353 (88.7%)
	Contractual	10 (6.8%)	18 (17.6%)	7 (7.4%)	10 (18.2%)	45 (11.3%)
	Outsource	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
<b>Total</b>		<b>147 (100.0%)</b>	<b>102 (100.0%)</b>	<b>94 (10.0%)</b>	<b>55 (100.0%)</b>	<b>398 (100.0%)</b>
Total Experience	3-15	43 (29.3%)	102 (100.0%)	36 (38.3%)	55 (100.0%)	236 (59.3%)
	16-28	68 (46.3%)	0 (0.0%)	44 (46.8%)	0 (0.0%)	112 (28.1%)
	Above 28	36 (24.5%)	0 (0.0%)	14 (14.9%)	0 (0.0%)	50 (12.6%)
<b>Total</b>		<b>147 (100.0%)</b>	<b>102 (100.0%)</b>	<b>94 (100.0%)</b>	<b>55 (100.0%)</b>	<b>398 (100.0%)</b>
Status	Top Management	15 (10.2%)	0 (0.0%)	7 (7.4%)	0 (0.0%)	22 (5.5%)
	Middle Management	108 (73.5%)	46 (45.1%)	45 (47.9%)	31 (56.4%)	230 (57.8%)
	Supervisor	3 (2.0%)	27 (26.5%)	33 (35.1%)	18 (32.7%)	81(20.4%)
	Staff/clerk	21 (14.3%)	29 (28.4%)	9 (9.6%)	6 (10.9%)	65 (16.3%)
<b>Total</b>		<b>147 (100.0%)</b>	<b>102 (100.0%)</b>	<b>94 (100.0%)</b>	<b>55 (100.0%)</b>	<b>398 (100.0%)</b>

Source : Computed from primary data

**ASSOCIATION OF DEMOGRAPHIC VARIABLE WITH THE IMPACT OF TRAINING**

To analyze the various demographic variables influencing the impact of training on service delivery of the selected sample respondents. The variables are classified into two important strata viz. Dependent variable and Independent variables. The "impact of training" is taken as the "dependent variable". The "independent variables" used in the study are "Type of bank", "Gender of the employee", "Age of employee", "Location of Branch", "Work Experience of employee respondent". The results are expected to give a preliminary indication of the variables affecting the impact of training on employee's service delivery.

**ASSOCIATION OF IMPACT OF TRAINING AND EMPLOYEE'S BANK (PUBLIC/PRIVATE)**

Here the dependent variable is "Impact of training on Service Delivery" which is an ordinal scale and the independent variable is "type of banks" having two options i.e. Public and Private. So, for testing the hypothesis, we have to use one way ANOVA by finding Levene's test for equality of variance. From Table 2, it is evident that Levene's F-test for equality of variance (F-value) is 9.823; hence the null hypothesis is rejected. It means there is a significant relationship between the type of bank (public/private) and their overall impact of training; so, it is clear that overall impact of training is dependent of the type of bank (public/private).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Training will improve Service Delivery in my Bank	Equal variances assumed	9.823	.001	-3.017	396	.003	-.58321	.19332	-.96327	-.20316
	Equal variances not assumed			-3.073	353.747	.002	-.58321	.18976	-.95641	-.21001

**ASSOCIATION OF IMPACT OF TRAINING AND GENDER OF EMPLOYEE**

Today, there is no discrimination to study the impact of training on male and female group. Today, women are equally competing with men in all the fields including business, military organisation and space research center too. For the purpose of the study, gender classification is observed. The sample consists of 249 male respondents and 149 female respondents thus making a total of 398 respondents. The distribution of respondents according to the gender of the respondent, and overall impact of training as shown in Table3

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Training will improve Service Delivery in my bank	Male	249	4.3293	1.90182	.12052
	Female	149	4.7181	1.88909	.15476

Here the dependent variable is "impact of training on service delivery" which is an ordinal scale and independent variable is "gender of the respondent" having two options. So, for testing the hypothesis, we have to use one way ANOVA by finding Levene's test for equality of variance. From Table 4, it is evident that Levene's -test for equality of variance (F-value) is 10.606, hence the null hypothesis is accepted. It means that there is no significant relationship between "gender of the respondent" and the overall impact of training. So, it is clear that overall impact of training is independent of gender of the respondent.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Training will improve Service Delivery in my bank	Equal variances assumed	10.606	.437	-1.979	396	.049	-.38880	.19649	-.77509	-.00252
	Equal variances not assumed			-1.982	313.207	.048	-.38880	.19615	-.77475	-.00286

**ASSOCIATION OF IMPACT OF TRAINING AND AGE OF THE EMPLOYEE**

Age is an important factor in training of an employee for service delivery function. Hence, the respondents have been grouped under four categories viz., 20-34 years, 35-44 years, 45-54 years and above 55 years. Out of total 398 respondents, 130 respondents belong to the age group of 20-34 years, 144 respondents belong to the age group of 35-44 years, 110 respondents belong to 45-54 years, 14 respondents belong to above 55 years. Here the dependent variable is "impact of training" and independent variable is "age of the respondent" is a nominal variable with more than two options. So, for testing the hypothesis we have used Chi-square test. As the Chi-square value obtained is 40.085a and P-value obtained is 0.052 which is more than 0.05, hence, the null hypothesis is accepted. Therefore it could be concluded that there is no significant relationship between the age of the respondent and their overall Impact of training.(Table-5)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.085 <sup>a</sup>	18	.052
Likelihood Ratio	41.344	18	.051
Linear-by-Linear Association	8.203	1	.064
N of Valid Cases	398		

a. 7 cells (25.0%) have expected count less than 5. The minimum expected count is .70. **Source:** Computed through primary data collected

**ASSOCIATION OF IMPACT OF TRAINING AND LOCATION OF BANK'S BRANCH**

Respondents have been grouped under three categories viz., Urban, Semi- Urban Rural. Out of total 398 respondents, 186 respondents belong to the branches in Urban area, 145 respondents belong to the Branches in Semi Urban areas, 67 respondents belong to branches operating in Rural areas. Here the dependent variable is "impact of training" and independent variable is "Location of branch of the respondent" is a nominal variable with more than two options. So, for testing the hypothesis we have used Chi-square test. As the Chi-square value obtained is 7.395a and P-value obtained is 0.830 which is more than 0.05, hence, the null hypothesis is accepted. Therefore it could be concluded that there is no relationship between the branch location of the respondent and their overall Impact of training. (Table-6)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.395 <sup>a</sup>	12	.830
Likelihood Ratio	7.141	12	.848
Linear-by-Linear Association	.003	1	.958
N of Valid Cases	398		

2 cells (9.5%) have expected count less than 5. The minimum expected count is 3.37. **Source:** Computed through primary data collected

**ASSOCIATION OF IMPACT OF TRAINING AND WORK EXPERIENCE OF EMPLOYEE**

Work experience of the employees is an important factor in service delivery function. Hence, the respondents have been grouped under four categories viz., less than 3 years, 3-15 years, 16-28 years and above 28 years. Out of total 398 respondents, no respondents belong to the work experience less than three 3 years as we have included employees having more than 3 years of work experience only , 236 respondents belong to the work experience of 3-15 years, 112 respondents belong to 16-28 years, 50 respondents belong to more than 28 years. Here the dependent variable is "impact of training" and independent variable is "total experience of the respondent" is a nominal variable with more than two options. So, for testing the hypothesis we have used Chi-square test. As the Chi-square value obtained is 22.070 and P-value obtained is 0.057 which is more than 0.05, hence, the null hypothesis is accepted. Therefore it could be concluded that there is no relationship between the total experience of the respondents and their overall Impact of training.(Table-7)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.070a	12	.057
Likelihood Ratio	22.048	12	.056
Linear-by-Linear Association	3.844	1	.050
N of Valid Cases	398		

a. 2 cells (9.5%) have expected count less than 5. The minimum expected count is 2.51. **Source:** Computed through primary data collected

**SUMMARY OF THE RESEARCH FINDINGS**

The findings of the research study can be summarized as follows:

1. There is a significant relationship between the type of bank (public/private) and their overall impact of training;
2. There is no significant relationship between "gender of the respondent" and the overall impact of training.
3. There is no significant relationship between the age of the respondent and their overall impact of training.
4. There is no relationship between the branch location of the respondent and their overall impact of training.
5. There is no relationship between the total experience of the respondents and their overall impact of training.

**CONCLUSION**

This research study was an attempt to study the association between employee demographics and the overall impact of training for improved service delivery in banking sector. Banking sector particularly Public sector is under tremendous pressure to improve upon the quality of human resources which are the drivers of the technology as well as face of the organisation. The employees need to change their skills, knowledge and attitude for improving the overall service delivery. Training interventions are the only source to equip the employees with required skill sets. Success of the training interventions is dependent on the learning ability of the employees. Demographic profile of the employee is the key motivational factor which enhances the learning ability. During the study it was observed that overall impact of training is dependent of the type of bank (public/private) where the employee is employed therefore it may be concluded the type of organisation affects the learning outcomes. This may be due to different work cultures prevailing in public and private organisations. Whereas the impact of training was found to be independent of gender, age, branch location and total experience of the employees. This indicates that the banks can ignore these factors while planning their training strategies. As perceived by the trainer that every individual has the potential to learn and develop and bring the desired change in his skill sets for enhanced efficiency and efficacy factors to match the service benchmarks in the interest of personal and organisational growth, the only requirement is to give the right environment to support the learning ability of the employee for improved quality of services leading to customer satisfaction /delight as an output.

**LIMITATIONS**

The research study was carried out in the region of Agra and its surroundings. The findings of the study cannot be generalized for other areas. Employees' views and opinions may change from time to time, so the research made now may or may not produce the same result if carried out in future. This is drawn on the fact that the employees' training needs and organisations' requirements changes from time to time. The study is confined to four banks only.

**SCOPE FOR FURTHER RESEARCH**

The Present study was carried out in the field of banking. Similar studies may also be carried out in other service organisations like Insurance sector, Airline industries, Hotel industries etc. Similarly the study can also be extended by considering several other demographic variables with respect to the impact of training for the improvement of Service Delivery.

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## AN INDUCTIVE APPROACH TO IDENTIFYING THE JOB SATISFACTION FACETS AND JOB SATISFACTION LEVEL IN AN EXTREME ENVIRONMENT IN BANKING SECTOR EMPLOYEES IN NORTHERN REGION IN SRI LANKA

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### ABSTRACT

*Job satisfaction has a long research tradition. Researches on the facets of job satisfaction have tended to use conceptualizations based on western employees. However, are these conceptualizations appropriate in any context? Thus, the present study examined what the most appropriate conceptualization of the facets examining job satisfaction is in the context of the employees of the banks in Northern Region of Sri Lanka. An inductive approach is used in this study to investigate the appropriate conceptualization of job satisfaction. Altogether 30 senior and junior executive employees were randomly selected from leading private bank and state bank for an interview. The results indicated that the facets salary, supportive working condition, job security, recognition, work-itself, responsibility, relationship with supervisor, advancement/promotion, relationship with peers, customer relationship, reward structure, communication, state/position, achievement, relationship with subordinates, bank policy and administration, job contents, and autonomy, constitute job satisfaction and were the most important satisfying facets among employees, in this context. Whereas training, workload and safe working environment constitute job satisfaction in this context and were not the important satisfying facets on satisfaction, which indicates that even extreme environment facets associated with job satisfaction do not differ from those already found in the literature except the facet of customer relationship. Moreover, Overall job satisfaction is highly correlated with, supportive working condition ( $r=.60$ ), and training ( $r=.57$ ). Overall job satisfaction is correlated with safe working environment ( $r=.55$ ), achievement ( $r=.51$ ), responsibility ( $r=.48$ ), recognition ( $r=.48$ ), relationship with supervisor ( $r=.48$ ), relationship with peers ( $r=.46$ ), significantly. Surprisingly, Advancement ( $r=-0.54$ ) is significantly correlated negatively. Managerial implications of these studies suggest the nature of job satisfaction seems to be constant across contexts. Organizations in many areas of the world should be able to use a common metric for monitoring job satisfaction. They should be able to compare job satisfaction levels in various locations.*

### KEYWORDS

Job satisfaction, Job Satisfaction facets, Extreme environment.

### INTRODUCTION

Job satisfaction has been conceptualized in different ways. One of the difficulties, however, in defining job satisfaction is the different terminology that is used by researchers to describe it. The literature reveals that job satisfaction is used interchangeably with terms such as morale, attitude, and feelings. Job satisfaction is defined as a positive feeling about one's job resulting from an evaluation of its characteristics (Robins & Timothy, 2007). According to Ganzach (1998) job satisfaction is the attitude of greatest interest in an individual's job. That is the general attitude of employees toward work or toward a job. Job satisfaction is sometimes regarded as a single concept; that is, a person is satisfied or not with the job. Similar definition have been suggested by Spector (1997); Luthans, (2001); These definitions however differ in terms of how much they stress the affective and cognitive nature of job satisfaction.

### DIMENSIONALITY OF JOB SATISFACTION

Many conceptualization of job satisfaction have attempted to identify the different dimensions that constitute job satisfaction. Locke (1976) explains that for researchers to understand job attitudes, they need to understand job dimensions, which are complex and interrelated in nature. Perhaps the earliest attempt to identify the dimensionality of job satisfaction is in the work of Herzberg (1968) was identified that hygiene factors that involve the presence or absence of job dissatisfiers including working conditions, pay, status and security, company policies and interpersonal relationship. Also he identified some motivating factors that influence job satisfaction such as achievements, recognition, responsibility, and opportunity for growth. Thus, job satisfaction or dissatisfaction were viewed as independent dimension that determine the overall perception of an individual towards his or her job (Herzberg 1968).

Knights and Kennedy (2005) identified many facets of job satisfaction, with common classifications being pay, promotion, benefits, supervision, co-workers, job conditions, the nature of the work itself, and to introduced communication and job security as other elements in the facets of job satisfaction. When an employee experiences a discrepancy between what was expected and what was received in one or more of these facets, the employee may experience a decrease in job satisfaction. Some of the above aspects are in par with Ganesan et al., (2002).

Locke (1976) identified recognition as another facet of job satisfaction. Wooten & Finley-Hervey; (n.d) identified opportunity for job training as another facet of job satisfaction and found strong correlation between job satisfaction and learning opportunities (Training).

Garcia-Bernal et al.'s (2005) study observed that the level of job satisfaction is determined by four factors: "economic aspects"(wages, advancement opportunities and job security), "interpersonal relationships"(relationships with superiors and relationships with co-workers),"working conditions"(dangerous conditions, stress physical effort, stressful work and exhausting work), and "personal fulfilments" (helping people, a useful job to society, working independently, interesting work).

Kaye and Jordan-Evans (2003), says that challenging and meaningful work, opportunities to learn and grow the sense of being part of a group or team, and having a good boss are the primary sources of satisfaction. Further, they stated that exciting and challenging work and meaningful work that makes a difference or a contribution to society as one of the most important factors in job satisfaction. Taking responsibility for one's own work is a source of satisfaction for most workers. Working with great people, being part of a team, and having fun on the job are some other important factors in job satisfaction. Further, a popular measure of job satisfaction is the job descriptive index (JDI) measures satisfaction in terms of five specific aspects of a person's job, pay, promotion, supervision, a work itself and co-workers.

Researches on the facets of job satisfaction have tended to use conceptualizations based on western employees. Much of the research in this area has been carried out in the west for instance, Achievement (Herzberg, 1968), Recognition (Locke, 1976), Work- itself (challenging) (Smith et al., 1969; Kaye and Jordan-Evans, 2003), Responsibility (Herzberg, 1968), advancement Herzberg, 1968), Bank policy and administration (Herzberg, 1968), Relationship with supervisor (Smith et al., 1969; King, 1970; Brown et al., 1998), Supportive Working condition (Smith et al., 1969; King, 1970; Brown et al., 1998), Salary (Knights & Kennedy, 2005; Smith et al., 1969; King, 1970; Brown et al., 1998), Relationship with peers (Smith et al., 1969; King, 1970; Brown et al., 1998), Relationship with subordinates (Smith et al., 1969; King, 1970; Brown et al., 1998), State/position (Herzberg, 1968), Job Security (Maheswaran, et al. 2003; Garcia-Bernal et al.'s, 2005; Yousef, 1998), Autonomy (Velnumby, 2006), Reward structure (Velnumby, 2006), Communication (Knights and Kennedy; 2005), Training (Wooten & Finley-Hervey, n.d.) Job contents (Maheswaran et al., 2003), Workload (Maheswaran et al., 2003), Safe Working Environment (Chernyshenko et al., n.d).

However are these conceptualizations appropriate in any context? To investigate this issue, a work environment in close proximity the war affected areas of Sri Lanka's civil war seems appropriate. This study became most important because different researchers found different facets of job satisfaction in different places and different jobs. Thus, this study extends identifying facets of job satisfaction if the same facets are important in the Northern context as in a typical work setting because environment of Northern is the extreme situation due to the civil war. This area has been affected by domestic war since 1983. Abnormality is the common situation in Northern and the life of the people in Northern is almost different to the places where war is not a way of life. Thus the present study examines what the most appropriate conceptualization of the facets examining job satisfaction is in the context of Northern banks employees in Sri Lanka. Specifically, these objectives were fulfilled through this study. First, based on the study, what facets were recalled by employees as affecting their satisfaction levels were examined. Second the context to which these facets were related to overall job satisfaction was examined. Third, was to get a good understanding of job satisfaction on employees in particular region. Fourth, the factors that are dissatisfying employees examined.

The present study intends to address the question as to what extent job satisfaction facets in Northern context are different to existing conceptualization of job satisfaction facets.

## METHOD

### RESEARCH SAMPLE PROCEDURE

#### SELECTION OF PARTICIPANTS

For the purpose of this study, respondents were randomly selected from leading private bank and state bank. These banks are located in Northern Region and more than 30 employees are working in each bank. Altogether 30 senior and junior executive employees were selected for an interview. Of the sample 05 of them assistant managers, 19 were staff officers and other 6 were banking trainees. Of the selected participants, 22 of them were male and 8 of them were female.

#### MEASURES

The data was gathered through an interview conducted in Tamil that used both structured and unstructured questions. Unstructured question regarding job satisfaction is "What factors contribute to satisfaction with your current work"?

Un- structured questions include a section for the following variables on satisfaction. After a careful study of theoretical and review of literature twenty facets of determining job satisfaction have been identified. They are as follows;

Achievement (Herzberg, 1968), Recognition (Locke, 1976), Work- itself (challenging) (Smith et al., 1969; Kaye and Jordan-Evans, 2003), Responsibility (Herzberg,1968), advancement (Herzberg, 1968), Bank policy and administration (Herzberg, 1968), Relationship with supervisor (Smith et al., 1969; King, 1970; Brown et al., 1998), Supportive Working condition (Smith et al., 1969; King, 1970; Brown et al., 1998), Salary (Knights & Kennedy, 2005; Smith et al., 1969; King, 1970; Brown et al., 1998), Relationship with peers (Smith et al., 1969; King, 1970; Brown et al., 1998), Relationship with subordinates (Smith et al., 1969; King, 1970; Brown et al., 1998), State/position (Herzberg, 1968), Job Security (Maheswaran, et al. 2003; Garcia-Bernal et al.'s, 2005; Yousef, 1998), Autonomy (Velnumby, 2006), Reward structure (Velnumby, 2006), Communication (Knights and Kennedy; 2005), Training (Wooten & Finley-Hervey, n.d), Job contents (Maheswaran et al., 2003), Workload (Maheswaran et al., 2003), Safe Working Environment (Chernyshenko et al., n.d).

Firstly each respondent was asked to describe what gives them satisfaction. Based on their answer, the satisfaction facets revealed by the employees were listed down by the researcher in a separate paper. Secondly, all respondents were asked to rank the most important satisfying facets in the list.

In last, other unstructured questions which were designed to reconfirm satisfaction facets and dissatisfying facets in the typical work situation in their work also asked from respondents: would you like to remain in this organization for long period? Do you have the intention to leave from this bank? Do you have more satisfaction with your work in this bank when compare to other organizations? What set of factors cause dissatisfaction in the present job? were also collected. The answers for these questions were either yes or no. After which, respondents were asked to give reasons, in respect of the above questions. The main purpose of these questions was to reconfirm their satisfaction facets in their work in another way. Then respondents were asked to rate their satisfaction level with their facets using rating scales with anchors.

Finally, regarding the satisfaction facets, listed above respondents were asked to rate their satisfaction level how satisfied they were with each facets on a five point Likert scale ranging from strongly dissatisfied(1)-strongly satisfied(5). High scores indicated high level of satisfaction with each satisfaction facets. The level of satisfaction of the employees, based on the above twenty one facets have been assessed using rating scales with anchors with the structured questions.

#### PROCEDURES

Banking sector employees were selected for the purpose of this study. First of all, permission was obtained from the General Manager of each bank by explaining the purpose of the study. Due to the workload of the employees, the interview was permitted by the management in the evening and afternoon times. All categories of staff were randomly selected for interviews. For this purpose, 15-20 minutes time was spent with each employee. The interview was started by explaining the purpose of the study to each employee. All participants were actively participated in the interview. The language was in Tamil.

#### DATA ANALYSIS PROCEDURE

##### RANKING OF FACETS

Rank order of the facets which were revealed by respondents was analysed.

The facets expressed by respondents in relation to their ranking (items) were scored and summed using the following formula.

**Score= (1<sup>st</sup> important factor x 21) + (2<sup>nd</sup> important factor x 20) + (3<sup>rd</sup> important x 19) .....+ (21<sup>st</sup> important factors x 1)....** (Velnumby et al, 2007).

Each respondent gave a preference for 21 satisfaction factors. In case of order of preference, maximum score for the first preferring factor was given, i.e. maximum score for first preferring facet depends on the number of factors which are related by each respondents, because number of facets selected by each respondent, differ from person to person.

Using the above formula, the score was computed and the satisfaction facets were ranked. Mean value was taken into account to rank the satisfaction facets, because all respondents were not responded to all satisfaction facets. Hence, total score was divided by the total number of responses for mean value.

The second aim of the data analysis was to find out inter correlation between facets and overall job satisfaction. The level of satisfaction of the employees, based on the above twenty one facets have been assessed using rating scales with anchors with the structured questions. The result has been analysed using correlation matrix. Responses were summed across the 21 facets to obtain the overall score. Total score was divided by the total number of responses for mean value, and then the mean value had been taken as overall satisfaction. Mean value (overall satisfaction) was taken into account to correlate with each satisfying facets, because all respondents were not responded to all satisfying facets.

## RESULTS AND DISCUSSIONS

The respondents came up on their own with 21 satisfying facets. These dimensions comprise of: Salary, supportive working condition, job security, recognition, work-itself, responsibility and relationship with supervisor, advancement/promotion, relationship with peers, reward structure, communication, state/position,

achievement relationship with subordinates, bank policy and administration, job contents, autonomy, safe working environment, workload, training and customer relationship. It is importance to note that customer relationship has been added as new category in satisfying facets and it was ranked as ten by employees (mean 8.42).

The most commonly brought up factors were; Relationship with supervisor (n=28), relationship with peers (n=28), salary (n=24), job security (n=24), bank policy and administration (n=22), customer relationship (n=20), workload (n=20), work itself (n=19), supportive working condition(n=19), achievement (n=17), recognition (n=17), and autonomy (n=17).

Averagely brought up factors by respondents were communication (n=16), advancement (n=16), safe work environment (n=16) relationship with subordinate (n=15), job contents (n=15), training (n=13) and state /position (n=12).

**RANKING OF SATISFYING FACETS**

According to this study the average satisfying facets have been ranked by respondents in their current job. It is reflected in the following Table (1).

**TABLE 1: RANKING OF THE SATISFACTIONAL FACTORS BY THE EMPLOYEES**

Satisfaction factors	Total score	Total Responses	Mean	Rank
Salary	253	24	10.54	<b>1</b>
Supportive working condition	197	19	10.37	<b>2</b>
Job Security	244	24	10.17	<b>3</b>
Recognition	169	17	9.94	<b>4</b>
Work Itself (challenging)	183	19	9.63	<b>5</b>
Responsibility	218	23	9.47	<b>6</b>
Relationship with supervisor	246	26	9.46	<b>7</b>
Advancement/promotion	149	16	9.31	<b>8</b>
Relationship with peers	227	26	8.73	<b>9</b>
Customer relationship	177	21	8.42	<b>10</b>
Reward structure	73	9	8.11	<b>11</b>
Communication	123	16	7.68	<b>12</b>
State/position	90	12	7.50	<b>13</b>
Achievement	124	17	7.29	<b>14</b>
Relationship with subordinates	99	15	6.60	<b>15</b>
Bank policy and Admin	126	22	5.72	<b>16</b>
Job contents	78	15	5.20	<b>17</b>
Autonomy	86	17	5.05	<b>18</b>
Safe working environment	72	16	4.50	<b>19</b>
Workload	86	20	4.30	<b>20</b>
Training	41	13	3.15	<b>21</b>

According to the ranking preferences of job satisfaction facets; Salary, supportive working condition, job security, recognition, work-itself, responsibility and relationship with supervisor had got highest ranks.

Advancement/promotion, relationship with peers, customer relationship, reward structure, communication, state/position, achievement were got moderate ranks followed by relationship with subordinates, bank policy and administration, job contents, autonomy, safe working environment, workload and training as lowest ranks.

The results from this study, in the Table above (1) showed that the most job satisfying facets which are ranked by the individual employees. Interestingly, salary (m=10.54) is the first satisfying facet of employees in banking sector. Supportive working condition (m=10.37) and job security (m=10.17) have the second and third priority respectively. Conversely, training (m=3.15), workload (m=4.30), and safe working environment (m=4.50) were ranked as the least important facets on satisfaction. It seems clear that the above ranked satisfying facets are linked with existing conceptualization of job satisfaction facets that is, a popular measure of job satisfaction is the job descriptive index (JDI) measures such as pay, work itself, promotion, supervision, and co-workers. These existing five job satisfaction facets are fallen within 9 ranks in the above Table (1).

However, it is interesting that some facets which are not in the JDI (Job security, recognition, responsibility and supportive working conditions also revealed higher rankings

The following Table (2) showed the satisfaction facets ranked by the employees in public and private sector organizations in Colombo and Jaffna districts in Sri Lanka. Fifth column showed the findings of the current study, which is in bold.

**TABLE 2: COMPARISON OF RANKS OF SATISFYING FACETS IN COLOMBO AND JAFFNA DISTRICTS IN SRI LANKA**

Ser. No:	Satisfactional factors	Ranking		
		Public sector	Private sector	<b>Banking sector in Jaffna</b>
1	Good interpersonal relationships	1	1	<b>9</b>
2	Freedom to work	2	2	<b>18</b>
3	Pay and fringe benefits	5	3	<b>1</b>
4	Social Relationship	3	4	<b>10</b>
5	Safety in work	6	5	<b>19</b>
6	Good working conditions	4	6	<b>2</b>
7	Flexible rules and regulations	8	7	<b>15</b>
8	Participation in decision making	7	8	-

The findings of the above Table (2), is somewhat different. Since Velnumby's (2006) study was carried out in Colombo district Sri Lanka, it seems clear that satisfying facets varies place to place and person to person.

**RELATIONSHIP BETWEEN OVERALL JOB SATISFACTION AND FACETS**

The below Table (3), shows the maximum number of ratings given, minimum number of ratings given and average number of ratings given for each satisfying facets. Also Table (3) shows means and standard deviation for each job satisfaction facet. Of the above factors, customer relationship had the highest mean values, because most of respondents scored highly.

**TABLE 3: DESCRIPTIVE STATISTICS OF SATISFACTION FACETS**

Satisfying factors	N	Maximum	Minimum	Mean	Std. Deviation
Achievement	23	5	1	3.83	.88
Recognition	18	5	3	4.00	.34
Work-itself	20	5	2	4.20	.76
Responsibility	24	5	3	4.25	.60
Advancement	17	5	2	4.06	.65
Bank policy	23	5	1	3.48	.89
Relationship with supervisor	27	5	2	4.44	.84
Supportive work conditions	24	5	3	4.29	.62
Salary	26	5	2	4.15	.88
Relationship with peers	28	5	3	4.25	.70
Relationship with subordinates	16	5	3	4.31	.70
State /position	16	5	3	4.00	.36
Job security	23	5	3	4.30	.63
Autonomy	23	5	2	3.87	.69
Reward structure	15	4	1	3.00	.75
Communication	17	5	2	3.88	.78
Training	22	5	1	2.91	1.30
Job contents	16	5	3	3.94	.57
Workload	23	5	2	3.78	.85
Safe working environment	20	5	2	3.45	.82
Customer Relationship	20	5	4	4.65	.48
Valid N (listwise)	4				

When we comparing these results with the recalled facets and rankings which were revealed by respondents, based on the ranking orders; mean value for salary is (m=4) supportive working condition (m=4.29) job security (m= 4.3), recognition (m=4), work-itself (m=4.20), responsibility (m=4.25) and relationship with supervisor (m=4.44). Advancement/promotion (m=4.06), relationship with peers (m=4.25), customer relationship (4.65), were got highest rank and high mean value for ratings. Whereas reward structure (m=3.00), communication (m=3.88), bank policy and administration (m=3.48), job contents (m=3.9), autonomy (3.87), safe working environment (m=3.45), workload (m=3.78) and training (m=2.91) were got lowest rank as well as lowest mean value for ratings compare to highest ranking facets. Thus, this is not much difference ranking preferences and ratings of same facets.

Regarding to the inter correlation between job satisfaction and job satisfaction facets of this study, the relationship between overall job satisfaction and the each satisfying facets were tested by Spearman correlation. The purpose of this analysis was to find out associations between overall job satisfaction and job satisfaction facets. The table below (4) shows the correlations between the job satisfaction and each satisfying facets. Interestingly, Overall job satisfaction is highly correlated (r=.62) with workload at the significance level of 0. 01 compare to all other satisfying facets.

**TABLE 4: CORRELATION BETWEEN SATISFACTION AND EACH SATISFYING FACETS**

Spearman's rho	Average satisfaction (total/No. of Responses)
Achievement	.51
Recognition	.48*
Work Itself (challenging)	-.007
Responsibility	.48
Advancement	-.54*
Bank policy and Admin	.32
Relationship with supervisor	.48*
Supportive working condition	.60**
Salary	-.01
Relationship with peers	.46*
Relationship with subordinates	.29
State/position	-.38
Job Security	.15
Autonomy	.34
Reward structure	.42
Communication	.21
Training	.57**
Job contents	.30
Workload	.62**
Safe working environment	.55*
Customer relationship	-.009
Total satisfaction (total/No. of Res)	1.00
<b>** . Correlation is significant at the 0.01 level (2-tailed).</b>	
<b>* . Correlation is significant at the 0.05 level (2-tailed).</b>	

Moreover, Overall job satisfaction is highly correlated with, supportive working condition (r=.60), and training (r=.57). Overall job satisfaction is correlated with safe working environment (r=.55), achievement (r=.51), responsibility (r=.48), recognition(r=.48), relationship with supervisor (r=.48), relationship with peers (r=.46), significantly. Surprisingly, Advancement (r=-0.54) is significantly correlated negatively.

This study seems to bear out the findings of Brewer and Athens, (2005) satisfaction with supervisor exerts more influence on job satisfaction than pay satisfaction i.e. Satisfaction with supervisor has the strongest influence on satisfaction as well as those of Garcia-Bernal et al., (2005) "economic aspects"(wages, advancement opportunities and job security), "interpersonal relationships"(relationships with superiors and relationships with co-workers) presents a positive and statistically significant influence, on job satisfaction. This study contradict Maheswaran, et al. (2003) that is job security as a dimension of job satisfaction falls in between the top five preferred and the least five preferred dimensions. Surprisingly, supervision is considered to be the least preferred dimension of all the job satisfaction dimensions, also contradict findings of Yousef (1998) it indicates that there is a significant positive correlation, although not very strong, between satisfaction with job security. But in this study job security (r=.15) is not significantly correlated with job satisfaction. Also the results contradict the

findings of Drago, Estrin, and Wooden, (1992) that is, promotion opportunities (advancement) and pay positively influence satisfaction but consistent with the finding, that is job security positively influence satisfaction.

#### DISSATISFYING FACTORS

The final objective of this study was to examining the dissatisfying facets of the respondents in the context of Jaffna District Sri Lanka. According to the interview, the following dissatisfying facets were revealed by respondents: Workload(n=12),threatening external environment(n=21), training (poor; n=22), transfer difficulties (n=18), promotion procedure (n=09), risk taking N=12), repetitive work(13), lack of technology in the work set up (n=17), authority limited(n=9), political intervention(n=14) were revealed by employees as dissatisfying factors in a war or typical work setup. Of the dissatisfying factors, poor training facilities due to the poor transportation to other parts of the country, external environment, and transfer difficulties were got more attention among employees. Most of these dissatisfying facets caused by war related issues, because poor transportation, external environment (instability) lack of technology, and risk are associated with war conditions.

#### MANAGERIAL IMPLICATIONS

The nature of job satisfaction seems to be fairly constant across contexts. Organizations in many areas of the world should be able to use a common metric for monitoring job satisfaction. They should be able to compare job satisfaction levels in various locations, because the existing job satisfaction facets are same even in the extreme context. Thus it enables researchers to compare levels of job satisfaction in various locations.

#### CONCLUSION

Jaffna environment is proximity for the extreme situation due to the civil war. Due to the political instability and civil disorder the people have been displaced from their own places. Abnormality is the common situation in Jaffna and the life of the people in Jaffna is almost different to the places where war is not a way of life. The data used for this research were collected from bank employees who were located in such extreme environment in Jaffna district.

An attempt was made to find out whether existing conceptualization of the job satisfaction facets are same as in a typical work situation in Northern Region bank employees. Accordingly, salary, supportive working condition, job security, recognition, work –itself, responsibility, relationship with supervisor, advancement, and relationship with peers are the most important satisfying facets, whereas training, workload and safe working environment are not important facets on satisfaction. Identification of these facets was helpful for measuring the facets of job satisfaction of the banking sector employees in Northern Region.

The job satisfaction facets define the construct of overall job satisfaction; therefore one must treat the facets as manifestations of the overall construct of the job satisfaction. A popular measure of job satisfaction is the job descriptive index (JDI) measures satisfaction in terms of five specific aspects of a person's job. They are satisfaction with supervision, satisfaction with pay, satisfaction with promotion, satisfaction with co-workers, and satisfaction with the work itself.

Many factors including challenging work, interesting co- workers, salary the opportunity to learn and good working condition influence a person's satisfaction with job (Hellriegel, Slocum, and Woodman, 2001). The level of satisfaction is affected by intrinsic and extrinsic motivating factors, the quality of supervision, and social relationship with the work group and the degree to which the individual succeeds or fails at his or her work (Armstrong, 2004). The situational characteristics commonly proposed as key factors in job satisfaction are, the work itself, pay, promotion, supervision and co- workers, compensations and work policies (Smith et al., 1969; King, 1970). Knights and Kennedy (2005) they cited many facets of job satisfaction, with common classifications being pay, promotion, benefits, supervision, co-workers, job conditions, the nature of the work itself, communication and job security. This Study found that salary, supportive working condition, job security, recognition, and work –itself, responsibility, relationship with supervisor, advancement, and relationship with peers were the most important satisfying facets, whereas training, workload and safe working environment were not important facets on satisfaction of banking sector employees in a typical work situation in Northern region.

Facets in the Jaffna context are not much different to western and non western context except dissatisfying factors due to the war situation, that is poor transportation facilities, difficulties in getting transfers; poor training facilities, and lack of technology developments. Only satisfaction with customer relationship was revealed as different facet in the northern context.

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**AREA EFFICIENT APPROACH FOR 64-BIT MULTIPLICATION USING CONFIGURABLE DEVICES**

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**ABSTRACT**

Multiplication and division are the two elementary operations essential for the core computing process or for the arithmetic operation. These two operations are also the most critical functions carried out by the processors as the multiplication requires more number of steps for the computation, limiting the overall performance of the system, and the division has the highest latency among all arithmetic operations. Thus, high performance multiplication and division algorithms/ architectures, if available, will considerably improve the speeds of processing system. Consequently, the need for faster processing of arithmetic operations, is continuously driving major improvements in processor technologies. This work attempts to design such hardware architecture for double precision floating-point multiplication that is easily implementable with high efficiency. The multiplier unit is based on ancient Vedic mathematics technique. The proposed design is described using VHDL. The code description is simulated on reconfigurable device using Modelsim SE 5.7f and synthesized using ISE Xilinx 10.1i for the FPGA device Virtex -XC4V5X25-12FF668.

**KEYWORDS**

Multiplier, Double Precision, Configurable, Floating point, FPGA.

**1. INTRODUCTION**

With the rapid development and wide application of computer technology, high performance applications have become extremely popular in modern computer systems, requiring enhanced computation capabilities at low cost and power consumption. Also, in contemporary signal processing and communication applications, a high throughput rate and numerical accuracy is often demanded. One of the important requirements in such applications is to perform a large number of mathematical calculations in a very less time. That is, faster computational methods are vastly claimed for advancement in technology.

Multiplication and division are the two elementary operations essential for the core computing process or for the arithmetic operation. These two operations are also the most critical functions carried out by the processors, as the multiplication requires more number of steps for the computation, limiting the overall performance of the system, and the division has the highest latency among all arithmetic operations. Thus, high performance multiplication and division algorithms/ architectures, if available, will considerably improve the speeds of processing system. Consequently, the need for faster processing of arithmetic operations, is continuously driving major improvements in processor technologies, as well as the search for new arithmetic algorithms. This work attempts to design such hardware architecture for double precision floating-point multiplication [1,2] that is easily implementable with high efficiency. The multiplier unit is based on ancient Vedic mathematics [3] technique. The proposed design is described using VHDL. The code description is simulated on reconfigurable device using Modelsim SE 5.7f and synthesized using ISE Xilinx 10.1i for the FPGA device Virtex -XC4V5X25-12FF668.

This paper is organized in the following way: Section II highlights the related work. In Section III a brief review of IEEE 754 standard for binary floating-point arithmetic is given. Then in section IV, the synthesis results is demonstrated. Finally, in section V the paper is concluded with the applications of the operators and prospects for future improvements in these implementations.

**2. BRIEF SUMMARY OF PREVIOUS WORK**

Earlier work was presented [4] for 24\*24 multiplier in which they used digit-serial arithmetic which is not so fast method. Also, proper rounding techniques were not implemented. However, they presented a pipelined structure in order to produce a result every clock cycle. A work for floating-point division is reported [5] for embedded VLSI integer processors with no hardware unit. They focused on high-radix digit-recurrence algorithms. In these implementations, 32 bit operators are designed. However, by using a small floating point format (16 bits or 18 bits wide), smaller and faster implementations can be built but with less accuracy.

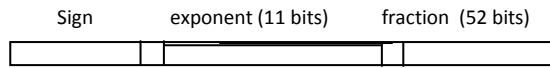
There are number of problems associated with tree and array multipliers [6]. Tree multipliers have shortest logic delay but irregular layouts with complicated interconnects. Irregular layouts introduce significant interconnect delay and make noise a problem and the delay of the interconnection is not suitable for VLSI implementation. Similarly array multipliers have larger delay and significant amount of power is consumed.

Transistor level implementation of Vedic Mathematics based 32-bit multiplier for high speed low power processor was suggested by [7]. Simple Boolean logic is combined with 'Vedic' formulas, which reduces the partial products and sums generated in one step, reduces the carry propagation from LSB to MSB. The implementation methodology ensure substantial reduction of propagation delay in comparison with Wallace Tree, modified Booth Algorithm, Baugh Wooley and Row Bypassing and Parallel Architecture based implementation which are most commonly used architectures. The functionality of these circuits was checked and performance parameters like propagation delay and dynamic power consumption were calculated by spice spectre using standard 90nm CMOS technology.

**3. DOUBLE PRECISION FLOATING POINT FORMAT**

The IEEE Standard for Binary Floating-Point Arithmetic (IEEE 754) is the most widely-used standard for floating-point computation, and is followed by many CPU and FPU implementations. The standard defines formats for representing floating-point numbers (including negative zero and denormal numbers) and special values (infinities and NaNs) together with a set of floating-point operations that operate on these values. It also specifies four rounding modes and five exceptions (including when the exceptions occur, and what happens when they do occur). Four formats for representing floating-point values are: single-precision (32-bit), double-precision (64-bit), single-extended precision ( $\geq 43$ -bit, not commonly used) and double-extended precision ( $\geq 79$ -bit, usually implemented with 80 bits). The basic format for single precision is further divided into sign, exponent, and mantissa part as shown in Fig 3.1.

FIG 3.1: FORMAT FOR DOUBLE-PRECISION MULTIPLIER



**3.1 Normalized Numbers [8]**

In most cases, the floating-point real numbers are represented in normalized form. A normalized real number consists of a normalized significand that represents a real number between 1 and 2 and an exponent that specifies the number's binary point. The requirement that the leftmost digit of the significand be nonzero is called normalization.

**3.2 Real Numbers and non number Encodings**

A variety of real numbers and special values can be encoded in floating-point format. These numbers and values are generally divided into the following classes:

**1. Signed Zeros**

Zero can be represented as a +0 or a -0 depending on the sign bit. Both encodings are equal in value. The sign of a zero result depends on the operation being performed and the rounding mode being used.

**2. Normalized and Denormalized Finite Numbers**

Non-zero, finite numbers are divided into two classes: normalized and denormalized. The normalized finite numbers comprise all the non-zero finite values that can be encoded in a normalized real number format between zero and infinity (∞). The denormalized number is computed through a technique called gradual underflow.

**3. Signed Infinities**

The two infinities, +∞ and -∞, represent the maximum positive and negative real numbers, respectively, that can be represented in the floating-point format. Infinity is always represented by a zero significand (fraction and integer bit) and the maximum biased exponent allowed in the specified format

**4. Not a Number (NaN)**

There are two classes of NaN: quiet NaNs (QNaNs) and signaling NaNs (SNaNs). A QNaN is a NaN with the most significant fraction bit set; a SNaN is a NaN with the most significant fraction bit clear.

**5. Indefinite**

For each FPU data type, one unique encoding is reserved for representing the special value indefinite.

**3.3 Conversion and Rounding**

When a number is represented in some other format (such as a string of digits), then it will require a conversion to be used in floating-point format. When the result is obtained from an operation, it may not be possible to represent exactly in the IEEE 754 standard. Therefore, rounding is needed before the result is stored in the memory or registers, and/or sent to the output. In round to nearest even the value is rounded up or down to the nearest infinitely precise result. In round up and down the number will be rounded up towards +∞ and -∞ respectively. Round towards zero modes is not used in general.

**3.4 Exceptions**

There are four types of exceptions that should be signaled through a one bit status flag when encountered. Some arithmetic operations are invalid, such as a division by zero or square root of a negative number. The result of an invalid operation shall be a NaN.

Inexact exception should be signaled whenever the result of an arithmetic operation is not exact due to the restricted exponent and/or precision range. Two events cause the underflow exception to be signaled, tininess and loss of accuracy. The overflow exception is signaled whenever the result exceeds the maximum value that can be represented due to the restricted exponent range. It is not signaled when one of the operands is infinity, because infinity arithmetic is always exact.

**3.5 Multiplication Algorithm**

A binary floating-point number is represented by a sign bit, the significand and the exponent. Given two numbers Operand A and Operand B, the flowchart in figure 2 can be used to compute their product, given that e<sub>A</sub>, e<sub>B</sub> and frac<sub>A</sub>, frac<sub>B</sub> are the exponents and significands of the numbers, respectively. A detailed description of the algorithm follows:

1. The hidden bit (24<sup>th</sup> bit) is made explicit. If e<sup>a</sup> or e<sup>b</sup> = 0, it is made '0', otherwise a '1'.

2. The result of the multiplication is given by the formula:

$$\text{Sign} = \text{sign}_A \text{ xor } \text{sign}_B, e = e_A + e_B,$$

$$\text{Frac} = \text{frac}_A \times \text{frac}_B$$

The addition of the exponents is a trivial operation as long as we keep in mind that they are biased. This means that in order to get the right result, we have to subtract 127 (bias) from their sum. The sign of the result is just the XOR of the two sign bits. The multiplication of the significands is just an unsigned, integer multiplication.

3. There must be a leading '1' in the significand of any floating-point number (unless it is not denormalized). To make the MSB '1' in the result, the bits are shifted left, and with each shift, the exponent is incremented by 1. This way normalization is done.

**3.6 Vedic Multiplier**

The multiplier A[n] is of size 'n' words and the multiplicand B[m] is of size 'm' words, where A and B are given by equation 1 and 2.

$$A[n] = \sum_{i=0}^{n-1} a_i * X^i \tag{1}$$

$$B[m] = \sum_{i=0}^{m-1} b_i * X^i \tag{2}$$

Product of A and B is given by equation 3.

$$P [n + m] = A [n] * B [m] \tag{3}$$

$$\sum_{i=1}^n CP[0,0,i] * X^{i-1} + \sum_{j=1}^{m-n} CP[0,j,n] * X^{n+j-1} + \sum_{k=1}^{n-1} CP[k,k+m-n,n-k] * X^{m+k+1}$$

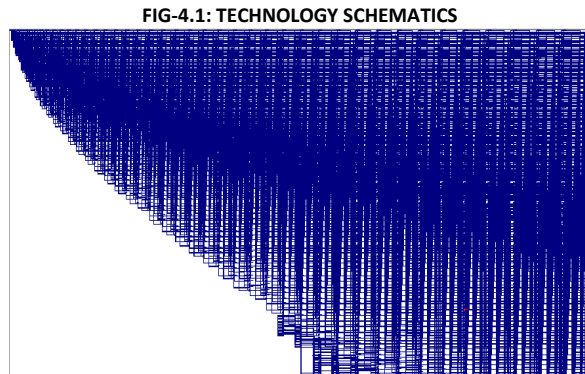
Where

$$CP[n,m,q] = \sum_{i=n}^{n+q-1} a_i * b_j \tag{4}$$

Equation 4 gives the cross-product of two numbers. where j = (m + n + q - i - 1)

4. RESULTS

The code is written in HDL, synthesized and simulated using Virtex 4 (Device : xc4vsx35-10-ff668) and speed grade of -12. Technology schematics is shown in Fig. 4.1.



Synthesis results shows 12447 slices are used out of 15360, 22789 numbers of 4 input LUTs are used out of 30720 and number of bonded IOBs are 195 out of 448. This is shown in Fig.4.2.

FIG-4.2: SYNTHESIS RESULTS

Device Utilization Summary (estimated values)				
Logic Utilization	Used	Available	Utilization	
Number of Slices	12447	15360		81%
Number of Slice Flip Flops	144	30720		0%
Number of 4 input LUTs	22789	30720		74%
Number of bonded IOBs	195	448		43%
Number of GCLKs	1	32		3%

Macro Statistics details are given below:

- # Adders/Subtractors : 252
- 9-bit adder : 103
- 12-bit adder : 2
- 12-bit subtractor : 1
- 16-bit adder : 1
- 17-bit adder : 4
- 18-bit adder : 14

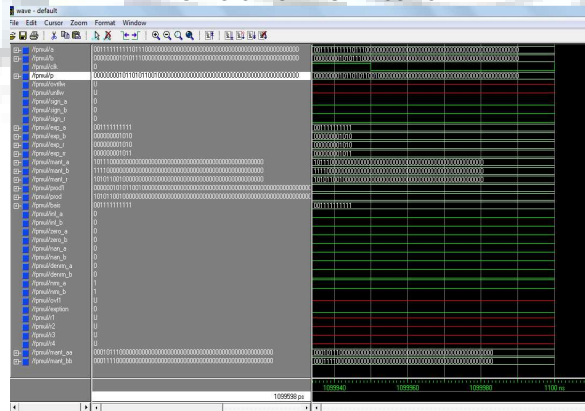
5. CONCLUSION

In this paper, it is shown that double precision floating point multiplier is synthesized and simulated using Configurable devices. The presented implementations give

- 19-bit adder : 29
- 9-bit adder : 49
- # Registers : 18
- 1-bit register : 15
- 12-bit register : 1
- 53-bit register : 1
- 64-bit register : 1
- # Comparators : 8
- 12-bit comparator greater : 2
- 12-bit comparator less : 2
- 53-bit comparator equal : 2
- 53-bit comparator greater : 2
- # Multiplexers : 1
- 109-bit 4-to-1 multiplexer : 1
- # Xors : 5538
- 1-bit xor2 : 5538
- 8 bit adder : 49

Timing report summary indicates total time taken for process is 203.817 ns out of which 79,879 ns are used for logic and 18.755ns are utilized for routing. Simulation Results are shown in Fig. 4.3.

FIG-4.3: SIMULATION RESULTS



Since area and speed of the design is always a main concern, finding possible ways of customizing our design in terms of timing delay and slices has been tried and this can also be a future enhancement of the present work. In the end, it can be perceived that such a design can enable substantial savings of resources in the FPGA when used for signal processing applications.

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**THE EVOLUTION OF TECHNOLOGY ACCEPTANCE MODEL: A LITERATURE REVIEW****INDER SINGH****ASST. PROFESSOR****CENTRE FOR INFORMATION TECHNOLOGY****COLLEGE OF ENGINEERING STUDIES (COES)****UNIVERSITY OF PETROLEUM & ENERGY STUDIES****DEHRADUN****DEVENDRA KUMAR PUNIA****PROFESSOR****DEPARTMENT OF INFORMATION SYSTEMS MANAGEMENT****COLLEGE OF MANAGEMENT & ECONOMIC STUDIES****UNIVERSITY OF PETROLEUM & ENERGY STUDIES****DEHRADUN****ABSTRACT**

Now days, organizations are investing enormous amount in Information Technology to achieve productivity gain, excellence and competitive advantage. Academicians and practitioners have conducted many researches to determine the gain from IT investment. Actual productivity gain can only be achieved through adoption and use of technology in the organization. In this paper, extensive review of literature has been done on TAM and its other related theories such as TRA, and TPB.

**KEYWORDS**

TRA, TPB, TAM, TAM2, UTAUT.

**1. INFORMATION TECHNOLOGY AND ITS IMPACT ON ORGANIZATIONAL PERFORMANCE**

From many decades, Researchers and practitioners have discussed on whether investment in Information Technology improves the organizational performance or not? These discussions have coined the term information technology productivity paradox.

**1.1. IT PRODUCTIVITY PARADOX**

There is a debate from many decades that whether the computers contribute to productivity growth or not. The success of a business is generally depends on the ability of the firm to provide real value to their customers without using much labor, capital, or other inputs (Brynjolfsson and Hitt 1998). Productivity growth doesn't come from working harder but primarily from working smarter. Productivity growth comes from working smarter usually means adopting new technology and techniques. There have been many anecdotes about whether IT investment gives any productivity gain or not. On the one hand, there are many success stories like Dell and Cisco those transacted billions of dollars via internet. On the other hand, there are many stories about abandoned systems investment, cost overrun, and IT failure (Brynjolfsson and Hitt 1998). The aggregate statistics suggest that productivity has grown more between 1950 and 1973 and become slow down since 1973. In the late 1980, payoffs from IT have been debated among the researchers and practitioners resulting in coining the term "IT Productivity Paradox" (Brynjolfsson 1993; Brynjolfsson and Yang 1996).

**2. INFORMATION PAYOFF**

There have been many studies at different level – that is, the economy level, industry level and firm level (Devaraj and Kohli 2000). Studies during late 1980s focused IT investment impact on whole economy, but in early 1990s, researchers had reexamined the data and look at the IT investment behavior of firm level. The results from firm level studies show the positive correlation between IT and productivity gain (Devaraj and Kohli 2000). Researchers also measure some intangible value created by IT at firm-level. Firm-level studies found that there is positive relation of IT investment and productivity and contradicting claims of "Productivity Paradox" (Brynjolfsson and Hitt 1995, 1996; Malone 1997). Organizations adopting IT technologies at a faster rate found to be getting more benefits from IT. Survey suggests that the prime motive of managers to use IT is to improve customer services and quality consistently above cost savings (Brynjolfsson and Hitt 1997).

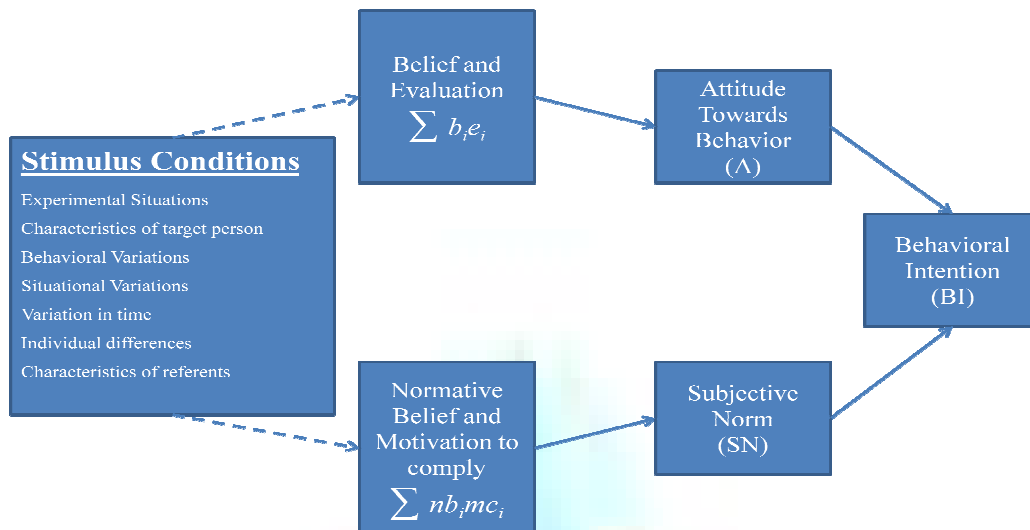
There were several studies, which assessed about IT investment and its effect on organizational performance. Researchers and academicians use different variables, levels (economy, industry, and firm), and technologies to determine IT payoff. Some studies found positive relationship between IT investment and organizational performance, but other studies found negative relationship between technology investment and organization performance. According to Devaraj & Kohli, the main effect of Information technology on organizational performance is not because of enormous investment in it but the adoption and actual use of Information Technology. The adoption of technology may be mandatory or voluntary. In mandatory adoption, subjective norms have a significant effect on intention. In Voluntary, the adopters perceive that adoption is non-mandatory (Devaraj and Kohli 2003).

**3. EVOLUTION OF TECHNOLOGY ACCEPTANCE MODEL**

There are several theories which have been used to determine the individual's behavioral intention to accept or reject technology, such as the Theory of Reasoned Action (Fishbein and Ajzen 1975), the Theory of Planned Behavior (Ajzen 1991), and the Technology Acceptance Model (Davis 1989). The TAM is most popular model in the field of information systems to determine the individual's behavioral intention to use information technology (Alshare and Alkhatieb 2008). The TAM was developed by (Davis 1989) to find out the user acceptance of information technology.

The Technology Acceptance Model developed from two foundation theories, TRA and TPB. The TRA and TPB are the general purpose theoretical models from social psychology usually used to determine the behavioral intention of individuals to perform a particular behavior, where Behavioral intention can jointly determined by individual's attitude towards that behavior and subjective norm (Davis et al. 1989).

FIGURE 1: THE THEORY OF REASONED ACTION MODEL



Source: Obtained from Fishbein /Ajzen, Belief, Attitude, Intention, and Behavior, Figure 7.2(Schematic representation of effects of stimulus variables on intentions), p. 334

Behavioral intention is a measure of the strength of an individual's intention to perform a particular behavior (Davis et al. 1989). Attitude refers to an individual's favorable and unfavorable feelings about performing an intended behavior (Fishbein & Ajzen, 1975, p. 216). Subjective norm refers to "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302).

According to TRA, there are two factors that have been used to determine the behavioral intentions: an individual factor or "attitudinal" factor and social or "normative" factor. The symbolical representation of equation of the theory is as follows:

$$BI = (A_B) w_1 + (SN) w_2 \quad (1)$$

Where,  $B$  belongs to the Behavior;  $I$  belong to the intention to perform behavior;  $A_B$  is the attitude towards performing behavior;  $SN$  is the subjective norm;  $w_1$  is empirical weight assigned to  $A$  and  $w_2$  is empirical weight assigned to  $SN$  (Fishbein & Ajzen, 1975, p. 301), where, the relative weights of the attitudinal and normative factors may vary from one person to another. Behavioral Intention (BI) is a linear function of sum of two weighted variables Attitude ( $A_B$ ) and Subjective Norm (SN).

According to Theory of reasoned action, a person's attitude toward performing a specified behavior can determined by his or her salient beliefs about perceived outcomes or consequences of performing the behavior multiplied by evaluation of those consequences or outcomes:

$$A_B = \sum_{i=1}^k b_i e_i \quad (2)$$

Where,  $A_B$  is the attitude toward behavior,  $b$  is the salient belief about performing the specified behavior  $B$  leads to consequence or outcome  $i$ ,  $e$  is the person's evaluation of consequence or outcome  $i$  and  $k$  is the number of beliefs a person hold about the specified behavior (Fishbein & Ajzen, 1975, p. 301).

The above equation represents information-processing view of attitude structure and change, which posits that external stimuli do not affect person's attitude directly but can influence the person's belief formation which influence the person's attitude.

The normative component of the TRA model, SN, deals with influence of the behavior through social environment. According to TRA, a person's subjective norm (SN) is determined by sum of his or her normative beliefs ( $nb_i$ ) about perceived expectation of specified referent individuals and groups and multiplied by his or her motivation to comply ( $mc_i$ ) with those expectations (Fishbein & Ajzen, 1975, p. 302):

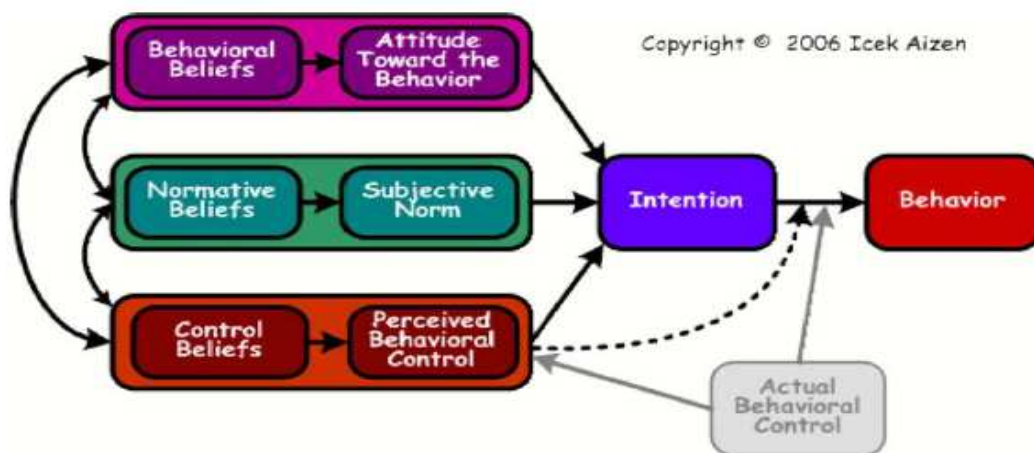
$$SN = \sum_{i=1}^k nb_i mc_i \quad (3)$$

Where, SN is the subjective norm,  $nb_i$  is the normative belief (i.e. the person's belief that referent individual or group  $i$  think that he or she can or can't do the specified task),  $mc_i$  is the motivation comply with referent individual or group  $i$ ,  $k$  is the number of individual or group referents.

According to Davis, et al., TRA is a general model as such; the belief construct is not included for performing a particular behavior (Davis et al. 1989). Researchers those who are using TRA model in his or her research to study human behavior should first identified the belief construct for that particular behavior being assessed (Davis et al. 1989). Previous study suggested that eliciting five to nine salient beliefs are sufficient to conclude the individual's behavior to do the specified behavior(Fishbein and Ajzen 1975).

The theory of reasoned action has been widely used in many domains and applied research (Davis et al. 1989). The TRA deals with prediction and explanation of behavior that is usually under an individual's volitional control. In TRA, behavioral intention can be determined by attitude towards the behavior and subjective norms, under a person's volitional control (Ajzen 1991). Theory of planned behavior is an extension of the theory of reasoned action that will allow us to include consideration of non-volitional factors as determinants of behavior.

FIGURE 2: THEORY OF PLANNED BEHAVIOR



Source: <http://people.umass.edu/aizen/tpb.diag.html>

The TRA was not use for prediction of a specific behavior in a given situation. The TPB framework designed to predict human behavior in specific contexts. TPB differs from TRA by adding perceived behavioral control, which plays an important part in the TPB (Ajzen 1991). Perceived behavioral control differs from Rotter’s (1966) concept of perceived locus of control, locus of control remain stable across situations and actions, whereas perceived behavioral control vary across situations and actions (Ajzen 1991). According to TPB, perceived behavioral control refers to the individual’s perceived ease or difficulty of performing a specific behavior. According to Ajzen, behavioral achievement can be determined by perceived behavior control and behavioral intention (Ajzen 1991).

$$BI = (A_B) w_1 + (SN) w_2 + (PBC) w_3 \quad (4)$$

According to above formula of behavioral intention, behavioral intention to perform behavior at different situation and kinds can predicted by attitude towards behavior, subjective norm, and perceived behavioral control. Where,  $w_1$  is the empirical weight assigned to A,  $w_2$  assigned to SN, and  $w_3$  assigned to PBC respectively. Performance of the behavior can facilitate by multiplying each control belief (c) with the perceived power (p) of the particular control factor.

$$PBC = \sum_{i=1}^n cb_i p_i \quad (5)$$

The results of products are the summation of the n salient control beliefs to produce the perception of behavioral control.

According to Ajzen, the strength of individual’s intention to perform the specific behavior is determined by the favorable attitude and subjective norm towards that behavior, and the perceived behavior control (Ajzen 1991). According to TRA, the attitude, subjective norm, and perceived behavior control relatively vary across the behaviors and situations. In the previous researches’, TPB have been widely used across many domains such as meat consumption (Bonne et al. 2007), intentions to smoke (Smith et al. 2007; Walker et al. 2006), leisure (Walker et al. 2006), condom use(Bryan et al. 2006), technology adoption and use (Baker et al. 2007; Brown and Venkatesh 2005).

#### 4. INFORMATION TECHNOLOGY ACCEPTANCE

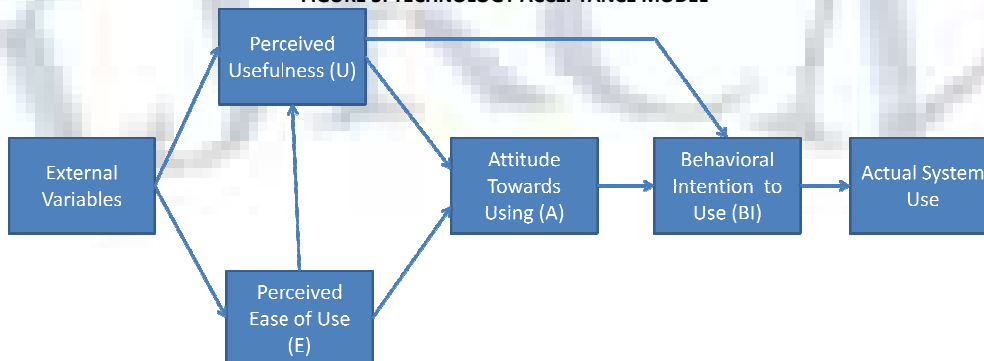
The Theory of Reasoned Action and the Theory of Planed Behavior were widely used to examine human behavior in general.

##### 4.1. TECHNOLOGY ACCEPTANCE MODEL

The Technology Acceptance Model has been used specifically to determine technology acceptance and usage behavior. Technology acceptance model was developed by Devis (1986). TAM was an adaptation of Theory of Reasoned Action, and it was specifically tailored to find out the determinants of technology acceptance of new technologies, used by the end users. TAM is theoretically justified and parsimonious model to predict user behavior across wide range of end user computing technologies. Researchers and practitioners can utilize TAM model to predict why a particular technology accepted or rejected by the end user, so that they can pursue corrective steps. The key purpose of TAM model is to determine the impact of external factors on internal beliefs, attitudes and intentions (Davis et al. 1989).

There are two main beliefs used in TAM, perceived usefulness and perceived ease of use, which were primary used for computer acceptance behaviors. Perceived usefulness (PU) defines that using the particular technology improve his or her job performance. Whereas, perceived ease of use (PEOU) defines that using a particular technology is free of efforts (Davis et al. 1989).

FIGURE 3: TECHNOLOGY ACCEPTANCE MODEL



The TAM model shows that actual usage of technology can determined by behavioral intention to use technology, but behavioral intention can be jointly determined by attitude towards using technology and perceived usefulness, with relative weights, forming the following equation:

$$BI = A + U$$

Form the equation, the A-BI relationship explain that people attitude to perform particular behavior have positive effect on his or her intention. The U-BI relationship explains that people form positive behavior about intention to use particular technology, if he or she thinks that using the technology improves his

or her job performance. Subjective Norm was not included in TAM, just because of its uncertain theoretical and psychometric status (Davis et al. 1989). According to TAM, Attitude towards a particular technology can jointly determined by perceived usefulness (U) and perceived ease of use (EOU), with their relative weights estimated by linear regression:

$$A = U + EOU$$

TAM model represents that there is direct effect of Perceived usefulness (U) on behavioral intention over and above attitude (A). The above equation also posits that perceived usefulness also influence the attitude (A). Perceived ease of use (EOU) has also significant positive effect on attitude. The TAM model also represent that improved perceived ease of use (EOU) contributes to improve the performance. So, perceived ease of use (POU) has direct effect on perceived usefulness (Davis et al. 1989). Perceived usefulness also effected by external fctors over and above perceived ease of use (EOU) and forming the following equation:

$$U = EOU + \text{External Factors}$$

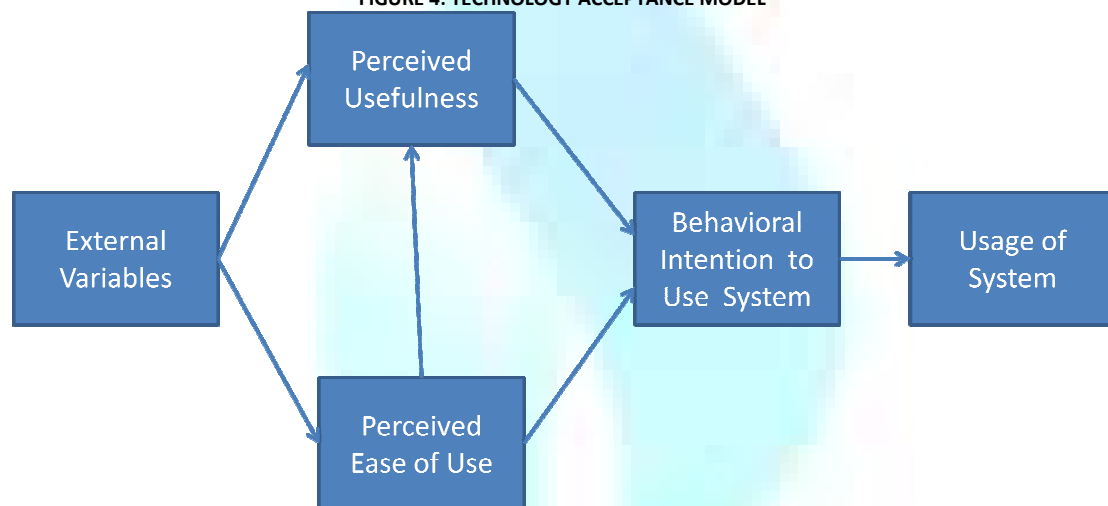
According to TAM, perceived ease of use can be influenced by extrenal factors. There are many features of an interface such as menus, icons, etc. which enhance the usability of particular computer system.

$$EOU = \text{External Factors}$$

The impact of external factors on perceived ease of use has been documented by many researchers (Davis et al. 1989). There is a controvesy in the literature regarding inclusion of attitude in the final model of TAM. The Attitude towards using a technology was omitted by (Davis et al. 1989) in their final model. Based on empirical analysis in their final model it was found that there is weak link between perceived usefulness and attitude, and there is strong link between perceived usefulness and behavioral intention. On the basis of empirical analysis attitude was excluded from the final TAM model. An exhaustive literature review reveals that many researchers have not included attitude in their research model. But in few studies (Sanchez-Francis and Roldan 2005) and (Gong et al. 2004) it was found that attitude has a positive correlation with other constructs (perceived usefulness, perceived ease of use and behavioral intention) of TAM model. (Gong et al. 2004) have not given any explanation about inclusion of attitude construct in their research model. Accroding to (Sanchez-Francis and Roldan 2005), though, there were many researchers including Davis (1989), suggested it was not meaningful to include attitude construct in TAM model, but they obtained positive correlation suggest otherwise. So, (Sanchez-Francis and Roldan 2005), suggested to include attitude construct in TAM studies.

Subjective Norm (SN) was a critical construct of theory of reasoned action and theory of planned behavior, but this construct was also excluded from the TAM to detremine the behavioral intention to use technology. It was acknowledged by (Fishbein and Ajzen 1975) that subjective norm is the least understood facet of theory of reasoned action. There was no significant relation found between subjective norm and behavioral intention to use (Davis et al. 1989). Hence, there was no evidence which shows significane relationship between subjective norm and behavioral intention, this construct was not included in the original TAM model (Davis et al. 1989).

FIGURE 4: TECHNOLOGY ACCEPTANCE MODEL



Source: (Venkatesh and Davis 1996)

While TAM model has been widely used to predict acceptance and usage behavior by using two key construct perceived usefulness and perceived ease of use, but still, it is limited to provide sufficient information to IT professional and managers to be in a better position to conduct effective intervantion programs to improve user acceptance of new technologies. This limitation influence the researchers (Venkatesh and Davis 2000) to focus on the antecedents of perceived usefulness and perceived ease of use. As depicted in the TAM model that there are few other external factors which impact on intention to use computer system. According to Davis, et al., there are various external factors such as individual differences, situational constraints and managerial controllable intervantion that impinging on behavioral intention to use system mediated through two key beliefs about system usage: perceived usefulness and perceived ease of use (Davis et al. 1989).

#### 4.2. ANTECEDENTS OF PERCEIVED USEFULNESS

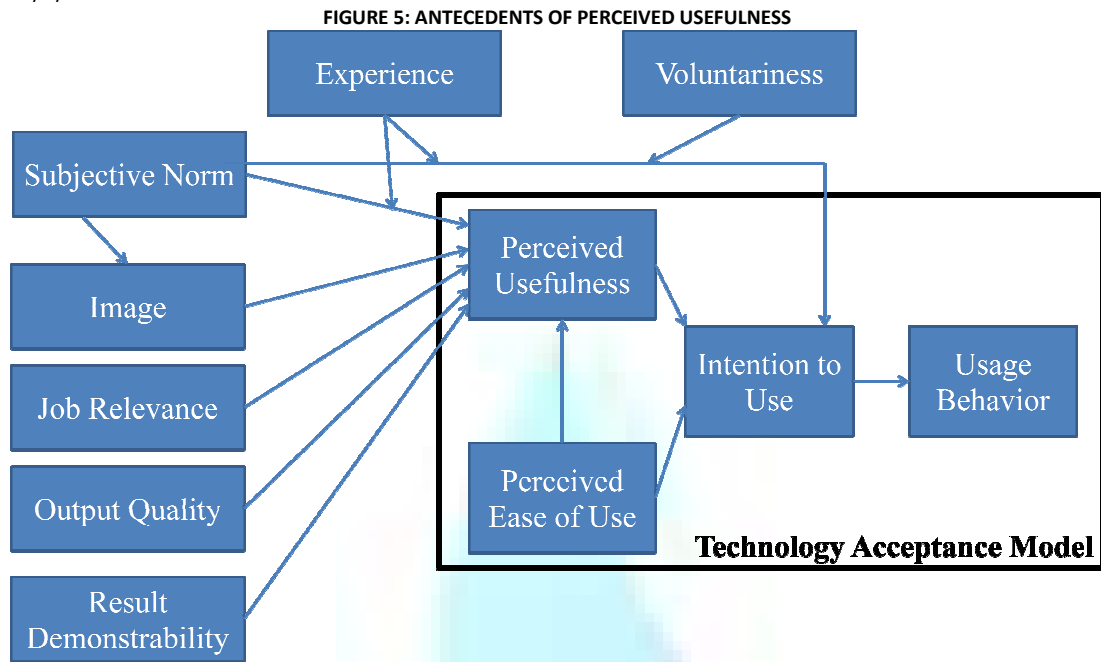
TAM has been found as well-established robust and parsimonious model for predicting user acceptance and usage. Many empirical test on TAM model suggests that perceived usefulness has consistently been a strong determinant of technology usage intention, with standard regression coefficients typically around 0.6 (Venkatesh and Davis 2000). During study it was found that perceived usefulness is a fundamental driver of usage intentions, it was important to determine the determinants of this construct and how its influence changes over time with increasing experience using the system (Venkatesh and Davis 2000). Perceived ease of use is also a direct construct to predict usage behavior and has a less consistant effect on intention across many studies, but there are many studies in which researcher have detremine the determinants of perceived ease of use, but detremnants of perceived usefulness have relatively overlooked (Venkatesh and Davis 2000).

A better understanding of detremnants of perceived usefulness will provide us useful information to design organizational intervantions to improve user acceptance and usage of new information system. (Venkatesh and Davis 2000) extnded the TAM by adding additional determinants of TAM's percieved usefulness and assessed that how these determinants will change over time and gaining experience with the target system. The TAM model they extended referred to as TAM2.

Using TAM as strating point, in TAM2 (Venkatesh and Davis 2000) included some additional theoretical constructs spanning social influence processes (Subjective norm, voluntariness, and image) and cognitive instruments processes (job relevance, output quality, result demonstrability, and perceived ease of use). TAM2 was tested using four logitudinal field studies. These four sites spanned a range of industries, organizational contexts, functional areas, and the type of systems be used. From these four sites two sites were choosen, where the usage was mandatory and the other two sites chooses where the usage was voluntary. The questionnaires were distributed to potential users at three different points in time: after initial training (T1), on month after implementation (T2), and three months after implementation (T3). Self-reported usage behavior was measued at T2 and T3, and also five months after implementation (T4). The results from the study suggests that study 1 and 2, the use of the new system was voluntary while study 3 and 4, the use of new system was mandatory. TAM2 was strongly supported in all the four organizations and three time periods. The results explaining upto 60% of the variance in perceived usefulness. Futhermore,



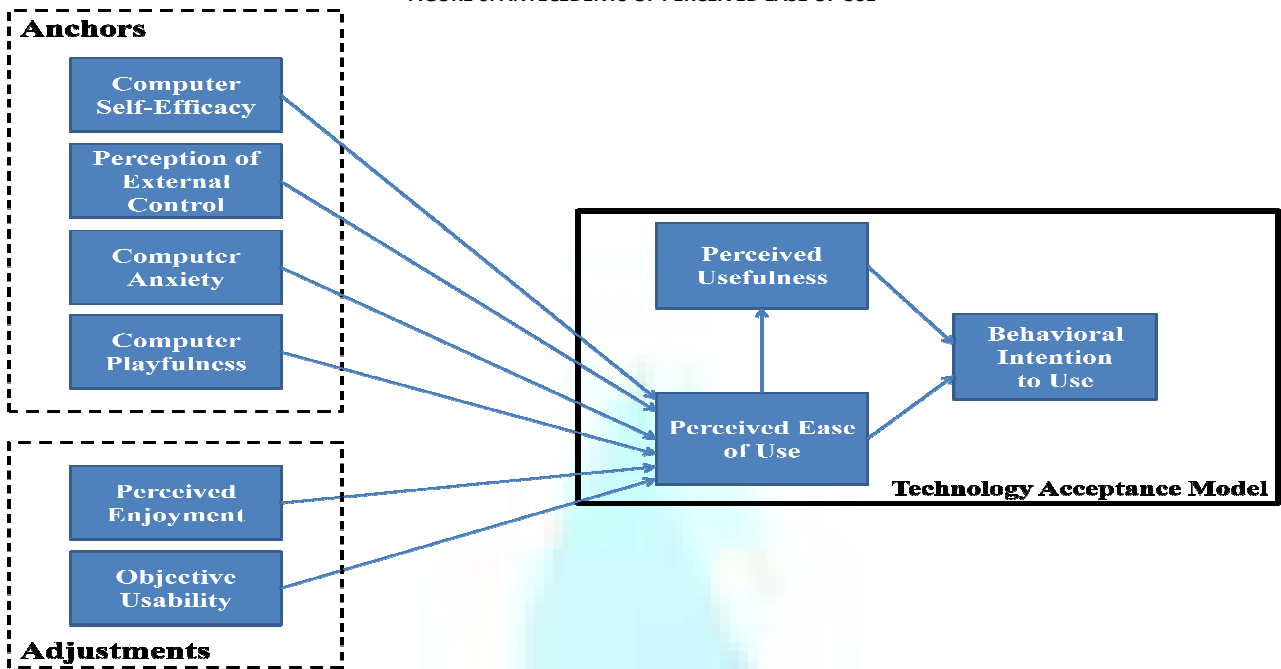
TAM2 extends TAM by showing that subjective norm exerts a significant direct effect on usage intention over and above PU and PEOU for mandatory system use but not for voluntary system use.



**4.3. ANTECEDENTS OF PERCEIVED EASE OF USE**

Previous studies suggest that perceived ease of use is an important determinant that influences user acceptance and usage behavior of new computer systems. Although, there have been several researches conducted in order to determine the impact of perceived ease of use on behavioral intention to use system, very less work has been conducted to understand the other determinants that influence the TAM's perceived ease of use (Venkatesh 2000). There were many studies conducted by many researchers with emphasize on system design characteristics or training when trying to enhance user perception of the ease of use of the system, but they overlooked the other controlled variables such as individual difference and variables that were a results of a new system-user interaction (Venkatesh 2000). A theoretical model was developed by (Venkatesh, 2000), based on anchoring and adjustment-theoretical framework.

FIGURE 6: ANTECEDENTS OF PERCEIVED EASE OF USE



Source: (Venkatesh 2000)

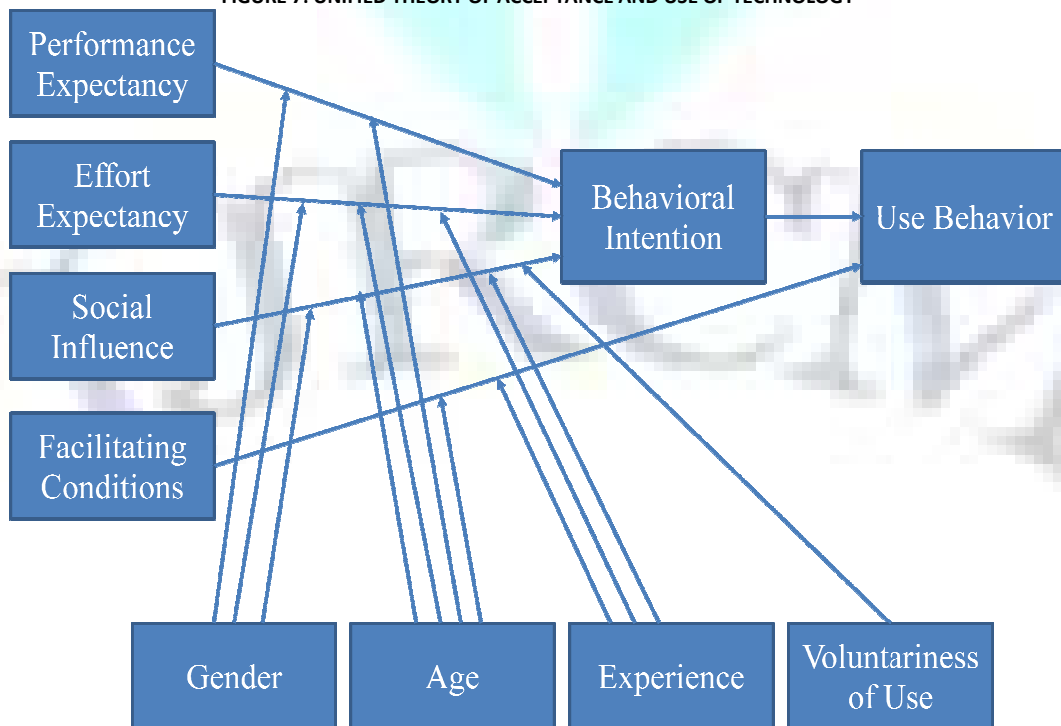
The proposed model control (internal and external – conceptualized as computer self-efficacy and facilitating conditions, respectively), intrinsic motivation (conceptualized as computer playfulness), and emotion (conceptualized as computer anxiety) as anchors that determine early perceptions about the ease of use of new system.

The extended TAM was tested in three different organizations among 246 employees over three-month period to test the impact of computer self-efficacy, perception of external control, computer anxiety, computer playfulness, perceived enjoyment, objective usability on intention to use new system mediated through a key construct of TAM model perceived ease of use. The results obtained from the regression analysis shows that all the determinants were significantly relate with the perceived ease of use, and there was 60% of the variance in the system-specific perceived ease of use. The findings from this research model suggest that there is a need for an increased focus on individual difference variables in order to enhance user acceptance for new system, rather than more emphasize on perception and design characteristics (Venkatesh 2000). Results also suggest organizing basic training programs to improve computer skills, as they have strong impact on acceptance and usage behavior.

**5. UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)**

Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003) proposes that an individual’s intention to use an information system is driven by performance expectancy, effort expectancy, and social influence. Actual system usage is driven by intention to use the system and by facilitating conditions. In the model, these constructs are moderated by gender, age, experience, and voluntariness of use. The model draws from a number of earlier models that attempt to explain an individual’s behavior (theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, and a combined theory of planned behavior/technology acceptance model, model of PC utilization, innovation diffusion theory, and social cognitive theory). Validation tests conducted by (Venkatesh et al. 2003) found that UTAUT explained 70% of the variance in information system usage intention.

FIGURE 7: UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY



Source: (Venkatesh et al. 2003)

The four constructs that directly affect intention and behavior in UTAUT are performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to an individual's expectation that using the system will result in better job performance. Effort expectancy refers to an individual's expectation about the difficulty involved in using the system. Social influence refers to an individual's perception of how other individuals of importance to him/her feel about him/her using the system. Last, facilitating conditions refers to an individual's perception of factors that exist within the organization that would encourage his/her use of the system.

## 6. CONCLUSIONS

However, Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) have been used by many researchers and academicians, but these theories were widely used in to determine the human behavior in general. TAM was developed by Davis, and is widely used model in information systems to determine the individual's behavioral intention to use information technology. Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the main factors of Technology Acceptance Model. There were many researchers, those who extended the Technology acceptance model by determining the external factors that have significant positive or negative effect on the individual's behavioral intention to accept or reject the Technology.

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## CONSUMER BEHAVIOUR ON FAST MOVING CONSUMER GOODS – A STUDY WITH REFERENCE TO PERSONAL CARE PRODUCTS IN MADURAI DISTRICT

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### ABSTRACT

*Consumer behaviour assumes much importance in the present consumer oriented marketing system with particular reference to 'gender attention'. The FMCG sector consists of four product categories such as Household Care, Personal Care, Food & Beverage and Tobacco each with its own hosts of products that have relatively quick turnover and low costs. Every consumer is purchasing a particular product due to the influence of many factors. The influencing factors differ from one consumer to another and from product to product also. Similarly the brands which hitherto occupied a place in the minds of the consumers have started to disappear due to various sales promotion techniques and the quality brands from FMCG have slowly started to attract the rural consumers. Though there is a different ways and means to exhaust and to distribute abundantly produced personal care FMCGs products in markets, but the consumers in the market are influenced generously by responding to selling habits of retailers both in urban and rural market. In markets the consumers usually purchase what is available at the retail outlet. Therefore the producers of personal care FMCGs should progressively strengthen their distribution reach in the market. At the same time, there are some challenges such as poor distribution system, fragmented rural market and heterogeneity of population which the retailers ought to meet for satisfying the needs of consumers.*

### KEYWORDS

Brand; Consumer Behaviour; FMCGS; Personal Care Products; Rural Marketing.

### INTRODUCTION

Marketing is all about knowing the consumers. Rural consumers are fundamentally different from their urban counterparts and different rural geographies display considerable heterogeneity and hence it requires rural specific and region specific analysis of consumer behaviour for understanding the rural consumers and to know well to what extent the consumer welfare is being enjoyed by the rural consumers. A rural consumer may be illiterate but he is not unintelligent. He is conscious of value for money and for every rupee he spends, he expects good value. His decision to purchase a product is influenced by a lot of consultations with family members, co-consumers and this approach is indicative of his high involvement to purchase a product. Even suggestive advertising does not work with him. Rural consumer is said to be the pivot around which all the retail business practices and activities revolve. Hence, satisfaction of the consumers becomes the most important goal of retail business. Being influenced by various factors, consumer-shopping behaviour which is a part of consumer behaviour assumes much importance in the present consumer oriented marketing system in rural area with particular reference to 'gender attention'.

India is one of the world's largest food producers, producing around one tonne of food for every single inhabitant and the second largest producer of fruit and vegetables. India is also one of the world's major food and drinks markets, reflecting the large population rather than high spending levels. A study by the Federation of Indian Chambers of Commerce and Industry (FICCI) concluded that the food market alone was around US\$70 billion in 2004, although that is most likely an underestimate. The Indian Department of Commerce forecasts that investment in the segment will exceed US\$4.8 billion in the financial year ending in 2005.<sup>1</sup> Rural markets account for around 56 percent of total FMCG demand, although some companies believe that much more can be done by the organized sector to tap rural demand. The sector generates 5% of total factory employment in the country and is creating employment for three million people, especially in small towns and rural India.<sup>2</sup> The FMCG sector consists of four product categories such as Household Care, Personal Care, Food & Beverage and Tobacco each with its own hosts of products that have relatively quick turnover and low costs.

Madurai district is the second largest district in the state of Tamil Nadu. Madurai district is basically rural dominated agriculture district. Madurai district comprises seven taluks namely Madurai South, Madurai North, Peraiyur, Usilampatti, Melur, Vadipatti and the Thirumangalam. All the taluks have both the urban and the semi-urban and rural characteristics. Madurai district is provided with good infrastructural facilities for almost all its entire area in respect of transport, communications and power supply. The railway lines connect all the major towns within and outside the state. Besides, the district possesses a very good communication network and almost all the villages in the district are fully electrified. The density of Madurai district is higher than the densities of the state and the nation (Which have a density of 429/sq.km. and 221 sq/km. respectively). The proportion of women to men is 964 to 1000 in Madurai district compared to the ratio of 978 to 1000 for the state. Total workers in the district agricultural labourers accounted for nearly 35.29 per cent, cultivators for 16.37 per cent and other workers for nearly 31.91 per cent of the total number of workers. The household industry, manufacturing and the like accounted for 12.09 per cent of the total number of workers; while the marginal workers constituted the remaining 4.34 per cent of the same. Hence there is an abundant scope towards demand and supply for FMCGs in this district. With this back ground information the authors have prepared this paper with following objectives such as

1. To analyse the factors influencing the consumer on brand preference of personal care FMCGs in the study area
2. To study the attitudes and level of satisfaction of consumer on personal care FMCGs in study area
3. To study the factors influencing on the buying behavior of consumer towards personal care FMCGs in Madurai district

### REVIEW OF LITERATURE

The Unfulfilled needs and wants of human beings given birth to product or service which looks for a prospects to hit upon breathing space in the markets. The marketers in India are penetrating rapidly to tap the titanic untapped markets. The consumers are confronted with a complex set of alternatives in many

<sup>1</sup> A cover story entitled "corporate India" published , Mumbai, March 16-31, 2008, Pp 83-88

<sup>2</sup> <http://www.naukrihub.com/india/FMCG/overview/>

purchase situations. They have to choose the products and product classes from many varieties worth their money and efforts. Again from each product category they have to make selections from different sizes, colours, models and brands.

**C.V.Kumar (2007)** in his article entitled FMCG Spear Heading, States that FMCG Sector provides employment to three million people in downstream activities. Further the stressed that there is a greater disposable income in the hands of Indian Consumer especially the Indian Middle Class who are climbing up the aspiration ladder. The demand for FMCG products is all set to boom by 60 percent in 2007 and more than 100 percent by 2015. He has concluded that the implement of VAT has also make the sector more efficient with unorganized sector being brought under much strict. **Rajaram (2006)** in his articles entitled Trends and Growth of Indian Industry in FMCG studied the problems associated with rural markets and factors affecting FMCG companies. Further the trends of FMCG companies in India in terms of various categories of products as on 2005 has been analysed. Further he has concluded that the India FMCG has registered a 4.4 percent growth rate for Five year period from 1999 to 2003. Further it is concluded that categories like toilet soaps and washing powders that have struggled with growth over the last three years. **Thirulogachandar (2006)** has said MNCs Branding Strategies in India product perspective studied the brand strategies of MNCs products in India, Acquisition of local brands by MNC to achieve to growth in the FMCG sector. Managing FMCG brands to MNC to achieve the growth in the FMCG sector. Managing FMCG brands and building brands in consumer durables for reaching rural India. He concluded that initially Indian Consumers paid little attention to international brands of sector, luxury cars, breakfast, cereals, American colas, Jeans, Cosmetics and Sunglasses, Later things reverted in favour of these multinational brands, as consumers experiences with their products perspective Marketing Master Mind. **Nagaraja (2004)** found rural consumers as different type of consumers with whom clever and gimmicky advertisements do not work well. Quality of product and its easy availability were observed as primary and vital determinants of rural consumer’s buying behaviour. “Touch and feel” promotional activity has a guide high influence on rural consumers. **Shaprio (1999)** has mentioned, advertising increase brand awareness and affects consumer’s brand images but only rarely influences conscious decisions to choose a certain advertised brand. Brand image, on the other hand has a tremendous impact on product perceptions, it has often been found that people have different perception of products features.

**METHODOLOGY**

**SAMPLING**

Multi stage stratified random sampling method was adopted in the present study with block as the universe, the village as the primary unit for sampling purpose and the households as the ultimate units of the study. The first 10 villages in each 13 block making a total of 669 revenue villages for the whole of the district were selected which accounted for 3 respondents in each 130 villages selected based level of income such as low income, middle income and high income groups thus total of 390 consumers were selected in the entire Madurai district.

**COLLECTION OF DATA**

A detailed schedule was drafted pre-tested and used in field survey. Direct personal interview method has been adopted to collect primary data regarding the characteristics of the sample respondents, family profile, general shopping pattern, and extent of consultation, influences and other aspects to the overall objectives of the study. The secondary data relating to rural marketing practices and the like were obtained from the journals, books and websites.

**PERIOD OF STUDY**

The primary data were collected during month of September 2012 to February 2013.

**KEY WORDS**

**BRAND**

A brand of a product is the version of it that is made by one particular manufacturer.

**CONSUMER BEHAVIOUR**

Our business is based on understanding the consumer and providing the kinds of products that the consumer wants. We place enormous emphasis on our product development area and our marketing area and on our people knowing the consumer.

**FMCGs**

Fast Moving Consumer Goods also known as Consumer Packaged Goods are products that have a quick turnover and relatively low cost. FMCGs generally include a wide range of frequently purchase consumer products such as Personal Care, Household Care, Food and Beverage and Tobacco.

**PERSONAL CARE PRODUCT**

Personal care products refers to a product of personal care in nature which includes oral care, hair care, skin care, personal wash, cosmetics, and toiletries, deodorants, perfumes, feminine hygiene and paper products.

**RURAL MARKETING**

Rural Marketing is defined as any marketing activity in which the dominant participate is from a rural area marketing consists of marketing inputs (products or services) to the rural as well as marketing of outputs from the rural markets to other geographical areas.

**SUMMARY OF FINDINGS**

On the general personal care FMCGs shopping pattern of the sample respondents in the study area, Table 1 show that the numbers of family members using the selected personal care FMCG products namely tooth paste, health drinks, toilet soap and shampoo.

**TABLE NO. 1: NUMBER OF FAMILY MEMBERS USING THE PERSONAL CARE FMCGs**

Sl.No.	Product	Number of the respondents	Percentage
1.	Tooth paste	281/390	72.00
2.	Health drink	164/390	42.00
3.	Toilet soap	312/390	80.00
4.	Shampoo	153/390	39.33

Source: Primary Data.

It has been observed from Table 1 that out of 390 consumers selected maximum of 312 (80.00 per cent) of the consumers family members use toilet soap followed by 281 (72.00 Per cent) 164 (42.00 per cent) and 153 (39.33 per cent) of the consumers family members who we consumer goods like tooth paste, health drink and shampoo respectively.

With regard to monthly budget of the respondents for the purchase of personal care FMCG products of toothpaste, health drink, toilet soap and shampoo is presented in Table 2.

**TABLE NO. 2: RESPONDENTS MONTHLY BUDGET FOR PERSONAL CARE FMCGs**

Sl.No.	Monthly Budget (Rs.)	Number of the respondents	Percentage
1.	Below Rs.250	160	41.02
2.	250 – 500	95	24.36
3.	500 – 750	83	21.28
4.	750 – 1000	27	6.93
5.	Rs.1000 and above	25	6.41
	Total	390	100.00

Source: Primary Data.

The above Table 2 indicates that out of 390 respondents maximum 160 (41.02 per cent) of the consumers have monthly budget for personal care FMCGs below Rs.250 followed by 95 (24.36 per cent), 83 (21.28 per cent), 27 (6.93 per cent) of the consumers whose monthly budget for personal care FMCGs is between Rs.250 – 500, 500 – 750, 750 – 1000 and Rs.1000 and above respectively.

About the sources of buying for the selected products by the sample respondents are presented in Table 3.

**TABLE NO. 3: SOURCES OF BUYING FOR THE SELECTED PERSONAL CARE FMCGs**

Sl.No.	Buying Sources	Number of the sample respondents	Percentage
1.	Local petty shop	200	51.28
2.	Town retail shop	64	16.41
3.	Weekly market	38	9.74
4.	Margin free shop	20	5.13
5.	Others	68	17.44
	Total	390	100.00

Source: Primary Data.

It is observed from Table 3 that out of 390 sample respondents maximum of 200 (51.28 per cent) of them buy personal care FMCGs from local petty shop followed by 68 (17.44 per cent), 64 (16.41 per cent), 38 (9.74 per cent), and 20 (5.13 per cent), of the them who buy personal care FMCGs from other shops, town retail shop, weekly market and margin free shop respectively.

Regarding the frequency of purchases of the personal care FMCGs by the sample respondents is furnished in Table 4.

**TABLE NO. 4: FREQUENCY OF PURCHASES OF THE PERSONAL CARE FMCGs**

Sl.No.	Pattern of purchases	Number of the respondents	Percentage
1.	Daily	3	0.77
2.	Weekly once	4	1.02
3.	Monthly once	59	15.13
4.	Once in two months	40	10.26
5.	Whenever need arises	284	72.82
	Total	390	100.00

Source: Primary Data.

The above Table 4.4 reveals that out of 390 respondents maximum 284 (72.82 per cent) of them purchase personal care FMCGs whenever need arises followed by 59 (15.13 per cent), 40 (10.26 per cent), 4 (1.02 per cent), and 3 (0.77 per cent) of the consumers purchase monthly once, once in two months, weekly once and daily respectively.

On the mode of payment towards buying of personal care FMCGs, out of 390 sample respondents majority of 293 (75.13 per cent) of the consumers' mode of payment is by ready cash while 97 (24.87 per cent) of the consumers mode of payment is by credit.

**RELATIONSHIP BETWEEN CONSUMER BEHAVIOUR AND CHARACTERISTICS OF THE SAMPLE RESPONDENTS**

This section devotes itself to a discussion of the relationship between the consumer behaviour such as brand preference, of the selected products and characteristics of the sample respondents such as age, sex, education, occupation and income of the family.

**THE ANALYTICAL FRAMEWORK**

In order to examine the relationship between the brand preferences and characteristics of the sample respondents, Chi-square test has been applied. The degrees of freedom exceed 30 and above the Bartlett's test were used.

$$= \sum \frac{(O - E)^2}{E}$$

Chi-square with (r-1) (c-1) degree of freedom

Where

O = observed frequency

E = expected frequency

C = number of column in a contingency table

R = number of row in a contingency table.

The calculated value of chi-square is measured with the table value of chi-square for given level of significance usually at 5 per cent level. If at the stated level, the calculated value (C.V) is less than the Table value (T.V), the null hypothesis is accepted and otherwise it is rejected. It the degree of freedom exceeds 30; Bartlett's test has been applied.

Ho: There is no relationship between profile of the respondents such as age, sex, education, occupation and monthly income and Brand Preference of Personal care FMCGs

**TABLE NO.5: RESULTS OF CHI- SQUARE TEST FOR PROFILE OF THE RESPONDENTS AND BRAND PREFERENCE**

Sl.No.	Statement	X <sup>2</sup> Calculated value	X <sup>2</sup> Table value	Degrees of freedom	Level of significant
1.	Age and Brands Preference	47.123	26.296	16.50	Significant
2.	Sex and Brands Preference	38.196	15.507	8	Significant
3.	Education and Brand Preference	50.023	36.415	24	Significant
4.	Occupation and Brands Preference	52.778	36.415	24	Significant
5.	Monthly Income and Brands Preference	53.211	36.415	24	Significant

Source: Primary data

Table 5 shows that the calculated value is greater than the table value for all above said hypothesis. Hence the author has rejected the entire null hypothesis framed. Therefore, it could be inferred that the age, sex, education, occupation and monthly income of the respondents does influence the purchase of various brands of personal care products.

**FACTORS INFLUENCING THE PURCHASE OF THE SELECT PERSONAL CARE FMCGs**

Every consumer is purchasing a particular product due to the influence of many factors. The influencing factors differ from one consumer to another and from product to product also. In this section, an attempt has been made to identify the factors which influence the purchase of the selected personal care FMCGs in the study area.

In order to identify the factors which influence the purchase of fast moving consumer goods, Garrett's Ranking Technique<sup>3</sup> is adopted. For this, the sample respondents were asked to rank the factors in order of their importance. The order thus given by the respondents was converted into ranks by using the following formula.

<sup>3</sup>Garrett E.Henry, Statistics in Psychology and Education, Vakils, Feffer and Simons Private Ltd., 1969, pp.328-331.

$$\text{Per cent positions} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

where,

$R_{ij}$  = Rank given for the 6<sup>th</sup> factor by j<sup>th</sup> respondents

$N_j$  = Number of factors ranked by j<sup>th</sup> respondents

The per cent position of each rank thus obtained was converted into scores by referring to the Table given by Garrett.

Then for each factor the scores of respondents were added together and divided by the total number of respondents. The mean score for all the factors was arranged in a descending order; ranks were assigned and the important factors identified.

Here, the researcher attempted to identify the factors that influence the purchase of personal care FMCGs and the one that is the most influencing factor. The ranks assigned to the twelve identified factors are presented in Table 6.

**TABLE NO. 6: FACTORS INFLUENCING THE PURCHASE OF PERSONAL CARE FMCGs**

Sl. No.	Factors	Tooth Paste		Health Drink		Toilet Soap		Shampoo	
		MS	R	MS	R	MS	R	MS	R
1	Freshness	44.95	I	---	---	32.63	IV	--	--
2	Company image	40.45	II	33.29	IV	31.29	V	20.89	IX
3	Medicinal value	39.09	III	25.43	VI	26.10	VIII	---	---
4	Taste	36.55	IV	37.18	II	---	---	16.35	XII
5	Price	33.25	V	20.29	VII	33.86	III	39.10	II
6	Date of manufacturing	30.05	VI	29.99	V	26.79	VII	30.68	VI
7	Advertisement	28.03	VII	16.97	IX	30.29	VI	33.92	IV
8	Lather	27.40	VIII	---	---	35.85	II	26.74	VII
9	Herbal	26.73	IX	---	---	---	---	32.46	V
10	Colour	23.46	X	15.22	X	18.27	XI	19.66	X
11	Availability in different sizes	17.29	XI	13.75	XI	21.85	IX	16.99	XI
12	Package	16.98	XII	19.25	VIII	19.25	X	24.68	VIII
13	Flavour	---	---	34.54	III	---	---	---	---
14	Fragrance	---	---	---	---	38.49	I	39.89	III
15	Anti-dandruff quality	---	---	---	---	---	---	40.39	I
16.	Health	---	---	39.81	I	---	---	---	---

Source: Computed data. (MS: Mean Score; R: Rank)

From Table 6, it has been observed that about the factors influencing the purchase of tooth paste, freshness is the first factor ranked first which influences the respondents for the purchase of particular toothpaste. Company image ranked second, medicinal value, taste and price factors were ranked third, fourth and fifth respectively. The least factors which influence the respondents for the purchase of toothpaste are availability in different sizes and package which were ranked eleventh and twelfth respectively.

On the factors influencing the purchase of health drinks, it has been inferred that health ranked first among the various factors of health purchase followed by taste, flower, company image and date of manufacturing that were ranked second, third, fourth and fifth respectively. The least factors that influence the purchase of health drinks are advertisement, colour and availability in different sizes which are ranked ninth, tenth and eleventh respectively.

Regarding the factors influencing the purchase of toilet soap, it has been revealed that fragrance ranked first among the various factors which influence the respondents' purchase of toilet soap followed by later, price, freshness and company image that were ranked second, third, fourth and fifth respectively. The least factors that influenced the respondents were durability, package and colour which were ranked fifth, eleventh and twelve respectively.

With regard to the factors influencing the purchase of shampoo, it has been observed that the factor Anti-dandruff quality was ranked first which influences the respondents to purchase shampoo followed by price, fragrance, and advertisement and herbal that were ranked second, third, fourth and fifth respectively. The least factors that influence the respondent to buy shampoo are colour, availability in different sizes and medicinal value which were ranked tenth, eleventh and twelfth respectively.

**OPINION OF CONSUMERS' PREFERENCE ON TOP FIVE BRAND OF FMCGs**

Generally in retail marketing of FMCG, the consumers are influenced to select a particular brand of FMCGs. For the purpose of analyzing the opinion of consumers regarding top five brands of FMCGs preferred in markets in the Madurai district, the researcher has selected four major personal care products such as toilet soap, shampoo, health drinks and tooth paste in the categories of personal care products under FMCGs. In these selected four products the researcher has asked the opinion of consumers on the major brands of products preferred. The result is presented in Table 7.

**TABLE NO. 7: OPINION OF CONSUMERS PREFERENCE ON TOP FIVE BRAND OF PERSONAL CARE PRODUCTS OF FMCGs**

Rank	Tooth Paste		Health Drinks		Toilet Soap		Shampoo	
	Brand	Response (%)	Brand	Response (%)	Brand	Response (%)	Brand	Response (%)
1	Colgate	110 (28.20)	Horlicks	104 (26.67)	Hamam	117 (30.00)	Clinic plus	110 (28.20)
2	Pepsodent	91 (23.33)	Complan	94 (24.10)	Lifebuoy	91 (23.33)	Sunsilk	91 (23.33)
3	Close-up	80 (20.50)	Boost	75 (19.23)	Rexona	78 (20.00)	Chik	78 (20.00)
4	Vicko	61 (15.64)	Bournvita	64 (16.41)	Chinthol	59 (15.13)	Pantene	59 (15.12)
5	Cibaco	48 (12.30)	Viva	53 (15.39)	Lux	45 (11.54)	Dove	52 (13.33)
		390 (100.00)	Total	390 (100.00)	Total	390 (100.00)		390 (100.00)

Source: Primary data

Regarding the toothpaste 110 consumers have used the Colgate tooth paste followed by the Pepsodent and close up under study. On the major five brands of health drinks used in the study area, out of 390 selected consumers 104 consumers have preferred Horlicks is major brand of soft drinks followed by Complan and Boost under study. On the major five brands of toilet soap used in the study area, out of 390 selected consumers 117 consumers have preferred the Hamam soap followed by lifebuoy and Rexona under study. About the shampoo, 110 consumers have used clinic plus shampoo followed by Sunsilk and chick under study.

**OPINION OF CONSUMERS ON THE FACTORS INFLUENCING THE LEVEL OF SATISFACTION TOWARDS PERSONAL CARE FMCGS**

Satisfaction is very important for the consumer to feel happy while using the any kind of products FMCGs. The factors influencing the consumer to have satisfaction with personal care FMCGs is given below in table 8.

**TABLE NO. 8: OPINION OF CONSUMERS ON THE FACTORS INFLUENCING THE LEVEL OF SATISFACTION TOWARDS PERSONAL CARE FMCGs**

Sl. No	Factors	Response on Level of Satisfaction					Total Scores
		Highly Satisfied	Satisfied	Neutral	Dissatisfied	Highly Dissatisfied	
1	Quality	95	85	90	70	50	1275
2	Colours	80	60	80	95	75	1145
3	Price	108	87	98	57	40	1336
4	Quantity	78	62	97	72	81	1154
5	Brand image	120	70	60	90	50	1360
6	Social status	85	72	63	75	95	1147
7	Package	130	60	80	70	50	1320
8	Design	73	69	98	79	91	1164
9	Energy	137	95	69	52	37	1413
10	Offer & Discount	120	98	75	54	43	1368

Source: Primary data

Most favourable attitude	-	5 x 390 = 1950
Neutral attitude	-	3 x 390 = 1170
Most unfavourable attitude	-	1 x 390 = 390
Energy	-	1413 scores
Offer	-	1368 scores
Brand	-	1360 scores
Price	-	1336 scores
Packages	-	1320 scores
Quality	-	1275 scores

Responses recording the level of satisfaction of the respondents on Energy, Offer, Brand, Package, and Quality are more than neutral value of 1170. Hence according to Likert's Summated Scale, the respondents are satisfied with those factors.

Colours	-	1145 scores
Status	-	1147 scores
Quantity	-	1154 scores
Design	-	1164 scores

Responses regarding the level of satisfaction of the respondents on colours, social status, Quantity, Design are less than the neutral value of 1170. Hence according to Likert's summated scales, the respondents were dissatisfied with those factors. According to Likert's summated scales, it is concluded that the majority of respondents were satisfied with the Energy, Offer, Brand, Price, Package and Quality.

**SUGGESTIONS**

Rural market is a huge market and to tap it fully it is needed to improve the efficiency of distribution channel so that rural consumers receive required commodities at right time, at right place and affordable prices. Hence the marketers need to concentrate the rural market by way of effective advertising and attractive packaged goods. As a result, the consumption pattern of rural people will be changed drastically.

One of the observations of the study is that illiteracy is a major hindrance in the way of rural marketing. So audio-visual add are most effective in rural areas to inform the consumers regarding the commodities.

Among the rural consumers the use of tooth paste and shampoo is very meager. It shows that they follow traditional methods and are unaware about the product usage and its benefits. So FMCG companies should create awareness about the usage of toothpaste and shampoo, educate the product values and increase their market share.

The brands which hitherto occupied a place in the minds of rural consumers have started to disappear due to various sales promotion techniques and the quality brands from FMCG have slowly started to attract the rural consumers. Hence it is recommended that rural market retailers should strive to maintain the superior quality products and enhance the brand image of their FMCG to retain the rural consumers' confidence and win loyalty.

Conventionally the rural consumers prefer to buy products from available retailers. Retailers' proximity to one's living area influenced the buying of customers over brand considerations. But most of the time rural retailers are unable to update their inventory due to financial constraints and lack of interest in brand promotions. Hence it is recommended that small retailers must manage their stock to the best of their ability even in rural markets.

Generally retailers in rural market sell their FMCG higher rates than maximum retail price hence it is advised that the retailers may strictly adhere to sell FMCG at least in maximum retail price.

**CONCLUSION**

Variety of personal care FMCGs consumer products dumped in the market has great implications on the buying behaviour of both urban and rural consumers. Though there is a different ways and means to exhaust and to distribute abundantly produced FMCGs products in markets, but the consumers in the market are influenced generously by responding to selling habits of retailers both in urban and rural market. In rural markets the consumers usually purchase what is available at the retail outlet. Therefore the producers of personal care FMCG should progressively strengthen their distribution reach in the market. At the same time, there are some challenges such as poor distribution system, fragmented rural market and heterogeneity of population which the retailers ought to meet for satisfying the needs of consumers. Hence the marketers of personal care FMCGs should understand these challenges and tune their strategies accordingly will surely be the winners in the years to come taking advantage of the changing needs of vast section of consumers in the society.

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### **ABSTRACT**

*A distribution channel consists of chain of intermediaries which transfers the goods and services from producer to end customers, henceforth bridges the gap between producer and consumer. It helps companies in reaching their target market and delivering superior value proposition to customers. Researchers have tried to understand the channel satisfaction Index for Videocon mobile services and its competitor in Punjab and to find out the limitations and scope for improvement in its present business scenario. Researchers want to gain insights into the efficiency and effectiveness of the channel, especially at the dealer & the retailer level and need to retain & motivate channel participants. Besides, it seeks to find out and study the challenges being posed by organization in its document management supply chain and claim settlement.*

### **JEL CLASSIFICATION**

M31

### **KEYWORDS**

Channel partners, Claim settlement, Document handling, Factor analysis, Satisfaction.

### **INTRODUCTION**

 Videocon Telecommunications Limited (VTL), a Videocon Group company is a GSM based cellular operator in India based in Gurgaon, Northern Capital Region. With 1.9 million subscribers and a market share of 0.31 percent<sup>4</sup>, VTL offers GSM mobile services under the brand name Videocon. The services are already running in Tamil Nadu, Punjab, Haryana, Mumbai, Gujarat, Kerala, Madhya Pradesh, UP East, UP West, Himachal Pradesh and soon will be present across the country. Because of the late entry of Videocon in Telecom market in India it is facing high competition from major players like Airtel, Idea, Reliance Communications, Vodafone, Tata Indicom, BSNL etc.

A distribution channel consists of chain of intermediaries which transfers the goods and services from producer to end customers, henceforth bridges the gap between producer and consumer. It helps companies in reaching their target market and delivering superior value proposition to customers. The channel partners (such as dealers, distributors, resellers) play a crucial role in the effective functioning of the channel. Their needs and goals may not always be aligned to those of the producers or the consumers. Companies need to design an effective distribution channel and work in collaboration with the channel partners, taking any corrective actions based on periodic assessment and monitoring.

Telecom distribution channel in India basically comprises of three actors or entities - a distributor who is given a territory to service, a DSR (District Sales Representative) present on payroll of the distributor, who is appointed by the distributor to service a portion of his overall territory and a retailer who is an entity who purchases stock from the distributors (from the servicing DSR) and sells it to the end consumer. Of course, other conventional channels like direct sales/online sales or branded retailer are also used. Distribution channel is generally seen to be contributing to around 65-75% of a telecom company's subscriber base as well as revenues.

The channel partners are the important elements for any of the service based company. Their efficiency and effectiveness leads to the proper application of the strategies adopted by the company. Leading mobile telecom providers have two separate channels for prepaid and post-paid connections. Within the prepaid segment, there are different channel structures for the urban and rural areas. In urban areas, the company supplies to distributor who in turn supplies to the retailer. There is a Distribution Sales Executive (DSE) attached to the distributor whose salary is sometimes reimbursed by the service provider. On the service provider end, there is a channel manager who overlooks the functioning of the channel. In the rural segment, the channel structure is similar to the urban with the addition of a sub distributor between the distributor and retailer.

### **REVIEW OF LITERATURE**

There has been conducted a lot of studies and researches to understand the channel performance and satisfaction of various service based industries including the telecom industry. The channel satisfaction level has always been found to be affected by a variety of the factors. These factors are related to the service operator's efficiency of service and the supply chain management system of service provider. (Choudhury & Alam, 2012) in their research found out the various factors influencing the retailer's perception and ultimately the satisfaction towards the mobile operators. The main factors of the study were commission, convenience, promotion, after-sale service, consumer demand and earned profit. It was found out that the factors that influence most is promotion and earned profit followed by consumer demand. (Heggde & Kumar, 2011) studied the sustainable channel relations that the channel members like the company executives at the distributors and the retailer ends tend to be crucial in framing the channel relations. The study resulted that the efficiency of a distribution system is increased by following a proper audit process for monitoring the pricing policies, margins, nature of product line, new products launch, servicing policies,

<sup>4</sup> As per TRAI data March 2012

territory of operation and sales force. The research study suggested to focus on the retailers separately on the basis of the high performer and low performers. (Srivastava, Akhter, & Shashank, 2011) analyzed the retailer satisfaction of BSNL in Kanpur zone of India and found out that more than one third of the retailers were not satisfied by the company's services. It was found out that the distribution department was maximum times at fault. Moreover the study concluded that the behavior of the officials and agents was not appreciable towards the retailer side. (J. Csapak James, 1995) undertook a research to find out the relationship of the channel structure, the service quality and the distribution system of the organization. In this study the researcher found out that the indirect channels of distribution for service were perceived as providing superior service quality when compared to the direct channel but short direct channels permit greater control of service quality. (Shoham, Brencic, Virant, & Ruvio, 2008) studied the effect of standardization in various processes regarding the channel management on the basis of the characteristics like coordination, support, autonomy, communications, and control of firm and suggests that the standardization of processes affects the behavioral outcomes and the international performance positively. (Kabadayi, Eyuboglu, & P. Thomas, 2007) studied the performance of the multiple-channels with respect to the various environment variables and specifically the channel's contribution to overall firm performance and concluded that a proper alignment of the multiple channels with the business strategy and environment conditions tends to improve the performance of the channel. (Arcelus, Srinivasan, & Kumar, 2005) evaluated the role of trade incentives specifically designed to prevent the retailer's forward-buying practices by examining the use of scan backs and direct rebates. It has highlighted the importance of cohesiveness of the retailer's pricing policy and the discount policy using scanner data. The performance has also been studied in terms of the relationship between the various points of the channel. (Samaha, Palmatier, & Dant, 2011) studied the effect of the perceived unfairness on the channel relationship by taking into consideration various relationship destroying factors like opportunism, conflict, control, etc. The study concluded that the perceived unfairness aggravates the negative effects of both channel member conflict and seller opportunism and acts as a relationship poison which directly damages the channel relationship. (Kadiyali, Chintagunta, & Vilcassim, 2000) conducted a study to measure the power of the channel members and reasons for this power by taking the parameters like demand and cost factors into consideration and found that retailer's market power is significant and the demand factors tend to be consistent with the conduct between the manufacturers and the retailers. (Christian, 2007) evaluated the performance of the channel with respect to the standardisation of various processes and found out that the factors like coordination, autonomy and communication are some of the key characteristics towards the satisfaction of the channel members. (Chen & Chang, 2010) assessed the effects of the different distribution channel strategies on the productive efficiency and satisfaction by studying various channel types and concluded that the channel strategies mostly work effectively in customisation with the various variables like direct and indirect channels, regulations, laws and others. (Vinhas, et al., 2010) studied the effective design and management of the channels of the distribution by assessing the variables like the direct marketing efforts, the retail outlets and the sales agents with the company and concluded that the customers and retailers' performance are very important for the channel satisfaction. In this study, the various variables and factors are taken from the above specified researches to study satisfaction of the channel members, mainly the retailers and the dealers, and their various behavioral characteristics.

## NEED AND SCOPE OF STUDY

A distribution channel is a chain of intermediaries; each passing a product down the chain, before it finally reaches the consumer. It bridges the gap between the producer or service provider and the consumer. Effective channels serve targeted market segments, maximize sales, minimize cost, and help producer companies gain a sustainable competitive advantage in delivering superior value to their customers. The channel partners (such as dealers, distributors, retailers) play a crucial role in the effective functioning of the channel. Their needs and goals may not always be aligned to those of the producers or the consumers. Companies need to design an effective distribution channel and work in collaboration with the channel partners. They should take corrective actions based on periodic assessment and monitoring.

The scope of this study is broader in nature. Its main emphasis would be on the assessment of the satisfaction level of the retailers and dealers with the channel management of the company. In addition to this, the study would be focusing on the document management process adopted by the company. Moreover, the VTL also wants to know the retailer's perception regarding their claim settlement policy. This broadens the scope of this study. This study has been conducted in the period of October to November 2012 in the 2 zones (5 cities) in which VTL is operating.

## OBJECTIVES OF THE STUDY

Considering the above discussed management research problem, the researcher is proposing following objectives for this research:

- To identify the factors affecting retailer's satisfaction level towards various mobile service operators.
- To evaluate the satisfaction level of the retailers towards the claim management and document management process of the various operators.
- To rank the various mobile service providers on the basis of the satisfaction level among the retailers.

## RESEARCH METHODOLOGY

### RESEARCH DESIGN

This research study has components of descriptive as well as exploratory research design. So, research design adopted for the present study would be both descriptive and exploratory in nature. The descriptive research is the exploration of certain existing phenomena and to obtain information concerning the current status of the phenomena in order to describe "what exists" with respect to variables or conditions in a situation. The idea behind this research is to study frequencies, averages, correlation and other statistical calculations. This study would identify and evaluate the channel performance and satisfaction in case of the mobile telecom companies in Punjab. In addition to the factors affecting the retailers' satisfaction level, the study would also be examining the document management process adopted by the company which would mainly comprise of the qualitative data; as such the exploratory component comes into picture. So, descriptive and exploratory, both research designs would be used in this study.

### TARGET POPULATION

Retailers and dealers involved in the distribution channel of the mobile service providers in Punjab. The study has been conducted on retailers, dealers and distributors who are operating in 2 zones (5 cities) of Punjab.

### SAMPLING TECHNIQUE

Here, researcher is proposing to follow 'convenience sampling' which will be performed purposefully. It is a type of non-probability sampling technique. Non-probability sampling focuses on sampling techniques where the units that are investigated are based on the judgment of the researcher. As this study is broadly on the 'Assessment of the satisfaction level of retailers associated with telecom industry'. So, the researcher has chosen this sampling design due to convenience and with the purpose of fulfilling the objectives of this proposed study.

### SAMPLE SIZE

The data is collected from 300 retailers in Punjab. The complete breakdown of the sample size from various areas is given in the table as follows:

TABLE 1: SAMPLE DISTRIBUTION

ZONE	Town	No of Retailers
Jalandhar	Hoshiarpur	50
	Jalandhar	75
	Nawashahr	50
Amritsar	Amritsar	75
	Batala	50
<b>Total</b>	<b>5 Areas</b>	<b>300</b>

Source: Researcher's Survey

**TYPE OF DATA**

For this proposed research study, researcher will use both the primary and secondary data. Primary data will be collected from defined target population with the help of questionnaire and secondary data will be collected from different sources like Internet, books, journals and periodicals.

**DATA COLLECTION TOOLS AND SOURCE OF DATA**

Major data for proposed study will be collected by means of structured questionnaires. To fulfil the objectives of proposed study a 'Likert scale' of five points will be used as a survey instrument to record the preferences of retailers. Few dichotomous questions will also be put into the questionnaire for measuring the document management process. The secondary data will be collected from the company's annual reports, various magazines, newspapers, internet, journals etc.

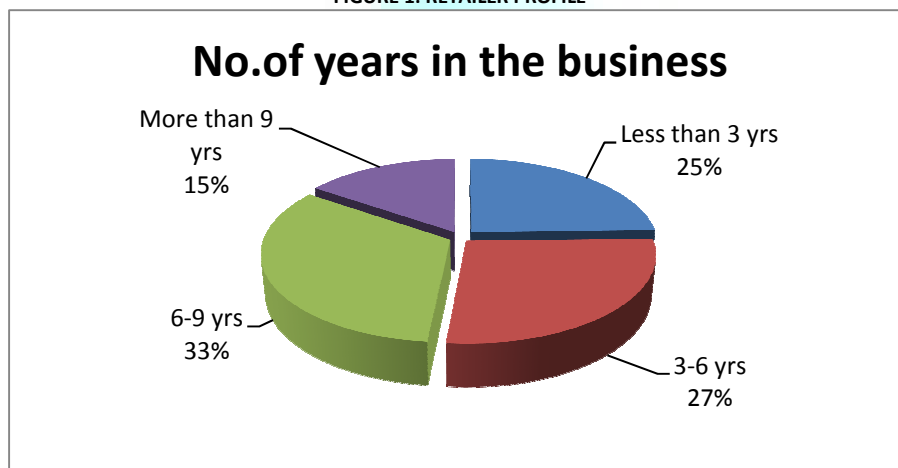
**DATA ANALYSIS**

The data collected is regarding two categories – first, the satisfaction assessment and second, the document management process and claim settlement. To begin with, the descriptive of the data are highlighted. The factor analysis is used to find out the main factors governing the satisfaction level of retailers with the various service providers. This would give the factors associated with each network affecting the satisfaction level of retailers for that network. Friedman's rank test has been used to understand the position of a various mobile service providers on the basis of the factors like the complaint handling process, efficiency in claim settlement, minimum problems faced by the retailers and efficiency in document management process. The mean plots from the test are used to assess the satisfaction level of the retailers from the various cities for each of the network service providers.

**FREQUENCY DISTRIBUTION OF DATA**

**Retailer's Profile:** Number of years the retailers have been associated with telecom industry

**FIGURE 1: RETAILER PROFILE**



Source: Researcher's output

The chart shows that the retailers covered in this study include both the naive and the decade old retailers in the telecom industry with 60% of the retailers having been in business for 3-9 years.

**FACTOR ANALYSIS**

The data regarding the different network service providers is subjected to factor analysis for identification of the main factors affecting the satisfaction level of the retailers for various network service providers.

**TABLE 2: KMO AND BARLETT'S TEST**

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.652
Bartlett's Test of Sphericity	Approx. Chi-Square	599.813
	df	66
	Sig.	.000

Source: SPSS Output

To check the adequacy of data, we have applied Kaiser-Meyer-Olkin and Bartlett's Test and we find that the KMO value is 0.652 which is more than ideal value of 0.6. Hence, the data under study is adequate in nature and the significance level is 0.000 which is less than 0.05 confirming the validity of the test so that we can proceed to next step.

**TABLE 3: ROTATED COMPONENT MATRIX<sup>a</sup>**

	Component			
	1	2	3	4
Credit Policy	.840			
Discount & Offer	.773			
Terms & Conditions of the Company	.686			
Behaviour of Comp. Representative		.780		
Availability of SIM		.736		
Visit Frequency of sales representative		.640		
Relationship with distributor			.836	
Brand Image			.779	
Advertisement Support				.874
Margin				.627

Source: SPSS output

A Rotated Component Matrix Table is generated and four factors were derived. Varimax rotation with Kaiser Normalization was chosen to get the percentage of variance for 12 statements in the questionnaire and the factor loadings of more than 0.5 were considered in the above case.

TABLE 4: FACTORS FOR RETAILER’S PREFERENCE

Terms of Selling and offers	Company Representatives and SIM	Relationship and Brand Image	Margins and Advertising
Factor 1	Factor 2	Factor 3	Factor 4
Credit Policy	Behaviour of Company Representatives	Brand Image	Advertising Support
Discount and Offers	Availability of SIM	Relationship with distributor	Margins/Incentives
Terms and Conditions associated with selling of products	Frequency of visit/ interaction by company’s sales representative		

Source: SPSS output

**DESCRIPTION OF THE FACTORS**

- Factor 1, refers to ‘Terms of Selling and offers and contributes to 22.996% variance. This factor is described in terms of Credit Policy, Discount and Offers, Terms and Conditions associated with selling of products.
- Factor 2, describes the ‘Company Representatives and SIM’ and contributes to 19.367% variance. This factor refers to Behaviour of Company Representatives, Availability of SIM and Frequency of visit/ interaction by company’s sales representative.
- Factor 3, focuses on ‘Relationship and Brand Image’ and contributes to 9.683% variance. This factor includes Brand Image and Relationship with distributor.
- Factor 4, explains the ‘Margins and Advertising’ and contributes to 8.961% variance. This factor includes Advertising Support and Margins/Incentives.

**FRIEDMAN TEST**

Ranking on the basis of the least problems faced with the dealers.

TABLE 5: MEAN RANK - COMBINED Ranks

	Mean Rank
Airtel	1.48
MPF Vodafone	2.47
Idea	2.80
Reliance	5.95
Videocon	5.24
Docomo	4.34
Aircel	6.63
BSNL	7.09

Source: SPSS Output

The mean rank is arranged on the basis of the ascending order of mean ranks to get the ranking of the various mobile service providers on the basis of the least problems faced with the dealers for all the cities. The ranking is given as below:

TABLE 6: RANK - COMBINED

Network	Mean Rank	Rank	Network	Mean Rank	Rank
Airtel	1.48	1	Videocon	5.24	5
Vodafone	2.47	2	Reliance	5.95	6
Idea	2.80	3	Aircel	6.63	7
Docomo	4.34	4	BSNL	7.09	8

Source: SPSS Output

**RANKING ON THE BASIS OF MINIMUM NUMBER OF COMPLAINTS COMBINED DATA**

The data regarding the ranking of the networks on the basis of the minimum number of complaints from customers regarding a service provider was used to find out the combined for the ranks given to various service providers using Friedman Test in SPSS. The results of the test are given as below:

TABLE 7: MEAN RANK - COMBINED Ranks

	Mean Rank
Rnk MNC_Airtel	1.74
Rnk MNC_Vodafone	2.51
Rnk MNC_Idea	2.64
Rnk MNC_Reliance	5.20
Rnk MNC_Videocon	5.26
Rnk MNC_Docomo	4.66
Rnk MNC_Aircel	6.57
Rnk MNC_BSNL	7.41

Source: SPSS Output

The mean rank is arranged on the basis of the ascending order of mean ranks to get the ranking of the various mobile service providers on the basis of the minimum number of complaints from customers regarding a service provider for all the cities. The ranking is given as below:

TABLE 8: RANK - COMBINED

Network	Mean Rank	Rank	Network	Mean Rank	Rank
Airtel	1.74	1	Reliance	5.20	5
Vodafone	2.51	2	Videocon	5.26	6
Idea	2.64	3	Aircel	6.57	7
Docomo	4.66	4	BSNL	7.41	8

Source: SPSS output

**RANKING ON THE BASIS OF THE EFFICIENCY IN CLAIM SETTLEMENT  
COMBINED DATA**

The data regarding the ranking of the networks on the basis of the efficiency in claim settlement by a service provider was used to find out the combined for the ranks given to various service providers using Friedman Test in SPSS. The results of the test are given as below:

TABLE 9: MEAN RANK - COMBINED  
Ranks

	Mean Rank
ECS Rnk_Airtel	2.24
ECS Rnk_Vodafone	2.20
ECS Rnk_Idea	2.91
ECS Rnk_Reliance	4.69
ECS Rnk_Videocon	4.89
ECS Rnk_Docomo	4.73
ECS Rnk_Aircel	6.65
ECS Rnk_BSNL	7.69

Source: SPSS Output

The mean rank is arranged on the basis of the ascending order of mean ranks to get the ranking of the various mobile service providers on the basis of the efficiency in claim settlement by a service provider for all the cities. The ranking is given as below:

TABLE 10: RANK - COMBINED

Network	Mean Rank	Rank	Network	Mean Rank	Rank
Vodafone	2.20	1	Docomo	4.73	5
Airtel	2.24	2	Videocon	4.89	6
Idea	2.91	3	Aircel	6.65	7
Reliance	4.69	4	BSNL	7.69	8

Source: SPSS output

**RANKING ON THE BASIS OF BETTER DOCUMENT MANAGEMENT PROCESS  
COMBINED DATA**

The data regarding the ranking of the networks on the basis of the better document management process of a service provider when subjected to Friedman Test in SPSS gave following results:

TABLE 11: MEAN RANK - COMBINED  
Ranks

	Mean Rank
Rnk DMP_Airtel	1.63
Rnk DMP_Vodafone	2.57
Rnk DMP_Idea	2.61
Rnk DMP_Reliance	4.75
Rnk DMP_Videocon	4.94
Rnk DMP_Docomo	5.21
Rnk DMP_Aircel	6.91
Rnk DMP_BSNL	7.37

Source: SPSS Output

The mean rank is arranged on the basis of the ascending order of mean ranks to get the ranking of the various mobile service providers on the basis of the better document management process of a service provider for all the cities. The ranking is given as below:

TABLE 12: RANK - COMBINED

Network	Mean Rank	Rank	Network	Mean Rank	Rank
Airtel	1.63	1	Videocon	4.94	5
Vodafone	2.57	2	Docomo	5.21	6
Idea	2.61	3	Aircel	6.91	7
Reliance	4.75	4	BSNL	7.37	8

Source: SPSS output

**RANKING OF NETWORK SERVICE PROVIDERS ON THE BASIS OF COMBINING ALL FACTORS**

The weighted ranks of various mobile service providers obtained by the Friedman Test are evaluated by analyzing the ranking modes for various mobile service providers. The weighted mode ranking obtained for various service providers are given as below:

**TABLE13: COMBINED WEIGHTED RANKING**

Network	Rank
Airtel	1
Vodafone	2
Idea	3
Reliance	4
Docomo	5
Videocon	6
Aircel	7
BSNL	8

Source: Researcher's evaluation

The ranking clearly shows that the retailers of the telecom service providers are most satisfied with Airtel in terms of the problems faced with dealers, customer complaints, claim settlement and document management process. The second network following Airtel in terms of the satisfaction among retailers is Vodafone, with Idea, Reliance and Docomo in the race of top five companies with which the retailers are satisfied. Videocon falls at number six only preceding a single private network service provider Aircel. BSNL is at the far end in terms of the retailer satisfaction with them.

**DISCUSSION ON FINDING OF THE STUDY**

- The main factors that the retailers look into for a telecom service provider are Brand Image, which is defined by the awareness, connectivity and advertising efforts by the company; Relationship with distributor is another main factor which depicts the satisfaction level of the retailer as the distributor is the link between the company and the retailer, the more transparent the relation between the two is, more is the satisfaction level of the retailer.
- In case of the complaint handling approach adopted by a company, the network service providers Airtel, Vodafone, Reliance, Videocon, Docomo and Aircel are having the satisfaction level which significantly varies from one city to another.
- On the basis of the complaint handling process, the most and least satisfied retailers in a city for the various network providers is given as below:
  - Airtel & Vodafone are having most satisfied retailers in Amritsar and the weakest satisfaction levels in Hoshiarpur.
  - Idea is having maximum and minimum satisfaction level in Amritsar and Batala, respectively.
  - Reliance is having the most satisfied retailers in Nawanshahr and Amritsar.
  - Amritsar is having the most satisfied retailer for Videocon out of four cities and the least satisfied are in Nawanshahr and Jalandhar.
  - Docomo is also having its maximum satisfied retailers in Amritsar while the least satisfied belong to Batala and Hoshiarpur.
  - Aircel have Amritsar and Nawanshahr at the two extremes of the satisfaction level with Amritsar having most satisfied retailers and Nawanshahr having least satisfied retailers.
  - The least satisfied retailers for BSNL are in Jalandhar and Hoshiarpur.
- There is a significant difference in the satisfaction level among retailers of various cities regarding the claim settlement process adopted by the company.
- On the basis of the claim settlement process, the most and least satisfied retailers in a city for the various network providers is given as below:
  - Airtel – Amritsar (Most) and Nawanshahr (Least)
  - Vodafone – Amritsar (Most) and Hoshiarpur (Least)
  - Idea - Amritsar (Most) and Hoshiarpur (Least)
  - Reliance – Batala (Most) and Hoshiarpur (Least)
  - Videocon – Amritsar (Most) and Nawanshahr (Least)
  - Docomo – Amritsar (Most) and Hoshiarpur (Least)
  - Aircel – Batala (Most) and Nawanshahr (Least)
  - BSNL – Batala (Most) and Hoshiarpur (Least)
- On the basis of the least problems faced by the retailers with the distributors of the various companies the ranking of Airtel is at top and Videocon is at fifth, so improvement is required in this context from Videocon.
- On the basis of the minimum number of complaints received from customers, the ranking given to the various service providers by retailers, Airtel is again fared better than their counterparts including Videocon.
- On the basis of the ease of claim settlement, the retailers have ranked the various service providers in which Vodafone is at the top and followed by Airtel.
- On the basis of the document management process adopted by a network service provider Airtel has got top rank followed by Vodafone.
- The overall weighted ranking for all the factors combined together, Airtel is at the top, followed by Vodafone and Videocon is at 6<sup>th</sup>.
- The study shows that the retailers from Amritsar are most satisfied out of all the cities taken into consideration and the retailers from the cities of Nawanshahr and Hoshiarpur are the least satisfied channel partners for the mobile telecom service providers in these areas.
- Airtel is the leading network service provider which is having maximum satisfaction level for retailers out of all the network service providers; and is followed by Vodafone and Idea. BSNL and Aircel are the network service providers who are at the bottom of the satisfaction level table. Reliance and Docomo are having almost similar satisfaction levels with Reliance having a slight edge over Docomo. Videocon is lagging in the race with only one private network service provider, Aircel, behind it.

**CONCLUSION**

- The retailers from the cities of Nawanshahr and Hoshiarpur are least satisfied so they need to be paid more attention as compared to other cities in consideration.
- The retailers are the channel partners for the telecom service providers and each channel partner has ultimately one goal i.e. to pass down as much quantity through them as possible with proper compensation and commission. The more the sales of a network service provider in terms of the SIM or the recharges, more is the benefit to the retailer. So, the main factor that the company can focus upon is to increase the demand for their product in the market so as to help the retailer to maximize his benefits at a given margin.
- The main factors that the retailers look into for a telecom service provider is Brand Image, which is defined by the popularity, connectivity and advertising efforts done by the company. So, the network service providers need to have their primitives like connectivity strong enough to keep the retailer as satisfied as possible.
- Relationship with distributor is another main factor which depicts the satisfaction level of the retailer as the distributor is the link between the company and the retailer, the more transparent the relation between the two is, more is the satisfaction level of the retailer. So, there should be some efforts done to make the relationship between the retailers and distributors very cordial, supportive and friendly.
- The main reason cited for not keeping the mobile connection of a service provider is less customer demand. So, the demand should be surged through the mass campaigns as done by Idea which is having an almost similar satisfaction level in all of the cities taken into consideration.

- The terms and conditions associated with the selling of the products of a service provider also have come up as a main factor. So, increased transparency and clarity in the terms and conditions can help in improving the satisfaction level of the retailers.
- The claim settlement process should be as easier and transparent as possible. Most of the retailers do not take part in schemes due to the claim settlement process adopted by the service provider being inefficient and not transparent.
- Advertising support is also one of the factors on which the satisfaction level of the retailers is dependent. So, the advertising support can be used to tune the satisfaction level of retailers.
- Document management process of the network service provider does not have a very significant effect on the satisfaction of the retailers.
- The complaint handling process of the network service provider also has an effect on the satisfaction level of the retailers. The more efficient and effective the complaint handling process of a service providers is, more favorable is the effect on their satisfaction level.

#### LIMITATIONS OF THE STUDY

- The Friedman test is used to analyze the ranking of the various network service providers which is based on the mean which has some inherent limitations which are applicable in our case also.
- The sampling technique used in this study is convenience sampling which gives researcher the discretion to choose the sample as per the convenience. So, the sample collected may not be the true representative of the whole population.
- The city size was used as a parameter to define the sample size for each of the cities which may not be the true variable to define the sample size or selection of sample from the various cities.

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## INTEREST FREE BANKING: A POTENTIAL SUBSTITUTE TO CONVENTIONAL BANKING IN THE CONTEMPORARY GLOBAL FINANCIAL SCENARIO

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### ABSTRACT

The current global economic recession that triggered in 2008-09 has yet again proved the failure of the prevailing financial architecture that is founded on the interest based conventional banking system. Prior to the present economic crisis, there have been numerous breakdown instances of the so called time tested world financial mechanism which interest is a key component of. The current global economic meltdown, as everyone knows, is the offshoot of the sub-prime mortgage crisis that emanated from the U.S. The sub-standard housing loans that lacked the backing of adequate real value were repackaged and traded as derivatives. The unending transaction of such mortgages at highly inflated prices took the shape of a bubble that was sooner or later destined to burst. The crisis was no longer confined to the housing sector and the eventuality that occurred in September, 2008 shook the nerves of some most powerful economies of the world which were hitherto champions of the free market interest based economic system. The crisis that is often considered as the worst after the World War-II engulfed the whole world which is now highly globalized. Experts of interest free financial mechanism dub the crisis as the 'crisis of confidence' in the prevailing financial system and argue that there is a 'systemic flaw' inherent in the conventional banking. In the wake of continual global recessions over the last few decades including the latest one, some right thinking people have started focusing on the need for rationalizing and reforming the global financial architecture in a way that prevents the recurrent tremors in the global financial mechanism. Economists believe that the latest global financial crisis, that the world is still struggling to recover from, could have been evaded had there been interest free banking system in place of the conventional one. The present paper, therefore, takes a dig into the factors that lead to recurrent breakdowns of global financial system and explores the viability of PLS based (Profit-Loss Sharing) banking practices replacing the interest based banking system that is fast losing its relevance in the changing global financial milieu.

### KEYWORDS

Banking, conventional, interest-free, financial, crisis.

### INTRODUCTION

Interest free banking has the same scope and purpose as the conventional banking except that it operates on one comprehensive and distinguishing principle viz., profit and loss sharing (PLS) instead of accrual of interest. This distinguishing principle of interest free banking has essentially its roots in the Islamic mechanism of financial system based on the core Islamic rules of transactions known as *Fiqh al-Muamalat* which in turn is an important component of Islamic jurisprudence popularly called as *shariah*. It is in this backdrop that interest free banking originated from Islamic countries and as such is often termed as Islamic Banking. Numerous studies have in detail discussed the rationale behind the prohibition of interest (see, for example, Chapra, 2000) and the importance of PLS in Islamic Banking (see, for example, Dar and Presley, 2000). All such studies have in fact emphasized that all commercial transactions and contracts must be free from elements of *Riba* (interest), *Gharar* (uncertainty), *Maysir* (gambling) and *non-Halal* (prohibited activities). The contemporary financial economics differs from Islamic economics in many critical respects, of which the nature of money is one. Whilst both systems accept money as a store of value and a medium of exchange, the financial market based economic system treats money as any other commodity which can be traded for a profit. This profit on sale and purchase of money is nothing but interest. And it is this interest that is the precursor for the activity of money creation by the conventional banking system. A true interest free banking or Islamic banking abstains from the paying or receiving of interest (*riba*) as well as the artificial creation of money via the process of miniscule reserve. This circulation of artificial money (money not backed by real assets) paves, in fact, the way for ethical and unethical practices of earning money and amassing wealth. Greed, exploitation and abuses are the dominant factors in most financial transactions that take place under the conventional banking system. So long as commissions are received and interests paid, and the collaterals are in place, banks continue to lend. Reckless investors, on the other hand, knowing that the borrowed money is not theirs, borrow to the maximum. Depositors who care most about the high interest they receive, keep on depositing regardless of the portfolio and conduct of the bankers. This vicious circle continues until the bubble builds up and becomes a perfect recipe for a crisis, which all the parties viz., depositors, bankers and borrowers contribute to and all of them eventually suffer from.

### RECURRENT FAILURES OF CONVENTIONAL BANKING SYSTEM

By creating money out of thin air and putting it into circulation, central and commercial banks almost all over the world have together caused a succession of speculative bubbles that can be traced back to more than 300 years in the Western world. As such, the current crisis is not an unusual phenomenon and therefore is not the first one and does not seem to be the last one either, given the structure of the present global financial architecture. As Stiglitz (2003) emphasized, "...international financial crises or near-crises have become regular events....It is becoming rarer for a country not to have a crisis than to have one and, by some reckonings, there have been 100 such crises in the past 35 years". Thus, there have been intermittent economic tremors during the last many decades. However, the only difference, if at all there is one, is that of the severity. Experts feel that the present crisis is the worst after the World War-II and even more severe than the Great Depression of 1930s. The present crisis engulfed the whole world which is now extremely globalized and shook the very foundations of the global financial structure. Though the repackaging and trading of sub-prime housing mortgages as derivatives, CDOs and CDSs, that lacked the backing of adequate real value, triggered the economic downturn in the US, the crisis was no longer confined to the housing sector and the phenomenon snowballed into a full blown recession that brought the whole world to the virtual economic standstill within a matter of days.

There are many similarities of the current crisis with the previous ones that have occurred since 1930s. The analysis shows that there is a host of specific factors inherent within capitalism and the free-market economy that trigger the recurrence of economic crises. Like in the case of previous financial crises, many voices have been raised against the conventional banking practices for being at root of the current crisis. Great panic in fear of the collapse of the world financial system has led to the search of rescue plans for banks and hence bailout packages worth billions of dollars for banks and financial institutions by the governments which were hitherto champions of the free market and survival of the fittest economic model. It has taken more than three trillion dollars of bailout and liquidity injections by a number of industrial countries to somewhat ease the intensity of the crisis. Experts of interest free financial mechanism dub the crisis as the 'crisis of confidence' in the prevailing financial system and argue that there is a 'systemic flaw' inherent in the conventional banking (SESRC Monthly Report, June 2009).

Islamic economists and advocates of interest free banking like Siddiqui (2009); Chapra (2009) and Bagsiraj (2009) refer to the continual global economic crises in general and the latest one in particular as a result of interest and its rate structure. Huge budgetary imbalances, excessive monetary expansion, large balance of payments deficits and inadequate international cooperation can all be related to flaws in the theory of interest, which, according to experts, is at the root of the crisis. Moreover, there are fears that present crisis may have exposed the world economy to a prolonged period of slowdown. In the above backdrop, there have

been voices which call for rethinking of some alternative financial systems and search for a new architecture that could help minimize the frequency and severity of such a crisis in the future (Camdessus, 2000; Stiglitz, 2007; Baily *et al.*, 2008).

## ANATOMY OF THE CURRENT CRISIS & RATIONALE FOR DESIGNING A NEW FINANCIAL STRUCTURE

It is illogical even to think of designing a new financial architecture without first determining the primary cause of the economic crises that have sporadically plagued the world over the past some decades. The generally recognized most important cause of almost all crises has been excessive and imprudent lending by banks (BIS, Annual Report, June 2008). This raises a serious question of what makes it possible for banks to resort to such an unhealthy practice that not only hurts their own long-run interest but destabilizes the international financial system as a whole. There are a number of factors that make this possible.

One of the most important of these is the inadequate market discipline in the financial system (Chapra, 2009). What is it that makes it possible for the financial system to have unwarranted discipline when this is considered to be a precursor for the global financial mess? In the simplest terms, the market is able to impose discipline only when it is able to reward efficiency and prudence and punish inefficiency and recklessness. In other words, there would be a check on excessive lending only if the banks were afraid that it would lead to losses, impact their reputation, and even cause bankruptcy. However, excessive lending is a predominant feature in a system where profit-and-loss sharing (PLS) does not exist, rather the repayment of loans with interest is generally assured, and *'the too big to fail'* concept ensures a fictitious sense of survival. This false sense of immunity from losses and possible collapse, in fact, introduces a fault line into the system and consequently, the banks do not undertake a careful evaluation of loan applications. Besides disproportionate increase in sub-prime mortgages, this leads to an unhealthy expansion in the overall volume of credit, to excessive leverage, unsustainable increase in speculative investment and the resultant rise in asset prices. If allowed to prolong, such a phenomenon, later on, gives rise to a steep decline in asset prices, and to financial fragility and debt crises. The consequences are catastrophic in case it is accompanied by overindulgence in short sales, inadequate market regulations and less state intervention. Inadequate discipline, thus, promotes excessive lending and high leverage, and leads first to a bubble and then to a debt crisis (see for example, Fisher, 1992; Minsky, 1975). This phenomenon has been endorsed by the G-20 Summit held on 15 November 2008 which opined that excessive leverage was one of the root causes of "vulnerabilities in the system" (G-20, 2008). Historically studying the intermittent global financial meltdown, Galbraith (1990) concludes that there has been a decisive role of debt and leverage in the speculative booms of the last three centuries.

The second reason of the crisis, which in fact is the precursor for imprudent lending, is the quality and valuation of collateral. Collateral is, of course, indispensable for managing the risk of default. However, this purpose is served only in case the collateral is of good quality. Nevertheless, collateral is prone to a valuation risk and its value is influenced by the same factors that diminish the borrower's ability to repay. If there is no risk-sharing and the return is so called guaranteed, the banks will have little incentive to undertake a careful evaluation of the collateral and will extend financing for any purpose including speculation and gambling. The collateral can, therefore, by itself hardly be a substitute for a more careful evaluation of the project financed (Summers, 2008).

Another factor that provides protection against losses is securitization which is a paradigm shift from *'originate-to-hold'* model to the *'originate-to-distribute'* model of financing. This enables the lenders to sell the debt, transfer the risk of default to the purchasers, and use the proceeds to make more loans and hence, increase their profits.

One problem which the reckless bankers confronted while securitization was that while prudent and rational purchasers would be willing to buy the prime debt, they would be reluctant to buy the subprime debt. This problem was solved by the creation of collateralized debt obligations (CDOs). Under this arrangement, prime and subprime debts were mixed and securitized by putting them into different groups with varying degrees of risk and maturity. For an average buyer, the CDOs were difficult to understand as complex models were used for this purpose. This made the purchasers primarily rely on rating agencies. The rating agencies, in turn, also used complex computer models to predict the likelihood of default. Independent judgment of the risk involved, therefore, became difficult (Baily, *et al.*, 2008). Still there would have been no problem in this had the rating agencies not suffered from conflict of interests and provided accurate ratings. However, since they were paid by banks and hedge funds which organized and sold these structured securities, they had no incentive to be more ethical and professional in their business. The rating agencies, therefore, issued ratings on the basis of information that was provided to them without much analysis. The high ratings plus the relatively higher yields on these CDOs, made it easier for mortgage originators to pass the risk of default to the ultimate purchasers. Loan volume accordingly gained greater priority over loan quality and the amount of lending to subprime borrowers and speculators increased steeply (Mian and Sufi, 2008; Keys, *et al.*, 2008).

An important factor that further impacted the underwriting standards is the spread of derivatives like credit default swaps (CDSs) which made it possible for lenders to insure themselves against the risk of default. The buyer of the swap (creditor) paid a premium to the seller (a hedge fund) for the compensation he would receive in case the debtor defaults. Even though this innovation would have resulted in further reducing underwriting standards, it may not have caused much harm had the hedge funds also performed some scrutiny and sold the swaps to just the actual lending banks. They, however, sold them also to a large number of other institutions and individuals who were willing to bet on the default of the debtor. These swap-holders, in turn, resold the swaps to others and the whole process continued several times. While a genuine insurance contract indemnifies only the insured party against losses actually suffered, in the case of CDSs the hedge funds and insurers had to compensate several other swap-holders who had not suffered any loss from default. In addition to this betting on debt default, there was also betting in the case of interest rates and exchange rates far in excess of the genuine need for hedging. As a result of all this, risk became excessively accentuated and made it impossible for the hedge funds and banks to honour their commitments.

The notional amount of all outstanding derivatives was estimated at \$683.7 trillion in June, 2008 (BIS, November 2008), more than 12 times the world GDP of \$54.3 trillion in 2007 (World Bank, 2008). Of even greater risk was the fact that a large proportion of derivative contracts became concentrated in the hands of relatively few dealers who were interlinked to one another through different credit instruments. As a result, the default of even one could quickly destabilize all others and lead to a financial crisis. It is in this backdrop that George Soros described derivatives as *'hydrogen bombs'*, and Warren Buffett called them *'financial weapons of mass destruction'*.

A fourth factor that tended to provide a false sense of security is the *'too big to fail'* concept which provided an assurance to 'big' banks that the central bank would come to their assistance and bail them out. Obviously, banks which carried such a safety net have incentives to take greater risk than what they otherwise would (Mishkin, 1997).

Yet another important factor for the intermittent global financial crises in general and that of the current one in particular is that many countries, especially the Western economies have shifted their focus from industry to services. Consequently, the services sector now represents over 80 percent of the US economy, with the financial sector being the largest one. Rather than contributing in physical terms, the players in the financial industry gamble on what is going to happen in the real world, by speculating the performance of businesses and betting on their profits. This financial sector is a parallel economy which exists alongside the real economy and produces nothing real and tangible. On the other hand, the real economy consists of housing, production, manufacture and other tangible goods which can be traded, leased, and bought and sold. In other words, these are physical goods that are produced by people who are employed to make them. But the financial economy consists of tradable paper with financial values that rise and fall based upon the value people assign them, often representing no real asset.

The size of financial economy worldwide is now enormous and its estimated value is far more than the real economy. The size of the worldwide bond market is estimated at \$50 trillion. The size of the world's stock markets is estimated at \$55 trillion. The world derivatives market has been estimated at \$500 trillion, more than 30 times the size of the US economy and 12 times the size of the entire world economy. In fact, the financial markets have now become so divorced from the real economy that investors are no longer interested in dividend income. They are rather eying to make profits out of rising prices. This has led to speculation of gigantic proportions, including bets on the rise and fall of economies.

Given that banks lend excessively to maximize their profit, why is it that the depositors do not impose a discipline on the banks? They can do this in several different ways, for example, by demanding better governance, greater transparency, and more efficient risk management. If this does not work, they can always punish the banks by withdrawing their deposits. They do not, however, do so in the conventional financial system because they are assured of the repayment of their deposits with interest (Mishkin, 1997). This makes them complacent and they do not take as much interest in the affairs of their financial institution as they

would if they expected to suffer losses. The false sense of immunity from losses provided to bankers as well as depositors impairs the ability of the market to impose the required discipline. This, along with the easy monetary policy pursued by the central banks, led to an unhealthy expansion in the overall volume of credit, to excessive leverage, to subprime debt, and to living beyond means. This tendency of the system got further reinforced by two other factors. One of these was the excessive use of complex computer models which few people understood. These models took the place of human judgment and left little incentive for bank management to use their own knowledge and skills to assess the actual risk of the underlying assets. The second factor was the bias of the tax system in favour of debt financing; dividends are subject to taxation while interest payments are allowed to be treated as a tax-deductible expense. The result is that a number of banks have either failed or have had to be bailed out or nationalized by the governments in the US, the UK, Europe and a number of other countries. This generated fear and uncertainty in the market and led to a credit crunch, which has made it hard for even healthy banks and firms to find financing. There is a lurking fear that this might be only the tip of the iceberg and a lot more may follow if the crisis causes a prolonged recession and leads to defaults on the part of credit card institutions, corporations, and derivatives dealers.

### INTEREST FREE BANKING: A POTENTIAL ALTERNATIVE TO CONVENTIONAL BANKING

In the backdrop of the anatomical facts of the latest global financial crisis given in the preceding paragraphs, there have been voices for rethinking of some alternative financial systems and search for a new architecture that could help minimize the frequency and severity of such a crisis in future (Camdessus, 2000; Stiglitz, 2007; Baily *et al.*, 2008). Among these alternatives, the Islamic finance and interest free banking is the largely debated one in the developed and developing countries in general and Islamic countries in particular. Experts believe that the recurrent global economic downturns including the latest one could have been avoided had there been interest free banking in place of conventional banking (see for example, Chapra, 2009; Hassan, 2009). The arguments they put forward in support of their view seem to be logically founded.

The current global financial crisis affected a number of most successful institutions operating in the international financial arena including some of those which were hitherto considered as well established and 'too big to fail'. Islamic banks and financial institutions, operating on non-interest mechanism, on the other hand proved comparatively cushioned from the crisis. Given the scenario where Islamic banking and finance proved resilient to the global financial slump, many experts and analysts, particularly in the developing economies intensified their argument that conventional banking is highly vulnerable and that there is a need to think of potential alternatives and most of them assert that Islamic banking and *shariah* based finance is a potential and feasible substitute.

In the conventional banking, the process of lending is subject to asymmetric information, moral hazard and greed. In an attempt to borrow more and divert funds in speculative investments, borrowers most of the times misinform lenders who do not exercise adequate care while lending as they eye on the so called assured but illusionary returns (interest). Such a self-centered outlook poses as unimaginable risk on all the parties including the depositors whose money the banks actually lend. Thus, the assured and guaranteed returns or interest, a cardinal element of conventional banking, which is essentially highly uncertain and never so guaranteed, is at the root of the failure of the conventional banking practices.

Interest free banking and Islamic finance is devoid of the fundamental flaws that serve as avenues of immoral indulgence and human greed and cause the breakdown of the conventional banking system. Islamic finance requires that all financial transactions must be free from *riba* (interest or usury), *gharar* (uncertainty), *maysir* (gambling) and other *haram* (prohibited) activities. Besides, financial dealings in Islamic banking and finance are guided by the ultimate objective of achieving the ideals of equity and equitable justice where priority is given to equity-based financing rather than leveraging and debt-based financing (Kassim and Majid, 2009).

Being at the core of Islamic finance and banking, the principle of equity and justice in the society requires that financial transactions must be based on profit and loss sharing rather than interest. This ensures sharing of risk of loss by all the parties viz., the depositor, lender and borrower and not just confining it to either of them (Chapra, 2008). Such an arrangement paves the way for a prudent behaviour on the part of the parties and a better market discipline. Not only the lenders evaluate the loan applications of prospective borrowers more cautiously and subsequently more effectively monitor the use of funds by them but also the depositors, whose hard earned money bankers actually lend, scrupulously evaluate the investment alternatives before taking a final decision. The borrowers, in turn, exercise restraint from indulging in non-real asset investments and unscrupulous business ventures.

Islamic financial system and interest free banking does not allow the creation of debt through either lending or borrowing. It rather requires creation of debt through the sale or lease of real assets via various modes and instruments of *shariah* compliant financing such as *murabahah*, *istisna*, *sukuk* etc. The objective is to enable the needy borrowers to buy urgently needed real goods and services at present considering their ability to pay at a later time. Such an arrangement prevents the falsely created rat race and deters the unnecessary expansion of debt. Experts of interest free financial system suggest certain conditions for the unwarranted debt expansion and money creation, which according to them is the root cause of almost all major financial breakdowns. Chapra (2008) summarizes these conditions as under:

- the asset which is being sold or leased must be real and not imaginary or notional,
- the seller must own and possess the goods being sold or leased,
- the transaction must be a genuine trade transaction with the intention of giving and taking the delivery, and
- since the debt cannot be sold and the risk associated with it cannot be transferred, it has to be borne by the creditor himself.

Under the above conditions, the debts cannot be traded and the financial markets cannot be stretched beyond what the real economy can bear. Hence, the derivatives and their trading, which is essentially speculative in nature and do not add any value to the real economy, is eliminated from the market mechanism, the phenomenon that was at the core of the recent financial global meltdown. Since the above conditions fall within the framework of Islamic finance, many economists and macro financial experts and analysts have come to support the interest free banking and Islamic financial system.

In the backdrop of the current financial breakdown and above principles of Islamic finance, many banks and financial institutions across the world are building up their Islamic units and tapping in the emerging industry which is now estimated at a whopping \$ 1 trillion in asset size and growing annually at 15-20% (Reuters, 2009). Presently, interest free investments and Islamic financial instruments are acceptable in a vast number of countries, both Islamic and others, including the UK, US, Japan, Malaysia, China, Indonesia etc. and continue to expand to many other countries as an alternative or, at least, complementary to the existing banking and finance system. As Wilson (2009) asserts, "the spread of Islamic finance to Western markets demonstrates that it is now being treated seriously by regulators and finance ministries because Islamic banking is less prone to cyclical fluctuations and provides a viable alternative to conventional banking".

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**A STUDY ON DIMENSION OF SMARTPHONE AND ITS INFLUENCE ON CONSUMER PREFERENCE**

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**ABSTRACT**

A Smartphone is a cell phone that allows you to do more than just make phone calls and send text messages. Smartphone's can browse the Internet and run basic software programs like a computer and the user often interacts with the Smartphone by using their finger on the touch screen. The principal objective of the study is to ascertain the dimension of smart phone influencing Sales of Smartphone. The other objectives are to study the type of sim preferred by the smart phone users and to determine the gender factor and its influence in smart phone purchase decision. This statement has been detailed through collection of primary and secondary resource. Primary source is mostly based on questionnaire. The target populations are smart phone users and the sample size is 325. Secondary source was obtained from data bases through net. The present study concludes that Male smart phone users are more opinion regarding utilitarian and technological perspective generally male customers are highly influenced by the technology and utility factor due to their technical back ground and there is no significant difference between male and female with respect to dimension of smart phone. Based on mean score people who are interested in technological and utilitarian are more opinion toward single sim smart phone with regard Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Customer Choice of Smartphone.

**KEYWORDS**

smartphone, consumer preferences, marketing.

**INTRODUCTION**

Smartphone is a cell phone that allows you to do more than just make phone calls and send text messages. Smartphone's can browse the Internet and run basic software programs like a computer and the user often interacts with the Smartphone by using their finger on the touch screen. There are thousands of Smartphone apps (software programs), including games, personal-use programs, and business-use programs that can all be ran from the phone. In the picture to the right, is an example of the Apple iPhone, one of the most popular Smartphone available today.

**REVIEW OF LITERATURE**

Ding Hooi Ting and Suet Fong Lim, et al., (2011)<sup>1</sup>, The use of mobile phones has triggered consumer market demand as it forms a new dimension of virtual mobility to a continuing trend for geographically extended, faster and more personalized social interaction (Wei and Lo, 2006). In recent years, the mobile phone has evolved from essentially an interpersonal communication device to a multimedia machine known as Smartphone. The term Smartphone refers to a programmable mobile phone that offers advanced capabilities and features that help individuals in their daily work and personal life (Euro monitor, 2010a). It contains functions such as instant messaging, downloading applications, utilizing information services such as Wi-Fi and global positioning system (GPS) and entertainment (Euro monitor, 2010a). With the popularity and functions offered in the phone, Smartphone have seen an increase in terms of demand (Park and Chen, 2007). Research by Ni et al. (2009) found that in the third quarter of 2008, Canals reported that global shipments of Smartphone had hit a new peak of just under 40 million units despite the gloomy economic picture and Smartphone represented around 13 percent of the total mobile phone market. In meeting these demands, several companies such as Apple, Microsoft, Nokia and Google have developed various Smartphone operating systems (OS) such as Symbian OS, iPhone OS, Windows Mobile and Android, respectively (Sharma, 2008) for the convenience of their users by providing different supports, features and applications.

Wooyang Kim and C. Anthony Di Benedetto, (2011)<sup>2</sup>, in their study about "the effects of country and gender differences on consumer innovativeness and decision processes in a highly globalized high-tech product market. According to Zeithaml (1985), one must consider the effect of changing demographics through time, which can lead to changing customer purchasing behaviors and attitudes. That is, demographic variables can be of substantial help in customer segmentation and targeting the most innovative market condition. Nevertheless, demographic factors are often overlooked in consumer innovativeness studies (Tellis et al., 2009). Among demographic variables, gender and country (or culture/nationality) have broadly used as important moderators between cause and effect relationship in psychology and business research studies of human behavior.

Ewan Sutherland, (2009)<sup>3</sup>, in their article, "Counting customers, subscribers and mobile phone numbers", the possible reasons for an individual having more than one SIM card, telephone number or cell phone include: overcoming patchy or poor network coverage, avoiding network congestion, saving money by making on-net calls, benefiting from discounted or bundled tariffs, receiving calls or voicemail to an older number; and having separate voice and data network operators. In countries where the perceived quality of the networks is not good, either where the coverage of individual operators is poor and uncertain or where congestion is considered likely, some customers will carry more than one SIM card so that they can switch to a network which is available and on which they can make a call.

**IMPORTANCE OF THE STUDY**

Smartphone provides a total and advanced operating system, and provides customer an opportunity to use features, like e-mail, e-book, and USB functions. The best depiction is that Smartphone is a small computer, which also works as a phone. Today, with the emergence of many smart phone brands and the Demand for these 'computer alike' telephones are growing each day. Smart phone marketers are faces more knowledgeable and demanding consumers and since business exists to satisfy the needs of consumer they often change their product offering. Despite the fact that bearing in mind the noteworthy development of Smart phone sales in India, it was established that the smart phone sales is influenced by dimensions of smart phone and the demographic factors influence in purchase decision of smart phone. But concerning the earlier research, we saw most of researches are focusing on online purchase through smart phone. Hence the present study is undertaken to find out the answers for following questions:

1. Which type of sim is preferred in Smartphone?
3. How for the gender factor influence the Smartphone purchase?

**OBJECTIVE OF THE STUDY**

The principal objective of the study is to ascertain the dimension of smart phone influencing Sales of Smartphone. The other objectives are as follows:

- To study the type of sim preferred by the smart phone users.
- To determine the gender factor and its influence in smart phone purchase decision.

**RESEARCH DESIGN AND METHODS**

This statement has been detailed through collection of primary and secondary resource. Primary source is mostly based on questionnaire. The target populations are smart phone users and the sample size is 325. The purposive sampling techniques are used in this study. Secondary source was obtained from data bases through net.

**RESULTS AND DISCUSSION****HYPOTHESIS I**

*Null Hypothesis:* There is no significant difference between male and female with respect to Dimension of smart Phone choice

**TABLE 1.1: t TEST FOR SIGNIFICANT DIFFERENCE BETWEEN MALE AND FEMALE WITH RESPECT TO DIMENSION OF SMART PHONE CHOICE**

Dimension of smart phone choice	Gender				t value	P value
	Male		Female			
	Mean	SD	Mean	SD		
Marketing Perspective	21.66	4.32	24.52	4.11	5.303	0.000 **
Utilitarian Behaviour	19.68	3.76	17.48	3.78	4.631	0.000**
Hedonic Behaviour	11.57	2.86	13.57	2.85	5.540	0.000**
Customer Choice of Smartphone	24.95	5.07	26.10	4.60	1.831	0.068
Technological Perspective	32.14	6.81	29.37	5.74	3.339	0.001**

Note \*\* denote significance at 1% level

Since P value is less than 0.01, the null hypothesis is rejected at 1% level of significance with regard to all the factor smart phone users except customer choice of smart phone users. Hence there is a significance difference between male and female with respect to Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Technological Perspective. Based on mean score female are more opinion regarding marketing and hedonic behavior than male .The Male smart phone users are more opinion regarding utilitarian and technological perspective generally male customers are highly influenced by the technology and utility factor due to their technical back ground.

There is no significance difference between male and female with respect to customer choice of smart phone, since P value is higher than 0.05. Hence null hypothesis is accepted with regard to customer choice of smart phone.

**HYPOTHESIS II**

*Null Hypothesis:* There is no significant difference between single and Dual Sim with respect to dimension of smart Phone choice.

**TABLE 1.2: t TESTS FOR SIGNIFICANT DIFFERENCE BETWEEN SINGLE AND DUAL SIM WITH RESPECT TO DIMENSION OF SMART PHONE CHOICE**

Smart Phone choice	Preference of Smartphone				t value	P value
	Single Sim		Dual Sim			
	Mean	SD	Mean	SD		
Marketing Perspective	22.25	4.39	22.67	4.55	0.804	0.422
Utilitarian Behavior	19.25	3.82	18.87	3.99	0.838	0.403
Hedonic Behavior	12.09	3.11	12.08	2.74	0.032	0.975
Customer Choice of Smartphone	25.46	4.85	24.83	5.19	1.092	0.276
Technological Perspective	32.04	6.59	30.29	6.64	2.275	0.024*

Note: \* denote significance at 5% level

Since P value is less than 0.05, the null hypothesis is rejected at 5% level of significance with regard to technological perspective of single and dual sim smart phone. Hence there is a significance difference between single and dual sim with respect to technological perspective. The P value is greater than 0.05 the null hypothesis is accepted at the 5% level of significance with regard to marketing perspective, utilitarian behavior, hedonic behavior, and customer choice of smart phone. Hence there is no significant difference between single and dual sim with regard to smart phone choice with regard Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Customer Choice of Smartphone.

**FINDINGS**

1. t test for significant difference if any between male and female with respect to dimension of smart Phone choice was analyzed and it is found that there is a significance difference between male and female with respect to Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Technological Perspective. Based on mean score female are more opinion regarding marketing and hedonic behavior than male reason .Male smart phone users are more opinion regarding utilitarian and technological perspective generally male customers are highly influenced by the technology and utility factor due to their technical back ground and there is no significant difference between male and female with respect to customer's choice of smart phone.

2. t tests for significant difference between single and Dual Sim With respect to dimension of smart Phone was studied and found that there is a significance difference between single and dual sim with regard to technological perspective . Based on mean score people who are interested in technological and utilitarian are more opinion toward single sim smart phone with regard Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Customer Choice of Smartphone.

**CONCLUSION**

The present study concludes that Male smart phone users are more opinion regarding utilitarian and technological perspective generally male customers are highly influenced by the technology and utility factor due to their technical back ground and there is no significant difference between male and female with respect to dimension of smart phone. Based on mean score people who are interested in technological and utilitarian are more opinion toward single sim smart phone with regard Marketing Perspective, Utilitarian Behavior, Hedonic Behavior and Customer Choice of Smartphone.

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**CENTRALISED SYSTEM FOR e-PROCUREMENT- A NEW RISE IN PUBLIC SECTOR: A CASE STUDY**

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**ABSTRACT**

In this era of modern world, people are more conscious about the integrity, efficiency and transparency in public sector. Based on the recommendations of the Committee on Public Procurement, headed by Shri.Vinod Dhall, the Department of Expenditure launched a Central Public Procurement Portal ([www.eprocure.gov.in](http://www.eprocure.gov.in)) with the help of National Informatics Centre (NIC) for ensuring transparency, which in turn eliminates corruption. As it is in its developing stage, this study is meant for reviewing the progress made through this new initiative. At present, a total of 1300 nodal officers have registered in this portal for availing this facility of e-publishing/e-procurement. Even though the government has issued many circulars for implementing this system of e-procurement for the tenders with an estimated value of Rs. 10 lakhs and above, many organisations are not following this mandatory requirement. The objective of this study is to find out the impact of e-procurement system in our country. It has been found through this study that it is mainly happening in the sector of autonomous bodies and subordinate offices. Government has to take immediate steps for ensuring the participation of entire public sector undertakings. E-procurement system introduced by the central government can be termed as a gift to the suppliers also, as all tenders can be searched by them easily at one point access.

**KEYWORDS**

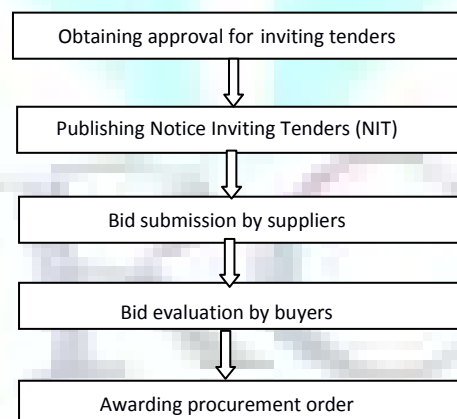
CPP Portal, E-procurement, E-procurement in India.

**INTRODUCTION**

Electronic procurement (E-procurement) is the use of Information and Communication Technology for procurement of goods and services by the buyers. It refers to the use of Internet-based (integrated) Information and Communication Technologies (ICTs) to carry out individual or all stages of the procurement process including search, sourcing, negotiation, ordering, receipt, and post-purchase review (Croom & Brandon-Jones, 2004). E-procurement is a link between the buyers and suppliers of goods and services. It helps the buyer to acquire goods through web-based technologies which reduces the cost, time and also enables promptness and transparency in the procurement system. First level definition of e-government procurement provided by the World Bank (2003) is that "E-GP is the use of Information & Communications Technology (especially the Internet) by governments in conducting their procurement relationships with suppliers for the acquisition of goods, works, and consultancy services required by the public sector"

In our words, "E-procurement is the process of doing procurement cycle in a systematic way with the use of web-based technologies for publishing, inviting and accepting tenders for the purchase/sale of goods, services, works, etc."

Before the introduction of e-procurement, the system of procurement was entirely different in government organisations. They were using the manual method of procurement system for purchase at that time. Even though the internet has launched in India in 1995 itself, in the recent years only the system of e-procurement has got a platform in India. Manual process of procurement involves a number of steps, which is figured in the following diagram:

**LIMITATIONS OF MANUAL PROCUREMENT SYSTEM**

- High cost
- Time consuming
- No transparency
- Heavy work load
- Less efficiency and control
- Less number of competitive bids
- Chance for bribery as the payment method is conventional
- Chance for suppliers to syndicate for quoting a high rate
- Possibility of errors

E-procurement involves a set of technology solutions, such as e-tendering, e-auction, e-catalogue/purchasing, e-market place and e-invoicing etc.

**ADVANTAGES OF E-PROCUREMENT SYSTEM**

**BENEFITS TO THE GOVERNMENT ORGANISATIONS**

By implementing e-procurement system, an organisation will get the following benefits:

- Saves -
  - money
  - manpower
  - time
- Ensures smooth functioning and transparency with efficient control
- Implementation of e-procurement does not change any policies or laws related to procurement
- Reduce errors
- As it promotes competition, the organisation will be able to get a competitive rate
- Ensures authentication through Digital Signature Certificate
- There is no scope for the suppliers to join together for quoting a high rate which in effect reduces the competitive number of bids.

*We can say that the main impact of e-procurement system is that it makes a good change in  $m^2t^2$  (money, manpower, time and transparency)*

**BENEFITS TO THE SUPPLIERS**

Besides the benefits offered to the organisations, e-procurement also provides the following advantages to the suppliers:

- Transparency: E-procurement system is free from the malpractices likely to be made by certain organisations as the system is very transparent.
- Centralised system for searching of tenders: It was difficult in manual procurement system for the suppliers to search tenders as the organisations were only depending on news papers and other traditional methods for publishing tenders at that time. By the use of latest technology, it is possible for the suppliers to track the tenders, which meets their requirements by a "one-click" process.
- Fast supply of information to the awardees: As the manual system cycle takes long time for completing the processes, the suppliers need to wait for a long time to know about the award of tender. But in e-procurement, the award details are easily available to the suppliers within a short period of time as the entire procurement cycle takes less time by using the internet facilities.
- Reduces the chance for bribery.
- The suppliers are able to resubmit quotation before the last date, in case of modification, if any.
- History of submitted tenders is available in individual suppliers account.
- Anytime accessibility.

**NEED FOR IMPLEMENTATION OF E-PROCUREMENT SYSTEM IN GOVERNMENT ORGANISATIONS**

It has been decided by the Dept. of Expenditure, Ministry of Finance in the year 2012, that all the ministries/departments of central government and its attached and subordinate offices would need to commence e-procurement in respect of all procurements with estimated value of Rs. 10 lakhs and above in a phased manner as per the prescribed schedule given below:

- In case of ministries / departments and their attached and subordinate offices: w.e.f. 1<sup>st</sup> January 2012
- In case of central public sector enterprises: w.e.f. 1<sup>st</sup> February 2012
- In case of autonomous / statutory bodies: w.e.f. 1<sup>st</sup> April 2012.

The Govt. of India with the help of National Informatics Centre (NIC) has opened a Central Public Procurement (CPP) Portal at URL [www.eprocure.gov.in](http://www.eprocure.gov.in), to facilitate all the government organisations to publish their tenders and other related activities. NIC also offers class room based and web based training for the users from all the government organisations. It also provides a 24 hour help desk and toll free number facility.

The primary objective of CPP portal is to provide a single point access to the information on procurements made across various Ministries /Departments and all the organisations functioning under them.

Options are given for the organisations either to adopt the e-procurement solution developed by the National Informatics Centre or to develop their own software solution as per the guidelines. However, the organizations using the latter option must publish the tender details simultaneously on the CPP Portal and their website should have a link to the CPP Portal.

The Department of Information Technology, Ministry of Communications & Information Technology, has released the guidelines for compliance to quality requirements of e-procurement systems in August 2011. As per this document, the following are the important aspects to be kept in mind while implementing e-procurement in government organisations:

- Compliance of General Financial Rules, processes, roles (purchasing officer, local purchasing committee, etc.)
- Confidentiality and integrity of information
- Compliance of guidelines issued by Central Vigilance Commission from time to time
- System adaptability and customisation as prescribed by the respective authorities

The guidelines may be used by the stores department of govt. organisations, service providers of e-procurement and e-procurement application/solution providers. It is mandatory for the organisations to test the e-procurement solution through the Standardization, Testing and Quality Certification (STQC) Directorate laboratories, which are located in Delhi, Bengaluru and Kolkata. STQC can be directly contacted by the service providers for testing/auditing. The e-procurement solution developed by NIC has also to be certified by STQC. After testing/auditing, STQC will issue a compliance certificate to the concerned organisation.

**PRESENT STATUS OF CENTRAL PUBLIC PROCUREMENT PORTAL**

As on 31<sup>st</sup> March 2013, a total of 1300 nodal officers have been registered in CPP Portal for availing the facility of e-procurement. The users registered in this portal are classified in to the following categories.

- Central government / department:
- State government /Union territories
- Public sector undertakings
- Public sector banks
- Other organisations

Even though the portal is targeted for the benefit of central govt. ministries/departments, the state government departments and other organisations are also availing this facility.

The following tables depict a picture on e-procurement trends (Table 1) and details of tenders published through CPP Portal (Table 2):



TABLE 1: E-PROCUREMENT TRENDS

Financial Year	No. of Tenders	Value in Crores (INR)
2003 - 2004	1549	3623
2004 - 2005	4901	30822
2005 - 2006	9930	11892
2006 - 2007	21985	31487
2007 - 2008	33904	75119
2008 - 2009	44883	130061
2009 - 2010	26062	28208
2010 - 2011	47182	19675
2011 - 2012	49354	24436

Source: www.eprocurement.gov.in

TABLE 2: MINISTRY-WISE DETAILS OF REGISTERED USERS AND PUBLISHED TENDERS (AS ON 15.04.2013)

Name of Ministry/Department	No. of Registered Users	No. of published tenders
Ministry of Railways (MoR)	27	11565
Ministry of Defence (MoD)	66	7856
Ministry of Coal (MoC)	47	2145
Ministry of Rural Development (MoRD)	13	1900
Ministry of Petroleum and Natural Gas (MoPNG)	64	1636
Ministry of Power (MoP)	24	1576
Department of Atomic Energy (DoAE)	16	1234
Ministry of Urban Development (MoUD)	8	1140
Ministry of Heavy Industries and Public Enterprises (MoHIPE)	39	663
Ministry of Communications and Information Technology (MoCIT)	49	588
State Government/Others	46	478
Ministry of Chemicals and Fertilizers (MoCF)	29	467
Ministry of Mines (MoM)	17	457
Ministry of Shipping (MoS)	23	359
Ministry of Home Affairs (MoHA)	26	257
Ministry of Steel (MoS)	28	217
Ministry of Human Resource Development (MoHRD)	18	214
Ministry of Finance (MoF)	38	192
Ministry of Health and Family Welfare (MoHFW)	15	160
Ministry of Road Transport and Highways (MoRTH)	17	136
Ministry of Commerce & Industry (MoCI)	24	104
Ministry of Tourism (MoT)	9	98
Ministry of Food Processing Industries (MoFPI)	6	66
Ministry of External Affairs (MoEA)	13	64
Ministry of Agriculture (MoA)	15	58
Ministry of Science and Technology (MoST)	12	54
Ministry of Labour and Employment (MoLE)	12	51
Ministry of Housing and Urban Poverty Alleviation (MoHUPA)	5	31
Ministry of Textiles (MoTx)	6	29
Ministry of Micro, Small and Medium Enterprises (MoMSME)	3	26
Ministry of Earth Sciences (MoES)	6	24
Ministry of Water Resources (MoWR)	7	24
Ministry of Civil Aviation (MoCA)	1	22
Department of Space (DoS)	10	21
Ministry of Information and Broadcasting (MoIB)	8	21
Ministry of Youth Affairs (MoYA)	4	16
Ministry of Social Justice and Empowerment (MoSJE)	4	14
Cabinet Secretariat (CS)	7	12
Ministry of Culture (MoCul)	7	11
Ministry of New and Renewable Energy (MoNRE)	2	6
Ministry of Personnel, Public Grievances and Pensions (MoPPGP)	2	4
Ministry of Planning (MoPI)	1	2
Ministry of Overseas Indian Affairs (MoOIA)	2	2
Ministry of Environment and Forests (MoEF)	2	2
Ministry of Corporate Affairs (MoCA)	Nil	Nil
Ministry of Parliamentary Affairs (MoPA)	Nil	Nil
Ministry of Law and Justice (MoLJ)	Nil	Nil
Ministry of Minority Affairs (MoMA)	Nil	Nil
Ministry of Tribal Affairs (MoTA)	Nil	Nil
Ministry of Panchayati Raj (MoPR)	Nil	Nil
Ministry of Drinking Water and Sanitation (MoDWS)	Nil	Nil
<b>Total</b>	<b>778</b>	<b>34002</b>

Even though there are 1300 registered nodal officers under CPP Portal, only 778 registered users have availed this facility of e-procurement. The following figures show the details of ministry-wise registered users (Figure 1) and published tenders (Figure 2):

FIGURE 1: MINISTRY-WISE DETAILS OF REGISTERED USERS OF CPP PORTAL (TOP 20 MINISTRIES)

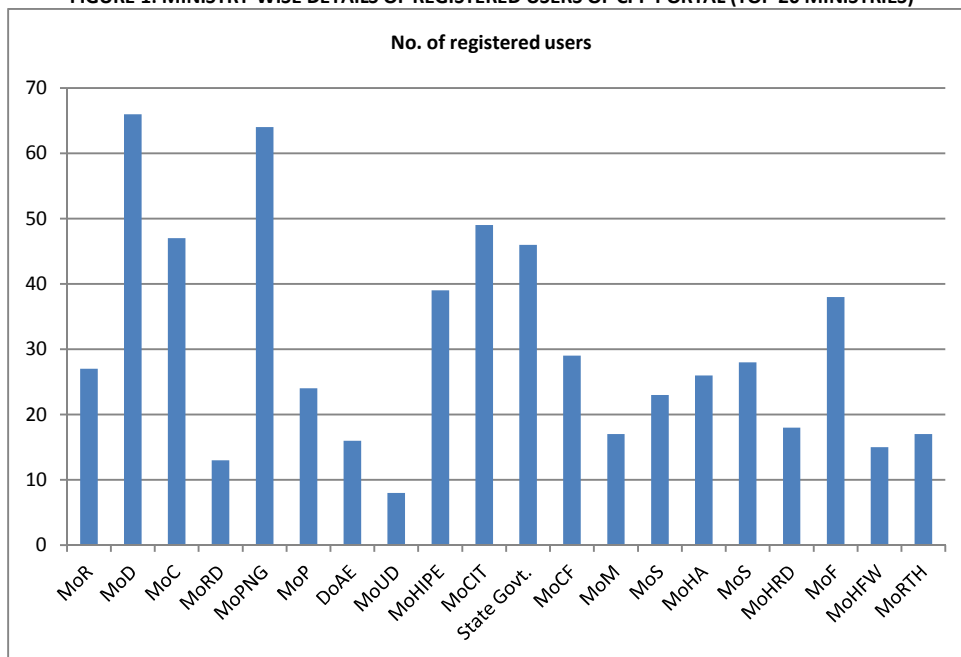
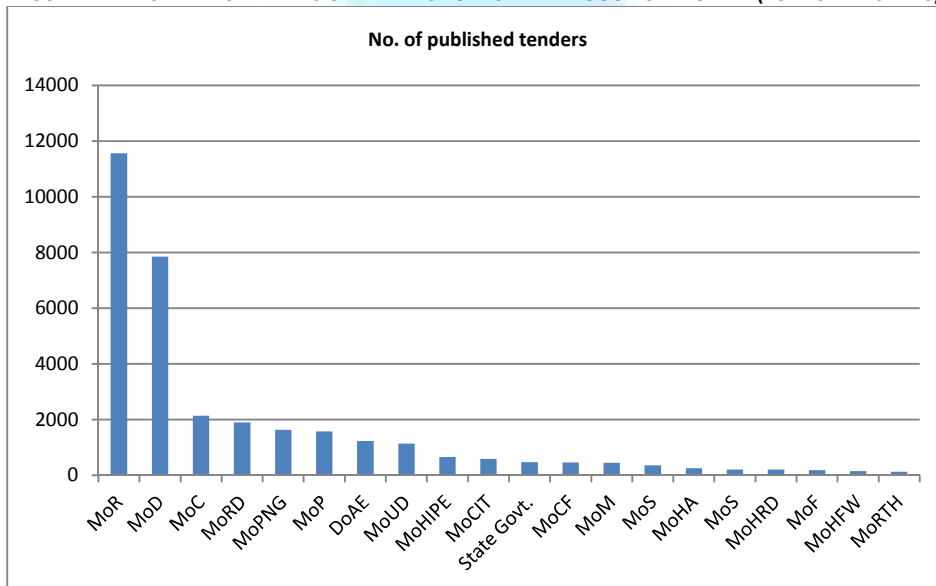


FIGURE 2: MINISTRY-WISE DETAILS OF TENDERS PUBLISHED THROUGH CPP PORTAL (TOP 20 MINISTRIES)



It is clear from the chart that the Ministry of Defence has the highest number of registered users. However, Ministry of Railways holds the credit of publishing highest number of tenders through CPP Portal. Up to March 31<sup>st</sup> 2013, a total of 18257 bids have been awarded through this portal.

**CONSTRAINTS FOR IMPLEMENTATION OF e-PROCUREMENT SYSTEM**

Although many organisations implemented e-procurement, this system is yet to be implemented in many organisations including central government autonomous bodies.

The following are the constraints for implementation of e-procurement system in the organisations:

- **Lack of awareness of government orders:** Even though the government has circulated the memorandum to various organisations/departments/autonomous bodies, due to ignorance, it has not been reached the ultimate authority, which has to take action for implementation of e-procurement in the concerned department.
- **Lack of knowledge in using web-based technologies/skilled staff:** Some organisations in rural areas are expressing poor response to this system due to non-availability of skilled staff for implementing this.
- **Lack of proper training:** NIC is providing training programmes to the needy persons. However, NIC could not achieve 100% success in providing training to all the departments. Web-based learning is not possible for those institutes, which lacks adequate skilled staff.
- **Poor response from the part of suppliers:** As some suppliers are showing a negative approach to this method of procurement, it reduces the number of competitive bids.
- **Lack of security:** Another important aspect is the fear about the security of the information submitted by the suppliers and departments.
- **Implementation of their own e-procurement system:** Even though some organisations in government sectors are successfully implemented e-procurement through their own software solution, they fail to upload a copy of the same in the Central Public Procurement Portal and to provide a link to CPP portal in the concerned portal, due to lack of awareness of CPP Portal/government orders.
- **Conservative mentality:** Some organisations are not ready to accept the latest technologies as they believe that the old system is best and it is difficult for such organisations to adapt to the new changing world.

**SUGGESTIONS**

The scope of CPP Portal may be widened by ensuring participation of all public sector undertakings. Awareness programmes and training programmes may be conducted in state level by NIC for the government organisations. As some organisations are depending private software solution providers for maintaining their own e-procurement portal, it increases the initial cost of implementation. Even though, such portal needs to be tested in STQC Laboratories, it is not being done by organisations. Moreover, those organisations are also required to publish the tenders in CPP portal in addition to their web portal. This creates duplication of work. Hence, government may withdraw the option given for the organisations to adopt their own software solution for e-procurement, instead government may strictly instruct the organisations to use CPP Portal and penalty may be charged from those organizations, which fail to follow this instruction. This change can ensure a full-fledged centralised system of e-procurement.

**CONCLUSION**

It has been found that the e-procurement system is widely accepted by most of the direct central government organisations. However, the system is yet to be implemented in certain ministries and statutory bodies/autonomous bodies, which still depends on conventional method of procurement. E-procurement system offers transparency, efficiency, better control and saving of money, manpower and time. The success of e-procurement with efficient security system is definitely a good initiative on the part of Govt. of India. Many state government departments initiated their own e-procurement system with the help of NIC. We can definitely say that this new initiative has a positive impact. By providing proper training and ensuring participation from all sectors coming under central government, it can achieve a cent percent success in this venture.

**ACKNOWLEDGEMENTS**

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## EFFECT OF ELECTRONIC MOBILE MONEY TRANSFER ON FINANCIAL LIQUIDITY AND GROWTH OF MICRO AND SMALL ENTERPRISES: A CASE OF NAIROBI CITY, KENYA

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### ABSTRACT

*Micro and small enterprises (MSEs) have emerged as promising opportunities to eliminate poverty and create jobs. Microenterprises are confronted with the liquidity challenges which lead to poor performance and finally failure of business. MSEs in the developing world are increasingly deploying the use of Mobile Phone Money Transfer (MPMT) to enhance their liquidity status and growth. The pace of transformation in the MSEs sector has speeded up with more MSEs realizing the potential of using the Mobile Phone Money Transfer in their daily business endeavors. Due to a handful of studies on the effect of this service the researchers have been puzzled to carry out further research. The study was based in Nairobi City, Kasarani District, focusing on retailers, workshops and hoteliers. Stratified random sampling was used to establish the size of the population to be studied in each stratum. A combination of descriptive and inferential statistics including chi-square test was used in data analysis supported by SPSS software. The research findings were that Mobile Phone Money Transfer (MPMT) contributes highly in both growth and stability of liquidity of Micro & Small Enterprises. Owners prefer using the technology as it is less costly and quick in transacting.*

### KEYWORDS

growth, liquidity, mobile phone money transfer, MSE.

### INTRODUCTION

In sub-Saharan Africa, businesses face a major challenge of liquidity which is the default means for carrying out small-scale transactions. Liquidity is a scarce resource, and an African entrepreneur's success may very well depend on his or her ability to mobilize liquidity quickly; from own savings, credit from suppliers, or to have customers that can pay upon delivery, or even better in the case of production and delivery being separate instances upon the placing of an order. Based on experience, the conjecture is that most MSEs struggle to make the cash-flow equation work out. Rutherford (1999) discusses the key role of supplier credits in facilitating sales for very small and informal businesses such as hawkers that enjoyed a credit to be returned by the end of the day. This is also one of the main reasons why it has always been important to move money efficiently.

Traditional money transfer service offered by for example Western Union, Money gram, banks and post operators has been around for a long time, but are generally being considered expensive, and/or inconvenient. Informal and/or local solutions have also been in place for a long time, the most common one being sending money by buses. Relaying money by bus is usually a fairly standardized practice (FSD-Kenya 2006 & 2009), although considered unsafe due to risk of robbery. Transactions over mobiles phone money transfer have rapidly gained market acceptance, as they address these shortcomings in traditional means of carrying out transactions. The demand is growing steadily for mobile phone money transfer services, in particular among the 'poorer' segments of society. In this case the 'poor' are found in the informal sector as MSEs, and they are potential or existing users of mobile phone services. The 'poor' found in the MSEs sectors comprise of a relative sense not the 'poorest' segments of the population, as there is adequate liquidity and solidity to set up and run a micro or small business.

### LITERATURE REVIEW

From a linguistic perspective, microenterprise is "very small-scale business that is normally owner-operated with few employees" (Webster's New Millennium™ Dictionary of English, 2003-2005). Schreiner and Woller (2003) suggested that microenterprises are tiny businesses; most have one employee, the owner. According to the Institute of Rural Management the term microenterprise refers to an informal activity run by poor with an investment limit of less than 100,000 of any local currency and employing less than five workers. Awasthi (2004) points out that there is no official definition available for microenterprise, and he suggests that microenterprise is a unit that employs less than six workers.

The ability to send and receive money is of major importance for MSEs in many developing countries, which is one of the main explanations to the immense uptake of MPMT services by the public in general. The main money flows are known to be from urban to rural areas; and from relatively well-off people to less fortunate friends and family. From the markets exposed to MPMT services, and from a general point of view, there is evidence from several developing markets that there is a clearly articulated need, as well as a willingness and ability to pay for such services. Hence, the demand is growing steadily for MPMT services, in particular among the 'poorer' segments of society.

As MSEs dominate in sub-Saharan Africa liquidity and cash-flow management are key bottlenecks for MSE operations, the fast diffusion of mobile money transfer was viewed as a potential tool for facilitating financial transactions. Research shows that most business owners have mobile phones; over 80 % and the difference between formal and informal businesses is small (Esselaar et al, 2008). Business, as well as society at large in Sub-Saharan Africa, has a very strong liquidity-based heritage and cash is the default means for carrying out small-scale transactions. Liquidity is also the key to doing business; it is a scarce resource, and an African entrepreneur's success may very well depend on his or her ability to mobilize cash quickly; from own savings, credit from suppliers, or to have customers that can pay upon delivery, or even better in the case of production and delivery being separate instances, upon the placing of an order. Based on our

experience, the conjecture is that most MSEs struggle to make the cash-flow equation work out. Rutherford (1999) discusses the key role of supplier credits in facilitating sales for very small and informal businesses such as hawkers that enjoyed a credit to be returned by the end of the day through MPMT.

## FACTORS CONTRIBUTING TO MPMT USAGE BY MSEs

### ACCESSIBILITY

Pagani (2004), states that accessibility is one of the main advantages of MPMT services. Small and micro businesses are among the greatest beneficiaries of MPMT. As at 31st March, 2009, there were 8,650 MPMT agents spread throughout the country offering the mobile payments service (Annual report, 2008/2009). The micro-business operators go to the bank less often and spend more time running their businesses. Equally, many unbanked Kenyans can now receive or send money wherever they are in the country (Omwansa, 2009).

### TRANSACTION COSTS

The transaction costs of sending money through the mobile payment technology are lower than those of banks and money transfer companies (Omwansa, 2009). Transaction costs are low to make the total cost of the transaction competitive. The cost of the mobile payments is affordable to most of the micro business operators and far below what the banks normally charge for their bank transactions (Mallat 2007). There are many different mobile handsets which are easy to operate and have the functionalities required for the mobile payment technology.

### CONVENIENCE AND SECURITY

Njenga (2009) states that although the mobile phone balances may seem low, the fact that there are balances proves that there is storage which can be perceived as acceptance of deposits. This is a significant indication of the high value placed on the convenience associated with the use of the mobile payment services. Omwansa (2009) states that a lost or stolen mobile phone does not mean catastrophe as no one can access an MPMT account without a correct Personal Identification Number (PIN). He further explains that in a country where majority of people have no bank accounts, MPMT provides both convenience and safety. People walk around with their virtual money knowing they can withdraw cash any time at a minimal fee. In a mobile environment, it is necessary to have perceived security and trust in the vendors and the payment system. (Siau et al. 2004; Mallat, 2007). Security and safety of MPMT is one of the primary concerns for users (Nam, Yi, et al, 2005). They state that safety represents no delay, no transaction incompleteness and no private information disclosure during payment transactions. The use of the pin and secret code for the MPMT transactions enhances the security and privacy issues. Key requirements for any financial transaction in an electronic environment should include confidentiality, authentication, data integrity and non-repudiation (Shon & Swatman, 1998). Other security factors important to the users are anonymity and privacy, which relate to use policies of customers' personal information (Jayawardhena & Foley, 1998; Shon & Swatman, 1998).

### SPEED AND USABILITY

According to Pagani (2004), most people described the MPMT services as user friendly, he also suggested that it is the usability, usefulness, ease of service operation and speed that people considered as bringing efficiency in the use of the MPMT services

### SATISFACTION

Personal experiences for a lot of people indicate that the current technology is user friendly and previous studies of the adoption of mobile payments show that it is the usability, usefulness, speed and convenience of the service itself that counts (Pagani, 2004). Safaricom's Annual Report for Year 2008/2009 shows that by end of March 2009, there were over 6.175 million registered M-PESA customers with an average of 11,580 new registrations per day representing a growth of 198% from the previous year (Annual Report 2008/2009). This indicates the wide satisfaction that the existing customers have reported which in turn has influenced new customers to take up the services.

### M-PESA AS SAVING ACCOUNT FOR INCREASING MSEs' LIQUIDITY

M-PESA, the first mobile money system in Kenya, was originally developed primarily as a money transfer device and was attractive because it allowed people to send remittances across distance at low cost. The system has become popular for other uses, including storing credit. Morawczynski (2009) suggests that incomes of rural mobile money transfer recipients have increased due to remittances, which have also led to higher savings by households. These results are based on an ethnographic study conducted in Kibera, a slum in Kenya, in 2007. A study by Plyler et al. (2010) ranked money circulation as the most important effect of mobile money, and credited mobile money with boosting local consumption. Moog (2010) found that factors responsible for adoption and continued usage of M-PESA services by MSEs include convenience, support, cost, satisfaction and security.

However, the degree of influence of the M-PESA to operation performances and financial liquidity of the small enterprises largely depends on how conducive the environment is (Porteous, 2006). He further says that, an environment is conducive if it has a set of conditions which enhanced a trajectory of developments in the market. This is particularly on the environments where wide spread access could be rampant. M-PESA in Kenya is spread wide but requires conducive environment to improve the welfare of its consumers. In Kenya the small enterprise are mostly clustered around the markets and the shopping centers providing them with the ability to register and transact with the other traders or their clients more effectively and efficiently as they are widely distributed in Kenyan markets and places which receive huge gatherings. M-PESA Services available to MSEs includes

### PERSON-TO-PERSON (P2P) SENDING OF MONEY

P2P is the most common means of using mobile money globally. In Kenya, 85% of all mobile money transfers are P2P with most being below Kshs.10, 000. In P2P, a user transfers value from his prepaid mobile wallet to another user's mobile.

### BULK PAYMENT SERVICE

This service allows an organization, whether it is a business, government ministry, to pay multiple recipients at one time by paying into their mobile money wallets. Because the vast majority of rural and/or seasonal workers across Kenya lack bank accounts, organizations have needed to find ways of delivering cash to pay salaries and expenses. They have adopted this method as most effective.

### BILL PAYMENT SERVICES

This service allows users to pay services providers using their mobile money account. Previously a common practice was for a client to travel to the bill pay location in towns, and stand in line for long periods of time to pay bills, resulting in extra expense for travel and productive time lost away from work. Such inconveniences in Kenya have been reduced by the use of MPMT. Organizations like educational institutions, government agencies, hospitals, utility companies, Micro Finance Institutions and many others use MPMT.

## IMPORTANCE OF THE STUDY

The information obtained from the study may help the government to come up with policies to enhance development of MSEs and partner with MPMT service providers to improve this service. Also the MSEs operators may use the findings in managing their financial liquidity levels in their MPMT accounts. This research can be a basis to scholars in carrying out further research.

## STATEMENT OF THE PROBLEM

Despite increased efforts by banks to extend their operations by opening agency banking to avail liquidity to their customers, liquidity and cash-flow management are key bottlenecks for MSEs operations. The fast diffusion of mobile money transfer is viewed as a potential tool for facilitating financial transactions. Research shows that most business owners have mobile phones; over 80 % and the difference between formal and informal businesses is small (Esselaar et al, 2008). Since it was launched in March 2007, it has been adopted by many MSEs operators as it requires basic knowledge to operate. As a result majority of MSEs in Kenya have embraced it to increase their financial liquidity in their daily business operations as the inherent costs are lower compared to bank services costs. The owners are also able to know their account balances and easily manage their liquidity. Banked and unbanked can also maintain liquidity balances in their mobile phones which can be perceived as deposits (Njenga, 2009). Although mobile money transfer is accessible to MSEs in many sub-Saharan

countries, little is known to date of its scope and impact on financial liquidity of businesses. It is in this regard the study is designed to determine the effect of mobile phone money transfer on financial liquidity and growth of MSEs in Nairobi City.

**RESEARCH OBJECTIVES**

The general objective of the study was to determine the effect of Mobile Phone Money Transfer (MPMT) on financial liquidity and growth of MSEs in Nairobi City. Specifically to:

1. determine the relationship between MPMT, financial liquidity and growth of MSEs in Nairobi City
2. determine the effect of MPMT on financial liquidity, and growth of MSEs in Nairobi City
3. determine the factors that enhances the usage of MPMT by MSEs in their operations

**RESEARCH HYPOTHESIS**

1. There is no significant effect of Mobile Phone Money Transfer (MPMT) on financial liquidity and growth of MSEs in Nairobi City.
2. There are no significant factors that enhance MPMT usage by MSEs in their operations.

**RESEARCH METHODOLOGY**

The study employed a descriptive research design. This design was used in preliminary and exploratory studies to allow researchers to gather information, summarize and interprets for the purpose of clarification. According to Cooper (2006), descriptive research is important for a business as it is able to clearly describe the characteristics associated with a subject population and show the association between different variables. The design will enable the researcher to collect data from a wide range of respondents who are owners of MSEs on the effect of MPMT on financial liquidity and growth of their MSEs. This design will be appropriate as the researcher will sought for information that exist without manipulation of variables.

**LOCATION AND SAMPLE SIZE**

This study was carried out in Nairobi city Kasarani District. It focused on retailers, workshops and hotels. The researcher selected 10% samples of the total population summing up to 1,184 subjects. According to Mugenda and Mugenda (2003), for descriptive studies 10% provides a sufficient sample size. The researcher used proportionate stratified sampling. According to Cooper (2006), this technique will be appropriate because it has a higher statistical efficiency.

**TABLE 1 : SAMPLE SIZE**

Strata	Total Number	Sample
Retailers	1053	105
Workshops	74	7
Hoteliers	57	6
Total	1,184	118

**3.8 DATA ANALYSIS AND CRITERION**

Data collected from the field was cleaned coded and entered into the computer using statistical packages for social sciences (SPSS) Version 17. Descriptive statistics like frequencies and tables was used to analyze the data obtained. Results of data analysis are presented in form of table graphs and pie charts. Chi square was used to test the hypothesis so as to get a general view from results of the sample population.

**TABLE 2: DATA ANALYSIS TABLE**

Research Hypothesis	Independent Variable	Dependent Variable	Statistical Tools
a.) There is no significant effect of MPMT on financial liquidity and growth of MSEs in Nairobi	MPMT	Financial liquidity Growth of MSEs	Chi-square, Frequencies and Percentages.
b.) There are no significant factors that enhance MPMT usage by MSEs in their operations.	Factors	MPMT usage by MSEs operators	Chi-square, Frequencies and Percentages.

**RESULTS AND DISCUSSION**

**1. MPMT USAGE IN MAINTAINING FINANCIAL LIQUIDITY AND GROWTH AMONG MSEs**

Financial liquidity among MSEs is largely influenced by extent of usage of MPMT .Growth in MSEs is enhanced by availability of liquidity to facilitate their business operations. Data obtained was presented descriptive.

**2. MPMT ACCOUNTS**

The study sought to find out whether MSEs owners have operational MPMT accounts.

**TABLE 3: DO YOU HAVE AN OPERATIONAL MPMT ACCOUNT?**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Yes	85.7	97.1	83.33
No	14.3	2.9	16.67
Total	100	100	100

Table 3: Workshop owners, 85.7% of the respondents have operational MPMT accounts while 14.3% do not have. To retailers 97.1% operates MPMT only 2.9% do not operate. Hoteliers 83.33% operates while 16.67% do not operate MPMT

**3. LEVEL OF IMPORTANCE OF MPMT SERVICES**

The study sought to find out importance of MPMT services usage by MSEs in terms of payment of bills, buying business goods, savings and holding liquidity.

**TABLE 4: WHAT IS THE LEVEL OF IMPORTANCE OF MPMT SERVICES?**

Users of MPMT services					
	Very important	Important	Less important	Not important	Not sure
Buying goods	18.8%	47.3%	21.4%	8.9%	3.6%
Paying bills	11.6%	29.5%	31.3%	23.2%	4.5%
Savings	22.3%	14.3%	58.9%	2.7%	1.7%
Holding liquidity	47.3%	29.5%	11.6%	7.1%	4.5%

In table 4, among the respondents 47.3% said MPMT is very important in holding liquidity in the business, 29.5% view it to be important this totals to 76.8%

**TABLE 5: DO YOU USE MPMT IN YOUR DAILY BUSINESS OPERATIONS?**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Yes	55.7	55.62	53.67
No	44.3	44.38	46.33
Total	100	100	100

In Table 5, 55.7% of Workshop respondents use MPMT in their daily business operations, while Retailers 55.62% and Hoteliers 53.67% are users.

**4. MAINTAINING REQUIRED LIQUIDITY**

Researchers sought to find out whether MPMT helps MSEs to maintain required liquidity.

**TABLE 6: TO WHAT LEVEL DOES MPMT HELP YOU TO MAINTAIN REQUIRED LIQUIDITY?**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Very high	28.58	11.43	33.33
High	28.58	50.48	33.33
Moderate	14.28	24.76	16.67
Low	14.28	9.52	16.67
Not sure	14.28	3.81	0.0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

In Table 6, the respondents in workshops noted that the level of maintaining liquidity via MPMT is 28.58% very high and 28.58% high. On retailers 11.43% very high and 50% high, while to hoteliers is 33.33% very high and 33.33% high

**TABLE 7: TO WHAT EXTENT DOES MPMT HELP YOU TO MAINTAIN GROWTH IN BUSINESS**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Very high	14.28	9.52	16.67
High	28.58	19.05	33.33
Moderate	28.58	36.19	16.67
Low	14.28	27.62	0.0
Not sure	14.28	7.62	33.33
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

In table 7, workshop respondents 14.28% say MPMT contributes very high on growth of business through liquidity, 28.58% high and 14.28% moderate, while retailers say it contributes 9.52 very highly, 19.05% high and 36.19% moderate. Hoteliers say 16.67% very high, 33.33% high and 16.67% moderate

**5. DEBTORS COLLECTION THROUGH MPMT**

Most MSEs owners receive their customers' payments through their MPMT accounts hence improving their cash flow and less strain on liquidity.

**TABLE 8: DO YOUR BUSINESS DEBTORS PAY DEBTS THROUGH YOUR MPMT ACCOUNT?**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Yes	57.14	70.48	33.33
No	42.86	29.52	66.67
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

In Table 8, among respondents in workshops 57.14% receive their customers' payments through MPMT while 42.86% do not, while in retailers 70.78% receive their customers' payments through MPMT while 29.22% do not and hoteliers 33.33% receive their customers' payments through MPMT while 66.67% do not.

**6. EFFECT OF DEBTORS COLLECTION THROUGH MPMT ON ENTERPRISE' LIQUIDITY**

Most respondents said MPMT has improved liquidity, speedier logistics and convenience

**TABLE 9: HOW DOES DEBTORS' COLLECTION THROUGH MPMT HELP YOU TO IMPROVE LIQUIDITY LEVELS?**

Strata	Workshops (%)	Retailers (%)	Hoteliers (%)
Very high	14.29	18.1	16.67
High	42.86	38.1	50.0
Moderate	14.29	15.24	33.33
Low	28.57	23.81	0.0
Not sure	0.0	4.76	0.0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

In Table 9, respondents in workshops noted that the effect is, 42.86% very high while 28.57% was moderate, on retailers 18.1% said to be very high while 38.1% said to be high. The hoteliers 50% said to be high while 33.33% said to be moderate

**7. FACTORS CONTRIBUTING MPMT USAGES AMONG MSEs**

Several of the entrepreneurs interviewed reported that MPMT services are fast compared to other alternatives, convenient, a well-developed agent network as well as affordable to most people. Many of the business people underscore that it saves time, is safe and that they have lessened their dependence of banks for holding their daily liquidity needs.

**TABLE 10: WHAT LEVEL OF PREFERENCE DO YOU PLACE ON THE FOLLOWING FACTORS WHEN USING MPMT?**

Factors	Very important	Important	Less important	Not important	Not sure
Transaction costs	20.8%	43.8%	18.8%	14.5%	2.1%
Accessibility	30.1%	20.8%	15.6%	24.1%	9.4%
Convenience and speed	31.2%	22.9%	28.2%	12.5%	5.2%
Security	26%	26%	24%	15.6%	9.4%
Satisfaction	7.3%	21.9%	22.9%	20.8%	7.3%

In table 10, 43.8% of the respondents prefer MPMT due to low transaction costs, 30.1% indicated that accessibility, 31.2% indicated convenience and speed, 52% (combined very important and important) indicated that security is important.

**8. HYPOTHESIS TESTING**

**RELATIONSHIP BETWEEN MPMT USAGE AND GROWTH OF MSEs**

The study sought to find out if there exists a relationship between the MPMT usage and the growth of MSEs. The results are as shown below;

**TABLE 11: THE RELATIONSHIP BETWEEN MPMT USAGE AND GROWTH OF CUSTOMER BASE**

		Growth of customer base %		
		Slow	Rapid	Gradual
Level of MPMT usage on maintenance of required liquidity %	Not sure	0	0	5.3
	Low	11.5	0	0
	Moderate	7.3	41.7	3.1
	High	5.2	4.2	20.8
	Very high	0	0	1.0
<b>Total</b>		<b>24.0</b>	<b>45.8</b>	<b>30.2</b>

Chi-square= 93.264, DF=8, P-value=0.002

The p-value obtained above is less than 0.05. This indicates that there exists a significant relationship between MPMT usage and growth in the customer base of MSEs.

TABLE 12: THE RELATIONSHIP BETWEEN MPMT USAGE AND GROWTH IN SALES TURNOVER

		Growth in sales turnover %		
		Slow	Rapid	Gradual
Level of MPMT usage on maintenance of required liquidity %	Not sure	5.2	0	0
	Low	11.5	0	0
	Moderate	16.7	26	9.5
	High	0	0	30.2
	Very high	0	0	1.0
<b>Total</b>		<b>33.3</b>	<b>26</b>	<b>40.7</b>

Chi-square= 93.194, DF=8, P-value=0.013

The p-value obtained in the cross tabulation above is less than 0.05. This indicates that there exists a significant relationship between MPMT usage and growth in the sales turnover of MSEs.

TABLE 13: THE RELATIONSHIP BETWEEN MPMT USAGE AND INCREASE IN NUMBER OF MSEs' EMPLOYEES

		Increase in Employee growth %		
		Slow	Rapid	Gradual
Level of MPMT usage in maintenance of required liquidity %	Not sure	5.2	0	0
	Low	4.2	7.3	0
	Moderate	3.1	14.6	34.4
	High	0	0	30.2
	Very high	0	0	1.0
<b>Total</b>		<b>12.5</b>	<b>21.9</b>	<b>65.6</b>

Chi-square= 74.263, DF=8, P-value=0.043

The p-value obtained in the cross tabulation above is less than 0.05. This also indicates that there exists a significant relationship between MPMT usage and growth of employees of MSEs

Thus from the results obtained, the null hypothesis is thus rejected.

**The relationship between MPMT usage and financial costs incurred**

The researcher also sought to find out whether MPMT usage affects the financial costs incurred on transactions among the MSEs. The results are tabulated in the table below;

TABLE 14: RELATIONSHIP BETWEEN MPMT USAGE AND TRANSACTION COST LIQUIDITY

		Transaction costs %				
		Not sure	Not important	Less important	Important	Very important
Level of MPMT usage in maintenance of required liquidity %	Not sure	2.1	3.1	0	0	0
	Low	0	11.5	0	0	0
	Moderate	0	0	18.8	33.3	0
	High	0	0	0	10.4	19.8
	Very high	0	0	0	0	1.0
	<b>Total</b>	<b>2.1</b>	<b>14.6</b>	<b>18.8</b>	<b>43.7</b>	<b>20.8</b>

Chi-square= 73.661, DF=6, P-value=0.009

The chi-square results above indicate that there exists a relationship between MPMT usage and transaction costs in availing liquidity.

TABLE 15: RELATIONSHIP BETWEEN MPMT USAGE AND ACCESSIBILITY OF LIQUIDITY

		Not sure	Not important	Less important	Important	Very important
		Level of maintenance of required liquidity	Not sure	5.2%	0%	0%
	Low	4.2%	7.3%	0%	0%	0%
	Moderate	0%	4.2%	4.2%	5.2%	16.7%
	High	0%	0%	0%	10.4%	19.8%
	Very high	0%	0%	0%	0%	1.0%
	<b>Total</b>	<b>9.4%</b>	<b>27.1%</b>	<b>15.6%</b>	<b>20.8%</b>	<b>27.1%</b>

Chi-square= 40.495, DF=10, P-value=0.049

The results above also indicate the existence of a significant relationship between MPMT usage and accessibility of liquidity.

TABLE 16: RELATIONSHIP BETWEEN M-PESA USAGE AND CONVENIENCE AND SPEED

		Not sure	Not important	Less important	Important	Very important
		Level of maintenance of required liquidity	Not sure	0%	0%	5.2%
	Low	0%	1.0%	1.0%	7.3%	2.1%
	Moderate	5.2	11.5%	5.2%	3.1%	27.1%
	High	0%	0%	17.7%	12.5%	0%
	Very high	0%	0%	1.0%	0%	0%
	<b>Total</b>	<b>5.2%</b>	<b>12.5%</b>	<b>30.2%</b>	<b>22.9%</b>	<b>29.2%</b>

Chi-square= 33.458, DF=10, P-value=0.031

There exists a relationship between usage of MPMT, the convenience and speed in availing financial liquidity.

Thus from the results obtained, the null hypothesis was thus rejected.

**SUMMARY**

Based on the research objectives, hypothesis and analysis of data, the following major findings were established.

From the results of data analysis, all the null hypothesis were rejected, hence, MPMT contributes highly to the growth of MSEs and financial liquidity; MSEs owners preferred MPMT to other modes of availing liquidity due to the following factors, transaction costs, convenience and speed. Due to the above factors MPMT is highly adopted by business people to avail the 'just in time cash'.



**CONCLUSION**

MSEs play an important role in Kenyan economy. They are the largest source of employment and contribute great deal to the GDP. This implies that growth of MSEs will lead to growth of our economy in general. Even as measures and policies are formulated so as to boost operations of MSEs, all this has not been successful due to inadequate liquidity to facilitate MSEs' operations. Adequate liquidity is very essential for MSEs in terms of effective operation and growth.

**RECOMMENDATIONS**

- a.) Facilitating the situation for MSEs' financial liquidity needs improvement. This role may be financed and guided by neutral actors such as NGOs, donor agencies, microfinance organizations (MFIs) that are not directly linked with the commercial aspects of the MPMT services. The facilitation should focus on functions that support the MPMT 'market' in general rather than funding individual companies' activities.
- b.) Establishment of a business version of MPMT that could address the specific needs of MSEs. Other functions should be included in MPMT services like payments of taxes and salaries as well as functions for generating reports for book-keeping purposes.
- c.) Integration between MPMT and the banking systems. This is not only a way of sending money across several systems, but also serves as lubrication for increased business exchange between smaller and larger businesses.

**RECOMMENDATION FOR FURTHER STUDY**

- a.) There is a need to conduct more comprehensive and thorough studies on the role of MPMT in MSEs' financial growth and security.
- b.) The impact of efficient payment models on improving cash flow

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## CORPORATE SOCIAL RESPONSIBILITY IN BUSINESS: A CASE STUDY ON GRAMEEN PHONE LIMITED BANGLADESH

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### ABSTRACT

*Any corporation's business goal is to provide value and incentive to its stakeholders. Therefore, profit-oriented corporations or organizations are not a charitable organization although sometimes it is in their direct interest to support charitable activities. Furthermore, sometimes business organizations carry out certain activities that government should undertake, although they are not government agencies. It is beneficial for the corporations to carry out such socially responsible activities and this performance of business activities is getting more importance and interest. It is strikingly obvious that a business operates within a complex web of social responsible owing to the pressures like changing expectations of stakeholders, restructuring of international business rules, continuous pressure to improve the quality of products and services, ecological imbalances due to business operations, etc. So, the business must have right directions for talking care of the society in which it operate. This study mainly focuses on the involvement of mobile telecommunication companies in corporate social responsible activities. Moreover it is vital to highlight the several unique features of this industry, such as stiff competition between the companies for a strong customer base, various new issues that arise from customer services and satisfaction.*

### KEYWORDS

Discretionary activities, Motivating factors, Corporate Social Responsibility (CSR), Stakeholders, GrameenPhone (GP).

### 1. INTRODUCTION AND CONCEPT OF CSR

 Social responsibility involves improving the well being of society. Besides obeying the law and meeting the normal and responsible expectations of the public, socially responsible organizations and individuals lead the way in setting standards of business and community performance. Social responsibility is voluntary; it is about going above and beyond what is called for by the law (legal responsibility). It involves an idea that it is better to be proactive toward a problem rather than reactive to a problem. It means eliminating corrupt, irresponsible or unethical behavior that might bring harm to the community, its people, or the environment before the behavior happens. Although social work in some areas of Bangladesh is gradually becoming recognized as a concept or an organized program but it will fill by the masses as an act of "god will" or Charity inspired either by a sense of religious duty or simple piety.

In Bangladesh, Non-government organizations (NGO) used to provide social activities in few areas such as in the field of health, education etc. Later NGO's started contribute to the victim of various worse incidents. Many business organizations were inspired by these NGO's. They frequently started social work. They frequently started only the well-known business organizations participated in social well-being gradually other. Medium and small business organizations started social activities. At first they used to provide social activities only to their customer by maintain quality of their products and services. Day-by-day business organizations engaged themselves in social activities to environment, employees and to their investor. Now became part of their business (Taher M and Rahman A, 1993).

In Bangladesh, a rapidly developing country, the business environment is typically characterized by powerful business enterprises, a legal environment aimed at ethical behaviors on the part of business, and societal expectations that businesses should be more ethical and socially responsible. Along with that, in developing countries the organizations need to be more competitive, therefore, issues of customer service and satisfaction is of great importance. Thus in decision making processes, companies try to avoid actions that may breach any regulation or negatively impact their reputation in order to avoid consumer dissatisfaction.

The business of the twenty first century-whatever its size- is going to be part of a global business community, affecting and being affected by social change, events and pressures from around the world. Whether the business entity large or small, its linkages to customers, suppliers, employees and communities around the world are likely to be more numerous, divers and important to its success. This is why the relationship between business, government, and society is significantly important to understand both as a citizen and a manager. Such a relationship becomes more and more complex as the whole world is now moving towards system where most nations will play to the 'same rules', for the time being those of global capitalism.

CSR covers the relationship between corporation (or other large organization) and this societies with which they interact. CSR also includes the responsibilities that are inherent on both sides of these relationships. CSR defines society in its widest sense and on many levels, to include all stakeholders and constituent groups that maintain an ongoing interest in the organization's operations (William B. Werther and JR. David Chandler). Moreover, business organizations have some obligations to the society, as they created some of the problems in their revenue generating races, and of course, these problems need to be addressed properly. So, corporate executives, employees, shareholders, consumers and other publics interested about business operations, today expect organizations to be engaged in some social issues like, reasonable price and quality living of consumer and employee, fair wage, employee safety, fair advertisement, proper fund

management, etc. Above all, the people of business enterprises have to be convinced that the arguments placed in favor of CSR practices are exaggerated. Rather, companies are aware that they can contribute to sustainable development by managing their operations in such a way as to enhance economic growth, increase competitiveness and ensuring at the same time environmental protection and promoting social rights. Thus CSR is a concept whereby companies integrate social and environmental concerns on their business activities (Julie, 2002). Social responsibility of business can be defined by the views and thoughts expressed by authors, researchers and observers in the respective context. Such expressions are mentioned below:

CSR is defined as categories of economic, legal, ethical and discretionary activities of a business entity as adapted to contribute to the values and expectations of society and it is also the continuing commitment by any business organization whereby they emphasize the ethical elements in their management and overall organizational structure (Richardson, 1999). Social responsibility refers to an organization's obligation to maximize its positive impact and minimize its negative impact on society (Pride Ferrell). Social responsibility is an ethical or ideological theory that an entity whether it is a government, corporation, organization or individual has a responsibility to society. This responsibility can be 'negative' in that it is a responsibility to refrain from acting (resistance stance) or it can be 'positive' meaning there is a responsibility to act (proactive stance) (Wikipedia). Social responsibility is the obligation of managers to choose and act in ways that benefit both the interests of the organization and those of society as a whole (John Naylor). Social responsibility means that a private corporation has responsibility to society that go beyond the production of goods and services at a profit –which a corporation has a broader constituency to serve than stockholders alone (Arif-1990)

In recent years the business strategy field has experienced the renaissance of corporate social responsibility (CSR) as a major topic of interest. The concept has not surfaced for the first time. CSR had already known considerable interest in the 1960s and 70s, spawning a broad range of scholarly contributions (Cheit, 1964; Heald, 1970; Ackermann & Bauer, 1976; Carroll, 1979), and a veritable industry of social auditors and consultants. However, the topic all but vanished from most managers' minds in the 1980s (Dierkes & Antal, 1986; Vogel, 1986).

Moreover, the concept of CSR, calls for a lengthy discussion due to its varied history. In the past, there have been traces of evidence in the business community that showed their concern for society in general. Although there are many definitions of CSR available, we center our attention on more recent concepts of CSR. CSR behavior can be defined as discretionary actions undertaken by companies that are intended to advance their social issues (Richardson, Welker and Hutchinson, 1999). CSR can be defined as regards to all aspects of business behavior so that the impacts of these activities are incorporated in every corporate agenda (Orgrizek, 2001)

## 2. OBJECTIVES OF THE STUDY

The study mainly focused on the analysis of CSR activities and performances of the Grameenphone Limited and the extent of their involvement in CSR activities. In light of main objective, the specific objectives of the study are as follows:

- !) To determine the concentration and areas of CSR activities.
- !!) To identify the factors that influence telecommunication companies' involvement in CSR activities.

## 3. METHODOLOGY OF THE STUDY

To cater the need of the objectives of the study, data were collected and used from the secondary sources of the sample company. An extensive desk work was conducted to get a clear idea about the concept of CSR of business and reviews published material from different sources to explain the relevant thought on the issue.

Furthermore, it confer to and look for advice from few academicians, qualified chartered accountants and cost and management accountants and experienced person in the relevant field in order to gain a logical and empirical basis of interpretation of corporate social responsibility, that comply with the prime objective. The data and information thus collected, analyzed, arranged and presented in logical format to make the study informative, comprehensive and reader- friendly covering all areas of corporate social responsibility activities of GrameenPhone Limited.

## 4. DESIGN OF THE STUDY

### 4.1. STATEMENT OF THE PROBLEM

In the competitive economy, a business has to be responsible sufficiently to her stakeholders to make profitable business growth. It is a reason why business firms integrate activities into social and economic objectives. At the same time people within and outside the organizations questioned about the type of engagement of businesses into society's interests protecting. The same argument is given by few leading management thinkers of today's practice. Some of them argued that profit should be the first and foremost motive of continuing a business. They raised question of justification and expertise of business managers to solve social problems. In such a view to say against social responsibility exercise, it is mentioned that engagement to social problems may hinder the prime responsibility in most of the cases (Arif, 1990). Actually investor and consumer do not want to take the share of such costs incurred in this case. Excepting cost consideration, business executives may lack the perceptions and skills to work effectively with social issues (Hoque, 1985). Although the debate has been continuing on the issue, organizations spend millions of dollar to take care of the stakeholders' interest.

However, in a very competitive global market, mobile telecommunication companies must strive to portray a picture of themselves as highly socially responsible companies. Active involvement in socially beneficial programs provides extra advantages to the company. This study examines the concentration of corporate social responsible performances and activities practices by GrameenPhone Limited in Bangladesh. Furthermore, this study also tests the motives and the most influencing factors in their concentration of involvement in CSR. On the basis of the agency theory assumptions, the primary motivating factors is the belief that CSR can increase long term profitability and sustainability of the company as well as enhance the reputation of the organization.

GrameenPhone Ltd. show satisfactory level of involvement in environmental concerns, welfare or charity, community involvement, product and services improvement, and natural disasters awareness programs. Bangladesh Telecommunication Regulatory Commission (BTRC) as the regulatory body has determined that the mobile telecommunication companies will actively be involved in CSR as the customer- oriented factors in their business operation is of utmost importance. Overall, it can be concluded that the GrameenPhone Ltd. has high initiative in CSR activities with several constructive motives. CSR actually portrays the image of the firm itself. It shows what the company has done to fulfill its corporate duty to ensure the firm is not only good in providing the service but also plays its roles by contributing something to the community (Tilt, 1994). In order to have a good relationship with the community, the firm should do something beneficial for the community. Within the company itself, there is also a platform for social contribution especially to the employees. Another industry feature is the stiff competition amongst each to attract as many customers as possible. As the customer is their main target, welfare of the customer is of great importance. Thus, all the players in the industry compete on gaining strong customer basis. They work very hard to attract as many customers by adapting a comprehensive marketing strategy, offering valuable packages or schemes as well as quality service. As any other service oriented provider, all players need to maintain a high customer satisfaction level in order to ensure their survival in the industry (Dennies, 1998). All these activities actually help the companies to enhance their corporate image and at the same time fulfill their corporate social responsibility. Thus considering all these factors, we intend to determine the comprehensiveness of Grameenphone Ltd. involvement in CSR activities.

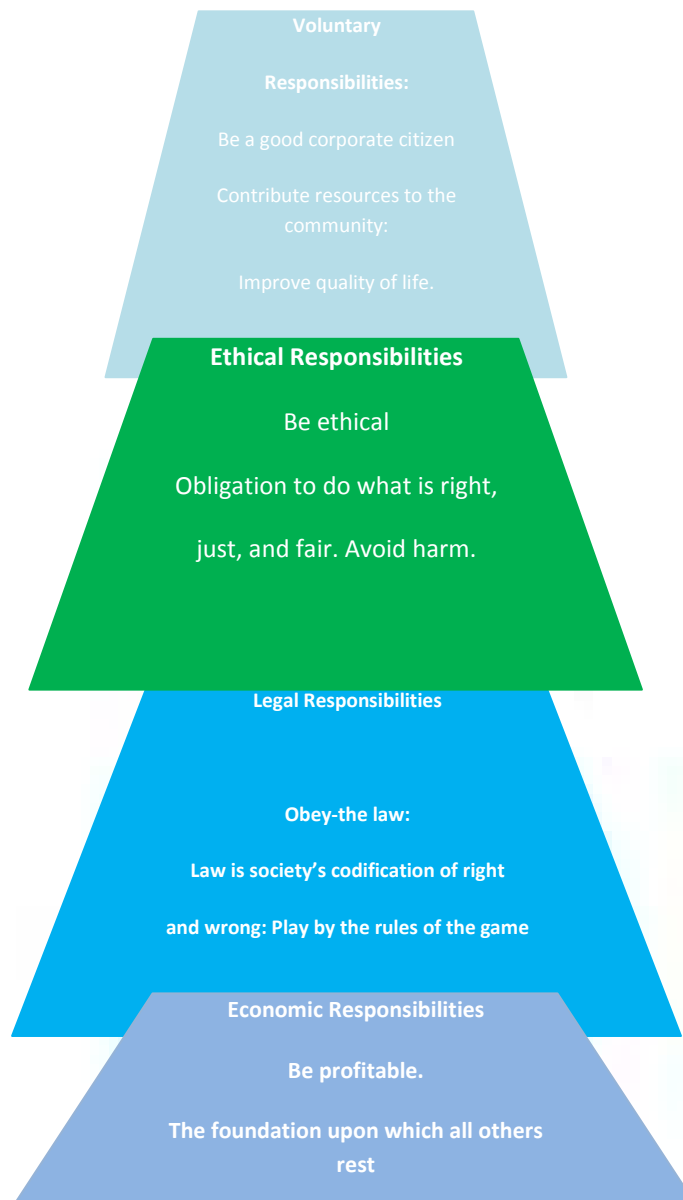
### 4.2. WHY CSR AND HOW IT IS RELATE TO THE BUSINESS ENVIRONMENT?

CSR is important because it influences all aspects of a company's operations. Increasingly, consumers want to buy products from companies they trust, suppliers want to form business partnerships with companies they can rely respect large investment funds want to support firms that they see as socially responsible; and nonprofits and NGOs want to work together with companies setting practical solutions to common goals. Satisfying each of these stakeholder groups (and other) allows companies to maximize their commitment to their owners (their ultimate stakeholders), who benefit most when all of these groups needs are being met. Relationship of CSR activities and responsibility in the business environment can be demonstrated into four basic categories, such as:

**Economic responsibilities:** Economic responsibilities are to produce goods and services that society wants at a price that perpetuates the business and satisfies its obligations to investors. **Legal responsibilities:** Legal responsibilities are, at the very least, to obey local, state, federal and relevant international laws. **Ethical**

**responsibilities:** Ethical responsibilities include meeting other societal expectations, not written law. **Voluntary responsibilities:** Voluntary responsibilities are additional behaviors and activities that society finds desirable and that the values of the business dictate.

FIGURE-1: THE HIERARCHY OF CORPORATE SOCIAL RESPONSIBILITY



Source: Bateman and Snell, Management 4<sup>th</sup> edition

Although criteria and standards for determining these responsibilities vary among organizations and countries, some efforts have been made to establish sets of global or universal ethical principles. For example, it is widely agreed that all people are normally obligated to adhere to core principles such as avoid harm to others, respect the autonomy of others, avoid lying and honor agreements.

**4.3. MOTIVATING FACTORS OF INVOLVEMENT IN CSR**

Based on the literatures definition of CSR, CSR behaviors are not constant over time or space, social expectations and pressure for specific types of CSR have varied over time and are contingent on the nature if the company. A study by Windsor, 2001 showed that social responsibility is achieved when the corporation conforms to the prevailing norms and expectations of social performance in a given society.

Since CSR behaviors are charitable and discretionary, the likelihood that a specific company will engage in CSR will also depend on the characteristics of the business and management. A company may decide to take a proactive attitude on an ethical issue in the absence of specific pressures for that company to act, more specifically it is voluntary. On the other hand, it is possible for businesses with publicly known CSR related problems to take no action with regard to these problems.

CSR is also influenced by the ethics of the firm or firm or organizations. Ethical motivation can guide the business or organization to do the right thing without any external pressure or governmental constrain. Joyner, Payne & Raiborn, 2002, contended that people believe businesses are amoral, when in fact they generally embrace the values of ethics in doing business. They cited several factors that serve to legitimize their position and one of the factors is society, which expects moral behavior of the business when it cries out against immoral labor practices or environmental policies.

Business leaders are starting to acknowledge some of the market benefits and competitive advantages for companies who put into place a comprehensive CSR policy (Ogrizek, 2001). This means that a business with a strong stance in corporate responsibility will attract top talent reputation. However, most of the respondents in a study by Zabid and Saadiatul, 2002, did not agree that business leaders who have too much social power should not engage in social activities that might increase their social power. It shows that the political power that they possess might have a direct relationship with the companies' social agendas.

Profitability or financial performance also has an influence on CSR. A study by Cochran & Wood, 1984, found that within industry groups, the financial variable that most strongly correlated with CSR is asset age and that omission of these variable results in a spurious correlated with CSR and financial performance. In other words, firm with older assets have lower CSR ratings.

In the context of CSR expenses and profit and profitability performance in Bangladeshi business organizations it may be mentioned that Income- tax Ordinance, 1984 provides some exemption i,e, tax credit under Section 44(1), part A of the Sixth Schedule and Section 44(4) part B of the Sixth Schedule of certain Non-

assessable and Tax-credit income is found related with CSR performance, and ten percent (10%) tax rebate is applicable on those CSR expenses subject to the specific conditions; CSR expenses should not exceed twenty percent (20%) of total income or amount not more than eight (8) core, lower one is eligible for tax rebate. Thus it is seen that government motivates corporate organizations to make their concentration on CSR activities with providing certain incentives.

A recent longitudinal Harvard University study found that, "stakeholder-balances" companies showed four times the growth rate and eight times the employment growth when compared to companies that are shareholder-only focused (BSR, 2001). Similarly, a study by the University of Southwestern Louisiana entitled "The Effect of Published Reports of Unethical Conduct on Stock Prices" showed that publicity about unethical corporate behavior lowers stock prices for a minimum of six months (BSR, 2001).

Furthermore, companies perceived to have strong CSR commitments often find it easier to recruit employees, particularly in tight labor market. Retention levels may be higher, too, resulting in a reduction in turnover and associated recruitment and training costs. Tight labor markets- as well as the trend toward multiple jobs for shorter periods of time- are challenging companies to develop ways to generate a return on the considerable resources invested in recruiting, hiring, and training talent.

#### 4.4. TELECOM INDUSTRY IN BANGLADESH: AN OVERVIEW

In this era of globalization, communication has become the most significant factor. For this, telecom industry is playing the major role to change the lives of the people and their business. In a densely populated country like Bangladesh, telecommunication can play a vital role to boost the economy and social level of people. This sector is poised for rapid growth in the coming years. Moreover, the efficiency of other businesses has already increased because mobile phone has become easily available in these days due to the government's decision of deregulating the telecommunications sector, which had been a state monopoly until the late 1980s. Privatization of the telecommunication sector began in 1989, when Sheba and BRTA were awarded 25-year licenses to install and operate fixed-wire lines and wireless services in rural areas. The same year, Pacific Telecom Bangladesh got the Government's permission to launch the country's first cellular phone and paging service sold under brand name Citycell in collaboration with a Hong Kong based company. The company targeted only the higher class of the society. During that time price of mobile was above Tk 50,000/. Naturally, the growth of the industry was very slow. Citycell had a virtual monopoly until 1996. Therefore, the government decided to bring more companies in the market and break the monopoly. After a careful evaluation, Bangladesh government decided to provide three licenses to Grameenphone, TMIB (AKTEL)(today's ROBI), and Sheba Telecom (today's Banglalink). Citycell is using the CDMA (Code Division Multiple Access) technology. Grameenphone, AKTEL, and Banglalink are using GSM technology. GSM is the most popular mobile telecommunication technology in the world. About 60% of the cell phone users of the world use GSM technology. These three new companies entered the market, not only helped to cut back the over-dependence on BTB's fixed-line system, but also made mobile phones cheaper and easier to get. A definite development has been observed in the business market with comparatively high expectations. Customer maturity and anticipation regarding technology has increased over time. Rumors regarding new entrants have groomed expectations in the market. Consequently, people are expecting cheaper handsets with lowered airtime. However, the recent entrances of private fixed land phone companies have increased the concern of the cell phone companies. New companies like Teletalk, RanksTel, OneTel, Bay Phone and Bijoy Phone have kicked off their operations in different districts in Southeast, Northeast and Northwest regions of Bangladesh. In near future, this new segment might be a creeping threat for the existing players inside the industry. The telecom industry in Bangladesh is now at its growth stage with demand increasing at 20% every year. It will be another 5-7 years before the industry reaches the maturity stage. As we have shown in the following graph, it is apparent that the telecommunication industry in Bangladesh is in the growth phase of the market as a whole. The statement is justified after analyzing the characteristics of the product life cycle, marketing objective & strategies the companies are setting up to. The sales in the mobile industry are rapidly increasing. The cost is average per customer. Profits are marginally increasing. Customers are more or less early adopters. They are aware of the services that have been offered to them more precisely. The competitors are growing in number. The common marketing objective of all the companies is to maximize their market share. On the market strategies segment the product strategy is on the offer product extensions and on service orientation. More and more offers of value added service and added features are included in the package. The pricing strategy is to penetrate the market. Therefore, they are all more or less following the penetration pricing strategy. In distribution strategy, the industry is the building on intensive distribution. More and more emphasis is given on gaining the market. So distributing the product to the far corners of the country has become a priority. In case advertising & promotional strategy the companies are all in aggressive advertising policy. Using all the possible media uses to increase the market share & reaching potential customers in mass market. Lastly in sales promotion the companies are on a rampage. They are offering enormous amount of services with the same package & low cost rate with different events all round the year.

#### 4.5. SAMPLE ENTERPRISE AT A GLANCE; GRAMEENPHONE- THE MARKET LEADER

In the late 1990s Norway's incumbent telecommunications company, Telenor, was facing saturation in its home market and needed a strategy of expansion that would open up new opportunities. It entered into a joint venture with the Grameen Bank in Bangladesh to provide mobile telephony to one of the world's least developed countries. The Grameen Bank, founded in 1976 by Professor Dr. Muhammad Yunus, for which he was awarded the Nobel Peace Prize 2006, provided microfinance to millions of poor in most of the villages in Bangladesh, and had set up a number of other enterprises to create economic opportunities for the poor. The joint venture between Telenor and the Grameen Bank led to the formation of two separate organizations. GrameenPhone, the commercial company was operated by experienced Telenor managers and its strategic objective was to maximize financial returns. Grameen Telecom was set up as the administrative interface to the existing Grameen Bank BOP model. Its strategic objective was quite different – to maximize the numbers of jobs created for the rural poor and it had a very different organizational culture and management structure. When it started out in 1997, GrameenPhone was one of four companies to receive a license to operate a mobile network in Bangladesh. It became profitable in 2000, and had more than two million customers in late 2004, and 6 million in February of 2006. GrameenPhone is now one of the largest private companies in Bangladesh and the second largest tax-payer reflecting significant profit levels. In 2006 it had a market share of over 60 percent in a country of 150 million people, which signifies the potential for further growth. By 2006, Grameen Telecom had created more than 250,000 jobs for micro-entrepreneurs, or better known as "Village Phone Ladies." These are poor rural women who, despite being illiterate, quickly learned how to operate a mobile phone and to generate income from these phones. Grameen Telecom is financially self-sustainable and provides more than 10 percent of the revenues of GrameenPhone. It is a joint venture enterprise between Telenor (55.8%), the largest telecommunications service provider in Norway with mobile phone operations in 12 other countries, and Grameen Telecom Corporation (34.2%), a non-profit sister concern of the internationally Acclaimed micro-credit pioneer Grameen Bank. The other 10% shares belong to general retail and institutional investors. Over the years, GrameenPhone has always been a pioneer in introducing new products and services in the local market. GP was the first company to introduce GSM technology in Bangladesh when it launched its services in March 1997. The technological know-how and managerial expertise of Telenor has been instrumental in setting up such an international standard mobile phone operation in Bangladesh. Being one of the pioneers in developing the GSM service in Europe, Telenor has also helped to transfer this knowledge to the local employees over the years.

Today nobody needs to introduce the brand 'GrameenPhone' to anyone in Bangladesh. It is one of the most significant brands throughout the whole country with 95% Top of the mind awareness as a telecommunication service provider Brand. GrameenPhone is now the leading telecommunications service provider in the country with more than 20 million customers as of October 2008. Presently, there about 60 million telephone users in the country, of which, a little over one million are fixed-phone users and the rest mobile phone customers and 36% of them are with GrameenPhone for its innovative service offers and best networks being as a market leader in telecommunication industry.

#### 4.6. CONCENTRATED AREAS OF CSR ACTIVITIES

The customers are the mainstream of sales oriented services. The success of such companies largely depends on the satisfaction of the customers. The buyers are happy if the product and the services meet their expectations. If their requirements do not meet the expectations the buyers become discontented, they are delighted when the performance fulfils their requirements. GPs' performances that are influence customer satisfaction most probably all are relates with after sales services, quality of airtime, 24hours helpline in Bangladesh, customer relation centers and its services and special value added services etc.,

However, GP started its journey twelve years ago with have faith in that- "Good development is Good business". Since its inception, GP has been driven to be inspiring and leading by example, when it comes to being involved in the community. GP believes that sustainable development can only be achieved through

long term economic growth. Therefore, as a leading corporate house in Bangladesh, GP intends to deliver the best to their customers, business partners, stakeholders, employees and society at large by being a partner in development. GP addressed CSR as a complimentary combination of ethical and responsible corporate behavior as well as a commitment towards generating greater prosperity in society as a whole by addressing the development needs of the country. GP has adopted a holistic approach to CSR, through this approach GP aims to, on the one hand, involve itself with the larger section of the society and to address diverse segments of the stakeholder demography and on the other hand, remain focused in its social investment to generate impact for the society. More specifically, GPs aims to combine all their CSR activities under these core areas to enhance the economic and social growth of Bangladesh.

#### 4.6.1. HEALTH CARE SERVICES TO UNDERPRIVILEGED COMMUNITY

Helping and caring for the community is an essential component of GPs' CSR, therefore, they endeavor to make a positive contribution to the underprivileged community of Bangladesh by helping in improvement of the health perils in the country as much as possible. Healthcare is still inaccessible for many Bangladeshis. Almost half of the country's population live below the poverty line and cannot even afford basic healthcare. Study show that, only 35% of the rural population use adequate sanitation facilities and 72% have access to clean drinking water. Moreover the people of the flood-prone areas suffer from many water borne diseases. The major problem in this sector is the significant gap between healthcare knowledge and practice and availability of the healthcare services. Therefore, all possible sources, be it public or private, should mobilize their efforts to make healthcare services available to the people who need it most, thus help in achieving the Millennium Development Goals (MDG). GP's plan is to engage in programs, especially in the rural areas, that will assist in creating awareness about healthcare and healthcare services and help improve the overall quality of life. Keeping their vision in mind- We are here to help; GP aims to extend their contribution to the development of the healthcare system and works to provide a brighter and healthcare future for the people of Bangladesh.

#### 4.6.2. ACID SURVIVORS' FOUNDATION

GrameenPhone extends its support to the Acid Survivors' Foundation (ASF) in the rehabilitation of acid victims by providing employment opportunities. GP has already taken many individuals who have been supported by the ASF and provided them with employment within the company. These individuals will also be provided with adequate training to help them develop the necessary skills to take on their new responsibilities in the company.

#### 4.6.3. SAFE MOTHERHOOD AND INFANT CARE PROJECT

GrameenPhone has always recognized its social responsibilities, especially towards the less privileged sections of the society, putting special focus on the healthcare needs of the poor of the country. Keeping that in mind, GP has undertaken various long term healthcare initiatives. Earlier this year, GP launch a nationwide primary healthcare initiative called "The GrameenPhone Safe Motherhood and Infant Care Project" with NSDP of USAID, GP also regularly conducts free eye-care camps for the economically disadvantaged in collaboration with Sightsavers International, through which it has provided free-eye care support to over 4000 poor patients.

#### 4.6.4. SOCIO-ECONOMIC DEVELOPMENT

GrameenPhone and Oslo University have taken up solar power project to test the concept of using excess solar power of a mobile base station to provide electricity in the surrounding area. The project intends to test smart mini-grid for a single village or cluster of villages and look at the dynamics of the implementation and operation of these technologies. The project also intended to determine how to successfully implement and socially organize such power mini- grids to facilitate social and economic development in rural areas of Bangladesh, with a particular emphasis on establishing models that are replicable on a very large scale. Furthermore, GP officially launched a Community Solar Power project at Paharpur village under Ajmirigonj upzilla of Hobigonj district. Paharpur, the site of GPs' first solar power base station is a remote village by the river Kusiara is populated mostly by poor farmers and share croppers. The village is not connected to the national electric grid. Under this project, solar power generation capacity to operate the base station has been expended and 2 km radius transmission line has been constructed surrounding the base station. A total of 136 households have been connected to the mini-grid and getting power from 5 pm to 12 am daily.

#### 4.6.5. EMPOWERMENT AND HUMAN DEVELOPMENT ACTIVITIES

Lack of empowerment and poverty is a chronic and complex problem for Bangladesh. According, to UNDP HDI Report 2006, which measures the average progress of a country in human development, in terms of, life expectancy, adult literacy and enrolment at the primary, secondary and tertiary level, Purchasing Power Parity (PPP), etc., Bangladesh ranks 137<sup>th</sup> among 177 countries. Moreover, 50% of the total population of Bangladesh lives below the poverty line, defined by less than a dollar a day. Some of the major factors contributing to this situation are inequality in income distribution, lack of access to resources, lack of access to information and inadequate infrastructure. The rural people of Bangladesh especially are deprived of these facilities, which is a major issue to break out from the shackles of poverty prevailing in the country.

Empowerment is a key constituent towards poverty reduction, and it is a key driver for sustainable economic development. Empowerment is a process of enhancing the capacity of individuals or groups to make choices and to transform those choices into desired actions and outcomes, which in turn helps them to secure a better life.

GP acknowledges that development and poverty reduction depend on holistic economic prosperity; therefore, their aims are to increase development opportunities, enhance development outcomes and contribute towards development of the quality of life of the people through their CSR initiatives and innovative services. They would like to facilitate empowerment opportunities to the vulnerable people of Bangladesh, so that it enable them to better influence the course of their lives and live a life of their own choice.

#### 4.6.6. ECO-LOGICAL SUPPORT TO MANAGE CLIMATE CHANGE RESPONSES

GrameenPhone being a socially and environmentally responsible company adopted systematic processes to ensure that, wherever possible, we manage and mitigate the probable negative impact of our business activities on the environment. GPs' Climate Change Program was initiated early 2008 with a vision for reducing carbon emission, being environment friendly and creating a momentum with the community and people.

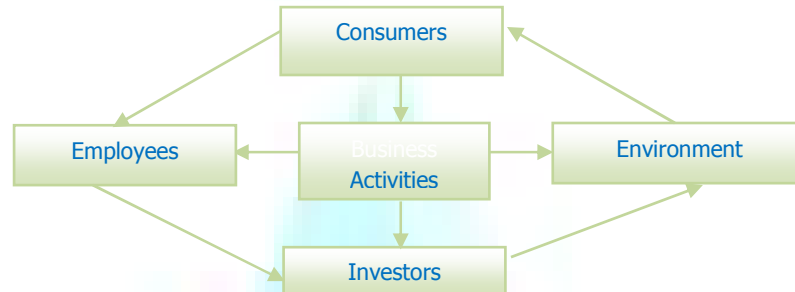
### 5. A PROPOSAL FOR CORPORATE SOCIAL RESPONSIBILITY

There are many possible ways that can be done in order to increase the concentration of the companies to play their roles in the practices of corporate social responsibility. Some of the many possible efforts are as follows:

- Analyze the market in a regular basis and find out what customers need and want in the area where subscribers are not satisfied. GrameenPhone as the largest telecom service provider in Bangladesh has to take necessary action to increase customer satisfaction by providing all kinds of after sales services through customer service and call center GPs'.
- Create strong Brand image by different promotional activities which catch peoples' emotion and feelings so that subscribers will be very much loyal.
- Fulfill CSR to create a good image in subscribers mind by organizing different events, donating money, doing something for the poor people, helping government to give education to the poor children.
- Motivate the employees by providing various incentives, such as free health checkup, sound office environmental facilities, on the job training facilities.
- The government may offer various types of incentives to those firms which reduce pollution, participate in disaster management, build infrastructural facilities for the poor and disadvantaged group, providing educational assistance etc.,. These incentives may include tax rebate, best corporate social responsibility award, best environmental responsibility award etc.
- It is the government of the country who play a significant role in promoting more companies voluntarily in the areas of corporate social responsibility practices in Bangladesh. Therefore, the government should come forward with appropriate policy support and create such an atmosphere so that the organizations feel obligation and comfortable in such types of involvement. Furthermore, the government must develop sustainable policies, encouraging and assuring that more profits will be achieved by the participation of the campaign on building good relationship with local and community and the environment. Therefore, CSR practices by the business enterprises will be improved.

**CONCLUDING REMARKS**

Today many firms practice social responsibility in various ways and to varying degrees. Practicing social responsibility costs money. But ignoring social responsibility also has its costs-whether in fines, increased regulation, negative publicity, public disfavor, or loss of customers. Consumers, special interest group and the general public are aware of business's impact on society and expect firms to do more than try to make profits. Most managers today regard social responsibility as a necessary part of doing business. Social responsibility raises many challenging questions for business firms. To whom are we responsible? How far should we go to satisfy our customers and achieve organizational objectives? Will our decisions affect any segments of society that we have not considered? Decision makers in every type and size of firm must address many such questions, which rarely have simple answers. Business activities have an impact on consumers, employees, the environment, and those investing in the firm, socially responsible firms weigh the consequences of their decisions on these different concerns. To understand how firms try to achieve an acceptable balance. Let's look more closely at each of these concerns.

**FIGURE-4: SOCIAL RESPONSIBILITY CONCERNS OF BUSINESS**

Moreover, Modern business is one part of a vast complex of social, governmental and private enterprise activities. Some times businesses have to do social responsibility because their competitors do and business try interacting with society by social activities to ensure their natural survival and success. Bangladesh is a less development country. Here, government can not always lookout at society's minor problem. So the companies which are very successful in their business should involve wish social responsibility. So the regulation of government sector will less stress on those companies. Business firm in our country social responsibility in many areas such as education and training, help to the neglected people, help to women victims, treatment of handicapped, develop the life style of rural people, help to the students, motivate to the people to clear environment etc. Business mainly does their responsibility to the consumer.

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**EFFECTIVENESS OF TRAINING EVALUATION PRACTICES – AN EMPIRICAL STUDY**

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**ABSTRACT**

*There is a decreasing willingness to spend money on faith and an increasing pressure to justify training and development costs. It is imperative for those in the field to focus on evaluation of training and development and to adequately and properly demonstrate and communicate to management that training efforts are making worthwhile contributions. The major purpose of evaluation is to determine the effectiveness of the various components of a training and development programme. To accomplish this sample of two hundred and sixty seven respondents are selected. The key issues discussed in this paper include the major factors influencing the training evaluation practices of the respondent service sector units in Karnataka. The researcher will consider seven independent variables (ownership pattern, nature of main business, ISO accreditation status, workforce size, age of the unit, stage of the organisational life cycle, and degree of corporate commitment to training and development ) for ascertaining the possible association with the dependent variable training evaluation practices. For the purpose of this analysis, training evaluation practices were examined under three categories (only training evaluation, both training needs analysis and evaluation, and no evaluation. The results and discussions were based on the chi-square test of significance ( $X^2$ ) initially and later on, multiple regression analysis (MRA) was used to draw inferences. Finally, all the three research hypotheses formulated have been tested and results will be reported in this paper.*

**KEYWORDS**

Training and Development, Training Evaluation, Corporate Commitment.

**INTRODUCTION**

The economic realities of the 2000s and beyond, however, resulted in a closer scrutiny of training and development expenditures. An increasing number of organisations are raising questions concerning the return on these investments. There is a decreasing willingness to spend money on faith and an increasing pressure to justify training and development costs. In this context, it is imperative for those in the field to focus on evaluation of training and development and to adequately and properly demonstrate and communicate to management that training efforts are making worthwhile contributions.

**CONCEPTUAL FRAMEWORK**

Evaluation of training is normally used in a broad sense to mean any attempt to obtain information (feedback) on the effects of a training programme, and to assess the value of the training in the light of that information. According to some experts on the evaluation of training, a distinction is made between *validation* (the assessment of whether the training has achieved its laid-down objectives) and *evaluation* (the measurement of the total effects of the training programme). In practice, however, this distinction is not always meaningful, since it may be almost impossible to obtain information on the total effects of training (which may be extremely complex).

The process of evaluating training and development has been defined by Hamblin (1974) as: “any attempt to obtain information (feedback) on the effects of a training programme, and to assess the value of the training in the light of that information”. Warr (1969) defined evaluation as “the systematic collection and assessment of information for deciding how best to utilise available training resources in order to achieve organisational goals”. From these definitions it follows that evaluation leads to *control* which means deciding whether or not the training and development was worthwhile (preferably in cost-benefit terms) and what improvements are required to make it even more efficient and effective.

Evaluation, in its crudest form, is the comparison of objectives (criterion behaviour) with effects (terminal behaviour) to answer the question of how far the training has achieved its purpose. The setting of objectives and the establishment of methods of measuring results are, or should be, an essential part of the planning stage of any training and development programme. Evaluation can be difficult because it is often hard to set measurable objectives and even harder to collect the information on the results or to decide on the level at which the evaluation should be made.

**OBJECTIVES**

The main objective of the study is to assess the effectiveness of training and evaluation practices in service industries. However, the specific objectives are as follows -

- To determine whether or not the training and development objectives are being met.
- To determine the effectiveness of the different components of a training and development programme (e.g., content, training aids, facility and environment, programme schedule, presentation style, the instructor, etc.).
- To examine stage of the Organisation Life Cycle Training Evaluation Practice.
- To study the stage of the organization life cycle (OLC) and the training evaluation practices.
- To examine the degree of Corporate Commitment to T&D and Training Evaluation Practice

**HYPOTHESIS**

H<sub>1</sub>: There exists a positive and significant correlation between the level of corporate commitment to training and development and robustness of training evaluation practices.

H<sub>2</sub>: Organisational characteristics tend to influence the rigorousness of training evaluation practices.

H<sub>3</sub>: Physical, social and psychological conditions prevalent in the workplace have got significant impact on the nature and extent of transfer of learning from the place of training to the workplace.



**METHODOLOGY**

At this juncture, it is both relevant and interesting to identify the major factors influencing the 'training evaluation practices' of the respondent industrial units in Karnataka. The researcher considered seven 'independent variables' for ascertaining the possible association with the 'dependent variable' – training evaluation practices. In line with the existing research tradition pertaining to this domain (Brewster & Bournois, 1991; Brewster & Hegewisch, 1994; Hendry & Pettigrew, 1990; Fujita, 1997; Kandula, 2001; Moore & Ashby, 1996; Ravi, 2001), the independent variables were: (1) ownership pattern, (2) nature of main business, (3) ISO accreditation status, (4) workforce size, (5) age of the unit, (6) stage of the organisational life cycle, and (7) degree of corporate commitment to Training and Development (T&D). For the purpose of this analysis, 'training evaluation practices' were examined under three categories: (1) only training evaluation, (2) both 'training needs analysis (TNA) and evaluation, and (3) no evaluation. The results and discussions were based on the chi-square test of significance ( $X^2$ ) initially and later on, multiple regression analysis (MRA) was used to draw inferences.

**DISCUSSION****ORGANISATIONAL CHARACTERISTICS AND TRAINING EVALUATION PRACTICE****OWNERSHIP PATTERN AND TRAINING EVALUATION PRACTICE**

The data and information relating to ownership pattern of the respondent industrial units and their training evaluation practices are shown in table 1.1, an overwhelming proportion of a little over 88 per cent of the multinational corporations (MNCs) conducted both training needs analysis (TNA) and training evaluation. The corresponding percentages in respect of private and public sector organisations were 64.7 and 43 respectively. Furthermore, around 30 per cent of the public sector and 13.7 per cent of the private sector respondent units did not have the policy and practice of measuring and assessing the effectiveness of their T&D programmes. In this context, MNCs emerged as the 'trend setters' followed by the private and public sector organisations - in that order. Presumably, MNCs are resource-rich and they have a tendency to import their home-country HRD practices to the host-country. Accordingly, their training evaluation practices are no exception to this acknowledged trend. (Brewster & Hegewisch, 1994; Martinsons & Chong, 1999).

**TABLE – 1.1: OWNERSHIP PATTERN AND TRAINING EVALUATION PRACTICES**

Ownership pattern	Training Evaluation Practices			Total
	Only training evaluation	Both TNA & evaluation	No evaluation	
Private	22 (21.6)	66 (64.7)	14 (13.7)	102 (100.0)
Public	31 (27.2)	49 (43.0)	34 (29.8)	114 (100.0)
MNC	06 (11.8)	45 (88.2)	0 (0.0)	51 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $X^2 = 35.52$ ;  $df = 4$ ;  $p = 0.000 < 0.01$  HS**NATURE OF MAIN BUSINESS AND TRAINING EVALUATION PRACTICE**

As far as the nature of main business of the industrial units and their training evaluation practices were concerned, nearly 63 per cent of the organisations mainly engaged in the provision of 'services' and 58 per cent of the manufacturing units reported the practice of conducting 'training needs analysis' and 'training evaluation'. However, a little over 23 per cent of these organisations did not have the practice of evaluating the effectiveness of their T&D programmes (Table 1.2).

**TABLE – 1.2: NATURE OF MAIN BUSINESS AND TRAINING EVALUATION PRACTICES**

Nature of main business	Training Evaluation Practices			Total
	Only training evaluation	Both TNA & evaluation	No evaluation	
Manufacturing	29 (18.8)	89 (57.8)	36 (23.4)	154 (100.0)
Service	30 (26.5)	71 (62.8)	12 (10.6)	113 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $X^2 = 7.933$ ;  $df = 2$ ;  $p = 0.029 < 0.05$ , sig.**ISO ACCREDITATION STATUS AND TRAINING EVALUATION PRACTICE**

It is worth noting that an overwhelming proportion of 84 per cent of the respondent units with ISO accreditation carried out both training needs analysis and evaluation of T&D programmes. Of course, the remaining 16 per cent conducted 'only training evaluation'. Again, nearly 57 per cent of those units who were in the process of getting ISO certified reported their practice of conducting training evaluation. In contrast, a little over 54 per cent of the non-ISO respondent organisations had no mechanism of evaluating the effectiveness of their T&D programmes (Table 1.3). From this analysis it follows that 'ISO accreditation' acts as a key driver for incorporating more rigorous and innovative mechanisms for measuring and assessing the contributions of T&D programmes.

**TABLE – 1.3: ISO ACCREDITATION STATUS AND TRAINING EVALUATION PRACTICES**

ISO accreditation status	Training Evaluation Practices			Total
	Only training evaluation	Both TNA & evaluation	No evaluation	
ISO accredited	26 (16.0)	136 (84.0)	0 (0.0)	162 (100.0)
In the process	21 (56.8)	05 (13.5)	11 (29.7)	37 (100.0)
Non-ISO	12 (17.7)	19 (27.9)	37 (54.4)	68 (100.00)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $X^2 = 158.42$ ;  $df = 4$ ;  $p = 0.000 < 0.01$ , HS

**WORKFORCE SIZE AND TRAINING EVALUATION PRACTICE**

With regard to the 'workforce size' of the industrial units and their training evaluation practices, only just over 9 per cent employing fewer than 100 persons reported the practice of conducting both training needs analysis and evaluation. The corresponding percentage in the case of those units having the workforce size in the range of 101-300 was 40.4, while the respondent units with a workforce size falling between 301 and 1000 conducting both training needs analysis and evaluation accounted for a little over 75 per cent. Finally, a significant proportion of around 83 per cent of the units employing more than 1000 persons reported their practice of analysing training needs and evaluating training and development programmes. It is also worth reporting that a little over 43 per cent with a workforce size of fewer than 100 did not have the practice of training evaluation. Intuitively, as the workforce size increases, the tendency of the organisations in conducting both training needs analysis and evaluation also increases (Table 1.4).

**TABLE – 1.4: WORKFORCE SIZE AND TRAINING EVALUATION PRACTICES**

Workforce size	Training Evaluation Practices			Total
	Only training evaluation	Both TNA and evaluation	No evaluation	
< 100	21 (47.7)	04 (9.1)	19 (43.2)	44 (100.0)
100-300	17 (32.7)	21 (40.4)	14 (26.9)	52 (100.0)
301 – 1000	12 (13.5)	67 (75.3)	10 (11.2)	89 (100.0)
> 1000	09 (11.0)	68 (82.9)	05 (6.1)	82 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $\chi^2 = 82.87$ ;  $df = 6$ ;  $p = 0.000 < 0.01$ , HS

**AGE OF THE ORGANISATION AND TRAINING EVALUATION PRACTICE**

As far as the age of the units and their training evaluation practices were concerned, 49 per cent aged below 10 years conducted only training evaluation. Around 39 per cent of them did not have the practice of evaluating their T&D programmes. On the other hand, 73.2 per cent of the respondent units in the age group of 10-20 years and 63 per cent of those aged more than 20 years reported the practice of analysing their training needs and evaluating training and development programmes (Table 1.5). It appears that the practice of conducting both training needs analysis and evaluation tends to be relegated to the backburner in the formative years of their existence.

**TABLE – 1.5: AGE OF THE UNIT AND THE TRAINING EVALUATION PRACTICES**

Age of the unit (in years)	Training Evaluation Practices			Total
	Only training evaluation	Both TNA & evaluation	No evaluation	
< 10	24 (49.0)	06 (12.2)	19 (38.8)	49 (100.0)
10-20	22 (13.4)	120 (73.2)	22 (13.4)	164 (100.0)
>20	13 (24.1)	34 (63.0)	07 (12.9)	54 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $\chi^2 = 59.63$ ;  $df = 4$ ;  $p = 0.000 < 0.01$ , HS

**STAGE OF THE ORGANISATION LIFE CYCLE AND TRAINING EVALUATION PRACTICE**

As seen in table 1.6, as many as 68 per cent of the respondent units in the 'growth stage' and 67 per cent in the 'maturity stage' of their life cycle reported the practice of conducting 'both training needs analysis and evaluation'. In contrast, not even a single unit belonging to the 'start-up stage' or 'turned-around stage' of life cycle adopted this training evaluation practice. In fact, the sense of priority and urgency of conducting both training needs analysis and evaluation should be felt increasingly more at start-up, decline and turned-around stages of organisational life cycle than at the stages of 'growth' and 'maturity'. This trend is perhaps indicative of the fact that T&D is based on an article of faith and the seriousness of analysing training needs and evaluating T&D programmes would be lost during the formative (teething) years and also the decline phase of the organisation's economic life (Budhwar, 1996, 2000; Ford, 1993).

**TABLE – 1.6: STAGE OF THE ORGANISATION LIFE CYCLE (OLC) AND THE TRAINING EVALUATION PRACTICES**

Organisational life cycle	Training Evaluation Practices			Total
	Only training evaluation	Both TNA and evaluation	No evaluation	
Start-up	03 (21.4)	0 (0.0)	11 (78.6)	14 (100.0)
Growth	24 (18.2)	90 (68.2)	18 (13.6)	132 (100.0)
Maturity	18 (18.6)	65 (67.0)	14 (14.4)	97 (100.0)
Decline	08 (61.5)	05 (38.5)	0 (0.0)	13 (100.0)
Turned-around	06 (54.5)	0 (0.0)	05 (45.5)	11 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

(1) Figures in parentheses indicate percentages to the respective total.

(2)  $\chi^2 = 70.35$ ;  $df = 8$ ;  $p = 0.000 < 0.01$ , HS

**DEGREE OF CORPORATE COMMITMENT TO TRAINING & DEVELOPMENT AND TRAINING EVALUATION PRACTICE**

In the fitness of things, it is widely acknowledged both at the academic and practitioner circles that training evaluation practices would assume prominence only when the senior management extends support, involvement and commitment to the cause of rigorously measuring and assessing the effectiveness of training and development programmes on the one hand, and the performance of training and development department on the other. Not surprisingly, there might exist a positive, significant correlation between the degree of corporate commitment to training and development, and the training evaluation practices of the respondent units.

As detailed in table 1.7, as many as a little over 77 per cent of the respondent organisations indicating “high” corporate commitment to training and development carried out both training needs analysis and evaluation. The corresponding percentages in respect of those units reporting “moderate” and “low” corporate commitment to training and development were only 48.1 and 18 respectively. Furthermore, decreasing corporate commitment (from high to low) also coincided with the practice of not measuring and assessing the contributions of training and development programmes. Because, nearly 38 per cent of the organisations characterised by ‘low’ corporate commitment and 14.5 per cent with ‘moderate’ commitment to training and development did not conduct training evaluation. Hence, higher the degree of corporate commitment to training and development initiatives, greater will be the likelihood of adopting the practice of analysing training needs and evaluating the effectiveness of the T&D programmes.

**TABLE – 1. 7: DEGREE OF CORPORATE COMMITMENT AND TRAINING EVALUATION PRACTICES**

Degree of corporate commitment to T & D	Training Evaluation Practices			Total
	Only training evaluation	Both TNA and evaluation	No evaluation	
High	11 (14.7)	58 (77.3)	06 (8.0)	75 (100.0)
Moderate	49 (37.4)	63 (48.1)	19 (14.5)	131 (100.0)
Low	27 (44.3)	11 (18.0)	23 (37.7)	61 (100.0)
	59 (22.1)	160 (59.9)	48 (18.0)	267 (100.00)

Notes:

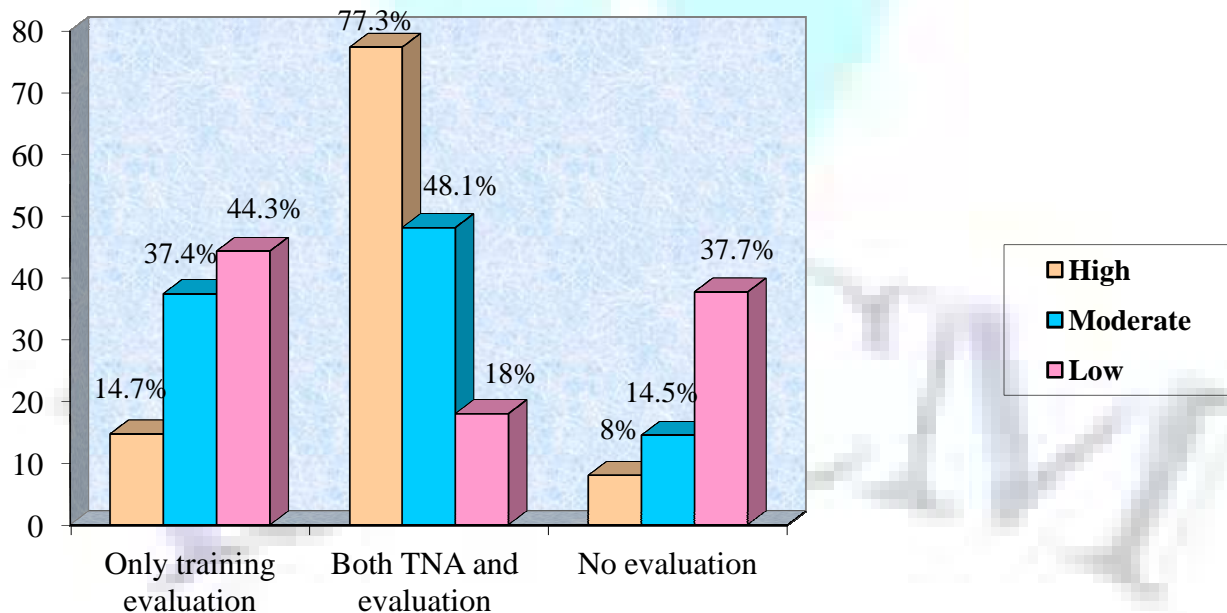
(1) Corporate commitment to T&D is measured and assessed based on generally accepted 10 indicators such as:

- a) % of payroll spent on TD,
- b) T&D money spent per employee,
- c) average number of T&D hrs per employee per year,
- d) % of employees trained per year,
- e) HRD / T&D staff per 1000 employees,
- f) strategic role and T&D,
- g) seriousness attached to T&D by senior mgt.,
- h) understanding T&D issues by senior mgt.,
- i) difficulty in getting adequate and timely assistance from senior management to develop training and development strategies, and
- j) presence of training and development budget.

(2) Figures in parentheses indicate percentages to the respective total.

(3)  $\chi^2 = 53.13$ ;  $df = 4$ ;  $p = 0.000 < 0.01$ , HS

**FIGURE – 1. 7 (a): DEGREE OF CORPORATE COMMITMENT AND TRAINING EVALUATION PRACTICES**



**TESTING OF HYPOTHESES**

**INTER-CORRELATIONS**

Table 1.8, presents the zero-order inter-correlations among the organisational characteristics including the degree of corporate commitment to T&D and the training evaluation practices of the respondent industrial units in Karnataka. It is worth noting that the inter-correlations among the organisational characteristics and training evaluation practices tended to be ‘moderately high’ and significant except the ‘age of the unit’. Furthermore, the degree of corporate commitment exhibited significant positive correlations with ‘only training evaluation practice’ ( $r=0.68$ ,  $p < 0.05$ ), ‘both training needs analysis and training evaluation practice’ ( $r=0.69$ ,  $p < 0.01$ ), and the practice of ‘not conducting any evaluation’ of T & D programmes ( $r=0.74$ ,  $p < 0.01$ ). Finally, the ‘rigorousness/robustness’ of training evaluation practice (level, timing, and design of evaluation) positively and significantly correlated with the ownership pattern ( $r = .39$ ,  $p < 0.05$ ), nature of main business ( $r = .44$ ,  $p < 0.05$ ), ISO accreditation status ( $r = .57$ ,  $p < 0.05$ ), stage of the organisational life cycle ( $r = .43$ ,  $p <$

0.01), degree of corporate commitment to T&D ( $r = .76, p < 0.01$ ), the practice of conducting only training evaluation ( $r = .23, p < 0.05$ ), and the practice of conducting both training needs analysis and evaluation ( $r = .34, p < 0.01$ ). Based on these observations, the research hypothesis ( $H_1$ ): "There exists a positive and significant correlation between the level of corporate commitment to training and development, and 'robustness' of training evaluation practices" has been confirmed. Hence, the degree of corporate commitment to T&D initiatives plays a significant role in influencing the training evaluation practice.

TABLE – 1.8: ZERO-ORDER INTER-CORRELATIONS AMONG THE ORGANISATIONAL CHARACTERISTICS INCLUDING THE DEGREE OF CORPORATE COMMITMENT TO TRAINING & DEVELOPMENT AND TRAINING EVALUATION PRACTICES.

Sl. No	Measures	1	2	3	4	5	6	7	8	9	10	11
1	Ownership pattern	-										
2	Nature of main business	.21	-									
3	ISO accreditation status	.32*	.19*	-								
4	Workforce size	.18	.13	.12	-							
5	Age of the unit	.16	.11	.18	.19	-						
6	Stage of the OLC	.14	.17	.14	.21	.24	-					
7	Degree of corporate commitment to T & D	.42*	.39**	.49**	.42*	.37	.51*	-				
8	Only training evaluation	.39*	.41*	.51*	.38	.41	.48*	.68*	-			
9	Both TNA & training evaluation	.47**	.52*	.66**	.41*	.45	.54*	.69**	.36	-		
10	No evaluation	.36*	.38*	.46*	.36	.38	.41*	.74**	.27	.18	-	-
11	Rigorousness of evaluation	.39*	.44*	.57*	.21	.19	.43**	.76**	.23*	.34**	.11	-

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; N=267

**MULTIPLE REGRESSION ANALYSIS**

In order to test the impact of organisational characteristics, the degree of corporate commitment to T&D, training evaluation practice (independent variables) on the 'rigorousness' of training evaluation (dependent variable), multiple regression analysis was used. As shown in table 1.9, the eight independent variables in respect of the respondent units including their commitment to T&D and training evaluation practice accounted for around 71 per cent of variance on the overall rigorousness of conducting training evaluation, which was statistically significant at  $p < 0.001$ , as depicted by the coefficient of multiple determination ( $R^2$ ). It is worth noting that out of the eight independent variables, three were not statistically significant ( $p > 0.05$ ): nature of main business, workforce size and age of the unit. The remaining five independent variables were statistically significant: ownership pattern ( $p < 0.05$ ), ISO accreditation status ( $p < 0.01$ ), stage of organisational life cycle ( $p < 0.001$ ), the degree of corporate commitment to T&D initiatives ( $p < 0.001$ ), and training evaluation practice ( $p < 0.01$ ). Hence, the research hypothesis ( $H_2$ ): "Organisational characteristics tend to influence the training evaluation practices" has been partially confirmed.

TABLE – 1.9: MULTIPLE REGRESSION ANALYSIS FOR MEASURING THE IMPACT OF ORGANISATIONAL CHARACTERISTICS AND CORPORATE COMMITMENT TO T&D ON THE 'RIGOROUSNESS' OF TRAINING EVALUATION PRACTICES

Independent variables	b	SEb	B	t	R <sup>2</sup>	ΔR	F (p)
1. Ownership pattern	0.092	0.026	0.124	3.32*	0.714	0.712	169.65***
2. Nature of main business	0.085	0.032	0.108	2.40 ns			
3. ISO accreditation status	0.071	0.029	0.090	2.30**			
4. Workforce size	0.064	0.026	0.124	3.62 ns			
5. Age of the unit	0.058	0.030	0.068	1.95 ns			
6. Stage of the OLC	0.114	0.029	0.144	3.98***			
7. Degree of corporate commitment to T & D	0.267	0.031	0.368	8.98***			
8. Training evaluation practice	0.272	0.038	0.392	8.91**			

Note:

- (1) Dependent variable = the rigorousness of training evaluation practice.
- (2) \*  $P < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; ns = not significant.
- (3) b = unstandardised coefficients; SEb = standard error of b,  $\beta$  = standardised coefficients
- (4)  $R^2$  = R square,  $\Delta R$  = adjusted R square, F (p) = F-value

**PHYSICAL, SOCIAL AND PSYCHOLOGICAL CONDITIONS IN THE WORKPLACE AND TRANSFER OF LEARNING**

From the study it was found that the respondents perceived and reported several factors which either facilitated or inhibited the transfer of learning from the place of training to the workplace. Perception of resource adequacy, supervisory support, support for creativity, support for freedom, coworker support, and a conducive and congenial transfer climate in the workplace enabled meaningful and effective transfer of learning. On the contrary, the perception of heavy workload, lack of performance feedback, lack of freedom to introduce change in the workplace, lack of encouragement for innovation, rigid rules and conservativeness of the organisation, absence of needed facilities and resources acted as the major inhibitors of transfer of learning. This clearly indicates that the physical, social and psychological conditions available in the workplace might either serve as stimulants or obstacles for the transfer of learning. Similar findings were also reported by previous research studies in this field. For instance, Awoniyi, *et. al.*, (2002) identified facilitators of transfer of learning as supervisory encouragement (assessing managers who give support to subordinates, communicating effectively, and setting clear expectations and goals), sufficient resources (access to appropriate facilities, equipment, funds, and information), freedom to decide how to accomplish tasks and a sense of control over work and ideas, and an overall assessment of support for creativity. The prominent inhibitor of transfer of learning highlighted by their study was 'workload pressure' (unrealistic expectations, insufficient time, and distractions). Past studies have found evidence that supervisory support relates to transfer of training (Brinkerhoff & Montesino, 1995; Gregoire, Propp and Poertner 1998; Tennenbaum & Yukl, 1992). These studies found that support from supervision could take the form of information sharing, direct feedback regarding performance, or the provision of resources or incentives.

Similarly, findings from this study have highlighted several job and work environment factors that appear to impede the transfer of learning to use on the job. Most of these inhibitors of transfer of learning correspond to the findings obtained from the limited studies so far undertaken within the United States (Seaburg, 1982; Rooney, 1985; Vinokur-Kaplan, 1986). Chiefly these were identified as: (1) heavy workloads; (2) time pressures; (3) lack of reinforcement of training; (4) an absence of feedback on performance; and (5) the perception of in-service training. In the light of these results and discussions, the research hypothesis ( $H_3$ ): "Physical, social, and psychological conditions prevalent in the workplace have got significant impact on the nature and extent of transfer of learning from the place of training to the workplace" has been confirmed.

**CONCLUSION**

This study examined and reported that the key determinants of 'the rigorousness' with which evaluation of T&D programmes was carried out by the respondent industrial organisations in Karnataka. Ownership pattern, ISO accreditation status, stage of organisational life cycle, degree of corporate commitment to T&D, and the pattern of training evaluation practice exerted significant influence on the overall rigorousness of training evaluation. Physical, social, and psychological conditions available in the workplace such as sufficient resources, supervisory support, support for creativity and freedom, coworker attitude, and favourable

transfer climate facilitated the transfer of learning. However, 'heavy workload' was often perceived as a major inhibitor of transferring and applying new learning in the workplace.

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**IMPACT OF LEARNING STYLES ON e-LEARNING ENVIRONMENT: AN EMPIRICAL STUDY**

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**ABSTRACT**

*e-learning is a popular medium of imparting knowledge during this age of World Wide Web (www). A large number of educational institutions have adopted this medium to educate students globally. Some students find this medium very exciting and useful while others are not very comfortable with it. There is a need to identify the characteristics of students who are comfortable with this medium and those who are not. In this study, an attempt is made to match students learning style with their attitude towards e-learning. Learning style questionnaire (LSQ) developed by Honey and Mumford (1992) was used to determine the learning style of the students belonging to institutes of higher learning. The results indicate significant difference in the attitude towards e-learning among students having different learning styles. Students characterized as activists and pragmatists were found to have a positive inclination towards e-learning programs, whereas those characterized as theorists and reflectors showed less inclination towards e-learning. The findings of the study have practical implications for educators and designers of e-learning programs.*

**KEYWORDS**

Learning styles, e-learning, Honey and Mumford, LSQ.

**INTRODUCTION**

There are many synonyms used for the term e-learning such as distance learning, web-based learning, computer assisted learning and internet learning. The main difference between e-learning and face-to-face learning is that in e-learning the learner is at a distance from the instructor, the learner can have access to the instructor via use of some technology (Ally, 2004).

The term e-learning has been defined by American Society for Training and Development (ASTD), as a medium that "covers a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaborations" (ASTD Learning Circuits, 2007). Fry (2000) defines e-learning as "delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies." Bleimann (2004) stated that e-learning is a self-directed learning that is based on technology, especially web-based technology. According to him e-learning is collaborative learning.

**TYPES OF e-LEARNING**

E-learning can be divided into the following three categories:

1. Face to face learning with support provided through internet.
2. Learning at self-pace through net.
3. Multiform learning through net (such as videos, e-book etc.).

**STRENGTH AND WEAKNESSES OF e-LEARNING**

The following are the strengths and weaknesses of e-learning

**TABLE 1: STRENGTHS AND WEAKNESSES OF e-LEARNING**

Strengths	Weaknesses
Flexibility in learning	Requires a lot of self-direction and self-discipline
Cost effective (saving cost of travelling, and other costs related to brick and mortar classroom)	Lack the advantages of classroom interaction
Results in positive return on investment (Cross, 2006; Bhattacharya and Sharma, 2007)	Suitable for independent learners and those who are tech savvy (Reynolds, 2008)

**LIMITATIONS OF e-LEARNING**

The following limitations of e-learning have been highlighted by Wong (2007):

1. Technology limitations: Success of e-learning initiatives depends upon availability of appropriate computer hardware and software as well as availability of internet with suitable bandwidth
2. Personal issues: such as lack of information and communication technology (ICT) skills, self-direction and self-discipline can hamper success of any e-learning program.
3. Limitations compared to traditional campus: Lack of physical interaction, counseling and career development.
4. Design limitations: ICT novices might find it too technical.
5. Other limitations such as time consuming since the instructor has to respond to the student queries in writing which is generally more time consuming as compared to verbal interaction.

**CHALLENGES FOR STUDENTS AND TEACHERS**

The challenges of e-learning for students and teachers are as follows:

**TABLE 2: CHALLENGES OF e-LEARNING FOR STUDENTS AND TEACHERS**

Challenges for Students	Challenges for Teachers
Learner centered and not teacher centered. The learners need to be more proactive as compared to the learners in a teacher centered environment. (Gannon-Cook & Ley, 2004).	Requires extra effort from the teacher
More time consuming than face to face learning (Howland & Moore, 2002)	Requires constant updating of the material available on the net
Requires better writing skills rather than spoken skills (Al-Harthy, 2005).	The quality of teaching is generally low as compared to face to face learning.

There exists difference in individual learning styles and these individual styles pose a challenge for those who want to impart knowledge. In case of e-learning these individuals learning styles need to be kept in mind by those who are using this medium (Canavan, 2004). The educators need to know how people acquire and preserve knowledge to keep track of their progress. Knowledge about learning styles can be helpful in increasing student’s self-awareness as well as better understanding of their strengths and weaknesses as learners (Coffield, 2004). The objective of this study is to find out whether there is significant difference in attitude among students with different learning styles towards e-learning and which learning style is more suitable for e-learning programs.

**LITERATURE REVIEW**

Different definitions of learning styles exist in literature, some of which are:

- A description of attitude and behavior which determines an individual’s preferred way of learning (Honey and Mumford, 1992, p.1).
- The complex means and conditions under which learners most efficiently and most effectively perceive, process, store and recall what they are attempting to learn (James & Gardner, 1995, p.20).
- Characteristics, strengths and preferences in the ways learners take in and process information (Felder, 1996, p.18).

Learning styles gained the attention of the researchers in the late nineteenth century. Various researchers noted the differences in learning behavior of learners. Several instruments were developed to measure learning styles of young and adults (Dunn et al., 1981). The literature review on learning styles bring to light many studies conducted on examining the learning styles of college students. In one of the studies conducted by Canfield (1988) learning style of students enrolled in different majors at the college level was investigated. The results showed a significant difference among learning styles of students. In another study students enrolled in business studies were the subject of investigation; the results indicated that the learning style of students enrolled in accounting, finance and economics was significantly different from those enrolled in management and marketing (Biberman and Buchanan, 1986). Dunn et al. (1981, 1989) pointed out that if learning style of college students is properly identified and instructions are provided accordingly it could lead to learning that is more effective.

The literature review on learning styles depicts several models presented by different authors. Coffield et al. (2004) highlighted 71 models of learning styles out of which they categorized 13 models to have significant importance with respect to their wide spread usage and influence on others models. A summary of some of the prominent models developed by different authors to define the learning style of individuals is given in table 3:

**TABLE 3: PROMINENT INSTRUMENTS FOR DEFINING STYLES OF LEARNING**

Instrument	Developed by	Description
Learning Style Inventory (LSI)	Kolb (1984)	LSI defines four stages of learning cycle: reflective observation (RO), concrete experience (CE), abstract conceptualization (AC), and active experimentation (AE).
Felder-Silverman Learning Style Model (FSLSM)	Felder & Silverman (1988)	FSLSM defines four dimensions of learning styles: sensory/intuitive, active/reflective, visual/verbal and sequential/global.
Cognitive Style Analysis (CSA)	Riding (1991)	CSA measures an individual’s preference for processing information holistically or analytically and to think verbally or visually.
Learning Style Questionnaire (LSQ)	Honey and Mumford (1992)	LSQ defines four types of learners: Theorists, activists, reflectors and pragmatists.
Index of Learning Style (ILS)	Felder and Soloman (1997)	ILS is based on FSLSM.

**HONEY AND MUMFORD LEARNING STYLE**

Based on Kolb’s (1976) work, Honey and Mumford (1982) presented a learning style model consisting of four stages: Activists, Reflectors, Theorists and Pragmatists (businessballs.com).

- Activists play an active role in learning process and enjoy new tasks and ideas. They learn best when they are involved in new problems and opportunities. They dislike strict schedules and tight instructions. They like to work in groups.
- Reflectors like to think and learn by observation. They prefer working through different analysis and report. They do not prefer to be leaders and do something without doing their homework.
- Theorists are more analytical and rational and they are challenged in complex environment where they can use their knowledge and skills. They learn less where they have to participate in situations involving feelings and emotions.
- Pragmatists are more in favor of hands on experience rather than theoretical learning. They can work on practical issues by drawing up action plans keeping end results in mind. They learn least when there is no practice or if clear guidelines on how to do things are missing (Campaign for Learning, 2012).

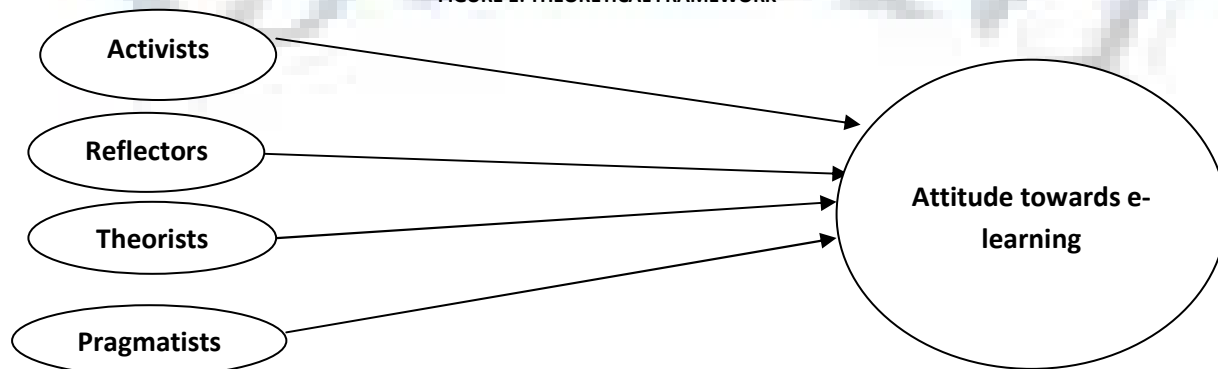
The reason for selection of Honey and Mumford learning style model for this study are same as identified by Canavan (2004). Honey and Mumford learning style is an information processing model based on experiential learning. The other models of learning focus on factors such as senses and environment while learning involves perceiving and processing of information (Sarrikoski, 2000). In UK the Honey and Mumford model of learning styles appears to be dominant in management and business practice, whereas in the USA same holds true for Kolb’s experiential model. As reported by Evans and Sadler-Smith (2006) about Honey and Mumford’s LSQ:

“As far as Honey and Mumfords’ Learning style Questionnaire (LSQ) is concerned, its pragmatic contribution cannot be denied, moreover its authors do not make any claims for it as self-standing psychometric test; rather they see LSQ as a means by which an awareness of the concept of learning style and the learning cycle may be raised and embedded in the minds of practicing managers”.

In online context, it is critical to consider learning styles of students. In the instructor is aware of differences in learning styles of their students and the different techniques to accommodate students with different learning styles, he will be able to teach more effectively in online environment. Teachers who are conscious of differences in learning styles are in a better position to adjust their teaching techniques and strategies. They can create a learning environment in which materials, resources and methods are utilized to address the learning requirements of their students, thus maximizing their learning potentials (Zapalska and Brozik, 2006).

**LEARNING STYLES**

**FIGURE 1: THEORETICAL FRAMEWORK**



**HYPOTHESES**

- H1: Activists learning style has a positive impact on attitude towards e-learning.
- H2: Reflectors learning style has a positive impact on attitude towards e-learning.
- H3: Theorists learning style has a positive impact on attitude towards e-learning.
- H4: Pragmatists learning style has a positive impact on attitude towards e-learning.

**METHODOLOGY OF STUDY**

Data was collected by means of a questionnaire developed to find out the impact of learning styles on attitude towards e-learning. Questionnaire consisted of two parts. In first part, demographic information of the respondents such as gender, age, education and computer experience was collected. In second part, learning style of the respondents and attitude towards e-learning was measured using 5-point likert scale - where 1 stands for strongly agree and 5 for strongly disagree. Learning style questionnaire (LSQ) developed by Honey and Mumford (1992) was used to determine the learning style of the respondents. Attitude towards e-learning was measured using the items defined by Chen and Huang (2012) for system acceptance in their study. Sample population for this study was the students enrolled in business degree program (BBA/MBA/MS Management Sciences) in the public and private sector universities located in Rawalpindi and Islamabad (twin city) region. Based on convenience sampling six universities (three public and three private) were selected for conducting the survey. A list of courses offering some online material (mixed mode e-learning) during spring 2012 semester was prepared. All the questionnaires were filled in the classroom environment and all the participants were briefed about the purpose of survey and the items on the questionnaire. Total 230 questionnaires were distributed since a sample of 200 is considered suitable enough for structural equation model (SEM) research (Kenny, 2011; Iqbal and Qureshi, 2012). Total 202 completely filled questionnaires were retrieved and found suitable for further analysis – a response rate of 88%. All the responses were entered in Statistical Package for Social Sciences (SPSS version 17.0) for further analysis.

**RESULTS AND DISCUSSIONS**

The demographic profile of the respondents is shown in Table 4:

**TABLE 4: DEMOGRAPHIC PROFILE OF RESPONDENT**

		Frequency	Percent
<b>Gender</b>	Male	121	59.9
	Female	81	40.1
	Total	202	100.0
<b>Age</b>	18-25	56	27.7
	26-35	112	55.4
	36-40	23	11.4
	Above 40	11	5.4
	Total	202	100.0
<b>Education</b>	Undergraduate	42	20.8
	Graduate	100	49.5
	Post Graduate	60	29.7
	Total	202	100.0
<b>Computer Experience</b>	Less than 2 years	17	8.4
	Between 2-5 years	114	56.4
	More than 5 years	71	35.1
	Total	202	100.0

In order to check the reliability of questionnaire cronbach alpha (Cronbach, 1951) for each variable was computed and were found to be well above the acceptable range of 0.60 (Nunnally, 1978): attitude towards e-learning (.821), activists (.855), pragmatists (.788), theorists (.817) and reflectors (.838). Ordinary least square (OLS) regression is used to find out the results of hypothesized relationships. The results are given below:

**TABLE 5: RESULTS OF REGRESSION TEST**

	Const.	Activists	Pragmatists	Theorists	Reflectors
Coefficient	.339	.633	.125	-.055	.087
Std. Errors	[.434]	[.065]	[.035]	[.089]	[.084]
T-stats.	(2.497)	(9.438)	(2.434)	(-1.096)	(1.329)
P-value	.013	.000	.016	.275	.186
F-stats.	56.587				
P-value	.000				
Adj. R square	.525				

- a. Predictors: (Constant), Reflectors, Pragmatists, Theorist, Activists
- b. Dependent Variable: Attitude towards e-learning

Table 5 shows that the overall model is significant (F=56.587,P<.05). The value for adjusted R-square is .525 which means 52.5% of the variance in the dependant variable is explained by the variations in the independent variables. As far as the impact of four learning styles on attitude towards e-learning is concerned, the results show that activists (sig. value 000) and pragmatists (sig. value .016) have a positive attitude towards e-learning medium of learning. Whereas theorists (sig. value .275) and reflectors (sig. value .186) learning styles have no significant impact on attitude towards e-learning. Therefore, the results support two of the hypotheses (H1 and H4) and do not support the other two hypotheses (H2 and H3). The findings are in line with some other researches on the topic. For example, Manochehr (2006) has made a study where he compared “the effects on e-learning versus those on traditional instructor-based learning, on student learning, based on students learning styles”. His findings were that Learning style is not very much important in traditional brick and mortar system of learning but it is crucial in e-learning. It was concluded in the study that students with converging learning style (assimilators) attained better learning results in e-learning.

In another study conducted by Graf and Kinshuk (2006) behavior of students in online courses was observed. The focus was to observe student behavior according to their preference of learning styles. Significant difference was observed in the learning of individuals with reflective and active learning styles; reflective learners spent more time on examples whereas active learners showed better performance on questions dealing with facts. Learning styles of intuitive learners and sequential learners also showed remarkable differences. Intuitive learners spend more time in answering tests and visited reference materials frequently. On the other hand, sequential learners showed a tendency to start from the beginning of each chapter.

Shaw and Marlow (1999) used LSQ to study the relationship between attitude towards information and communication technology (ICT) and learning styles. The study also included gender and student cohort as variables of interest. The results of the study indicated no significant difference in learning styles based on



gender or student cohort. However, a significant negative (but weak) relationship was noted between the “theorists” and the ‘interactivity’ and ‘context’ attitude dimensions.

Huang et al. (2012) tried to find out the relationship between learning styles and e-learning performance in their study. The results indicated that the students with “sensory” learning style participated more and for extended duration in online setup. Their higher level of online participation resulted in better e-learning performance. This finding is supported by the fact that sensing learners are more practical as compared to “intuitive” learners and they prefer to learn by solving problems using grounded theories (Felder and Silverman, 1988). Students with sensory learning style can perform better in current e-learning environment, whereas students characterized as intuitive may find difficult to adjust in current e-learning setup.

In another study relationship between learning styles, participation types and learning performance was examined among the students in a programming language course supported by an online forum (Shaw, 2012). The findings of the study were that different learning styles resulted in different learning scores and students characterized as ‘accommodators’ scored higher compared to others.

## CONCLUSION & RECOMMENDATIONS

The research concludes that e-learning is a medium of choice for the students who enjoy learning new tasks and like to work in groups. Similarly those students who prefer practical hands on experience over theory will be much excited about this idea. Whereas those students who are slow in learning new things and spend a lot of time in analyzing situations will find e-learning comparatively less attractive. The findings are useful for online teachers as well as designers of e-learning products to see how the needs of students with different learning styles can be fulfilled. Additionally students can also decide based on their learning styles whether they should enroll in any e-learning course or not.

MacKeracher (2009) pointed out that adult learners have distinct mental abilities and learning styles. If there were a mismatch between learners and facilitators’ learning style, the results would be unsatisfactory. Learning styles are value-neutral in the sense that a style adaptive in one situation may not be adaptive in others. The tendency of the learners is to begin with the learning activity they are comfortable with (p. 82-83).

An online learning environment can have the active learning features in which students interact with each other through writings and discussions in various platforms and it can have passive learning features when students read, listen and analyze different figures and graphs. The instructors should aim at meeting the requirements of individual and social learners by providing both synchronous and asynchronous activities, individual and group work, supportive interaction and facilitation. In order to facilitate the auditory and visual learners audio and visual materials, video casts of teaching performances, podcasts of different cases and samples, graphics including diagrams, figures and tables should be provided. The learning requirements of concrete and abstract learners can be fulfilled by providing various hands-on activities, simulations and games, activities that require research, exploration and creativity and different type of printed materials like books, handouts, worksheets, newspapers and puzzles. The logical and sensual readers need content that involve deductive and inductive approaches as well as real-life problems. In order to make online learning more effective the instructors should use a mix of different teaching methods including lecturing, discussion, role playing, storytelling, scaffolding, case-studies and discovery learning (Gülbahar & Alper, 2011).

## LIMITATIONS AND FUTURE DIRECTIONS

The study has been limited to students of higher learning belonging to business degree program. Students belonging to other disciplines were not covered in this study. Cross discipline study could yield different results. Also experimental study design to find out the effectiveness of e-learning program for students demonstrating different learning styles can yield results worthy of practical application.

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**THE EFFECT OF BOARD STRUCTURE ON FINANCIAL PERFORMANCE OF SRI LANKAN LISTED BANKS**

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**ABSTRACT**

*The purposes of this study were to determine the impact of board characteristics as corporate governance components (Board size, Non Executive Director Proportion, Independent Director Proportion and Female Director Proportion) on the financial performance of a sample of ten Sri Lankan banks listed on Colombo stock exchange. Data were collected from secondary data of listed banks for the period of 2008 to 2012 because it is suggested by Securities and Exchange Commission of Sri Lanka and CSE to adopt the compliance of rules of corporate governance mandatory among the listed companies with effect from April 2008. The data collected were analyzed by SPSS using correlation and regression analysis. The findings reveal that, there is no significant relationship between board structure and financial performance. These results are consistent with prior empirical studies. This may be due to the fact that in Sri Lanka, banks are still not adequately practiced corporate governance guidelines or there may be number of other factors which can have an impact on bank performance that need to be studied. Hence further research is significantly recommended.*

**KEYWORDS**

Corporate Governance, board structure, bank performance, Sri Lanka.

**1. THEORETICAL BACKGROUND**

Good corporate governance is globally accepted as being fundamental to an organization's competitiveness, growth and sustainability. There is great attention on Boards of Directors to discharge their duties with high ethical values and accountability in their commitment to good governance practices. Strong business ethics, sound policies and procedures, effective and efficient monitoring systems are considered as ingredients of good corporate governance system.

Corporate governance is a crucial issue for the management of banks. Corporate governance involves the manner in which the business and affairs of individual institutions are governed by their boards of directors and senior management. It is not a disputed fact that banks are crucial element to any economy; this therefore demands that they have strong and good corporate governance if their positive effects were to be achieved (Basel Committee on Banking Supervision, 2003). Better corporate governance is supposed to lead to better corporate performance by preventing the expropriation of controlling shareholders and ensuring better decision-making.

Effective corporate governance mobilizes the capital annexed with the promotion of efficient use of resources both within the company and the larger economy. It also assists in attracting lower cost investment capital by improving domestic as well as international investor's confidence. Good corporate governance ensures the accountability of the management and the Board. The Board of directors will also ensure legal compliance and take impartial decisions for the betterment of the business.

Good corporate governance can add value to developing sound corporate management and enriching the results of corporate entities for society in general and shareholders in particular to be the beneficiaries. To investigate the reasons for the effectiveness of corporate governance in the context of Sri Lanka, this study will examine literature on the relationship between board structure, corporate reporting and firm performance.

The banking institution occupies a vital position in the stability of the nation's economy. It plays essential roles on fund mobilization, credit allocation, payment and settlement system as well as monetary policy implementation. Management is expected to exhibit good governance practices to ensure achievement of its objectives and avoid the consequences of failure leading to loss of confidence.

From a banking industry perspective, corporate governance involves the manner in which their boards of directors and senior management govern the business and affairs of individual banks, affecting how banks set their corporate objectives, run day-to-day operations, consider the interests of various stakeholders, align corporate activities with the expectation that banks will operate in a safe and sound manner and in compliance with applicable laws and regulations and protect the interests of depositors.

Banks are "special" as they not only accept and deploy large amount of uncollateralized public funds in fiduciary capacity, but they also leverage such funds through credit creation.

The role of banks is integral to any economy. They provide financing for commercial enterprises access to payment systems and a variety of retail financial services for the economy at large. The integral role that banks play in the national economy is demonstrated by the almost universal practice of states in regulating the banking industry and providing in many cases a government safety net to compensate depositors when banks fail.

Securities and Exchange Commission of Sri Lanka as the apex regulator of the Sri Lankan Capital Market is committed to maintain a higher standard of Corporate Governance in order to maintain the market integrity. In view of this broader objective, the Securities and Exchange Commission of Sri Lanka together with the Institute of Chartered Accountants of Sri Lanka published the "Code of Best Practices on Corporate Governance" in the year 2008 in order to establish good corporate governance practices in Sri Lankan Capital Market.

**2. OBJECTIVE OF THE STUDY**

The main objective of this study is to find out Does the corporate governance practices affect on firm performance of selected banks? In particular the study sought to:

- Examine the development of corporate governance practices in the context of the Sri Lankan business environment.
- Determine the relationships between corporate governance practices (such Board size, Non Executive Director Proportion, Independent Director Proportion and Female Director Proportion) on bank performance

**3. LITERATURE REVIEW**

Several studies have been conducted so far and still going on to examine the relationship between firm performance and corporate governance mechanisms, but the results are mixed.

Using data from Jordanian banks, Mousa F. Al Manaseer, Riyad Mohamad Al-Hindawi, Mohamad Abdulrahim Al-Dahiyat and laad Issa Sartawi (2012) found a positive relationship between corporate governance dimensions: the number of outside board members and foreign ownership and Jordanian banks' performance. Whereas, board size and the separation of the role of CEO and chairman have a negative relationship with performance.

Giulia Romano, Paola Ferretti and Alessandra Rigolini (2011) find that board size does not affect Italian bank holding companies' performance and that smaller audit committees charged with internal control activities perform better, increasing vigilance over board decisions and activities and, thus, concurring to

enhance banks' profitability. They also find a significant negative relationship between the percentage of independent directors in the audit committee and banks' performance in terms of both ROE and ROA. Their study shows also a significant positive relationship between the presence of women on the board of directors and both ROE and ROA, even if the representation of women in Italian bank holding companies' boards is still scarce.

Empirical studies on the effect of board membership and structure on performance generally show results either mixed or opposite to what would be expected from the agency cost argument. While some studies find better performance for firms with boards of directors dominated by outsiders (Pearce and Zahra 1992; Vafeas, 1999), others find no such relationship in terms of accounting profits or firm's value (Daily and Dalton, 1992; Mehran 1995; Rosenstein and Wyatt 1997; Klein 1998 and Bhagat and Bolton 2005). Brickley, Coles and Terry (1994) find a positive relationship between the proportion of outside directors and the stock market reaction to poison pill adoptions.

With specific reference to bank industry, some empirical researches regarding different countries find no significant relationship between performance measures and board size (Love and Rachinsky, 2007; Shelash Al-Hawary, 2011; Bino and Tomar, 2007; Busta, 2007; Mayur and Saravanan, 2006; Simpson and Gleason, 1999). However, in banking researches, the results regarding the effectiveness of outside directors are mixed. Some empirical researches in the last decades show no significant relationship between board composition, considered as the proportion of outsiders or of independent board members on the board, and banks performance (Simpson and Gleason, 1999; Adams and Mehran, 2008; Love and Rachinsky, 2007; Adams and Mehran, 2005; Pi and Timme, 1993). Although the size of audit committee is influenced mainly by the size of the company and of its board of directors, a larger audit committee may not necessary cause in more effective functioning, as a larger committee may lead to unnecessary debates and delay the decisions (Lin et al., 2008).

With reference to the relationship between gender diversity and firm performance, the few existing empirical studies show contrasting results. Considering the US context, Zahra and Stanton (1988) find no statistically significant relationship between gender diversity and firm performance. Carter et al. (2003) report statistically significant positive relationships between both the presence and the percentage of women on the board of directors and firm value. Also Heinfeldt (2005) finds a positive relationship between the percentage of female board members and the market value added (MVA). Conversely, Shrader et al. (1997) show a negative relationship between the percentage of female board members and firm performance.

Beiner, Drobetz, Schmid and Zimmermann (2003) conducted a study over companies listed on the Swiss Stock Exchange (SWX). Study did not find a significant relationship between board size and firm valuation, as measured by Tobin's Q.

The role of auditor is important in implementing corporate governance principles and improving the value of a firm. The principles of corporate governance suggest that auditors should work independently and perform their duties with professional care. In case of any financial manipulation, the auditors are held accountable for their actions as the availability of transparent financial information reduces the information asymmetry and improves the value of a firm (Bhagat and Jefferis, 2002).

Bennedsen, Kongsted and Nielsen (2006) studied the relationship between board size and performance of 500 Danish firms. Their study also supported a negative relation between the two variables. Adams and Mehran (2002) accessed the relationship between banking firms' performance (represented by Tobin's Q) and board size and found a non-negative relationship between board size and Tobin's Q.

**4. METHODOLOGY OF THE STUDY**

There were 15 banks listed in the CSE in 2008. As per the scope of the study researcher has selected these organizations listed in the CSE as the population. Ten of these organizations have been selected randomly as the sample of the study.

The study examined the data for the years 2008, 2009, 2010, 2011 and 2012. The reason for selection of the years was that the corporate governance guidelines were introduced in 2003. Reporting of corporate governance practices was voluntary during this period. The code of corporate governance was mandated in 2007 to be effective for companies reporting on or after the 1<sup>st</sup> April 2008. Therefore, the year 2008 was an important year to examine the effectiveness of the voluntary code on performance.

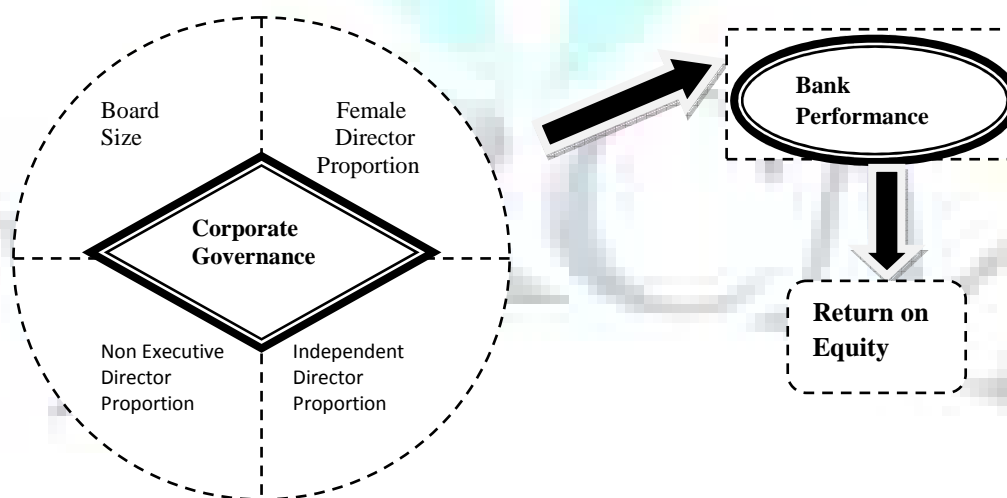
The data of the study is composed of two kinds of data. They are banks' financial information and the banks' corporate governance information over the period 2008-2012. The sources of these data are the financial data and the banks' corporate governance available on Colombo Stock Exchange (CSE) websites, annual reports, and the Colombo Stock Exchange publication "The Hand book of listed companies".

The data required for the study included board size, composition of the board (number of non-executive directors) and audit committee (details of the audit committees). Performance data used in the study were return on investment (ROE). SPSS (Statistical Package for Social Science) was used to analysis the data to test the hypothesis. Correlation and Regression were used to test the hypothesis.

**4.1 CONCEPTUAL FRAMEWORK**

The model used to conceptualize the dependent and independent variables was based on many other models used by different researchers over the years.

**FIGURE: CONCEPTUALIZATION MODEL**



4.2 VARIABLES DESCRIPTION

Tables 1a and 1b below show the variables used to operationalise the constructs and their measurement.

TABLE 1a: DEPENDENT VARIABLE DESCRIPTION

Concept	variable	Measurement
Bank Performance	Return on Equity[ROE]	Earnings before interest and tax shareholders' funds

TABLE 1b: INDEPENDENT VARIABLE DESCRIPTION

Concept	variable	Measurement
Board Characteristics	Board size	Number of directors on the board.
	Non Executive Director Proportion	Proportion of outside directors sitting on the board.
	Independent Director Proportion	number of Independent directors on the board
	Female Director Proportion	Presence of female members on the board of directors

4.3 HYPOTHESES

The hypothesis presented in this study will be tested to investigate the effect of corporate governance practices on bank performance in Sri Lanka.

H1: There is a positive significant relationship between board size and bank performance.

H2: The relationship between the proportion of non executive directors and the bank performance is positively statistically significant.

H3: The bank performance is positively related to the proportion of independent directors on the board of directors.

H4: The proportion of female directors is positively associated with bank performance.

4.4 MODEL SPECIFICATION

The linear model used in this study is as follows:

$$ROE = \alpha + \beta_1 BSIZE + \beta_2 NEXD + \beta_3 IND + \beta_4 WO + \epsilon$$

Whereas:

$\beta$  = Intercept

ROE = Return on Equity

BSIZE = Board size

NEXD = Non Executive Director Proportion

IND = Independent Director Proportion

WO = Female Director Proportion

$\epsilon$  = Standard error of the sample

5. RESULTS OF ANALYSIS

5.1 DESCRIPTIVE STATISTICS

TABLE 2: BELOW SUMMARIZES THE DESCRIPTIVE STATISTICS OF ALL THE VARIABLES USED IN THIS STUDY

	Minimum	Maximum	Mean	Std. Deviation
<b>Board size</b>	7	13	9.98	1.597
<b>Non-executive Director Proportion</b>	5	10	8.16	1.376
<b>Independent Director Proportion</b>	1	8	4.34	1.636
<b>Female Director proportion</b>	0	3	0.94	0.935
<b>Return on Equity</b>	0.221	0.3360	0.2082	0.08932

According to the table 2, it shows that the board of director consists of around ten directors and it has wide range from 7 to 13 with a variation of around two within the banks in Sri Lanka. The Cadbury committee report (1992) also recommends the size of the board to be between 8 and 10. Non-executive director proportion is about nine out of the total board members. The table shows a mean of 8.16 with a standard deviation of 1.376 and it ranges between five to ten non executive members. The number of independent director sitting in the boards of directors floats from one to 8, with a mean of 4.34, while, the presence of women on Sri Lankan bank' board floats from 0 to 3 with a mean of only 0.94, implying that there are boards without any female representation.

5.2 CORRELATIONS

In order to test the hypotheses, the researcher has obtained correlations output through SPSS statistical packages. The following figure shows the results of correlations analysis.

TABLE 3: CORRELATIONS BETWEEN BOARD CHARACTERISTICS AND BANK PERFORMANCE

Board Characteristics	Return on Equity
<b>Board size</b>	
Correlation Coefficient	.106
Sig. (2-tailed)	.464
<b>Non-executive Director Proportion</b>	
Correlation Coefficient	.157
Sig. (2-tailed)	.276
<b>Independent Director Proportion</b>	
Correlation Coefficient	.048
Sig. (2-tailed)	.742
<b>Female Director proportion</b>	
Correlation Coefficient	.131
Sig. (2-tailed)	.364

Table 3 shows the relationship between the board Characteristics and bank performance (ROE as the measures of firm performance). It is noted that none of the relationships are statistically significant which is in line with many of the previous studies. This result is supported by empirical evidence carried out by D.N.Ranasinghe (2010), Velnampy (2013).

5.3 REGRESSION ANALYSIS

A simple linear regression was carried out to recognize the impact of board characteristics on bank performance. Table 3 shows the results of the analysis.

TABLE 4: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.199 <sup>a</sup>	.040	-.046	.0913352

a. Predictors: (Constant), FED, BSIZE, IND, NED

According to this table R<sup>2</sup> values of 0.040 indicate that the board characteristics of the listed banks is contributing to the ROE by 4% and the remaining 96% can be attributed by other factors which are not studied, because they are outside the scope of the study. R<sup>2</sup> values indicate that there may be number of variables which can have an impact on performance that need to be studied.

TABLE 5: ANOVA- ROE AS A DEPENDENT VARIABLE

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.015	4	.004	.464	.762 <sup>a</sup>
Residual	.375	45	.008		
Total	.391	49			

a. Predictors: (Constant), FED, BSIZE, IND, NED

b. Dependent Variable: ROE

Table 5 shows the analysis of variance (ANOVA) of the variable. With F- values of 0.464 (sig 0.762) for ROE as performance proxies, it clearly shows that there is no significant relationship between the dependent variables(ROE) and the independent variables( the board characteristics) at 1%, 5% and 10% levels.

TABLE 6: COEFFICIENTS FOR PREDICTORS OF PERFORMANCE

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.124	.091		1.361	.180
BSIZE	.000	.013	-.008	-.033	.974
NED	.011	.017	.167	.646	.521
IND	-.003	.010	-.047	-.262	.795
FED	.012	.015	.125	.823	.415

a. Dependent Variable: ROE

The relationship between board characteristics and the performance measure (ROE) is not statistically significant. The implication of this is that for the sampled firms, there is no relationship between the banks' financial performances and corporate governance. Further t values for all four variables of corporate governance are insignificant even at 5% level. It means that these variables are not contributing to the performance measures of ROE. This outcome also has the support of D.N.Ranasinghe (2010) Weisbach (1991), Bhagat and Black (2002) and Velnampy (2013).

## 6. CONCLUSION AND RECOMMENDATION

Several studies have been conducted on the examination of the impact of corporate governance on bank performance, but there are mixed outputs in different contextual frame work. This study has focused on analyzing the relationship that exists between bank performance using ROE and four board characteristics as a corporate governance mechanism.

A sample of ten listed banks from the financial year 2008 to 2012 is used. Board size, Non Executive Director Proportion, Independent Director Proportion and Female Director Proportion were taken as the corporate governance variable where as ROE were taken as the measures of bank financial performance.

The study reveals that determination of corporate governance is no statistically significant to the performance measures of the bank. Therefore, it can be concluded that financial performance of the bank is independent of the corporate governance mechanism. This result is consistent with prior empirical studies.

As with any corporate governance, study has some limitations. This is only focused of financial accounting measures of performance. It is hereby suggested that attention should be put in the inclusion of non financial performance aspects. The sample used in this study consisted only ten banks which indicate the sample is relatively small. More sample size may have revealed the hypotheses to be significant. Hence further research is significantly recommended.

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## DISAGGREGATED VOLATILITY - A CASE STUDY IN INDIAN STOCK MARKET

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## ABSTRACT

This paper examines the benefits to forecasters of decomposing daily return volatility, applies a disaggregated approach to examine these characteristics in selected stocks of Indian Stock market. To decompose the return on a stock into three components. The market wide return, an industry- specific residual, and a firm - specific residual are based on this return decomposition. To construct time series of volatility measures of the three components for a typical firm and define volatility measures that sum to the total return volatility of a typical firm, without having to keep track of co-variances and without having to estimate betas for firms or industries. The analysis of volatility components relative to total volatility of an average firm reveals that market – level volatility has the largest portion of total volatility on an average. The time series variation in total volatility is due to market and industry level.

## KEYWORDS

disaggregated volatility, Indian stock market.

## INTRODUCTION

Important objective of this paper is to focus attention on disaggregated volatility measures. It is known that the return to an individual stock has three components: aggregate market return, industry-level shocks and firm-level shocks. Thus, volatility of an individual stock depends on the volatility of industry-specific and firm-specific shocks as much as the volatility of aggregate market returns. There is little empirical research on volatility at the level of the industry or firm.

A few papers, Black (1976), Christie (1982) and Duffee (1995), use disaggregated data to study the “leverage” effect, the tendency for volatility to rise following negative returns. Black (1976) conducted the first empirical work on the relation between stock returns and volatility using a sample of stock return volatility over the period of 1962- 1975 by summing squared daily returns and taking the square root of the result. For each stock  $i$  standard deviation was estimated using the equation

$$\frac{\sigma_{it+1} - \sigma_{it}}{\sigma_{it}} = \alpha_0 + \lambda_0 r_{it} + \varepsilon_{it+1} \quad (1)$$

Where  $\sigma_{it}$  is an estimate of the standard deviation of return. It was found that  $\lambda_0$  coefficient of return was always negative and usually less than -1.

A similar approach was used by Christie (1982). In this quarterly estimates of return volatility for 379 firms all of which existed throughout the period 1962-1978 were considered. In that equation (2) was used to estimate volatility

$$\log\left(\frac{\sigma_{t+1}}{\sigma_t}\right) = \alpha_0 + \lambda_0 r_t + \varepsilon_{t+1,0} \quad (2)$$

Over the period of 1962-1978 for each firm and finds a mean  $\lambda_0$  of -0.23. It was studied whether this negative coefficient could be explained by the leverage effect and explained that leverage is a dominant but probably not the only determinant of  $\lambda_0$ .

Duffee (1995) followed the previous work in this area by using daily stock returns for the period of 1977-1991 but takes a different approach. The coefficient  $\lambda_0$  in equation (3) equals the difference between  $\lambda_2$  and  $\lambda_1$  in the following equations:

$$\log \sigma_t = \sigma_t + \lambda_1 r_t + \varepsilon_{t1} \quad (3)$$

$$\log (\sigma_{t+1}) = \sigma_t + \lambda_2 r_t + \varepsilon_{t=12} \quad (4)$$

It was found that for the typical firm traded on the American or New York Stock Exchange  $\lambda_1$  was strongly positive, while the sign of  $\lambda_2$  depends on the frequency over which these relations were estimated. It is positive at the daily frequency and negative at the monthly frequency. In both cases  $\lambda_1$ , exceeds  $\lambda_2$ , so  $\lambda_2$  is negative in equation (2).

Some researchers, Bainard and Cutler (1993), Lowigani, Rush and Tave (1990), have used stock-market data to test macroeconomic models of reallocation across industries or firms. Bernard and Cutler (1993) develop a new measure of reallocation shocks based on the variance of industry stock market excess returns to assess the contribution of sectoral reallocation to unemployment in the postwar U.S. economy. They first construct a time series of the variance of sectoral stock market excess returns, termed cross-section volatility and unemployment. They construct the cross-section volatility series using industry data on stock market excess returns. Excess returns for each industry through time  $\varepsilon_{it}$  are formed as the residual from the market model:

$$R_{j,t} = \beta_{0j} + \beta_1 R_{mt} + \varepsilon_{it} \quad (5)$$

where  $R_{j,t}$  is the return on the market portfolio at time  $t$  (the Standard & Poor Composite Index) and  $R_{j,t}$  is industry  $j$ 's return at time  $t$ . They form the industry specific components of return variation:

$$\eta_{j,t} = \hat{\beta}_{0j} + \hat{\varepsilon}_{it} \quad (6)$$

The excess returns include the time-variant component of the industry-specific response in order to capture trend movements within industries. They form the measure of cross-section volatility as the weighted variance of one-quarter excess returns. Then they examine the relation between cross-section volatility and unemployment and find a positive and statistically significant correlation between them.



They find that the volatility of the market, industry and firm level volatilities are important components of the total volatility at the return of a typical firm. All three volatility measures experience substantial variations over time and they are positively correlated as well as auto-correlated. They also find that over their sample period, firm level volatility has a significant positive trend whereas market level and industry level volatility do not. They also study the lead-lag relations among their volatility measures and various Indicators of the state of the aggregate economy and find that all three volatility variables, particularly industry level volatility, help to forecast economic activity and reduce the significance of the other commonly used forecasting variable.

### 1.1 ESTIMATION OF VOLATILITY COMPONENTS

#### Volatility Decomposition

To decompose the return on a stock into three components. The market wide return, an industry- specific residual, and a firm - specific residual are based on this return decomposition. To construct time series of volatility measures of the three components for a typical firm and define volatility measures that sum to the total return volatility of a typical firm, without having to keep track of co-variances and without having to estimate betas for firms or industries. In this section, how to achieve such a representation of volatility is discussed.

Industries are denoted by an  $i$  subscript and individual firms are indexed by  $j$ , the simple excess return of firm  $j$  that belongs to industry  $i$  in period  $t$  is denoted as  $R_{jit}$ . This Excess return, is measured as an excess return over the Treasury bill rate. Let  $W_{jit}$  be the weight of firm  $j$  in industry  $i$  this methodology is valid for any arbitrary weighting scheme provided that it is used to compute the market return using the same weights; in this application market value weights are used. The excess return of industry  $i$  in period  $t$  is given by  $R_{it} = \sum_{j \in i} W_{jit} R_{jit}$  Industries are aggregated correspondingly, the weight of industry  $i$  in the total market is denoted by  $w_{it}$ , and the excess market return is  $R_{mt} = \sum_{j \in i} W_{jit} R_{jit}$

The next step is the decomposition of firm and industry returns into the three components. A decomposition based on the CAPM is used, and then it is modified for empirical implementation. The CAPM implies that we can set intercept to zero in the following equations.

$$R_{it} = \beta_{im} R_{mt} + \epsilon_{it} \quad (1)$$

For industry returns and

$$R_{it} = B_{ji} R_{it} + \eta_{ji} \\ = B_{ji} \beta_{im} R_{mt} + B_{ji} \epsilon_{it} + \eta_{jit} \quad (2)$$

For individual firm returns in equation (1)  $\beta_{im}$  denotes the beta for industry  $i$  with respect to the market return, and  $\epsilon_{it}$  is the industry – specific residual similarly, in equation (2)  $B_{ji}$  is the beta of firm  $j$  in industry  $i$  with respect to its industry, and  $\eta_{ji}$  is the firm-specific residual.  $\eta_{ji}$  is orthogonal by construction to the industry return  $R_{it}$  we assume that it is also orthogonal to the components  $R_{mt}$  and  $\epsilon_{it}$ . In other words, it is assumed that the beta of firm  $j$  with respect to the market.  $\beta_{jm}$ , satisfies  $\beta_{jm} = B_{ji} \beta_{im}$ . The weighted sums of the different betas equal unity.

$$\sum_i w_{it} \beta_{im} = 1, \quad \sum_{j \in i} \beta_{ji} = 1, \quad (3)$$

The CAPM decomposition (1) and (2) guarantees that the different components of a firm’s return are orthogonal to one another. Hence it permits a simple variance decomposition in which all covariance terms are zero;

$$Var(R_{it}) = \beta_{im}^2 Var(R_{mt}) + Var(\epsilon_{it}), \quad (4)$$

$$Var(R_{jit}) = \beta_{jm}^2 Var(R_{mt}) + \beta_{ji}^2 Var(\epsilon_{it}) + Var(\eta_{jit}), \quad (5)$$

The problem with this decomposition, however, is that it requires knowledge of firm-specific betas that are difficult to estimate and may well be unstable over time. Therefore we work with a simplified model that does not require any information about betas. We show that this model permits a variance decomposition similar to equations (4) and (5) on an appropriate aggregate level.

First, consider the following simplified industry return decomposition that drops the industry beta coefficient  $\beta_{im}$ , from equation (1) :

$$R_{it} = R_{mt} + \epsilon_{it} \quad (6)$$

Equation (6) defines  $\epsilon_{it}$  as the difference between the industry return --- and the market return  $R_{mt}$ . Campbell et al. (1997, 4, p.156) refer to equation (6) as a “market –adjusted-return model” in contrast to the market model of equation (1).

Comparing equations (1) and (6), we have.

$$\epsilon_{it} = \tilde{\epsilon}_{it} + (\beta_{im} - 1)R_{mt} \quad (7)$$

The market –adjusted –return residual equals the CAPM residual of equation (4) only if the industry beta  $\beta_{im} = 1$  or the market returns  $R_{mt} = 0$ .

The apparent drawback of the decomposition (6) is that and are not orthogonal, and so one cannot ignore the covariance between them. Computing the variance of the industry return yields.

$$Var(R_{it}) = Var(R_{mt}) Var(\tilde{\epsilon}_{it}) + 2 Cov(R_{mt}, \tilde{\epsilon}_{it}) \\ = Var(R_{mt}) + Var(\tilde{\epsilon}_{it}) + 2(\beta_{im} - 1)Var(R_{mt}), \quad (8)$$

Where taking account of the covariance term once again introduces the industry beta into the variance decomposition.

Note, however, that although the variance of an individual industry return contains covariance terms, the weighted average of variances across industrial is free of the individual covariances:

$$\sum_i w_{it} Var(R_{it}) = Var(R_{mt}) + \sum_i \omega_{it} Var(\epsilon_{it}) \\ = \sigma_{mt}^2 + \sigma_{\epsilon t}^2, \quad (9)$$

Where  $\sigma_{mt}^2 \equiv Var(R_{mt})$  and  $\sigma_{\epsilon t}^2 \equiv \sum_i \omega_{it} Var(\epsilon_{it})$ . The terms involving betas aggregate out because from equation (3)  $\sum_i \omega_{it} \beta_{im} = 1$ . Therefore we can use the residual in equation (6) to construct a measure of average industry level volatility that does not require any estimation of betas. The weighted average  $\sum_i \omega_{it} Var(R_{it})$  can be interpreted as the expected volatility of a randomly drawn industry (with the probability of drawing industry  $i$  equal to its weight  $\omega_{it}$ ).

We can proceed in the same fashion for individual firm returns; consider a firm returns decomposition that drops  $\beta_{ji}$  from equation (2):

$$R_{jit} = R_{it} + \eta_{jit}, \quad (10)$$

Where  $\eta_{jit}$  is defined as

$$\eta_{jit} = \tilde{\eta}_{jit} + (\beta_{ji} - 1)R_{it}, \quad (11)$$

The variance of the firm return is

$$Var(R_{jit}) = Var(R_{it}) + Var(\eta_{jit}) + Cov(R_{it}, \eta_{jit}) \\ = Var(R_{it}) + Var(\tilde{\eta}_{jit}) + 2(\beta_{ji} - 1)Var(R_{it}). \quad (12)$$

The weighted average of firm variances in industry  $i$  is therefore

$$\sum_{j \in i} \omega_{jit} Var(R_{jit}) = Var(R_{it}) + \sigma_{\eta it}^2, \quad (13)$$

Where  $\sigma_{\eta it}^2 \equiv \sum_{j \in i} \omega_{jit} Var(\eta_{jit})$  is the weighted average of firm –level volatility in industry  $i$ . Computing the weighted average across industries, using equation (9), yields again a beta-free variance decomposition :

$$\sum_i \omega_{it} \sum_{j \in i} \omega_{jit} Var(R_{jit}) = \sum_i \omega_{it} Var(R_{it}) + \sum_i \omega_{it} \sum_{j \in i} \omega_{jit} Var(\eta_{jit}) \\ = Var(R_{mt}) + \sum_i \omega_{it} Var(\epsilon_{it}) + \sum_i \omega_{it} \sigma_{\eta it}^2,$$

$$\sigma_{mt}^2 + \sigma_{\epsilon t}^2 + \sigma_{\eta t}^2, \quad (14)$$

Where  $\sigma_{\eta t}^2 \equiv \sum_i \omega_{it} \sum_{j \in i} \omega_{jit} Var(\eta_{jit})$  is the weighted average of firm-level volatility across all firms. As in the case of industry returns, the simplified decomposition of firm returns (10) yields a measure of average firm –level volatility that does not require estimation of betas.

We can gain further insight into the relation between our volatility decomposition and that based on the CAPM if we aggregate the latter (equations (4) and (5) across industries and firms. When we do this we find that

$$\sigma_{e_t}^2 = \tilde{\sigma}_{e_t}^2 + CSV_t(\beta_{im})\sigma_{m_t}^2, \quad (15)$$

Where  $\tilde{\sigma}_{e_t}^2 \equiv \sum_i \omega_{it} \tilde{\sigma}_{\eta_{it}}^2 = \sum_i \omega_{it} \sum_{j \in i} \omega_{jit} Var(\eta_{jit})$  is the average variance of the CAPM industry shock and is the cross-sectional variance of industry betas across industries. Similarly,

$$\sigma_{\eta_t}^2 = \tilde{\sigma}_{\eta_t}^2 + CSV_t(\beta_{jm})\sigma_{m_t}^2 + CSV_t(\beta_{ji})\tilde{\sigma}_{e_t}^2, \quad (16)$$

Where  $\tilde{\sigma}_{\eta_t}^2 \equiv \sum_i \omega_{it} Var(\tilde{\eta}_{it}), CSV_t(\beta_{jm}) \equiv \sum_i \omega_{it} \sum_j \omega_{jit} (\beta_{jm} - 1)^2$  the cross-sectional variance of firm betas on the market is across all firms in all industries and  $CSV_t(\beta_{im}) \equiv \sum_i \omega_{it} (\beta_{im} - 1)^2$  is the cross-sectional variance of firm betas on industry shocks across all firms in all industries.

Equations (15) and (16) show that cross-sectional variation in betas can produce common movements in our variance components  $\sigma_{m_t}^2, \sigma_{e_t}^2$  and  $\sigma_{\eta_t}^2$ , even if the CAPM variance components  $\tilde{\sigma}_{e_t}^2$  and  $\tilde{\sigma}_{\eta_t}^2$  do not move at all with the market variance  $\sigma_{m_t}^2$ .

**Estimation**

Firm-level return data is calculated for the firms traded on the BSE and the NSE. Estimation of the volatility components in equation (14) is based on the return decomposition (6) and (10), individual firms are aggregate into industries according to SIC classification. Sample period runs from January 2000 to December 2009. Obviously, the composition of firms in individual industrial has changed dramatically over the sample period. The industry with the most firms on average over the sample is financial services, information technology. Based on average market capitalization, the six largest industries on average over the sample are FMCG (24.5%), Oil / Gas (22.4%), Metal (18.7%), IT (18.3%), followed by Finance and transport sector. Table 4 includes a list of the 10 largest industries. To get daily excess return, we subtract the 30 day T-bill return divided by the number of trading days in a month.

Following procedure is used to estimate the three volatility components in equation (14). Let  $s$  denote the interval at which returns are measured. Daily returns are used for most of the estimates. Using returns of intervals, volatility estimates at intervals  $t$  is constructed. Unless otherwise  $t$  refers to months. To estimate the variance components in equation (14) time-series variation of the individual return components within each period  $t$  is used, the sample volatility of the market return in period  $t$ , which is denote from now on as MKT, is computer as

$$MKT_t = \tilde{\sigma}_{m_t}^2 = \sum_{\beta \in t} (R_{ms} - \mu_m)^2, \quad (17)$$

where  $\mu_m$  is defined as the mean of the market return  $R_{ms}$  over the sample to be consistent with the methodology presented above, to construct, the market returns as the weighted average using all firms in the sample in a given period is used. The weights are based on market capitalization, for weights average market capitalization of a firm during period of study is used and the weights are assumed to constant within sample period.

For volatility in industry  $i$ , sum the squares of the industry-specific residual in equation (6) within a period  $t$  is used:

$$\tilde{\sigma}_{e_{it}}^2 = \sum_{\beta \in t} \epsilon_{is}^2, \quad (18)$$

As shown above, average over industries are used to ensure that the co-variances of individual industries cancel out this yield the following measure for average industry volatility  $IND_t$ :

$$IND_t = \sum_t \omega_{it} \tilde{\sigma}_{e_{it}}^2, \quad (19)$$

Estimating firm-specific volatility is done in a similar way. First sum of the squares of the firm-specific residual in equation (10) for each firm in the sample is used:

$$\tilde{\sigma}_{\eta_{it}}^2 = \sum_{\beta \in t} \eta_{jis}^2, \quad (20)$$

Next, to computer the weighted average of the firm-specific volatilities within an industry:

$$\tilde{\sigma}_{\eta_{it}}^2 = \sum_{j \in i} \omega_{jit} \tilde{\sigma}_{\eta_{jit}}^2, \quad (21)$$

And lastly average over industries is to obtain as a measure of average firm-level volatility  $FIRM_t$  as:

$$FIRM_t = \sum_i \omega_{it} \tilde{\sigma}_{\eta_{it}}^2, \quad (22)$$

As with industry volatility, this procedure ensures that the firm-specific co-variances cancel out.

**1.2 MEASURING TRENDS IN VOLATILITY**

FIGURE 1: STANDARD DEVIATION OF VALUE – WEIGHTED STOCK INDEX. THE STANDARD DEVIATION OF MONTHLY RETURNS WITHIN EACH YEAR FOR THE PERIOD FROM 2000 TO 2009

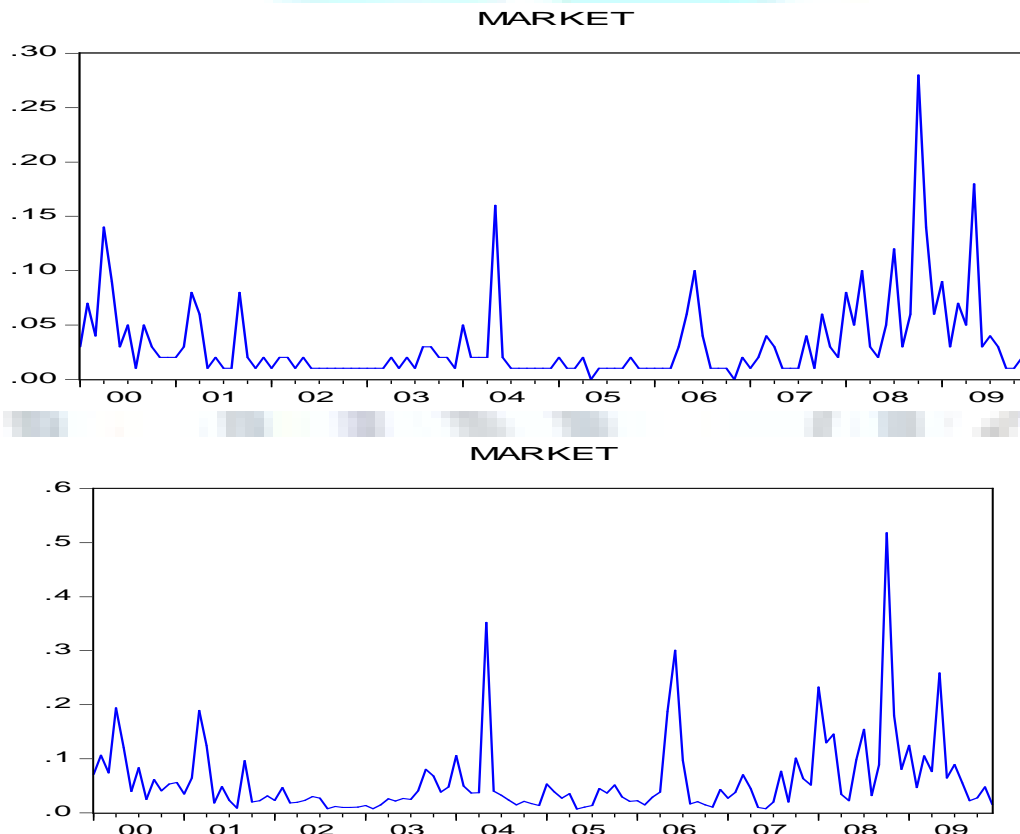
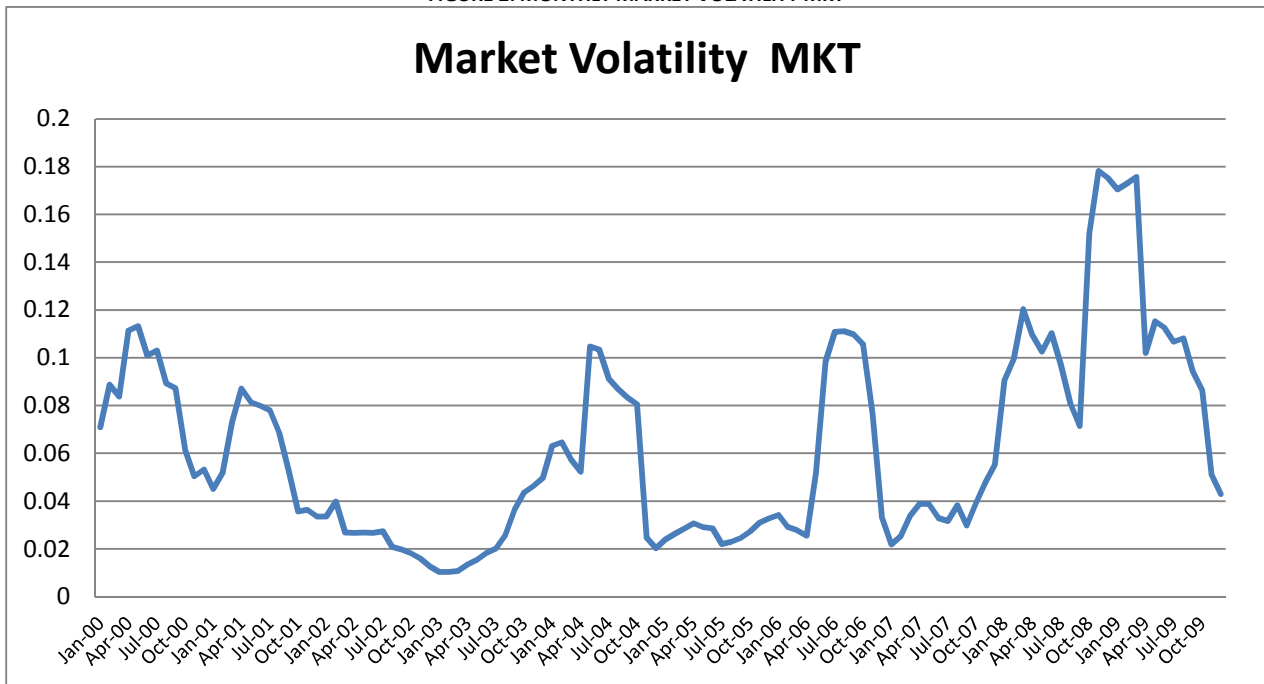
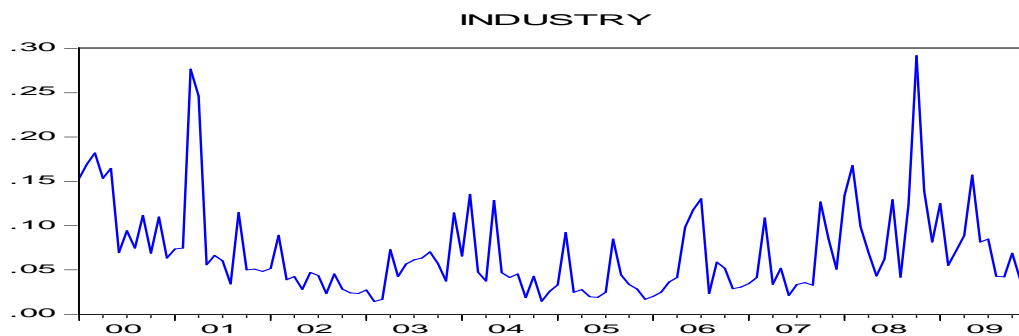


FIGURE 2: MONTHLY MARKET VOLATILITY MKT

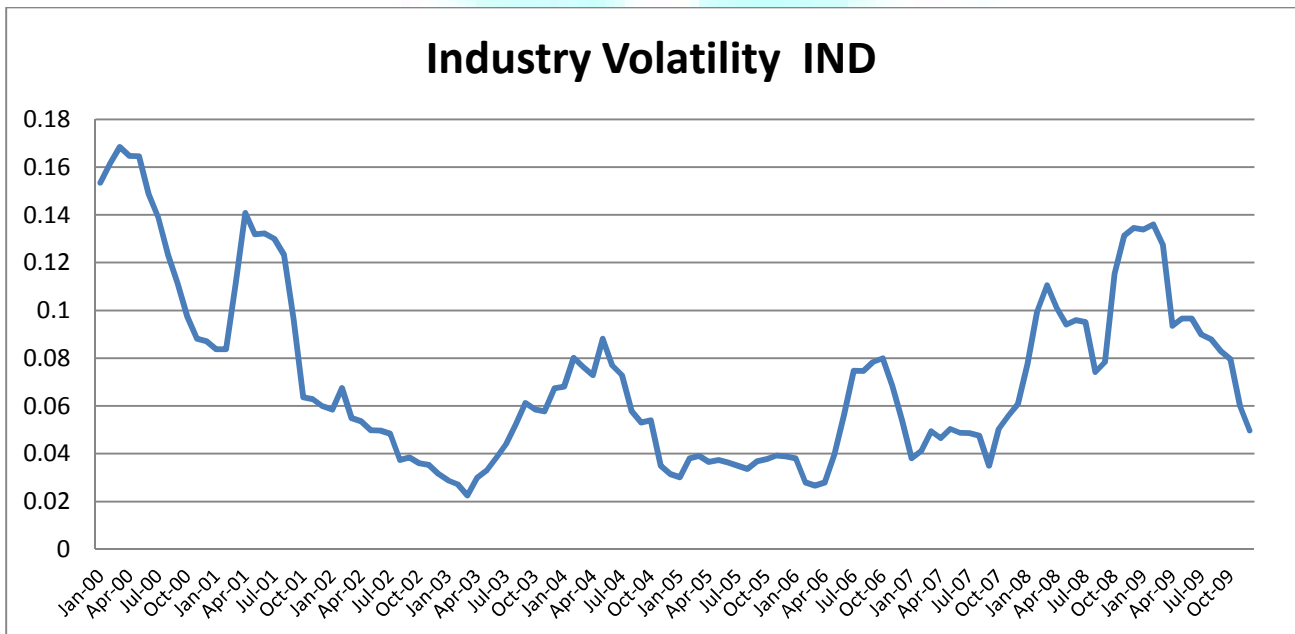


The top panel shows the variance within each month of daily market returns, calculated using equation (17), for the period January2000 to December 2009. The bottom panel shows a backwards 6 month moving average of MKT.

FIGURE 3: MONTHLY INDUSTRY-LEVEL VOLATILITY IND

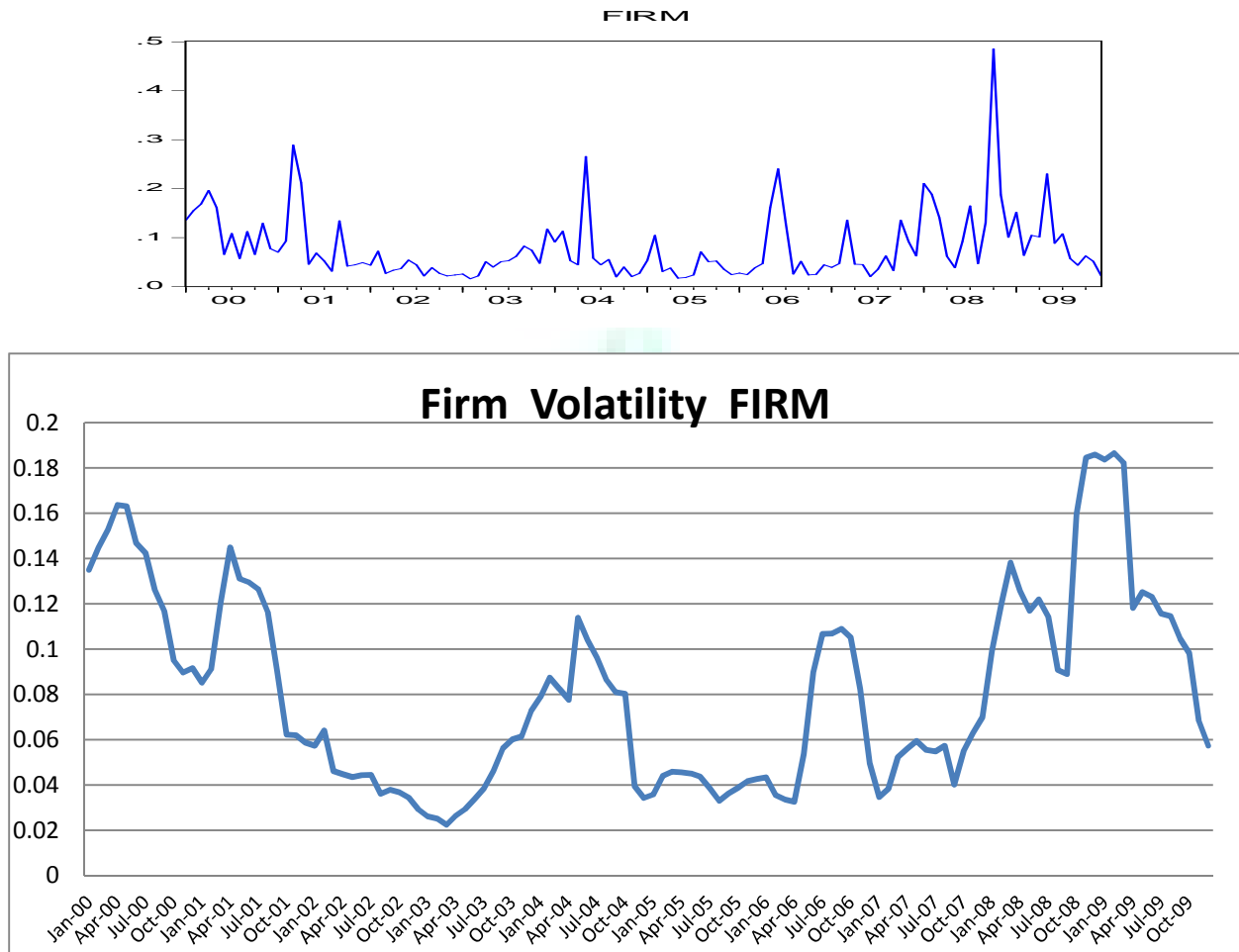


Industry Volatility IND



The top panel shows the variance within each month of daily industry returns relative to the market, calculated using equations (18) and (19), for the period from January2000 to December 2009. The bottom panel shows a backwards 6-month moving average of IND.

FIGURE 4: MONTHLY FIRM –LEVEL VOLATILITY FIRM



The top panel shows the monthly variance within each month of daily firm returns relative to the firms industry, calculated using equations (20)-(22), for the period from January 2000 to December 2009. The bottom panel shows a backwards 6- month moving average of FIRM.

**1.3 GRAPHICAL ANALYSIS**

Discussions on the stock market have often suggested that the volatility of the market has increased over time. At the aggregate level, however, this is not true; the percentage volatility of market index returns shows no systematic tendency to increase over time. To be sure, there have been episodes of increased volatility, but they have not persisted, Schwert (1989) presented a particularly clear and forceful demonstration of this fact, and we begin by updating his analysis.

In figure 1 plots the volatility of the value weighted BSE composite index for the period 2000 through 2009 for consistency with Schwert, annual standard deviations based on monthly data is constructed. The figure shows the huge spikes in volatility during the late 2000 and 2001 as well as the higher levels of volatility during the global melt down of the 2008s and the stock market crash of 2000 and 2008. In general however, there is no discernible trend in market volatility the average annual standard deviation for the period from 2000 to 2009 is 2.2 percent.

These results raise the questions of why the investor has such a strong impression of increased volatility. One possibility is that increased index levels have increased the volatility of absolute changes, measured in index points, and that the investor does not understand the need to measure percentage returns. Another possibility is that investor’s impressions are formed in part by the behavior of individual stocks rather than the market as a whole. Casual empiricism does suggest increasing volatility for individual stocks. On any specific day, the most volatile individual stocks move by extremely large percentage often 25 percent or more. The question remains whether such impressions from casual empiricism can be documented rigorously and, if so, whether these patterns of volatility for individual stocks are different from those existing in earlier periods with this motivation.

Figures 2 to 4 plot the three variance components, estimated monthly, using daily data over the period from 2000 to 2009: market volatility MKT, industry –level volatility IND, and firm-level volatility FIRM, all three series are annual The top panels show the raw monthly time series and the bottom panels plot a lagged moving average of order 12. Note that the vertical scales differ in each figure and cannot be compared with figure 1 (because variances are plotted rather than a standard deviation).

Market volatility shows the well-known patterns that have been studied in countless papers on the time variation of index return variances. Comparing the monthly series with the smoothed version in the bottom panel suggests that market volatility has a slow-moving component along with a Fair amount of high-frequency noise. Market volatility was particularly high around 2000s – 2001s, in the mid -2004s, around 2007 - 2008, and at the very end of the sample, the stock market crash in 2007-2008caused and enormous spike in market volatility which is cut off in the plot. The value of MKT in October 2008 is 0.5182. The cyclical behavior of MKT and the other volatility measures below.

Next, consider the behavior of industry volatility IND in figure 3. Compared with market volatility, industry volatility is slightly lower on average. As for MKT, there is a slow – moving component and some high –frequency Noise, IND was particularly high in the 2000s – 2001s and around 2007s mid of 2008. The effect of the crash in October 2008 is quite significant for IND, although not as much as for MKT. More generally, industry volatility seems to increase during macroeconomic downturns.

Figure 4 plots firm-level volatility FIRM. The first striking feature is that FIRM is on average much higher than MKT and IND. This implies that firm-specific volatility is the largest component of the total volatility of an average firm. The second important characteristic of FIRM is that it trends up over the sample. The plots of MKT and IND do not exhibit any visible upward slope whereas for FIRM it is clearly visible. This indicates that the Stock market has become more volatile over the sample but on a firm level instead of a market or industry level. Apart from the trend, the plot of FIRM looks similar to MKT and IND. Firm –level volatility seems to be higher in recessions and the crash also has a significant effect.

Looking at the three volatility plots together, it is clear that the different volatility measures tend to move together, particularly at lower frequencies, for example, all three volatility measures increase during the dot com bubble in the 2000s-2001s. However, there are also some periods in which the volatility measures move differently. It is evident from the plots that the stock market crash in 2007-2008 had a significant effect on all three volatility series. This raises the issue whether this one-time event might overshadow the rest of the sample and distort some of the results.

**1.4 STOCHASTIC VERSUS DETERMINISTIC TRENDS**

Figure 2 to 4 suggest the strong possibility of an upward trend in idiosyncratic firm-level volatility. A first important question is whether such a trend is stochastic or deterministic in nature. The possibility of a stochastic trend is suggested by the persistent fluctuations in volatility shown in the figures.

Table 1 reports autocorrelation coefficients for the three volatility measures using raw data. The autocorrelation structure of monthly volatility measure constructed from daily data. All these series exhibit fairly high serial correlation, which raises the possibility that they contain unit roots in the series.

**TABLE - 1: AUTO CORRELATION**

SL.	Market	Industry	Firm
1	0.309	0.484	0.412
2	0.100	0.257	0.166
3	0.138	0.243	0.206
4	0.072	0.148	0.094
5	0.035	0.135	0.075
6	0.054	0.169	0.099
7	0.187	0.154	0.164
8	0.130	0.212	0.189
9	0.178	0.153	0.210
10	0.076	0.154	0.111
11	-0.002	0.138	0.057
12	-0.040	0.141	0.037
13	-0.099	0.032	-0.076
14	-0.021	0.001	-0.061
15	-0.029	0.029	-0.017
16	0.011	-0.013	0.005
17	-0.040	-0.042	-0.048
18	-0.051	-0.027	-0.055
19	0.046	0.032	0.047
20	-0.018	-0.033	-0.028
21	-0.044	-0.102	-0.093
22	-0.071	-0.136	-0.118
23	-0.118	-0.160	-0.166
24	0.015	-0.049	-0.061
25	0.103	-0.033	0.011
26	-0.028	-0.045	-0.049
27	0.001	0.031	0.008
28	0.165	0.040	0.119
29	0.133	0.054	0.083
30	-0.017	-0.044	-0.026
31	-0.032	-0.077	-0.071
32	-0.029	-0.052	-0.048
33	-0.041	-0.082	-0.073
34	-0.009	-0.016	-0.009
35	0.033	-0.007	0.003
36	-0.027	-0.060	-0.039

To check this, in table.2 and table 3 employs augmented dickey and fuller (1979) p-tests based on regressions of time series on their lagged values and lagged difference terms that account for serial correlation. The number of lagged differences to be included can be determined by the Automatic based on SIC, MAXLAG=12 lagged difference term, and is also reported in table 5.3 the hypothesis of a unit root is rejected for all three volatility series at the 5 percent level and 1 percent level, whether a deterministic time trends is allowed or not.

**TABLE 2: AUGMENTED DICKEY-FULLER TEST (ADF) FOR LEVEL 0 (CONSTANT)**

	MKT	IND	FIRM
Constant ADF t-value	-7.84	-6.96	-6.96
Critical Value of t (1%)	-3.43	-3.43	-3.43
Critical Value of t (5%)	-2.86	-2.86	-2.86
Lag Length	0	0	0
H <sub>0</sub>	Rejected		

**TABLE 3 (a): AUGMENTED DICKEY-FULLER TEST (ADF) FOR LEVEL 0 (CONSTANT & TREND)**

	MKT	IND	FIRM
Constant & Trend ADF t-value	-8.00442	-6.38896	-6.95771
Critical Value of t (1%)	-4.03698	-4.03698	-4.03698
Critical Value of t (5%)	-3.44802	-3.44802	-3.44802
Lag Length	0	0	0
H <sub>0</sub>	Rejected		

TABLE 4: AUGMENTED DICKEY-FULLER TEST (ADF) FOR FIRST DIFFERENCE (CONSTANT)

	MKT	IND	FIRM
Constant ADF t-value	-12.5292	-12.0148	-12.5756
Critical Value of t (1%)	-3.43	-3.43	-3.43
Critical Value of t (5%)	-2.86	-2.86	-2.86
Lag Length	1	1	1
H <sub>0</sub>	Rejected		

TABLE 4 (a): AUGMENTED DICKEY-FULLER TEST (ADF) FOR FIRST DIFFERENCE (CONSTANT & TREND)

	MKT	IND	FIRM
Constant & Trend ADF t-value	-12.4742	-11.977	-12.5227
Critical Value of t (1%)	-4.03698	-4.03698	-4.03698
Critical Value of t (5%)	-3.44802	-3.44802	-3.44802
Lag Length	1	1	1
H <sub>0</sub>	Rejected		

Given these results, next step is to analyze the volatility series in levels rather than first differences. Table 5 shows some descriptive statistics

TABLE - 5: DESCRIPTIVE STATISTICS

	FIRM	INDUSTRY	MARKET
Mean	0.0793	0.0698	0.0610
Median	0.0531	0.0517	0.0374
Maximum	0.4852	0.2920	0.5182
Minimum	0.0159	0.0145	0.0070
Std. Dev.	0.0688	0.0519	0.0733
Skewness	2.5270	1.8404	3.2886
Kurtosis	12.5431	7.1648	17.0477
Jarque-Bera	583.0648	154.4706	1202.9880

All three volatility measures exhibit substantial variation over time unconditional standard deviations of the variance series. Market and firm volatility are more variable over time than industry volatility, but a large portion of the time-series variation in market volatility is due to the crash in 2008.

Next issue is of trends. In table 4 we rejected the unit root hypothesis for all three volatility series. An alternative hypothesis is the existence of a deterministic linear time trend. Since all volatility series are fairly persistent, standard trend tests are not valid.

TABLE 6: CORRELATION STRUCTURE

	FIRM	IND	MKT
FIRM	1.000	0.923	0.940
IND		1.000	0.752
MKT			1.000

Table 6 shows the correlation between the three volatility series are around 0.9 this result confirms the visual evidence trends in the plots. It is clear from figure 2 to 4 that there are many short run movements around these trends and these trends tend to correlate across the three volatility measures. All the three volatility measures are highly positively correlated.

Table 7 measures how important the three volatility components are relative to the total volatility of an average firm. First, consider the mean over the whole sample, market volatility accounts for about 16 percent of the unconditional mean of total volatility whereas IND accounts for 12 percent. However, the largest portion of total volatility is firm-level volatility, with about 72 percent. Consistent with the observation of trends in the three series, the share of firm-level volatility has increased from 71 percent in the first nine years of the sample to 77 percent in the last nine years.

A variance decomposition shows that most of the time-series variation in total volatility is due to variation in MKT and FIRM. Industry volatility is more stable over time. The two largest components are FIRM variance and the co-variation of MKT and FIRM; together they account for about 60 percent of the total time-series variation in volatility. The market component by itself is much less important, only 15 percent of the total variation in volatility. Relative to its mean, however MKT shows the greatest time-series variation.

TABLE 7: MEAN AND VARIANCE DECOMPOSITION

	MKT	IND	FIRM
Mean	0.160	0.116	0.724
	0.162	0.126	0.712
	0.134	0.097	0.769
Variance Raw series			
	0.149	0.081	0.328
		0.027	0.133
FIRM			0.282
Conditional means			
	0.099	0.067	0.334
		0.026	0.137
FIRM			0.337

Note: Entries are the shares of MKT, IND and FIRM in the total mean and variance of the volatility of a typical stock. MKT is market volatility constructed from equation (17), IND is industry –level volatility constructed from equation (18) and (19), and FIRM is firm –level volatility constructed from equations (20) –(22). The volatility of a typical stock = MKT +IND +FIRM Then for the mean of volatility.

At the top of table 7 a variance decomposition for the conditional expectations of the volatility series. This puts even more weight on the terms involving FIRM; about 80 percent of the total variation is due to variance and covariance terms of FIRM. The contribution of MKT is below 10 percent the industry – level terms for conditional expectations are more or less unchanged compared to the raw data.

TABLE 8: RESULT OF OLS REGRESSION

Dependent Variable: MARKET				
Variable	Coefficient	Std. Error	t-Statistic	R-squared
IND	1.0618	0.0857	12.3960	0.5656
FIRM	1.0006	0.0336	29.8007	0.8827

TABLE 9: RESULT OF OLS REGRESSION

Dependent Variable: INDUSTRY				
Variable	Coefficient	Std. Error	t-Statistic	R-squared
MKT	0.5327	0.0430	12.3960	0.5656
FIRM	0.6962	0.0267	26.0384	0.8518

TABLE 10: RESULT OF OLS REGRESSION

Dependent Variable: FIRM				
Variable	Coefficient	Std. Error	t-Statistic	R-squared
MKT	0.8822	0.0296	29.8007	0.8827
IND	1.2235	0.0470	26.0384	0.8518

One issue that arises in interpreting these results is whether the common variation in MKT, IND, and FIRM might be explained by cross-sectional variation in betas. In equation (15), we showed that movements in MKT might produce variation in IND if betas differ across industries and the volatility of industries CAPM residuals is independent of MKT. Under this hypothesis, the coefficient in a regression of IND on MKT would equal the cross-sectional variance of betas across industries empirically, the regression coefficient is 0.27 in full sample whereas a direct estimate of cross sectional variance of industry betas is only 0.03; this calculation suggests that cross-sectional variation in betas cannot explain more than a small fraction of the common movement in MKT and IND. A similar calculation based on equation (16) gives the same result for co-variation between FIRM and the other two volatility measures. In sample, a regression of FIRM on MKT and IND given coefficients of 0.72 and 1.40 respectively, much too large to be explained by plausible cross-sectional variation firm's beta coefficients. Table.8 to.10 explains the deterministic trend shown by the market, industry and firm level volatility using linear trend. When market volatility is treated as dependent variable firm has more predicting power than industry level volatility. When industry is treated as dependent then also firm volatility has forecasting ability rather than market volatility. When firm volatility is treated as depending variable then both market as well as industry has an explaining powersince the value of R square is high with both.

TABLE 11: GRANGER CAUSALITY (LAG 2)

	MKT	IND	FIRM
MKT		0.3408	0.6099
IND	0.337		0.0667
FIRM	0.2073	0.3877	

TABLE 12: GRANGER CAUSALITY (LAG3)

	MKT	IND	FIRM
MKT		0.5529	0.9355
IND	0.1921		0.815
FIRM	0.1921	0.5831	

Table 11 and 12 investigates whether the volatility measures help to forecast each other using Granger causality tests. The Table 11 reports p-values for bi-variate VARs and the Table 12 uses tri-variate VARs including all three series. The VAR lag length was chosen using the Akaike information criterion. In bivariate VARs MKT appears to granger cause both IND and FIRM at significance levels. IND does not help to predict MKT or FIRM, but FIRM helps significantly to forecast MKT and IND. Much of the causality survives in tri-variate systems. MKT granger causes IND and FIRM at high significance levels than in the bi-variate case. FIRM granger causes of IND are insignificant IND Fails to granger cause the MKT series as in the case of bivariate. Overall, market volatility appears to lead the other volatility measures, whereas industry volatility tends to lag. Firm-level volatility helps to predict market volatility as well as the other way round.

## 1.5 CONCLUSION

To conclude a significant positive deterministic trend has been found in market level volatility. Industry and firm level volatility, on the other hand do not show similar trend. High correlation between the series implies that they move together. The analysis of volatility components relative to total volatility of an average form reveals that market – level volatility has the largest portion of total volatility on an average. The time series variation in total volatility is due to market and industry level.

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## CUSTOMER SATISFACTION OF E-BANKING IN BANGLADESH WITH FOCUS ON DUTCH BANGLA BANK LTD.: THE CONTEXT OF TWENTY FIRST CENTURY

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### ABSTRACT

*E-banking is now a global phenomenon. It is an invaluable and powerful tool driving development, supporting growth, promoting innovation and enhancing competitiveness. Technological innovations have been identified to contribute to the distribution channels of banks and these electronic delivery channels are collectively referred to as E-banking. The developing country Bangladesh as a part and parcel of their economy is now using E-banking. The purpose of this study was to find the E-banking service dimensions of Dutch-Bangla bank that will have the impact on customer satisfaction. Questionnaires were used to collect data from 50 respondents by using random Sampling method. The major findings of this study show that customer satisfaction is influenced by seven factors namely safety reliability, transactions efficiency, customer support, service security, ease of use, performance, service content. This study is quite useful for understanding and comprehending the changes in customer E-banking behavior. E-banking applications offer wide benefits to customers and banks and it is now no longer a "nice to have" but an "impossible to survive without" for all banks in Bangladesh.*

### KEYWORDS

Customer satisfaction, Digital economy, E-banking, Transactions efficiency.

### INTRODUCTION

The rapid advancing global information infrastructure (including information technology and computer networks such as the Internet and telecommunications systems) facilitates the development of electronic commerce at a global level. The nearly universal connectivity which the Internet offers has made it a valuable business tool. These developments have created a new type of economy, which many call the 'digital economy'. This fast emerging economy is bringing with it rapidly changing technologies, escalating knowledge intensity in all areas of business, and creating virtual supply chains and new forms of businesses and service delivery channels such as e-banking. E-Banking satisfied customer demand in banking activities electronically throughout the world. At present, several private commercial banks (PCBs) and foreign commercial banks (FCBs) in Bangladesh providing the services of E-banking. Dutch-Bangla Bank is the first bank in Bangladesh to be fully automated and introduce Electronic Banking. The automation was started in 2002 & completed in 2003, but further additions and features are continuously being added and upgraded. DBBL has adopted the same exact automation solution used by many international banking giants. Although this was significantly more expensive than other solutions, it is a small price to pay for a client's peace of mind. DBBL also has the largest ATM network in Bangladesh. This gives DBBL clients full access to 'anytime anywhere' banking nationwide. All international and many local banks use the DBBL ATM network for their own clients. DBBL has installed over 2000 ATMs nationwide. As with most things, ATM access to all DBBL ATMs is unlimited and free for all DBBL clients. If a client of a member bank (not DBBL) uses a DBBL ATM, the member bank may add a transaction charge. A DBBL client now has unrivaled access to banking from any DBBL branch, ATM and POS. All of these services are free-of-charge and are surprisingly affordable for everyone. Even though DBBL has invested more in Electronic Banking more than any other bank, the division was never intended to be profitable. It was undertaken with the same mindset DBBL undertakes its Corporate Social Responsibility tasks. This is why you pay barely nothing even though these same services would cost you much more in other countries and other banks. Never has any bank given so much for free. DBBL has established drawing arrangement network with banks located in the important countries of the world namely in the United Arab Emirates, State of Kuwait, State of Qatar, State of Bahrain, Italy, Canada and United States of America. Bangladeshi Wage Earners can send their money with confidence, safety and speed to their respective beneficiaries in Bangladesh in shortest possible time. DBBL has set up a representation agreement with Western Union Financial Services Inc, USA, which is a reliable international money transfer company. Using the service of DBBL, Bangladeshi Wage Earners can send and receive money quickly from over 225,000 Western Union Agent located in 197 countries and territories worldwide only by visiting any branches of Dutch-Bangla Bank Limited in Bangladesh. DBBL offers E-banking facilities through a wide range of mobile phones. Customer using HTML browser has access to the E-banking facilities of DBBL.

### LITERATURE REVIEW

The concept of electronic banking has been defined in many ways. Daniel (1999) defines electronic banking as the delivery of banks' information and services by banks to customers via different delivery platforms that can be used with different terminal devices such as a personal computer and a mobile phone with browser or desktop software, telephone or digital television. Pikkarainen et al (2004) define internet banking as an "internet portal, through which customers can use different kinds of banking services ranging from bill payment to making investments". With the exception of cash withdrawals, internet banking gives customers access to almost any type of banking transaction at the click of a mouse (De Young, 2001). Indeed the use of the internet as a new alternative channel for the distribution of financial services has become a competitive necessity instead of just a way to achieve competitive advantage with the advent of globalization and fiercer competition (Flavián et al, 2004; Gan and Clemes, 2006). Banks use online banking as it is one of the cheapest delivery channels for banking products (Pikkarainen et al, 2004). Such service also saves the time and money of the bank with an added benefit of minimizing the likelihood of committing errors by bank tellers (Jayawardhena and Foley, 2000). Robinson (2000) believes that the supply of internet banking services enables banks to establish and extend their relationship with the customers. There are other numerous advantages to banks offered by online banking such as mass customization to suit the likes of each user, innovation of new products and services, more effective marketing and communication at lower costs (Tuchilla, 2000), development of non-core products such as insurance and stock brokerage as an expansion strategy, improved market image, better and quicker response to market evolution (Jayawardhena and Foley, 2000). Wise and Ali (2009) argued that many banks want to invest in ATMs to reduce branch cost since customers prefer to use them instead of a branch to transact business. The financial impact of ATMs is a marginal increase in fee income substantially offset by the cost of

significant increases in the number of Customer transactions. The value proposition however, is a significant increase in the intangible item "customer satisfaction". The increase translates into improved customer loyalty that in result in higher customer retention and growing organization value. E-Banking is a lower-cost delivery channel and a way to increase sales. An E-Banking service has become one of the most important factors in the business economy today.

**DEFINITION AND FEATURES OF INDEPENDENT VARIABLES**

**SAFETY RELIABILITY**

Reliability is defined as the firm performs the services right the first time and the firm honors its promises. It involves in accuracy in billing, keeping records correctly, performing the service at the designated time. In their further research, they also find the reliability consists of providing services as promised, dependability in handling customers' service problems, performing services right the first time, provide services at the promised time and maintaining error-free record. Furthermore, they stated reliability as the most important factor in conventional service [13], [14].

**TRANSACTIONS EFFICIENCY**

Transaction efficiency is the ability of the customers gets in to website, find they desire product and information associate with it, and check out with minimal of effort. Transaction efficiency also can understand as performance of E-Banking base on some elements: up to date information, response time, download time, complete product information, tutorial/demonstration, and help function [11].

**CUSTOMER SUPPORT**

Customer support including before sell support and after- sell supports . Before customer make decisions, the company should give some support to attract them, let customers feel they are at home. The relationship is like a good friend not like a business. After customers buy the services or products, company should solve the problem that customers met or response customers' questions immediately and according to the problems, company can ameliorate them. In the E-Banking industries, support is also important. Not everyone good at the computer so they need guide how to use. And maybe someone good at computer, but still have problems, and then they also need support. Sometimes, after services on the internet, customers might have questions waiting to answer, so he or she also needs support. So support is very important for customers.

**SERVICE SECURITY**

Security is defined as the freedom from danger, risk, or doubt. It involves physical safety, financial security and confidentiality. It consists of employees who instill confidence in customers, making customers feel safe in their transactions, employees who are consistently courteous and employees who have the knowledge to answer customer question [13].Moreover; security is defined as personal and possessions safety of the customers. It is includes confidentiality maintained by service providers [8].

**EASE OF USE**

Ease of use is as the factor influencing the adoption of E-Banking and related to an easy-to-remember URL address, well-organized, easy in site navigability, concise and understandable contents, terms and conditions [20].

**PERFORMANCE**

Performance refer to product's primary operating characteristic which is based on functional requirement, not taste with is circumstantial preferences [6]. Performance is the operating quality of each E-Banking service and feature.

**SERVICE CONTENT**

Service content is all information that provides to customers. For E-Banking service, is mean the content that bank provide to customers through website. High value-added content is essential.

**IMPORTANCE OF THE STUDY**

E-banking has so many importances not only the bank itself but also the society as a whole. The internet as a Channel for service delivery is fundamentally different from other channels such as branch networks, telephone banking or automated teller machines (ATMs).Therefore; it brings up unique types of challenges and requires innovative solutions. Dutch Bangla bank has already implemented or is planning to E-banking because of the numerous potential benefits associated with it.

**OBJECTIVES**

1. To Know the E- banking Facilities offered by Dutch Bangla Bank.
2. To identify corporate clients' perception of E-banking facility.
3. To identify satisfaction level of corporate clients towards the services they get from their banks.
4. To identify the issues those influence corporate clients in selecting a bank for their E-banking service
5. To know the overall functions of Dutch Bangla Bank.
6. To make some recommendations and conclusion to further the development of Customer satisfaction of Dutch Bangla Bank Ltd.

**RESEARCH HYPOTHESES**

To achieve the objectives of th study, the following hypotheses are formulated:

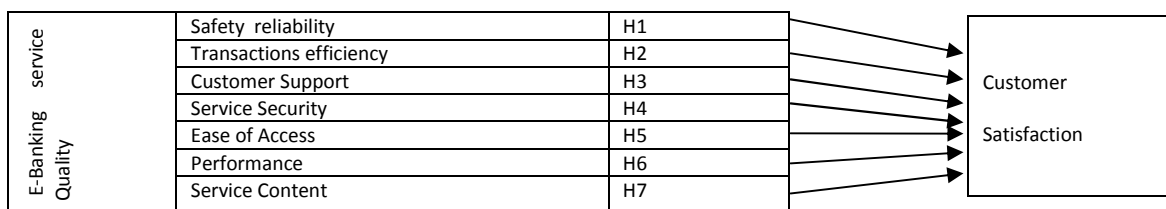
- H1: Safety reliability will have a significant impact on customer satisfaction
- H2: Transaction efficiency will have a significant impact on customer satisfaction
- H3: Customer support will have a significant impact on customer satisfaction
- H4: Service security will have a significant impact on customer satisfaction
- H5: Ease of use will have a significant impact on customer satisfaction
- H6: Performance will have a significant impact on customer satisfaction
- H7: Service content will have a significant impact on customer satisfaction

**RESEARCH METHODOLOGY**

**RESEARCH MODEL**

The aim of this study was to examine the impact of seven E- Banking service quality dimensions on customer satisfaction by the bank (see Figure 1).

FIG. 1: RESEARCH MODEL



In the present study, methodology is taken to indicate the underlying principles and methods of organizing and the systems or inquiry procedure leading to completion of the study. This chapter deals with various methodological issues relating to the study like profile of the sample unit, sample size of the respondents, sources of data and analysis of data used in the study. There are many Dutch Bangla Bank branch in Dhaka District but among them we have collected data from two branches. The two branches are at the area of Road Ring Road branch and Mirpur branch of Dhaka.

**SAMPLING SIZE**

One of the most important problems in planning a sample survey is that of determining how large a sample is needed for the estimates to be reliable enough. Due to resource and time constraints, a sample size of 50 is used in this research. At the time of selecting the sample here the most considerable things is that the customers who have direct relation with the bank at least one year. A total of 50 surveys are completed.

**SAMPLING PLAN**

This is all about how handle the sample. Here, at the time of taking sample plan we have spent some days. At the first five days we collect data from the DBBL (Ring Road & Mirpur Branch). It takes time because customers are not always in mood to talk and sometimes different types of situation have arisen so that we have to wait to make a favorable situation .But after all, sampling plan has done properly and able to get desire outcome.

**SAMPLING METHOD**

In case of choosing the sampling method here the first priority is random sampling method. Considering this method in mind here, we have tried to focus on those samples which are easy to get access.

**SOURCE OF DATA**

At the time of conducting this research, data are collected from both primary and secondary sources. The study is mainly based on primary data

**PRIMARY DATA**

The research initially conducted in-depth discussions with different customers and clients about the entire process that they underwent to obtain the necessary action when needed. It also includes personal interviews and self administrated questionnaires. The collected data have been processed, tabulated and analyzed in the logical manner.

**SECONDARY DATA**

The secondary sources include different web sites books, journals, annual report and unpublished research works. The collected data have been analyzed through the following statistical instruments:

**DATA ANALYSIS & FINDINGS**

**FREQUENCY TABLE**

**TABLE 1: GENDER OF THE RESPONDENT**

Gender	Number	Percentage (%)
male	29	58
female	21	42
Total	50	100

Source: Field survey.

Male respondents were more interested about online banking than female respondents. For that reason most of our respondents are male displayed in Table 1. But the number of females was increasing which was a good Sign.

**TABLE 2: AGE OF THE RESPONDENT**

age	Number	Percentage (%)
15-30yrs	31	62
31-45yrs	16	32
46-60yrs	3	6
Total	50	100

Source: Field survey.

From the above table it would be said that young people adopt the use of E-banking more rapidly. Therefore, age of the respondent (15-30 yrs) is 62%.

**TABLE 3: OCCUPATION OF THE RESPONDENT**

Occupation	Number	Percentage (%)
business	12	24
Govt.. service	10	20
private	10	20
others	18	36
Total	50	100

Source: Field survey.

From the above table it observed that Business man as well as others (students, housewife etc.) using E-banking service more because it is fast.

**TABLE 4: SAFETY RELIABILITY**

Perception statements in the safety reliability dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
deliver the service exactly	50	2	5	4.3	.76265
complete a task accurately	50	2	5	4.2	.80812
perform the service right at the first time	50	2	5	3.7	.95298
Valid Number of the respondent( list wise )	50				
average mean				4.07	

Source: Field survey.

Table 4: shows that average mean value of the Perception statements in the safety reliability dimension is 4.07 on the scale of 5.this means that customer are satisfied. So, hypothesis 1 is accepted.

**TABLE 5: TRANSACTIONS EFFICIENCY**

Perception statements in the Transactions Efficiency dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
information is up-to-date	50	1	5	4.1	.86307
provide complete help function	50	1	5	3.84	1.09470
transaction process is fast	50	2	5	4.2	.90351
Valid Number of the respondent( list wise )	50				
average mean				4.05	

Source: Field survey.

Table 5: shows that average mean value of the Perception statements in the Transactions Efficiency dimension is 4.05 on the scale of 5.this means that customer are satisfied. So, hypothesis 2 is accepted.

**TABLE 6: CUSTOMER SUPPORT**

Perception statements in the Customer support dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
case of problem happen, can contact staffs immediately	50	1	5	3.52	1.11098
staff can describe step to use & conditions to use clearly	50	2	5	4.06	.95640
Valid Number of the respondent( list wise )	50				
average mean				3.79	

Source: Field survey.

Table 6: shows that average mean value of the Perception statements in the Customer support dimension is 3.79 on the scale of 5.this means that customer are moderately satisfied. So, hypothesis 3 is accepted.

**TABLE 7: SERVICE SECURITY**

Perception statements in the Service Security dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
keeps accurate record of transaction	50	3	5	4.36	.56279
provide security for transaction & privacy	50	3	5	4.68	.55107
Valid Number of the respondent( list wise )	50				
average mean				4.52	

Source: Field survey.

Table 7: shows that average mean value of the Perception statements in the Service Security dimension is 4.52 on the scale of 5.this means that customer are satisfied. So, hypothesis 4 is accepted.

**TABLE 8: EASE OF USE**

Perception statements in the Ease of use dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
EBS website is easy to use	50	1	5	3.42	1.10823
provide clear instruction	50	1	5	3.76	1.00122
Valid Number of the respondent(list wise )	50				
average mean				3.59	

Source: Field survey.

Table 8: shows that average mean value of the Perception statements in the Ease of use dimension is 3.59 on the scale of 5.this means that customer are moderately satisfied. So, hypothesis 5 is accepted.

**TABLE 9: PERFORMANCE**

Perception statements in the Performance dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
provide 24 hours-7 days service	50	4	5	4.74	.44309
allow to transfer between bank	50	2	5	3.96	.80711
Valid Number of the respondent(list wise )	50				
average mean				4.35	

Source: Field survey.

Table 9: shows that average mean value of the Perception statements in the Performance dimension is 4.35 on the scale of 5.this means that customer are satisfied. So, hypothesis 6 is accepted.

**TABLE 10: SERVICE CONTENT**

Perception statements in the Service content dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
EBS website provides information that exactly fits needs	50	1	5	4.02	.95810
Valid Number of the respondent(list wise )	50				
average mean				4.02	

Source: Field survey.

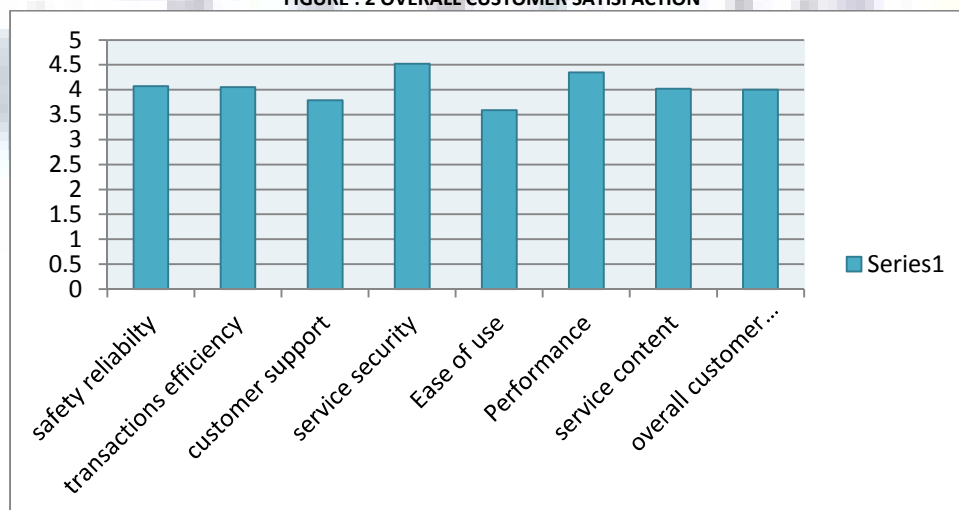
Table 10: shows that average mean value of the Perception statements in the Service content dimension is 4.02 on the scale of 5.this means that customer are satisfied. So, hypothesis 7 is accepted.

**TABLE 11: OVERALL CUSTOMER SATISFACTION**

Perception statements in the Overall customer satisfaction dimension	Number of the respondent	Minimum	Maximum	Mean	Std. Deviation
overall customer satisfaction	50	1	5	4	1.26168
Valid Number of the respondent (list wise )	50				
average mean				4	

Source: Field survey.

**FIGURE : 2 OVERALL CUSTOMER SATISFACTION**



Source: Field survey.

Table 11 & bar graph shows that average mean value of the Perception statements in the Overall customer satisfaction dimension is 4.02 on the scale of 5. this means that customer are satisfied. Because they get the Dutch Bangla bank e-banking service exactly, transactions is fast, provide 24 hours 7 days service etc

TABLE 12: CORRELATIONS

		deliver the service exactly	complete a task accurately	transaction process is fast	staff can describe step to use & conditions to use clearly	keeps accurate record of transaction	provide security for transaction & privacy	provide 24 hours-7 days service	ebs website provides information that exactly fits needs
deliver the service exactly	Pearson Correlation	1	.199	.237	.339(*)	.029	-.010	-.127	-.008
	Sig. (2-tailed)	.	.167	.098	.016	.844	.947	.380	.954
	N	50	50	50	50	50	50	50	50
complete a task accurately	Pearson Correlation	.199	1	.140	.222	-.027	-.037	-.194	-.005
	Sig. (2-tailed)	.167	.	.333	.122	.853	.800	.178	.971
	N	50	50	50	50	50	50	50	50
transaction process is fast	Pearson Correlation	.237	.140	1	.293(*)	.217	.008	.387(**)	.042
	Sig. (2-tailed)	.098	.333	.	.039	.131	.955	.005	.770
	N	50	50	50	50	50	50	50	50
staff can describe step to use & conditions to use clearly	Pearson Correlation	.339(*)	.222	.293(*)	1	.149	.192	.086	-.068
	Sig. (2-tailed)	.016	.122	.039	.	.303	.181	.554	.638
	N	50	50	50	50	50	50	50	50
keeps accurate record of transaction	Pearson Correlation	.029	-.027	.217	.149	1	.050	-.026	.062
	Sig. (2-tailed)	.844	.853	.131	.303	.	.730	.857	.668
	N	50	50	50	50	50	50	50	50
provide security for transaction & privacy	Pearson Correlation	-.010	-.037	.008	.192	.050	1	.070	.051
	Sig. (2-tailed)	.947	.800	.955	.181	.730	.	.628	.725
	N	50	50	50	50	50	50	50	50
provide 24 hours-7 days service	Pearson Correlation	-.127	-.194	.387(**)	.086	-.026	.070	1	.012
	Sig. (2-tailed)	.380	.178	.005	.554	.857	.628	.	.931
	N	50	50	50	50	50	50	50	50
ebs (E-banking service) website provides information that exactly fits needs	Pearson Correlation	-.008	-.005	.042	-.068	.062	.051	.012	1
	Sig. (2-tailed)	.954	.971	.770	.638	.668	.725	.931	.
	N	50	50	50	50	50	50	50	50

Source: spss correlations result of the field work

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

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

1. Transaction process fast has positive correlation with provide 24 hours-7days service. since Transaction process is fast, it is easy to provide 24 hours-7days service that is why customer are highly satisfied with E-banking.
2. Staff can describe step to use & conditions to use clearly has positive correlation with Transaction process fast. Since staff describe step to use & conditions clearly, therefore transactions is fast and customer are satisfied.
3. Deliver the service exactly has positive correlation with Staff can describe step to use & conditions to use clearly. As Staff can describe step to use & conditions to use clearly, delivering the service exactly is possible and it's satisfy the customer.
4. Complete a task accurately has negative correlation with provide 24 hours-7days service. Complete a task accurately does not affect provide 24 hours-7days service

REGRESSION ANALYSIS

TABLE 13: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.619(a)	.384	.112	1.18924

Source: spss Regression result of the field work

a Predictors: (Constant), deliver the service exactly, ebs website provides information that exactly fits needs, provide security for transaction & privacy, case of problem happen, can contact staffs immediately, keeps accurate record of transaction, provide 24 hours-7 days service, complete a task accurately, provide clear instruction, information is up-to-date, allow to transfer between bank, perform the service right at the first time, ebs website is easy to use, staff can describe step to use & conditions to use clearly, provide complete help function, transaction process is fast.

TABLE 14: ANOVA (B)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.914	15	1.994	1.410	.198(a)
	Residual	48.086	34	1.414		
	Total	78.000	49			

Source: spss Regression result of the field work

a Predictors: (Constant), deliver the service exactly, ebs website provides information that exactly fits needs, provide security for transaction & privacy, case of problem happen, can contact staffs immediately, keeps accurate record of transaction, provide 24 hours-7 days service, complete a task accurately, provide clear instruction, information is up-to-date, allow to transfer between bank, perform the service right at the first time, ebs website is easy to use, staff can describe step to use & conditions to use clearly, provide complete help function, transaction process is fast

b Dependent Variable: overall customer satisfaction

TABLE 15: COEFFICIENTS (A)

Model		Un standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.096	3.557		.870	.390
	deliver the service exactly	-.166	.266	-.100	-.623	.538
	complete a task accurately	.283	.242	.181	1.169	.251
	perform the service right at the first time	.645	.226	.487	2.851	.007
	information is up-to-date	-.369	.227	-.252	-1.620	.114
	provide complete help function	-.043	.216	-.037	-.198	.844
	transaction process is fast	.049	.266	.035	.183	.856
	case of problem happen, can contact staffs immediately	.038	.210	.034	.182	.857
	staff can describe step to use & conditions to use clearly	.008	.232	.006	.036	.972
	keeps accurate record of transaction	.191	.354	.085	.540	.593
	provide security for transaction & privacy	-.367	.363	-.160	-1.013	.318
	ebs website is easy to use	.458	.202	.402	2.263	.030
	provide clear instruction	-.004	.198	-.003	-.019	.985
	provide 24 hours-7 days service	-.234	.485	-.082	-.483	.632
	allow to transfer between bank	-.032	.275	-.021	-.118	.907
ebs website provides information that exactly fits needs	-.020	.220	-.015	-.093	.927	

Source: spss Regression result of the field work

A. Dependent Variable: overall customer satisfaction

From the above table we may say that, perform the service right at the first time & EBS website is easy to use has no significant relation with customer satisfaction. Provide clear instruction has the greatest value that means Dutch Bangla bank customer are very satisfied with this service. Moreover, other factors like transaction process ,24 hours-7 days service, complete help function etc, moderately satisfy the customer.

RECOMMENDATIONS

Some recommendations are given below:

- ATM's fall short of money should be reduced.
- Bankers should provide PIN number whenever client loses his Credit or Debit card quickly.
- Charges are for the card should be low.
- Dutch Bangla bank should perform their services at right time.
- Dutch Bangla bank E-banking network should be made strong.
- E-banking services should try to mobilize more deposit schemes through better marketing and incentive measures.
- E-banking system should be more flexible.
- ATM booths should be increased.
- E-banking service should be according to the customer expectation and satisfaction.
- E-banking services have to resolve the entire problem very quickly that customer face in the online transaction.
- The Dutch Bangla bank should arrange the demonstration programs for the clients to enjoy the services properly.

LIMITATIONS AND CONSTRAINTS

A wholehearted effort was applied to conduct the study work and to bring a reliable and fruitful result from which proper strategy can be adopted to strengthen the customer satisfaction of Dutch Bangla Bank. In spite of best efforts there were limitations that acted as barriers to conduct the study. Large-scale research was not possible due to constraints and restriction posed by the organization. The research only covers the corporate clients of Ring Road branch and Mirpur branch of Dhaka City. To protect the organizational confidentiality some parts of the report are not in depth. It was very difficult to give enough time to concentrate on the report, as the bank authority doesn't allow leaving the office before 5:30pm

CONCLUSIONS

E- Banking is a whole new sphere in Banking Sector of Bangladesh. This is the banking system of new century. So, if we want to sustain and earn global reputation, we must expand our E-Banking operations to the fullest extent. The research clearly indicates that those who use E- banking service of Dutch Bangla bank are satisfied. If the bank plans to expand the customer base of E- banking they should focus more on safety reliability, transactions efficiency, customer support, service security, ease of use ,performance , service content factors of E-banking. Attention should also be given in the encryption of the information

which is exchanged between the users and the bank. The study also shows that E- banking services throughout the country was gaining popularity. So the study is very beneficial for both Dutch Bangla bank and Bangladesh to get insights about E-banking relations with customer satisfaction. In Bangladesh most of the people were illiterate and obviously they were technology ignorant. But among the literate portion many of them had computer phobia. However, E- banking customers are increasing because it is comfortable with the digital lifestyle in Bangladesh. Technology has enabled the world to step into a new arena. To keep pace with advancing world it has become imperative to adapt new technologies in business and banking sector. At present, Bangladesh is trailing behind in acquiring the required quality of E-banking services to effectively compete in the global market. Therefore, the banking system needs up gradation for which urgent measures are needed to create a level playing field for rapid expansion of e-banking in the country. Despite the constraints, more efficient use of existing capabilities in developing the services can pave the way to quality provision of e-banking in Bangladesh.

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APPENDIX

QUESTIONNAIRE

Please put the tick ( ✓ ) Marks

1. Gender
    - a) Male
    - b) Female
  2. Age
    - a) 15-30 yrs
    - b) 31-45 yrs
    - c) 46-60 yrs
    - d) more than 60.
  3. Occupation
    - a) Business
    - b) Govt. service
    - c) Private
    - d) Others
- Strongly Agree    Agree    Neutral    Disagree    Strongly disagree

Perception statements in the safety reliability dimension:

4. Deliver the service exactly	5	4	3	2	1
5. Complete a task accurately	5	4	3	2	1
6. Perform the service right at The first time	5	4	3	2	1

Perception statements in the Transactions Efficiency dimension:

7. Information is Up-to-date	5	4	3	2	1
8. Provide complete help function	5	4	3	2	1
9. Transaction Process is Fast	5	4	3	2	1

Perception statements in the Customer support dimension:

10. Case of problem happen, can contact staffs immediately	5	4	3	2	1
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11. Staff can describe step to use & Conditions to use clearly	5	4	3	2	1
<u>Perception statements in the Service Security dimension:</u>					
12. Keeps accurate record of Transaction.	5	4	3	2	1
13. Provide security for transaction & privacy	5	4	3	2	1
<u>Perception statements in the Ease of Use dimension:</u>					
14. EBS website is easy to use	5	4	3	2	1
15. Provide clear instruction	5	4	3	2	1
<u>Perception statements in the Performance dimension:</u>					
16. Provide 24 hours- 7 days service.	5	4	3	2	1
17. Allow to transfer between bank	5	4	3	2	1
<u>Perception statements in the Service content dimension:</u>					
18. EBS website provides information That exactly fits needs.	5	4	3	2	1

EBS = E-Banking service.



**ENHANCING THE PERFORMANCE OF LEACH PROTOCOL IN WIRELESS SENSOR NETWORKS**

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**ABSTRACT**

*Low Energy Adaptive Clustering Hierarchy protocol is one of the clustering routing protocols in wireless sensor networks which uses distributed cluster formation & randomized rotation of the cluster head to minimize the network energy consumption and increase network life. In this paper we propose an algorithm which is modified version of existing protocol and is based on selection of cluster heads and vice-cluster heads on the basis of energy, residual energy & distance parameters. Simulation results show that the New Improved routing protocol reduces energy consumption and increases the total lifetime of the network compared to the existing protocol.*

**KEYWORDS**

Wireless sensor networks; LEACH protocol, Energy efficiency, Routing protocol.

**1. INTRODUCTION**

Wireless Sensor Networks (WSN) has many applications in military, medical, meteorological, agricultural, industrial and aerospace areas. A Wireless Sensor Networks (WSN) is a set of hundreds or thousands of micro sensor nodes that have capabilities of sensing, establishing wireless communication between each other and doing computational and processing operations. These nodes are typically tiny, disposable, low-power, and usually derive their energy from attached batteries.[1] A sensor node is made up of four basic components: a sensing unit, a processing unit, a transceiver unit and a power unit. These sensor nodes can self organize to form a network and can communicate with each other in a wireless manner. Each self-organized node collects data from the environment, exchanges these data with other nodes and sends the final information to the sink node or the base station. Energy plays an important role in wireless sensor networks because of the sensor nodes being battery operated. In order to save energy dissipation caused by communication in wireless sensor networks, it is necessary to schedule the state of the nodes, changing the transmission range between the sensing nodes, use of efficient routing and data routing methods and avoiding the handling of unwanted data. In general, routing in WSNs [4] can be divided into flat, hierarchical, and location based routing depending on the network structure. Hierarchical Routing is the well-known technique with special advantages related to scalability and efficient communication. LEACH, PEGASIS, TEEN [6] and APTEEN use this technique for routing. In hierarchical architecture, higher energy nodes can be used to process and send the information, while low-energy nodes can be used to perform the sensing in the proximity of the target.

LEACH (Low- Energy Adaptive Clustering Hierarchy) is a clustering based protocol that minimizes energy dissipation in sensor networks. However, LEACH outperforms classical clustering algorithms by using adaptive clusters and rotating cluster-heads, allowing the energy requirements of the system to be distributed among all the sensors. Instead, when the cluster-head dies, the cluster will become useless because the data gathered by cluster nodes will never reach the base station. So, there is a requirement to improve LEACH protocol to enhance the performance. In this paper we propose an Improved Leach Protocol that further enhances the Power consumption, simulation results bring out that our protocol outperforms Leach protocol in terms of energy consumption and increases the total lifetime of the WSN.

**2. LEACH PROTOCOL**

Low-Energy Adaptive Clustering Hierarchy (LEACH) protocol for sensor networks was proposed by W. R. Heinzelman et.al [3] which minimizes energy dissipation in sensor networks. LEACH is a very famous hierarchical routing algorithm for sensor networks which make clusters by using a distributive algorithm, where nodes make autonomous decisions without any centralized control. It is a self-organized, adaptive clustering protocol, in which the sensor nodes are grouped into clusters to achieve network scalability. Every cluster is often lead by a node called Cluster Head (CH) which can be elected by the sensor nodes based on some criterion or may be pre-assigned by the network designer. The Cluster Head (CH) is responsible for creating and manipulating a TDMA (Time division multiple access) schedule and sending aggregated data from nodes to the BS (Base Station) where these data is needed using CDMA (Code division multiple access).

The LEACH operates based upon rounds. Each round includes two stages: 1. Cluster-constructing (Set-up phase) 2. Working steadily (Steady-state phase)

**2.1 SET-UP PHASE:** During this phase, each node decides whether or not to become a cluster head (CH) for the current round. This decision is based on choosing a random number between 0 and 1, if number is less than a threshold  $T(n)$ , the node become a cluster head for the current round. The setup phase [4] is further divided into

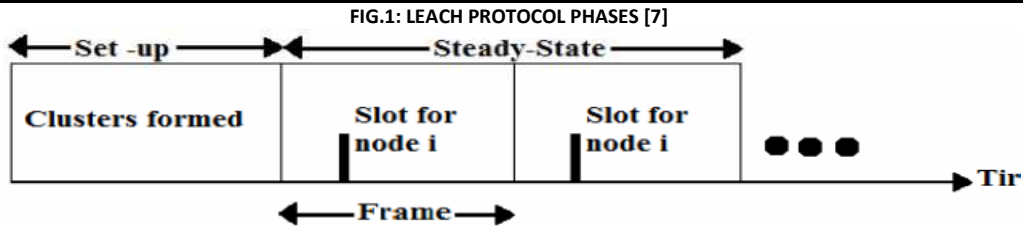
- Advertisement Phase
- Cluster set-up phase

In the advertisement phase, the randomly generated CHs advertise their election as clusters to its neighborhood sensor nodes. This is followed by the Cluster set-up phase where the sensor nodes which received the advertisement can join the CH with higher signal strength. Then the steady-state phase begins.

**2.2 STEADY-STATE PHASE:** The Data transmission from the source sensor node to the destination sink happens in the Steady state phase where the CH is maintained. Like set-up phase, the Steady-state phase [4] can be further classified into

- Schedule Creation
- Data transmission

The Schedule is created by breaking the Steady-state operation into frames, and the timeslots are allocated for each of the sensor nodes. The nodes send their data to their CH during their allocated TDMA slot [4]. When all the data are received, the CH aggregates them and sends the aggregated data to the Sink Node. Fig 1.describes the operation of LEACH during different phases.



The main problem with LEACH protocol lies in the random selection of cluster heads. There exists a probability that the cluster heads formed are unbalanced and may remain in one part of the network making some part of the network unreachable.

**3. RELATED WORK**

**3.1 F- LEACH PROTOCOL**

FLEACH ( ), is a protocol for securing node to node communication in LEACH-based network. It uses random key pre-distribution scheme with symmetric key cryptography to enhance security in LEACH. FLEACH provides authenticity, integrity, confidentiality and freshness to node-to-node communication. But it is vulnerable to node capturing attack.

**3.2 S-LEACH PROTOCOL**

This is the first modified secure version of LEACH called SLEACH [9], which investigated the problem of adding security to cluster-based communication protocol for homogeneous wireless sensor networks consisting of sensor nodes with severely limited resources. SLEACH provides security in LEACH by using the building block of SPINS (Security Protocol for Sensor Network), symmetric-key methods and MAC (Message Authentication Code). SLEACH prevents intruder to send bogus sensor data to the CH and CH to forward bogus message. But SLEACH cannot prevent to crowd the time slot schedule of a cluster, causing DoS attack or simply lowering the throughput of the CH and does not guarantee data confidentiality. The solution is meant to protect only outsider attack.

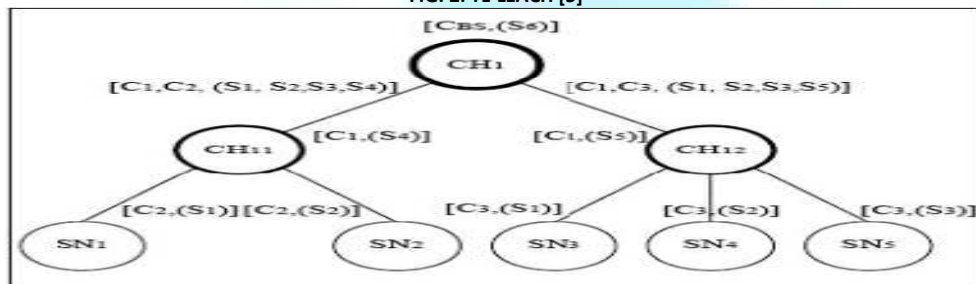
**3.3 E-LEACH PROTOCOL**

Energy-LEACH protocol improves the CH selection procedure. It makes residual energy of node as the main metric which decides whether the nodes turn into CH or not after the first round [1]. Same as LEACH protocol, E-LEACH is divided into rounds, in the first round, every node has the same probability to turn into CH, that mean nodes are randomly selected as CHs, in the next rounds, the residual energy of each node is different after one round communication and taken into account for the selection of the CHs. That mean nodes have more energy will become a CHs rather than nodes with less energy

**3.4 TL-LEACH PROTOCOL**

TL-LEACH [5] is the extension of the LEACH, where TL stands for Two-Level. In this protocol; CH collects data from other cluster members as original LEACH, but rather than transfer data to the BS directly, it uses one of the CHs that lies between the CH and the BS as a relay station. It utilizes two level of clustering where primary CH communicate with secondary CH in order to send the data, for better throughput. TL-LEACH form clusters based on minimum distance of nodes to their corresponding CH.

FIG. 2: TL-LEACH [5]



**3.5 M-LEACH PROTOCOL**

In LEACH, Each CH directly communicates with BS no matter the distance between CH and BS. It will consume lot of its energy if the distance is far. On the other hand, Multihop-LEACH protocol selects optimal path between the CH and the BS through other CHs and use these CHs as a relay station to transmit data over through them [8]. First, multi-hop communication is adopted among CHs. Then, according to the selected optimal path, these CHs transmit data to the corresponding CH which is nearest to BS. Finally, this CH sends data to BS. M-LEACH protocol is almost the same as LEACH protocol, only makes communication mode from single hop to multi-hop between CHs and BS.

**3.6 LEACH-CENTRALIZED (LEACH-C)**

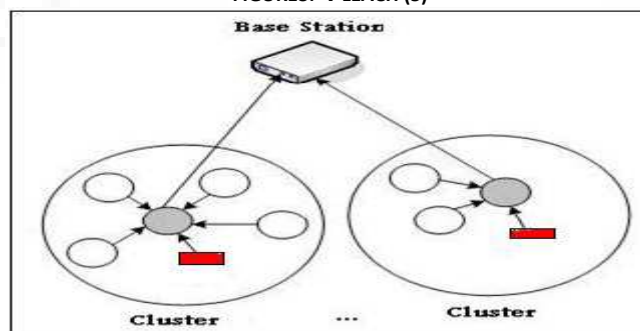
LEACH-C protocol offers a configuration algorithm [6] to perform efficient clustering. The efficient heads are selected based on the minimum exchanged data between cluster heads and their cluster nodes. In LEACH-C, during the setup phase, in each iteration the base station receives information about node state, node location and each node's remaining energy. LEACH-C uses this information to calculate the mean value of network nodes energy, and then selects efficient cluster heads between nodes with higher energy level than mean energy value.

The LEACH-C protocol can be used to detect nodes that have an energy value higher than the average and then the evolutionary algorithm is applied to select the optimum cluster heads, therefore achieving proper clustering.

**3.7 V-LEACH**

In the V LEACH [5] protocol, the cluster contains; CH (responsible only for sending data that is received from the cluster members to the BS), vice-CH (the node that will become a CH of the cluster in case of CH dies), cluster nodes (gathering data from environment and send it to the CH).

FIGURE3: V LEACH (5)



In the original LEACH, the CH is always on receiving data from cluster members, aggregate these data and then send it to the BS that might be located far away from it. The CH will die earlier than the other nodes in the cluster because of its operation of receiving, sending and overhearing. When the CH die, the cluster will become useless because the data gathered by cluster nodes will never reach the base station.

In V-LEACH protocol, besides having a CH in the cluster, there is a vice-CH that takes the role of the CH when the CH dies and there is no need to elect a new CH every time increasing the network lifetime.

**4. PROPOSED PROTOCOL**

V Leach uses the concept of alternate Cluster Head called Vice Cluster Head. As a Cluster Head dies it is replaced by the Vice Cluster Head. But in case of Vice Cluster Head Dies, it does not provide solution for that and the network start reducing the energy very fast and finally the network dies completely. The proposed protocol is the improvement over the V-Leach; In this, initially when the cluster heads are selected based on the energy and the distance parameters; the Vice Cluster Head are also selected. Now when the cluster head dies, it is replaced by Vice Cluster Head and new Vice Cluster Head will be selected at the same time. It means the cluster head will stay over the life of network. The decision of the Cluster head and Vice Cluster head selection is on the basis of Energy, Distance and Residual Energy.

The proposed protocol will improve the network life and total communication over the network.

**5. SIMULATION RESULTS**

Matlab software MATLAB (matrix laboratory), a numerical computing environment and fourth-generation programming language has been used to simulate the result. The result refers to the measurement of life time. Life time of network is related to no. of alive nodes, no. of dead nodes, and rate of packet transmission and how long time cluster of nodes is formed in network. System which is proposed here gives good output in all four parameters.

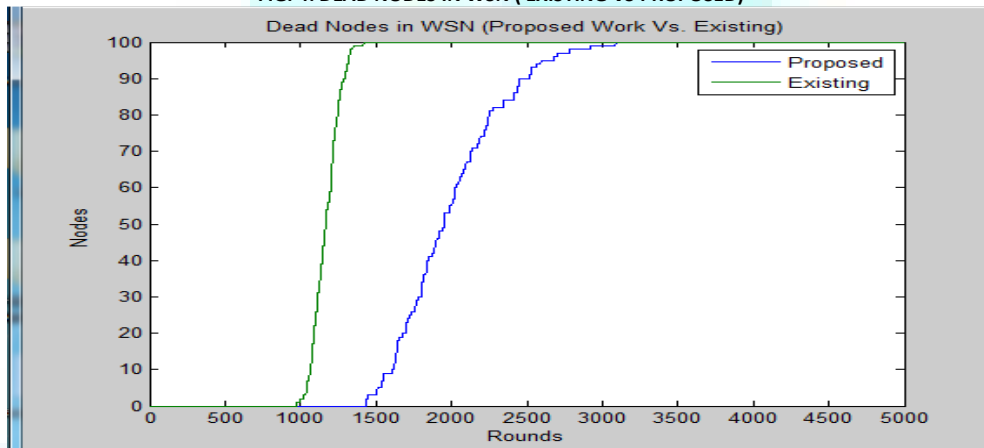
To validate the performance of modified V LEACH protocol, we simulate the protocol and utilize a network with 100 nodes randomly deployed between (x=0, y=0) and (x=100, y=100). The initial power of all nodes is considered to be 2J and maximum number of rounds is 5000. These parameters are summarized in Table1.

**TABLE 1 : SIMULATION PARAMETERS**

Parameter	Value
N (Number of nodes)	100
P (Probability Vector)	0.1
Eo (Initial Energy)	0.5
ETX (Energy loss on Transmission)	50*0.000000001
ERX (Energy loss on receive)	50*0.000000001
Efs (Energy loss on forward)	10*0.000000000001
Emp (Energy loss on cluster switch)	0.0013*0.000000000001
EDA (Energy loss on delay)	5*0.000000001
Rmax (Number of round)	5000
Do (Distance vector)	sqrt(Efs/Emp)

The above mentioned values were set for simulation and the results indicate that there are less dead nodes and more alive nodes in proposed system. Also rate of packet transmission is enhanced and due to more alive nodes and cluster formation process is ensured for a long time which tends to increase life time of wireless sensor network.

**FIG. 4: DEAD NODES IN WSN ( EXISTING VS PROPOSED)**



**FIG.5: ALIVE NODES IN WSN ( EXISTING VS PROPOSED)**

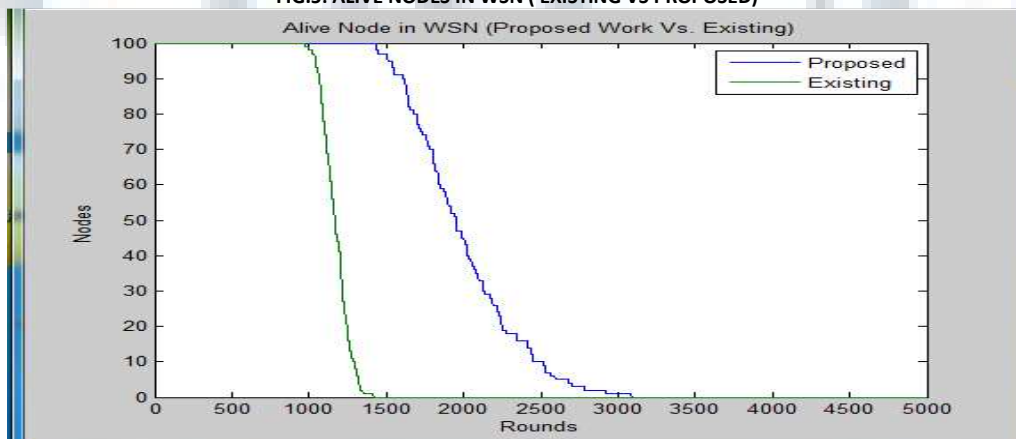


FIG.6: PACKETS TRANSMITTED TO BASE STATION( EXISTING VS PROPOSED)

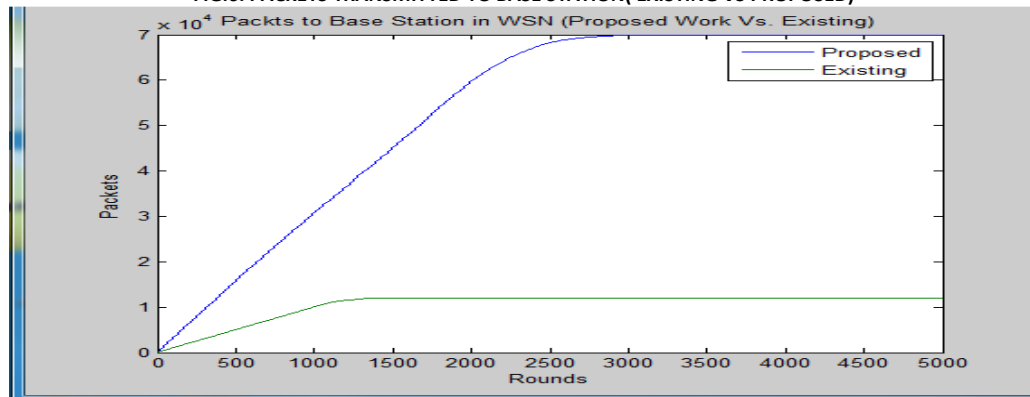
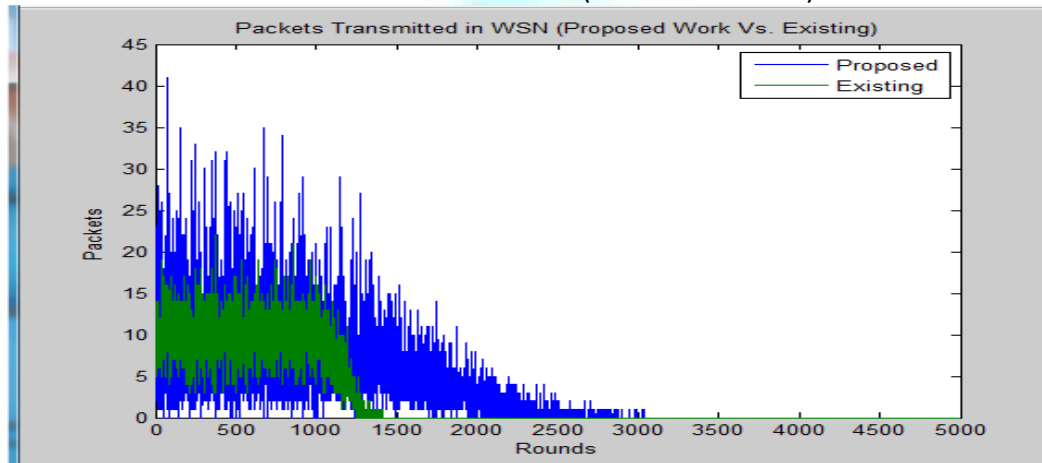


FIG. 7: PACKET TRANSMITTED IN WSN( EXISTING VS PROPOSED)



## 6. CONCLUSION

The core operation of a WSN is to gather and convey the collected data to a distant BS for further processing and analysis. Gathering information from a WSN in an energy effective manner is of supreme importance in order to prolong its life span. This calls for use of an appropriate routing protocol to ensure efficient data transmission through the network. In this thesis, we have proposed an architecture modified V-LEACH which extends the V-LEACH clustering routing algorithm. The result of simulations conducted indicates that the proposed clustering approach is more energy efficient and hence effective in prolonging the network life time compared to LEACH. In existing system data transmission depends on current energy of nodes and distance between nodes. Modified-LEACH algorithm works on two additional parameter residual energy of node and time stamp of packet transmission from. Modified-LEACH affords to conserve energy through multilevel clustering. If each node were to transmit its sensed data directly to the BS, it will deplete its energy reserves rapidly. So Next Node directly communicates with base station and approach to minimizing energy consumption which reduces transmission costs.

## 7. SCOPE FOR FUTURE WORK

A good exploitation of the system parameters i.e. transmission range and node density to find the best possible optimal setting could also be researched further. Another interesting observable fact that can be studied further is the relationship between the number of hops and the spatial uniformity of energy distribution in a WSN. Knowing this relationship can help to choose the right parameters in a WSN for different kinds of topology. Further work can be done in direction of control the number of nodes in every cluster. The idea is to create a relative load balanced clusters such that no cluster-head is heavily burdened. This load balancing technique could ensure a balanced number of nodes in each clusters formed. This can further extend the network life-time by ensuring a uniform energy pattern.

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**MULTI CRITERIA DECISION MAKING USING FUZZY TOPSIS****PRATHIBA PH****STUDENT****DEPARTMENT OF COMPUTER SCIENCE ENGINEERING****BHARATH UNIVERSITY****CHENNAI****KARTHIKEYAN R****ASST. PROFESSOR****DEPARTMENT OF COMPUTER SCIENCE ENGINEERING****BHARATH UNIVERSITY****CHENNAI****ABSTRACT**

The objective is to create a prototype of Multi Criteria Decision Making using Fuzzy TOPSIS - that will assist in selecting the most attractive alternative in making a decision under uncertainty, using criteria supplied and rated according to the priorities for said criteria. The program utilized fuzzy sets and multi-attribute decision matrices in order to select the most desirable option.

**KEYWORDS**

Decision Support, Fuzzy logic, TOPSIS, Multi criteria modeling.

**1. INTRODUCTION**

Multi Criteria Decision Making is an effort to create a single-user program - a decision support system using fuzzy logic that will assist in selecting the most attractive alternative in making a decision under uncertainty, using criteria supplied and rated according to his priorities for said criteria. The program utilized fuzzy sets and multi-attribute decision matrices in order to select the most desirable option. The Multi criteria decision making system using fuzzy logic consists of the following features:

Improve the ability to deal with uncertainty through the combination of mathematical process and expert's knowledge using Fuzzy sets.

Extending the usage of decision variables in more than one fuzzy set.

Application of this fuzzy multi-criteria decision model can be apply in complex decision-making cases.

The Multi criteria decision making system using fuzzy logic is developed using Microsoft web technology and its aim is achieve following goals

- Solves multi-criteria decision making problems using a suitable decision making method.
- Appropriately represents and handles uncertainty.
- Combines the two previous goals, to form a prototype that is easy to use.

The Internet is a powerful resource that has revolutionized the way people and businesses operate. Therefore it is important that any system developed take advantage of this medium, in providing a tool that is easily transferable and portable through the powers of the Internet. The components of the system are briefly explained below to get an idea about the model. The main modules in the system are

- Decision making in uncertain environment.
  - 1) Problem description.
  - 2) Compare criteria.
  - 3) Criteria comparison.
  - 4) Alternative entry.
  - 5) Compare alternative based on each criteria.
- Decision making by Enter weights directly.
  - 1) Problem description.
  - 2) Criteria and its weight.

**2. IMPORTANCE OF STUDY**

The aim of the project is, to analyze all the multi-criteria decision making methods, selecting the suitable one which is more efficient and accurate and to develop system software for Decision making in uncertain condition. There are decision making methods which are used to make decision under conditions where the data and values are crisp, these methods when used in uncertain condition where the linguistic variable are used these methods doesn't give a accurate solution. To get an accurate solution in uncertain condition the decision support system should be able to make accurate decision in both certain and uncertain conditions.

**3. STATEMENT OF THE PROBLEM**

There is no system present to handle uncertain environment for classic multiple criteria. Existing system is able to handle only a pair of input with a set of true/false [1/0]. With existing system user is able to measure only whether the alternative comes under true set or false set. Fuzzy logic is not implemented in existing system.

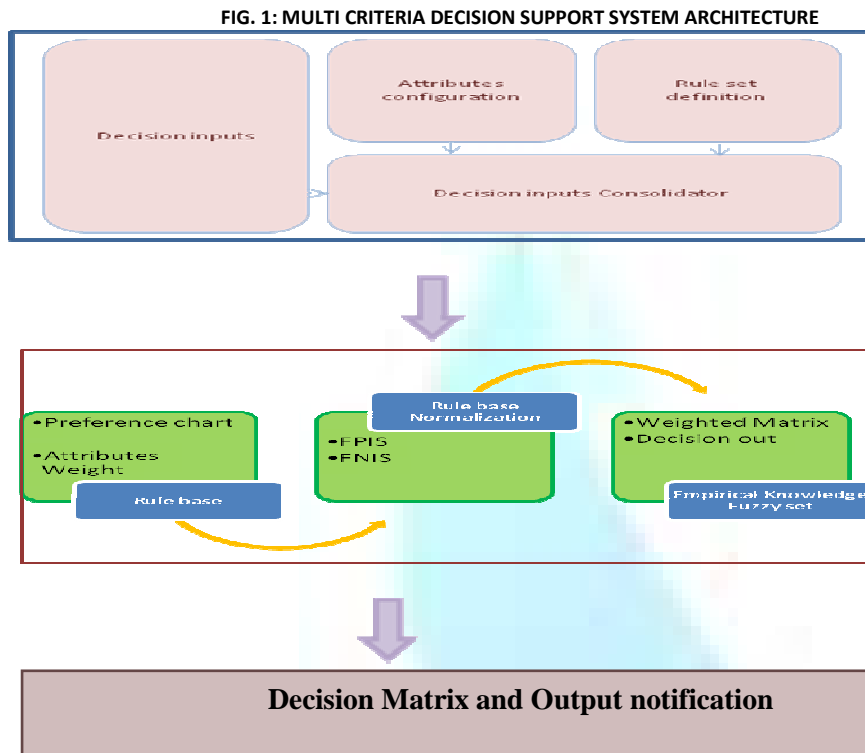
**4. OBJECTIVES**

In order to achieve the objectives mentioned above the scope of the project has to be clearly defined. The Decision support system should be able make decision in uncertain conditions using the MCDM methods. The first step to achieve the objectives is to analyze and choose the appropriate methods to design the system. With the selected method the system input is designed in a way that it accept linguistic variable and process is to give accurate outputs. The resulting software will solve the problem of making decision in uncertain condition, and the same software can be used in certain and uncertain condition to make decision.

**5. PROPOSED SYSTEM**

Solves multi criteria decision making problems using a suitable fuzzy decision making method using fuzzy decision matrix and fuzzy ranking. Fuzzy set is going to implement for proposed system with fuzzy set range from 0 to 1 with decimal values too. Using fuzzy set system can sort the alternative based on the result that produced by the set.

**6. SYSTEM ARCHITECTURE**

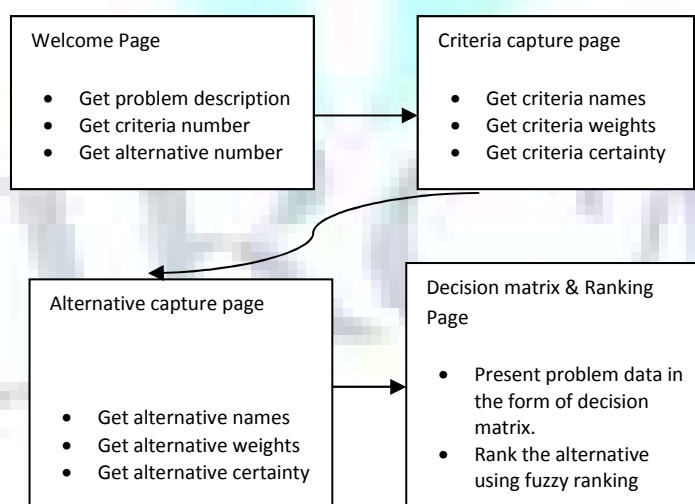


Above architecture provide an elaborated idea about the system. It contains mainly three modules they are  
 Data collection : Problem description along with number of criteria and alternative are getting on this stage. Once number of alternative and criterias are defined then details such as name, weightage, certainty are getting for the same.  
 Data process based on rules : Weightage is calculating based on the certainty supplied by the user and the make it ready for the decision matrix.  
 Formation of decision matrix and fuzzy ranking : Based on the certainty and weightage decision matrix is create, one this part is complete alternatives are ranking using the fuzzy ranking method and the end result is providing to the user.

**7. WEB PAGE INTERFACE**

The structure of the Web pages for the fuzzy decision support prototype tool is demonstrated in Figure (2), this storyboard details the purpose of each page and shows the users progression through the system.

**FIG. 2: STORYBOARD FOR WEB-PAGES**



**8. IMPLEMENTATION**

**8.1 MULTI CRITERIA DECISION MAKING METHODS**

This chapter introduces the decision making process and provides an overview of the varying methods for handling multi-criteria decision making (MCDM) problems. Section 8.2 defines the decision making process and its components. Section 8.3 provides an overview of the two most popular MCDM methods used in here. Section 8.4 is a more detailed explanation of the MCDM method chosen in the implementation of the DSS tool proposed in the System Request

**8.2 DECISION MAKING PROCESS**

MCDM is the process of making a selection from a group of predetermined alternatives, based upon a set of criteria, the weights of each criterion and the measure of performance of each alternative with respects to each criterion. For the purpose of explanation the following decision making problem is posed:

“Which area of Manchester should company X rent much needed additional office space?” This problem is defined by the set of alternatives choices and a set of known criteria, upon which an alternative is selected. In the given scenario the alternatives could be “Fallowfield”, Deansgate” and “Hulme”; for the sake of argument the set of criteria could include cost of rent, the size of the office space and the available amenities. Each of these criteria has a value of importance (weight) to the decision maker. In making a choice a subjective performance score is given to each alternative with respects to each criterion, taking into consideration the relative importance (weight) of the criterion. Then a number of decision-making methods could be implemented to process the decision (more on this later). This scenario is an example of a MCDM problem. The decision making process can be defined as being made up of three phases: intelligence, design and choice. The intelligence phase gathers information and defines the problem that is to be solved. The design phase constructs a model of this problem that contains evaluative criteria and alternative options. The choice phase selects an alternative that is deemed to be the best. The phases that concern this project are design and choice: assisting a user to create a model of the problem and selecting the most appropriate based on that model. A MCDM problem can be concisely expressed in a matrix format shown below:

TABLE 1: THE DECISION MATRIX

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	...	C <sub>n</sub>
	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	...	W <sub>n</sub>
A <sub>1</sub>	a <sub>11</sub>	a <sub>12</sub>	a <sub>13</sub>	...	a <sub>1n</sub>
A <sub>2</sub>	a <sub>21</sub>	a <sub>22</sub>	a <sub>23</sub>	...	a <sub>2n</sub>
A <sub>3</sub>	a <sub>31</sub>	a <sub>32</sub>	a <sub>33</sub>	...	a <sub>3n</sub>

(Source: Fabio J.J Santos and Heloisa A. Camargo “Fuzzy systems for multi criteria decision making” CLEI Electronic Journal Vol.13, No.3, pp 4, Dec 2010.) Where A<sub>i</sub> is the i<sup>th</sup> alternative, C<sub>j</sub> is the j<sup>th</sup> criterion, W<sub>j</sub> is the weight of the j<sup>th</sup> criterion, a<sub>ij</sub> is the performance measure (score) of the i<sup>th</sup> alternative in terms of the j<sup>th</sup> criterion, and there are m alternatives and n criteria. This decision-matrix is used by many decision-making methods to define the MCDM problem

**8.3 MULTI CRITERIA DECISION MAKING MODELS**

Following are brief descriptions of five popular decision-making models. Each method uses the decision-matrix shown in Table 1 to model MCDM problems. The following descriptions are based on those provided by Triantaphyllou and Lin

**8.3.1 WEIGHTED SUM MODEL (WSM)**

The WSM is probably the simplest and most widely used MCDM method. Suppose that there are M alternatives and N criteria in a decision-making problem. Then the priority score of the best alternative P\*WSM, is found with the following expression:

$$P^*_{WSM} = \max_{M \geq i \geq 1} \sum_{i=1}^N a_{ij} W_j \tag{1}$$

**8.3.2 WEIGHTED PRODUCT MODEL(WPM)**

The WPM is similar to the WSM, but uses multiplication rather than addition. Each alternative is compared with the others by multiplying a number of ratios, one for each criterion. Each ratio is raised to the power of the relative weight of the corresponding criterion. The following formula is used to compare two alternatives A<sub>k</sub> and A<sub>l</sub>:

$$R\left(\frac{A_K}{A_L}\right) = \prod_{j=1}^N \left(\frac{a_{Kj}}{a_{Lj}}\right)^{W_j} \tag{2}$$

**8.4 MODELING UNCERTAINTY IN DECISION**

This chapter looks at modeling uncertainty in decision-making and how uncertainty can be incorporated in the MCDM method, TOPSIS. Section 4.2.1 defines what characterizes uncertainty in decision-making. Section 8.3 explains the model chosen to model uncertainty along with it operations. Section 8.4 demonstrates the application of the uncertainty model to the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method.

**8.4.1 DEFINING UNCERTAINTY**

Taking into consideration the problem scenario presented in Section 8.2 as an example, input values are often not precise inputs like unit measurements. Linguistic variable are sometimes used to describe properties of object that don’t have quantitative values, like quality or beauty. These linguistic variables are subjective by nature; their meanings vary between decision makers, and situations. Such variables possess no real boundaries, and are open to interpretation. In some instances, even though an exact value could be given, a linguistic variable may be used instead. For example, the size of an office may be given as ‘large’ rather than ‘400 square feet’. This expression of a measurement through indistinct and potentially ambiguous terms is defined as uncertainty.

In its current state TOPSIS can only function with crisp data. A crisp set has clear boundaries: a value is either in the set or not in the set. TOPSIS must be modified so that it can solve problems that have uncertain values. There are several methods of modelling uncertainty, including rough set theory, probability theory, and fuzzy set theory. Fuzzy set theory is the most developed in the field of MCDM. It has an intrinsic ability to handle this described ambiguity of values, and can be implemented in an MCDM system easily. Hence, TOPSIS is to be ‘fuzzified’ so that it can handle uncertainty, by employing fuzzy sets.

**8.4.2 FUZZY SETS AND FUZZY OPERATORS**

Developed by Lotfi Zadeh at the University of California at Berkley, fuzzy set theory provides a simple way to arrive at a definite conclusion based upon a vague, ambiguous, imprecise, or missing data. In traditional mathematics every proposition must either be True or False, A or not A, either this or not this. An element has a degree of membership of 1 or 0.

Fuzzy sets allow degrees of membership between 0 and 1. A fuzzy subset of X is defined as a function f: X → [0, 1]. This is, answers and degrees of set membership can be fractions. Statements may be absolutely true, absolutely false or some intermediate truth degree; one proposition can be ‘more true’ than another proposition. Although this does not correspond with the long-established Boolean logic used in the field of computing, it can be seen that this is a much more human way of thinking. There are four basic fuzzy membership functions: triangular, trapezoidal, Gaussian and generalized bell. MCDM systems often use an implementation of triangular fuzzy numbers (TRN). TRN are often useful in an MCDM system because they can easily implement linguistic values, such as cold, tall, etc. They are intuitive for the decision maker to use and simple to interpret. A TRN can be defined by a triplet (n1, n2, n3), with the membership function μ: R[0,1].

$$\mu_m(x) = \begin{cases} \frac{1}{m-1}x - \frac{1}{m-1}, & x \in [l, m] \\ \frac{1}{m-u}x - \frac{1}{m-u}, & x \in [m, u] \\ 0, & \text{otherwise} \end{cases} \tag{3}$$

Where  $l \leq m \leq u$ , and  $l$  is the lower,  $m$  the modal and  $u$  the upper value of  $\mu$ . The wider the scope of the TFN the fuzzier it is, representing a greater degree of uncertainty. Crisp numbers can be represented by TRN also, such TRNs represent absolute certainty. A TFN representation of a crisp number is called a 'singleton', this is when  $l=m=u$ .

**8.4.3 RANKING FUZZY NUMBERS**

The last step of the MCDM method, TOPSIS involves ranking the alternatives. This is straightforward using crisp data, but fuzzy triangular values require a fuzzy method for ranking. There exist two categories of fuzzy ranking methods. Methods that use a function to map a TRN to a single point (thus ranking these points), and methods that use fuzzy relations to compare pairs of fuzzy numbers, providing a linguistic meaning of the relationship.

The ranking method to be implemented in this project is from the first category; the center of gravity method. The following equation finds the center of gravity  $C$  (geometric center) of a TRN  $F = (l, m, u)$

$$C = l + \frac{(u-l) + (m-l)}{3} \tag{4}$$

**8.4.4 FUZZY TOPSIS**

The best way to illustrate how TOPSIS functions when fuzzified is through the use of a numerical example:

Step 1: Construct the normalized decision matrix. The following decision matrix is derived from a MCDM problem with three alternatives and four criteria:

**TABLE 2: NORMALIZED DECISION MATRIXES**

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>
	(0.13,0.20,0.31)	(0.08,0.15,0.25)	(0.29,0.40,0.56)	(0.17,0.25,0.38)
A <sub>1</sub>	(0.08,0.25,0.94)	(0.25,0.93,2.96)	(0.34,0.70,1.71)	(0.12,0.24,0.92)
A <sub>2</sub>	(0.23,1.00,3.10)	(0.13,0.60,2.24)	(0.03,0.05,0.09)	(0.12,0.40,1.48)
A <sub>3</sub>	(0.15,0.40,1.48)	(0.13,0.20,0.88)	(0.62,1.48,3.41)	(0.24,1.00,3.03)

(Source: Evangelos Triantaphyllou., and Chin-Tun Lin., "Development and Evaluation of Five Fuzzy Multi attribute Decision-making methods" *International Journal of Approximate Reasoning*1996., Vol.14,pp.281-310.)

Step 2: Construct the weighted normalized decision matrix. After normalizing Table 2, the following matrix is produced:

**TABLE 3: WEIGHTED NORMALIZED DECISION-MATRIX**

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>
	(0.01,0.05,0.29)	(0.02,0.14,0.74)	(0.10,0.28,0.96)	(0.02,0.06,0.35)
A <sub>1</sub>	(0.03,0.20,0.96)	(0.01,0.09,0.56)	(0.01,0.02,0.05)	(0.02,0.10,0.55)
A <sub>2</sub>	(0.02,0.08,0.46)	(0.01,0.03,0.22)	(0.18,0.59,1.91)	(0.04,0.25,1.15)

(Source: Evangelos Triantaphyllou., and Chin-Tun Lin., "Development and Evaluation of Five Fuzzy Multi attribute Decision-making methods" *International Journal of Approximate Reasoning*1996., Vol.14,pp.281-310.)

Step 3: Determine the ideal and negative-ideal solutions. The ideal solution A\* is:

$$A^* = \{(0.03, 0.20, 0.96), (0.02, 0.14, 0.74), (0.18, 0.59, 1.91)\}$$

The negative ideal solution A- is

$$A^- = \{(0.01, 0.05, 0.29), (0.01, 0.03, 0.22), (0.01, 0.02, 0.05), (0.02, 0.06, 0.35)\}$$

Step 4: Calculate the separation measure. The separation distance between each alternative and the ideal and negative-ideal solutions are:

$$S_1^* = (0.09, 0.39, 1.41), S_1^- = (0.09, 0.28, 1.04),$$

$$S_2^* = (0.17, 0.59, 1.95), S_2^- = (0.02, 0.16, 0.76),$$

$$S_3^* = (0.02, 0.16, 0.71), S_3^- = (0.17, 0.60, 2.03),$$

For instance,

$$S_1^* = \{[(0.01, 0.05, 0.29) - (0.03, 0.20, 0.96)]^2$$

$$+ [(0.02, 0.14, 0.74) - (0.02, 0.14, 0.74)]^2$$

$$+ [(0.02, 0.06, 0.35) - (0.04, 0.25, 1.15)]^2$$

$$+ [(0.10, 0.28, 0.96) - (0.18, 0.59, 1.91)]^2\}^{1/2}$$

$$= (0.09, 0.39, 1.41).$$

Step 5: Calculate the relative closeness to the ideal solution. The relative closeness to the ideal solution is found using the fuzzy version of the Equation

$$C_1^* = \frac{S_1^-}{(S_1^* + S_1^-)}$$

$$= (0.09, 0.28, 1.04) / ((0.09, 0.39, 1.41) + (0.09, 0.28, 1.04))$$

$$= (0.04, 0.42, 5.83):$$

Similarly,

$$C_2^* = (0.01, 0.21, 3.99),$$

$$C_3^* = (0.06, 0.79, 10.42).$$

Step 6: Rank the preference order. Using the center of gravity ranking method (Equation 4), the scores produced are:

$$C_1^* = 2.1,$$

$$C_2^* = 1.4,$$

$$C_3^* = 3.75.$$



Which concludes that alternative three has the greatest amount of closeness to the ideal solution, and therefore is the best alternative ( $C3^* > C1^* > C2^*$ ).

## 9. CONCLUSION

Decision making becomes more precise by taking the advantage of combining theoretical and empirical knowledge. In this article, it was proposed Fuzzy TOPSIS method in order to explore the possibilities of flexibility method by analyzing the positive and negative ideal solution. Thus, the results presented in this article give clear viability of using the method in many areas of decision support. It allows the possibility of incorporating the decision making process knowledge of experts expressed in rules.

## 10. SCOPES FOR FURTHER RESEARCH

The experiments to adapt the Fuzzy F-TOPSIS method to the group decision making as well as investigating techniques for automatic generation of rule base, are among the future work planned.

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**MEASURING THE EFFECT OF CAPABILITY VERSUS USABILITY IN PURCHASE DECISION OF SMART PHONES****JITESH BISHT****STUDENT****CHRIST UNIVERSITY INSTITUTE OF MANAGEMENT  
BANGALORE****LAKSHMI SHANKAR IYER****ASST. PROFESSOR****CHRIST UNIVERSITY INSTITUTE OF MANAGEMENT  
BANGALORE****ABSTRACT**

*In the market for consumer electronic products, manufacturers are integrating a growing number of features or capabilities to satisfy consumer's preference for high-feature products. These newer capabilities are used as a marketing element to promote value proposition of products. The additional features vary in their degree of familiarity to consumer. Some attributes being very familiar others completely novel to most consumers. Each additional feature provides reason for the consumer to purchase a product and add desired capabilities, but too many features can make products overwhelming for consumers thereby leading to dissatisfaction and "feature fatigue". Previous research suggests that consumers do not use all the features of the products they buy (Ammirati 2003), and even more significantly indicates that consumers may experience negative emotional reactions due to product complexity. The current study would help one understand the concept of feature fatigue in smart phones among respondents in Bangalore city. It is found that more the capabilities in a smart phone, more the feature fatigue and lower the usability of the product. Respondents who had paid for these capabilities are unable to use most of them due to product complexities. Hence we can conclude that before adding a new capability, product manufacturers should take into consideration the present need of the consumers and the impact of added capability on consumer's product experience.*

**KEYWORDS**

capability, consumer electronic products, feature fatigue, product manufacturer, usability.

**INTRODUCTION**

The Indian electronics good industry forms a small part of the global electronics industry which has experienced rapid changes over the last few years. Higher disposable income, availability of finance, increase in digitization, affordability, establishment of retail chains have been the growth drivers of this industry. Due to the boom in the telecom industry, there has been an exponential growth in the mobile handset market. India is the second largest mobile handset market in the world after China and is poised to become an even larger market with unit shipment of INR 208.4 million in 2016 at a compound annual growth rate (CAGR) of 11.8 per cent from 2010 to 2016. The mature Indian mobile consumer's preference for high-end handsets and the younger consumer's desire to use mobile Web 2.0 technologies could result in the market revenues increasing from INR 255.91 billion in 2010 to INR 350.05 billion in 2016.

**REVIEW OF LITERATURE**

**Gregory S. Carpenter, Kent Nakamoto & Rashi Glazer**, (1994) in their paper titled "Meaningful brands from meaningless differentiation: The dependence on irrelevant attributes" have found from their research that an irrelevant attribute can be positively valued but that there are limits as to when and how much depending on price. **Kannan Srinivasan, Mayuram S. Krishnan & Sunder Kekre**, (1995) in their paper titled "drivers of customer satisfaction for software products: Implications for design and service support" investigated the key determinants of customer satisfaction with software products. The research was focused to measure the strength of capability and usability as the critical drivers of overall customer satisfaction. Findings from the research revealed that the capability and usability are the dominant factors in customers overall satisfaction followed closely by the performance factor. It was also found that the impact of the drivers varies across customers, product and product segment. **Itamar Simonson & Stephen M. Nowlis**, (1996) in their paper titled "The effect of new product features on brand choice" examined the factors that moderate the impact of a new feature on brand choice. The study was focused to understand and measure the effect of product characteristics on perceived uncertainty about a new feature performance. Findings revealed the contribution of new features to the basic features model and low quality brands is greater than it is to the top of the line models and high quality brands. **Ravi Dhar & Steven J. Sherman**, (1996) in their paper titled "The Effect of Common and Unique Features in Consumer Choice" have given value insights on consumer behavior. The study reveals that consumer choice often involves a comparison among the available alternatives. **Alex Chernev**, (1997) in his paper titled "The effect of common features on brand choice: Moderating role of attribute importance" investigated and measured the effect of common features on brand choice and the moderating role of the attributes.

**Shu Li**, (2001) in her paper titled "Equate-to-differentiate: The Role of Shared and Unique Features in the Judgment Process" developed a model for pairwise choice so that every alternative feature involves consequences to be measured on two conflicting dimensions. The findings from the research revealed that various judging task involves analyzing whether shared features and unique features are sub-features of a single main feature or not. **Martina Ziefle**, (2002) in her paper titled "The influence of user expertise and phone complexity on performance, ease of use and learnability of different mobile phones" investigated on usability, ease of use and learnability of three different mobile phones (Nokia 3210, Siemens C35i and Motorola P7389). The study was focused to measure the complexity and usability of the menu i.e. depth/breadth of the menu tree and navigation key i.e. number functionality. Results from the finding revealed the importance of the consumer expertise and its influence on consumer perception about the product usability. **Debra Viana Thompson, Rebecca W. Hamilton & Roland T. Rust**, (2005) in their paper titled "Defeating feature fatigue" provided insights on how additional features affect consumer's perceptions of a product and their purchase decision. The study also revealed that consumers do not use all the features of the product they buy. **Debra Viana Thompson, Rebecca W. Hamilton & Roland T. Rust**, (2005) in their paper titled "Feature fatigue: When product capabilities becomes too much of a good thing" examined how consumers balance their desires for capabilities and usability when they evaluate products and how these desires shifts over time. The researcher suggested that firms should consider having large number of more specialized products, each with a limited number of features, rather than loading all possible features into one product.

**Elke den Ouden, Jeroen Keijzers & Yuan Lu**, (2008) in their paper titled "The 'double-Edged Sword' of the High-Feature Products: An Explorative Study of the Business impact" investigated customer dissatisfaction and large no of problem triggered due to product complexities and lack of adherence to design guidelines. It was also found that promoting complex product as easy to use initially decreases complexity expectations at the moment of purchase but disconfirmation of this marketing promise during usage eventually results in negative emotions towards product and its brand. **Jin K. Han, Robert J. Meyer & Shenghui Zhao**, (2008) in their paper titled "Biases in valuation vs. usage of innovation product features" investigated biases in product valuation and usage decisions that arise when consumers consider a new generation of product that offers an expanded set of capabilities of uncertain value. It was also observed

that decision to pay extra for novel capabilities that are never used ultimately seen as regrettable mistake, despite whatever social boost the acquisition first conveyed. **Jing Lei & Tripat Gill**, (2008) in their paper titled "Convergence in a high technology consumer market: Not all brands gain equally from adding new functionalities to product" examined the effect of goal congruence of added functionalities on the relative gain to high versus lower brands of convergent products. Findings from the research revealed that the higher quality brand gains incremental value as compared to baseline condition i.e. no functionality added, while a lower quality one does not. **Matteo De Angelis**, (2008) in his thesis titled "The effect of adding features on product attractiveness: The role of product perceived congruity" have examined the effect of adding more features on consumer's evaluation of the product. It was also found that the probability of product evaluation increases as the number of features increases depending upon the degree of congruity of the features added with the product. **Ding Xihai, Liu Pan & Wang Liya**, (2010) in their paper titled "Modeling product feature usability through web mining" provided information about the product feature design resulting to customer satisfaction. The study proposed a novel product feature usability model to identify the critical features in the product development. Further the researchers also correlated consumer satisfaction to usability of product feature so as to evaluate the effective of the product feature usability.

**Kaifu Zhang & V. Padmanabhan**, (2011) in their paper titled "Feature overload" has provided detailed information about feature overload and reason behind its existence. They have defined feature overload as "The phenomenon wherein consumers purchase feature rich products but subsequently don't use all the features". **Mingxing Wu & Liya Wang**, (2011) in their paper titled "Feature fatigue analysis based on behavioral decision making" investigated the effect of decreasing consumer satisfaction and its relation with negative impact on manufacturer's long term profitability. Findings revealed that the inconsistent perceived value affects customers repurchase and purchase decision. Also it was found that customers tends to purchase high feature products but over a period of time the perceived value of product decreases when customers start working with these convergent products. **Caglar Irmak & Joseph K. Goodman**, (2012) in their paper titled "Having versus Consuming: Failure to estimate usage frequency makes consumers prefer multi-feature products" have investigated whether consumers systematically consider feature usage before making multifunctional product purchase decisions. It was found that consumers prefer multifunctional products to satisfy their need for cognition, to fulfill feature trivialness and due to materialistic behavior. It was also seen that those who estimated usage before choice experience tends to have greater product satisfaction and are more likely to recommend their chosen product.

### NEED/IMPORTANCE OF THE STUDY

With the expanding consumer electronic market, manufacturers are adding innovative and unique features to their products. These features have new capabilities which are further used as a marketing element to promote the value proposition of the products. Consumers view these additional features as point of differentiation amongst different brands. However, over a period of time as consumers start using products with added capabilities, they build negative emotions due to the complex and irrelevant functionalities of the new add-ons. The very same capabilities that were seen as an advantage and point of difference from other brands become the reason for customer dissatisfaction after usage of the product. The current study would help one understand whether customers experience a gap between capability and usability of an electronic product in particular smart phones. The study will also help the manufacturer take into consideration the current need of the consumers and design the products.

### STATEMENT OF THE PROBLEM

In today's business environment where technology is all pervading the easiest way to differentiate and enhance a product is by adding large number of features to it. Increasing the number of features adds desired capabilities to the product and thereby provides greater functionality to the consumers. The consumer perceives each added feature as useful and beneficial functionally and uses it as a parameter to differentiate the offering of different brands. But too many features make these products overwhelming for consumers as they are not able to use these features to the optimum. This leads to dissatisfaction and feature fatigue. The effect of such incongruent features in product innovation leads to negative impact on manufacturer's long-term profitability and customer relation.

### CAPABILITY

Capability is defined as the ability to execute a specified course of action. It is the ability of a product to perform desirable set of actions.

### USABILITY

Product usability is defined as a concept in product design. It is stated as the ease of use or user-friendliness of the product features. Further, it is related directly to the quality of the product and indirectly to the productivity of the work force. Ease of maintenance and usability both relate to product usability.

### FEATURE FATIGUE

Mingxing Wu and Liya Wang have defined feature fatigue as "the phenomenon that customers prefer to choose high-feature products at the purchasing moment (before use) but once they start using the products (after use), they become overwhelmed by the complexity of these feature-rich products and annoyed by the features they realize they don't want or need".

### OBJECTIVES OF THE STUDY

1. To study the effect of additional beneficial features on the pre purchase perception of product capabilities by consumers.
2. To determine the factors responsible for the cause of feature fatigue.
3. To examine the effect of feature fatigue on consumer's post purchase behavior.

### HYPOTHESIS

1. Ho: Smart phone users are able to use most of the features of their phone.  
Ha: Smart phone users are unable to use most of the features of their phone.
2. Ho: More the features not necessarily higher will be the performance of the phone.  
Ha: More the features higher will be the performance of the phone.
3. Ho: More features in the phone do not imply value for money.  
Ha: More features in the phone justify the value for money.
4. Ho: Buying a high feature phone does not raise praises from friends.  
Ha: Buying a high feature phone raises praise from friends.
5. Ho: More features do not mean difficulty in learning and remembering them.  
Ha: More the features difficult it is to learn and remember them.
6. Ho: More the features do not mean difficulty in effectively using all the features.  
Ha: More the features difficult it is to effectively use all of them.

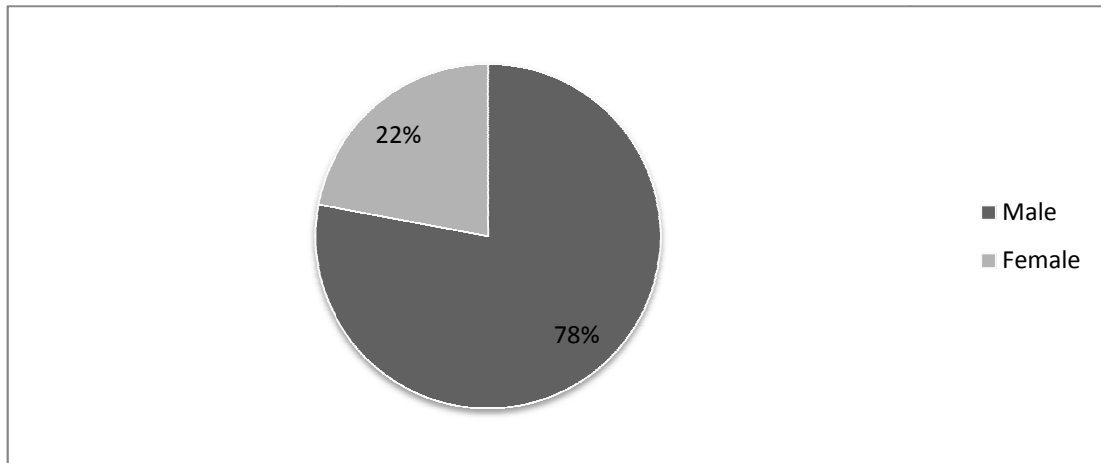
### RESEARCH METHODOLOGY

The current study understands the pre-purchase and post-purchase perception of decision making of consumers of smart phone devices. The study was conducted across different age groups ranging from teenagers to professionals in mid forties across the city of Bangalore, the capital state of Karnataka. The study focuses on the current users of smart phones. The sample size consists of 155 respondents who were selected by simple random sampling method. Chi-

square test was conducted to understand the post purchase behavior pattern of the respondents. 16 factors were taken into consideration to understand the reason behind the pre-purchase behavior of smart phone consumers. Out of which only six factors play a major role in the decision making process.

RESULTS & DISCUSSION

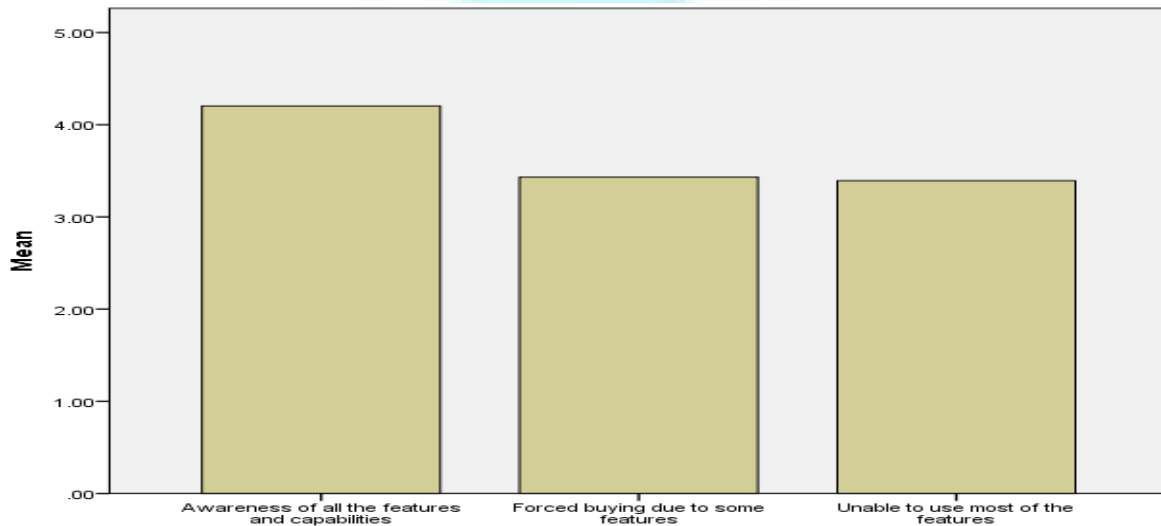
CHART 1: RESPONDENTS GENDER DESCRIPTION



Source: Primary data

From Chart 1 we can infer that the sample is dominated by males with 78% share while female respondents were only 22%.

CHART 2: RELATIONSHIP BETWEEN AWARENESS, FORCED BUYING AND NON-USABILITY OF FEATURES

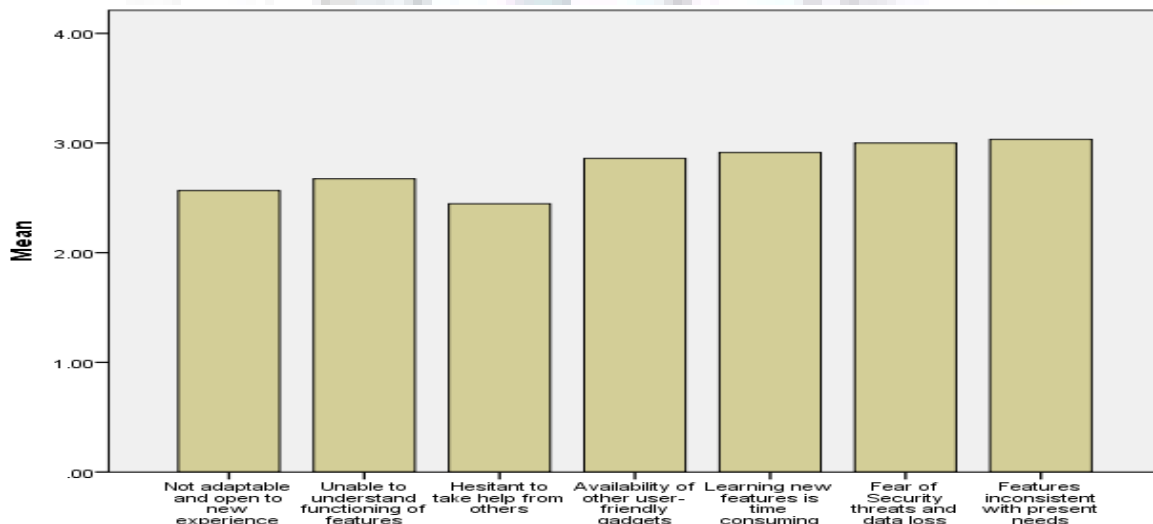


Note: (Y-axis: 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

Source: Primary Data.

Comparing the mean of “consumer awareness” with means of “force buying” and “unable to use” factor revealed a significant consumer behavior. It was found that the respondents had very high level of awareness regarding the features and capabilities of their smart phone but still they were not able to utilize the full capabilities of their phones. Further, it was observed that the consumers were forced to purchase smart phones with many unwanted and unknown features. This can be inferred from Chart 2.

CHART 3: FACTORS RESPONSIBLE FOR FEATURE FATIGUE



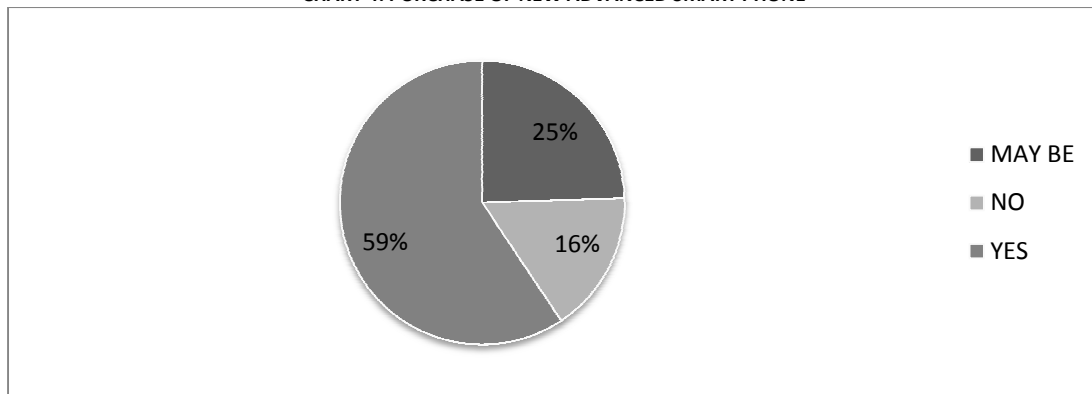
Note: (Y-axis: 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

Source: Primary Data

After comparing the means of various factors responsible for feature fatigue and extracting the factors with high mean, it was found that respondents were unable to utilize the entire capability of their smart-phone because of the following four major reasons. This is displayed in Chart 3.

1. Most of the features in their smart phone were inconsistent with their present need.
2. It was also observed that fear of security threat and loss of data while using certain application was the major reason for not using most of the features.
3. It was found that learning new features required lot of time therefore people resisted using unknown features.
4. High percentage of smart phone users admitted that they possess other devices that can perform similar function. They also found that other devices were more comfortable to operate.

CHART 4: PURCHASE OF NEW ADVANCED SMART PHONE



Source: Primary Data

It was observed that despite mismatch in consumer pre-purchase and post purchase perception of product usability, consumers tend to possess favorable and positive attitude towards smart phone usage. As depicted in Chart 4, it can be interpreted that 59% of respondents agreed that they would purchase a new advanced version of smart phone in future while only 16% showed their dissatisfaction towards complex smart phone capabilities.

Chi – square test was done to compare age group with awareness of all the features and capabilities. It was found that negative association exists between age group and awareness of all the features and capabilities.

**CROSS TABULATION BETWEEN “AGE GROUP” AND “UNABLE TO USE MOST OF THE FEATURES”**

Age group		Unable to use most of the features					Total
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
55 and above	37-55	0	1	0	1	0	2
	27-37	1	3	7	4	6	21
	17-27	0	4	5	7	3	19
Total	55 and above	9	23	21	38	21	112
	37-55	10	31	33	50	30	154
	17-27						

Source: Primary data

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.519 <sup>a</sup>	12	.743
Likelihood Ratio	10.328	12	.587
Linear-by-Linear Association	.217	1	.642
N of Valid Cases	154		

Source: Primary data

**INTERPRETATION**

Chi-square is showing negative association between “age-group” and “unable to use most of the features” at 90% confidence level. Thus, it can be concluded that the ability of the consumer to utilize features of a smart phone does not depend on their age groups.

**FACTOR ANALYSIS**

Factor analysis was done to determine and extract the most important factors that influences and attracts people to purchase smart phone. Respondents were asked to rate 18 features of the smart phones on a 5-point likert scale based on their perception and importance of the feature. Results from factor analysis are as follows:

**COMMUNALITIES**

	Initial	Extraction
Attracted towards Smartphone-Touch screen interface	1.000	.629
Attracted towards Smartphone-Wider display screen	1.000	.675
Attracted towards Smartphone-Light weight and slim design	1.000	.594
Attracted towards Smartphone-Video calling	1.000	.639
Attracted towards Smartphone-Media player	1.000	.486
Attracted towards Smartphone-HD camera	1.000	.548
Attracted towards Smartphone-Video recording	1.000	.720
Attracted towards Smartphone-Games	1.000	.714
Attracted towards Smartphone-Mobile emailing	1.000	.630
Attracted towards Smartphone-Business Apps	1.000	.760
Attracted towards Smartphone-Internet Apps	1.000	.667
Attracted towards Smartphone-WiFi connectivity	1.000	.654
Attracted towards Smartphone-Bluetooth	1.000	.766
Attracted towards Smartphone-GPS	1.000	.511
Attracted towards Smartphone-Operating system	1.000	.643
Attracted towards Smartphone-High processing speed	1.000	.557
Attracted towards Smartphone-Storage capacity	1.000	.566
Attracted towards Smartphone-Price	1.000	.713

Note: Principal component analysis extraction method was applied.

Source: Primary data

**INTERPRETATION FROM THE FACTOR ANALYSIS**

The output of factor analysis is obtained by requesting principle component analysis and specifying a rotation. It can be interpreted that six factors account for 63.74% of total variance. Extracted data from factor analysis clearly shows that the respondents were attracted towards smart phone because of the few appealing features. This result interprets that even though a smart phone user requires few specialized features he is still bombarded with large number of additional capabilities in order to attract and influence his buying criteria. Research results show that factors which influence consumers to purchase smart phones are computation power consisting of wi-fi connectivity, operating system, high processing speed. Other factors are visual communication consisting of video calling, HD camera, touch screen and wider display, mobile emailing etc.

**HYPOTHESIS TESTING**

Hypothesis 1:

**HYPOTHESIS 1 ONE-SAMPLE STATISTICS**

	N	Mean	Std. Deviation	Std. Error Mean
Unable to use most of the features	155	3.3871	1.19189	.09574

Source: Primary data

**HYPOTHESIS 1 ONE-SAMPLE TEST**

	Test Value = 3				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
				Lower	Upper
Unable to use most of the features	4.043	154	.000	.38710	.1980 .5762

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .000. This is the p-value, and it is less than the level of .05 we had set. Therefore, we have to reject the null hypotheses at a significance level of .05 and conclude that smart phone users are unable to use most of the features of their phone.

Hypothesis 2:

**HYPOTHESIS 2 ONE-SAMPLE STATISTICS**

	N	Mean	Std. Deviation	Std. Error Mean
More features-High performance	154	3.7792	1.01779	.08202

Source: Primary data

**HYPOTHESIS 2 ONE-SAMPLE TEST**

	Test Value = 3				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
				Lower	Upper
More features-High performance	9.501	153	.000	.77922	.6172 .9413

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .000. This is the p-value, and it is less than the level of .05 we had set. Therefore, we have to reject the null hypotheses at a significance level of .05 and conclude that prior to their purchase of smart phone the respondents believed that more the features higher will be the performance of the phone.

Hypothesis 3:

**HYPOTHESIS 3 ONE-SAMPLE STATISTICS**

	N	Mean	Std. Deviation	Std. Error Mean
More features-Value for money	154	3.9870	.93576	.07541

Source: Primary data

**HYPOTHESIS 3 ONE-SAMPLE TEST**

	Test Value = 3				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
				Lower	Upper
More features-Value for money	13.089	153	.000	.98701	.8380 1.1360

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .000. This is the p-value, and it is less than the level of .05 we had set. Therefore, we have to reject the null hypotheses at a significance level of .05 and conclude that prior to their purchase of smart phone the respondents believed that more features in the phone justifies the value for money.

Hypothesis 4:

**HYPOTHESIS 4 ONE-SAMPLE STATISTICS**

	N	Mean	Std. Deviation	Std. Error Mean
Feature-rich phone-High social status	153	3.1046	1.26264	.10208

Source: Primary data

**HYPOTHESIS 4 ONE-SAMPLE TEST**

	Test Value = 3				
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
				Lower	Upper
Feature-rich phone-High social status	1.024	152	.307	.10458	-.0971 .3063

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .307. This is the p-value, and it is greater than the level of .05 we had set. Therefore, we have to accept the null hypotheses at a significance level of .05 and conclude that prior to their purchase of smart phone the respondents believed that buying a high feature phone does not raise praises from friends.

Hypothesis 5:

**HYPOTHESIS 5 ONE-SAMPLE STATISTICS**

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
More features-Difficulty remembering and learning	152	2.7961	1.18679	.09626

Source: Primary data

**HYPOTHESIS 5 ONE-SAMPLE TEST**

One-Sample Test						
Test Value = 2						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
More features-Difficulty remembering and learning	8.270	151	.000	.79605	.6059	.9862

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .000. This is the p-value, and it is less than the level of .05 we had set. Therefore, we have to reject the null hypotheses at a significance level of .05 and conclude that the respondents post purchase experience with smart phone signifies that more the features difficult it is to learn and remember them all.

Hypothesis 6:

**HYPOTHESIS 6 ONE-SAMPLE STATISTICS**

	N	Mean	Std. Deviation	Std. Error Mean
More features-Difficulty effectively using them all	150	3.1200	1.17536	.09597

Source: Primary data

**HYPOTHESIS 6 ONE-SAMPLE TEST**

One-Sample Test						
Test Value = 2						
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
More features-Difficulty effectively using them all	11.671	149	.000	1.12000	.9304	1.3096

Source: Primary data

**INTERPRETATION**

The output of the one sample Z-test shows that the 2-tailed significance of the test is .000. This is the p-value, and it is less than the level of .05 we had set. Therefore, we have to reject the null hypotheses at a significance level of .05 and conclude that the respondents post purchase experience with smart phone signifies that more the features difficult it is to effectively use all of them.

**FINDINGS**

1. Even though a smart phone user requires few specialized features he is still bombarded with large number of additional capabilities in order to modulate and influence his buying criteria. Out of the 18 odd capabilities in the smart phone only 12 capabilities were observed responsible for attracting and motivating people to purchase the smart phone. They are wi-fi connectivity, operating system, high processing speed, video calling, video recording, HD camera, touch screen, wider display, business apps, mobile emailing, blue tooth and availability of games.
2. Respondents were indirectly forced to purchase smart phone with many unwanted and unknown features just to fulfill their specific need for some important features.
3. Respondents had very high level of awareness regarding the features and capabilities of their smart phone but still they were not able to utilize the entire capabilities of their phones.
4. Respondents had significantly different perceived value before purchasing and after usage of the smart phone.
5. Pre-purchase perception of respondents about smart phone capabilities - Respondents believed that more the features higher would be the performance, utility, value for money of the phone.
6. Consumers post purchase experience of product usability - Consumers accepted that more the features difficult it is to learn, remember and effectively use all of them. They accepted that unknown and unwanted features required lot of mental effort and time and accepted that complex and unknown features led to inconvenience and unpleasant experience.
7. Respondents feel that most of the features in their smart phone were irrelevant to their present need. Fear of security threats and loss of data while using certain application was the major reason for not using most of the features. Learning new features require lot of time therefore people resist using unknown features.
8. The inconsistent perceived value had no significant effect on the consumer's purchase and repurchase decision. Moreover, consumers were willingly ready to spread positive word of mouth about smart phone beneficial capabilities along with recommendations to friends and family members for the purchase of smart phone.

**SUGGESTIONS**

1. To avoid the negative impacts of feature fatigue manufacturers should develop stripe down versions of feature rich smart phones.
2. Penetrating the market with wider assortment of personalized and simpler smart phones will provide competitive advantage against the complexly configured smart phones.
3. Manufacturers should follow the concept of "simplicity" and "ease of use" rather than "all in one" and "feature richness".
4. Manufacturers should provide interactive learning and training material like brochures and DVD's with the initial product offering.
5. Providing customer testimonials and product demonstrations to consumers would help manufacturers reduce consumer's perceived risk of security and product functionality.
6. Manufacturers should do intense research of the target market before developing and launching the product.

**CONCLUSION**

The difference in the consumer's perceived value before and after usage of the smart phone is a significant reason for feature fatigue. Prior to the purchase, the consumer sees capabilities of feature rich smart phones as benefits and value for money, but once the consumer starts using the phone the complexities of unknown irrelevant features leads to resistance and anxiety. Henceforth the perception of the consumer changes and the added capabilities are now viewed as wastage of money and time. From the findings of the research, it can also be inferred that if the magnitude of feature fatigue is very high, it leads to severe

dissatisfaction and thereby causing reduction in manufacturer's customer lifetime value. But if the manufacturer maintains an ecosystem of optimum level of capabilities (according to consumers needs and adaptability), it can provide both competitiveness and preference towards a specific brand of phone.

### SCOPE FOR FURTHER RESEARCH

The level of feature fatigue varies across age groups. In addition, the factors responsible for feature fatigue might also be different across age groups. The research work was confined to smart phone market, thus it might not provided the exact scenario for other consumer electronics products. In addition, factors causing feature fatigue might also vary for different consumer electronic products. Data collected from a tech savvy population might not capture the exact scenario and target consumer behavior.

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## AN IMPACT OF GREEN COMPUTING IN HAZARDOUS DEVICE MANUFACTURING & MAXIMIZE ENERGY EFFICIENCY

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### ABSTRACT

*The primary objective of this paper is to study and practice of using computing resources efficiently. The motto of green computing is to account for the "triple bottom line" (People, Planet, Profit), an expanded spectrum of values and criteria for measuring organizational (and societal) success. The ultimate goals are trying to reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote recyclability or biodegradability of products and factory waste. Modern IT systems rely upon a complicated mix of people, networks and hardware; as such, a green computing initiative must be systemic in nature, and address increasingly sophisticated problems. Elements of such as solution may comprise items such as end user satisfaction, management restructuring, regulatory compliance, disposal of waste, telecommuting, virtualization of server resources, energy use, thin client solutions, and return on investment (ROI).*

### KEYWORDS

ROI return on investment, RoHS reduction of hazardous substances, WEEE waste electrical and electronic equipment, GCIO Green Computing Impact Organization.

### 1. INTRODUCTION

In 1992, the U.S. Environmental Protection Agency launched Energy Star, a voluntary labeling program which is designed to promote and recognize energy-efficiency in monitors, climate control equipment, and other technologies. This resulted in the widespread adoption of sleep mode among consumer electronics. The term "green computing" was probably coined shortly after the Energy Star program began; there are several USENET posts dating back to 1992 which use the term in this manner. Concurrently, the Swedish organization TCO Development launched the TCO Certification program to promote low magnetic and electrical emissions from CRT-based computer displays; this program was later expanded to include criteria on energy consumption, ergonomics, and the use of hazardous materials in construction.

When it comes to PC disposal, it is necessary to know everything there is to know in order to be involved in green computing. Basically, the whole green aspect came about quite a few years back when the news that the environment was not a renewable resource really hit home and people started realizing that they had to do their part to protect the environment.

### 2. REGULATIONS AND INDUSTRY INITIATIVE

#### 2.1 FROM THE GOVERNMENT

Many governmental agencies have continued to implement standards and regulations that encourage green computing. The Energy Star program was revised in October 2006 to include stricter efficiency requirements for computer equipment. The European Union's directives 2002/95/EC (RoHS), on the reduction of hazardous substances, and 2002/96/EC (WEEE) on waste electrical and electronic equipment required the substitution of heavy metals and flame retardants like PBBs and PBDEs in all electronic equipment put on the market starting on July 1, 2006. The directives placed responsibility on manufacturers for the gathering and recycling of old equipment (the Producer Responsibility model).

#### 2.2 FROM THE INDUSTRY

##### 2.2.1 Climate Savers Computing Initiative :

CSCI is an effort to reduce the electric power consumption of PCs in active and inactive states. The CSCI provides a catalog of green products from its member organizations, and information for reducing PC power consumption. It was started on 2007-06-12.

##### 2.2.2 Green Computing Impact Organization, Inc. :

GCIO is a non-profit organization dedicated to assisting the end-users of computing products in being environmentally responsible. This mission is accomplished through educational events, cooperative programs and subsidized auditing services. The heart of the group is based on the GCIO Cooperative, a community of environmentally concerned IT leaders who pool their time, resources, and buying power to educate, broaden the use, and improves the efficiency of, green computing products and services.

##### 2.2.3 Green Electronics Council :

The Green Electronics Council offers the Electronic Products Environmental Assessment Tool (EPEAT) to assist in the purchase of "green" computing systems. The Council evaluates computing equipment on 28 criteria that measure a product's efficiency and sustainability attributes. On 2007-01-24, President George W. Bush issued Executive Order 13423, which requires all United States Federal agencies to use EPEAT when purchasing computer systems.

**2.2.4 The Green Grid :**

It is a global consortium dedicated to advancing energy efficiency in data centers and business computing ecosystems. It was founded in February 2007 by several key companies in the industry – AMD, APC, Dell, HP, IBM, Intel, Microsoft, Rackable Systems, SprayCool, Sun Microsystems and VMware. The Green Grid has since grown to hundreds of members, including end users and government organizations, all focused on improving data center efficiency.

**3. THE DEMONS BEHIND GREEN COMPUTING****3.1 POWER SUPPLY**

Desktop computer power supplies (PSUs) are generally 70–75% efficient, dissipating the remaining energy as heat. An industry initiative called 80 PLUS certifies PSUs that are at least 80% efficient; typically these models are drop-in replacements for older, less efficient PSUs of the same form factor. As of July 20, 2007, all new Energy Star 4.0-certified desktop PSUs must be at least 80% efficient.

**3.2 STORAGE**

Smaller form factor (e.g. 2.5 inch) hard disk drives often consume less power than physically larger drives. Unlike hard disk drives, solid-state drives store data in flash memory or DRAM. With no moving parts, power consumption may be reduced somewhat for low capacity flash based devices. Even at modest sizes, DRAM based SSDs may use more power than hard disks, (e.g., 4GB i-RAM uses more power and space than laptop drives). Flash based drives are generally slower for writing than hard disks.

**3.3 VIDEO CARD**

A fast GPU may be the largest power consumer in a computer. Energy efficient display options include: No video cards used in a shared terminal, shared thin client, or desktop sharing software if display required.

1. Use motherboard video output - typically low 3D performance and low power.
2. Reuse an older video card that uses little power; many do not require heat sinks or fans.
3. Select a GPU based on average wattage or performance per watt.

**3.4 MATERIALS**

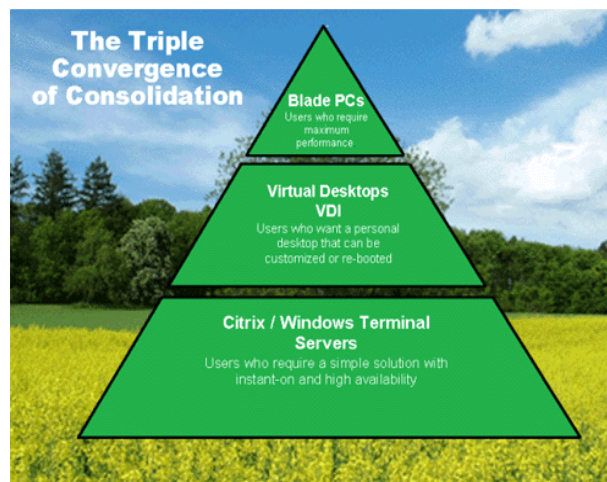
Computer systems that have outlived their particular function can be repurposed, or donated to various charities and non-profit organizations. However, many charities have recently imposed minimum system requirements for donated equipment. Additionally, parts from outdated systems may be salvaged and recycled through certain retail outlets and municipal or private recycling centers. Recycling computing equipment can keep harmful materials such as lead, mercury, and hexavalent chromium out of landfills, but often computers gathered through recycling drives are shipped to developing countries where environmental standards are less strict than in North America and Europe. The Silicon Valley Toxics Coalition estimates that 80% of the post-consumer e-waste collected for recycling is shipped abroad to countries such as China, India, and Pakistan. Computing supplies, such as printer cartridges, paper, and batteries may be recycled as well.

**3.5 DISPLAY**

LCD monitors typically use a cold-cathode fluorescent bulb to provide light for the display. Some newer displays use an array of light-emitting diodes (LEDs) in place of the fluorescent bulb, which reduces the amount of electricity used by the display.

**3.6 CHILLING OF DATA**

To keep servers at the right temperature, companies mainly rely on air conditioning. The more powerful the machine, the more cool air needed to keep it from overheating. By 2005, the energy required to power and cool servers accounted for about 1.2 % of total U.S electricity conception. By 2010, half of the Forbes Global 2000 companies will spend more on energy than on hardware such as servers.

**4 APPROACHES TO GREEN COMPUTING****4.1 VIRTUALIZATION:****FIG : 1 VIRTUALIZATION**

Computer virtualization refers to the abstraction of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. The concept originated with the IBM mainframe operating systems of the 1960s, but was commercialized for x86-compatible computers only in the 1990s. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby unplugging the original hardware and reducing power and cooling consumption. Several commercial companies and open-source projects now offer software packages to enable a transition to virtual computing. Intel Corporation and AMD have also built proprietary virtualization enhancements to the x86 instruction set into each of their CPU product lines, in order to facilitate virtualized computing.

In case of server consolidation, many small physical servers are replaced by one larger physical server, to increase the utilization of costly hardware resources such as CPU. Although hardware is consolidated, typically OS are not. Instead, each OS running on a physical server becomes converted to a distinct OS running inside a virtual machine. The large server can "host" many such "guest" virtual machines. This is known as Physical-to-Virtual (P2V) transformation.

Virtual machine can be more easily controlled and inspected from outside than a physical one, its configuration is also more flexible. This is very useful in kernel development and for teaching operating system courses.

A new virtual machine can be provisioned as needed without the need for up-front hardware purchase. Also, virtual machine can be easily re-located from one physical machine to another as needed. For example, a sales person going to a customer can copy a virtual machine with the demonstration software to its laptop, without the need to transport the physical computer. At the same time and error inside a virtual machine does not harm a host system, so there is no risk of breaking down the OS in said laptop.

**4.2 MATERIAL MANAGEMENT**

**RoHS:** In February 2003, the European Union adopted the Restriction of Hazardous Substances Directive (RoHS). The legislation restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. The directive is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE), which sets collection, recycling, and recovery targets for electrical goods and is part of a legislative initiative that aims to reduce the huge amounts of toxic e-waste. Driven by these directives, VIA implemented a set of internal regulations in order to develop products that are compliant with these accepted policies, including the use of nonhazardous materials in its production of chipsets, processors, and companion chips. In 2001, they focused on lead-free manufacturing, introducing the Enhanced Ball Grid Array (EBGA) package for power efficient VIA processors and the Heat Sink Ball Grid Array (HSBGA) package for their chipsets. In traditional manufacturing processes, lead is used to attach the silicon core to the inside of the package and to facilitate integration onto the motherboard through tiny solder balls on the underside of the package. VIA's lead-free manufacturing technologies do not require a lead bead, and the solder balls now consist of a tin, silver, and copper composite.

However, not everyone is satisfied with this new objective. Howard Johnson of the online *EDN* magazine says that the move toward lead-free devices is not only unhelpful but actually worse for the environment. "The additional tin mining required to produce high-purity tin alloys, plus the mining of other precious metals required to alloy with tin in substitution for lead, is a poor trade for the use of existing lead, much of which comes from recycled products," Johnson writes. He also believes that lead-free assembly is less reliable than lead-based assembly, partially due to the increased growth of tin whiskers — small, hair-like metallic growths that naturally emerge from the surface of solid tin. On lead-free tin surfaces, these whiskers can grow to a length sufficient to short an electronic circuit to another, leading to product failure.

**4.3 ENERGY EFFICIENT COMPUTING**

1. Do not leave your computer running overnight and on weekends. Also, wait until you are ready to use it before you turn it on.
2. A modest amount of turning on and off will not harm the computer or monitor. The life of a monitor is related to the amount of time it is in use, not the number of on and off cycles.
3. Try to plan your computer-related activities so you can do them all at once, keeping the computer off at other times.
4. Do not turn on the printer until you are ready to print. Printers consume energy even while they are idling.
5. Do not print out copies of email unless necessary.
6. If you spend a large amount of time at your computer, consider reducing the light level in your office. This may improve CRT (cathode ray tube) screen visibility as well as save energy.
7. Most computer equipment now comes with power management features. If your computer has these features, make sure they are activated.
8. The best screen saver is no screen saver at all - turn off your monitor when you are not using it. This option is second best only to turning off your computer all together.
9. Use "paperless" methods of communication such as email and fax-modems.
10. When typing documents, especially drafts, use a smaller font and decrease the spacing between lines, or reformat to keep your document to as few pages as possible, especially when typing drafts.
11. Review your document on the screen instead of printing a draft. If you must print a draft, use the blank back side of used paper.
12. Use a printer that can print double-sided documents. When making copies, use double-sided copying.
13. Always buy and use recycled-content paper. Look for papers with 50-100% post-consumer waste and non-chlorine bleached. Also, recycle your paper when done.
14. Buy a monitor only as large as you really need. Although a large monitor might seem more attractive, you should remember that a 17-inch monitor uses 40 percent more energy than a 14-inch monitor. Also, the higher the resolution, the more energy it needs.
15. Ink-jet printers, though a little slower than laser printers, use 80 to 90 percent less energy.
16. Request recycled / recyclable packaging from your computer vendor.
17. Buy vegetable (or non-petroleum-based) inks. These printer inks are made from renewable resources; require fewer hazardous solvents; and in many cases produce brighter, cleaner colors.

**4.4 RECYCLING**

Obsolete computers are a valuable source for secondary raw materials, if treated properly, however if not treated properly they are a major source of toxins and carcinogens. Rapid technology change, low initial cost and even planned obsolescence have resulted in a fast growing problem around the globe. Many materials used in the construction of computer hardware can be recovered in the recycling process for use in future production. Reuse of tin, silicon, iron, aluminum, and a variety of plastics – all present in bulk in computers – can reduce the costs of constructing new systems. In addition, components frequently contain copper, gold, and other materials valuable enough to reclaim in their own right. Electronic devices, including audio-visual components (televisions, VCRs, stereo equipment), mobile phones and other hand-held devices, and computer components, contain valuable elements and substances suitable for reclamation, including lead, copper, and gold. They also contain a plethora of toxic substances, such as dioxins, PCBs, cadmium, chromium, radioactive, and mercury.

Whole computers and pieces of electronic equipment are shredded into smaller pieces to be more manageable and facilitate the separation of the constituent components. Lead glass from cathode ray tubes is sold to foundries for use as a fluxing agent in the processing of raw lead ore. Other valuable metals, such as copper, gold, palladium, silver and tin are sold to smelters for metal recycling. The hazardous smoke and gases generated by these processes are captured, contained, and treated to ensure that they do not become a threat to the environment. These methods allow for the safe reclamation of all the valuable materials used in computer construction.

**4.5 TELECOMMUTING**

Telecommuting, e-commuting, e-work, telework, working at home (WAH), or working from home (WFH) is a work arrangement in which employees enjoy flexibility in working location and hours. In other words, the daily commute to a central place of work is replaced by telecommunication links. Many work from home, while others, occasionally also referred to as nomad workers or web commuters utilize mobile telecommunications technology to work from coffee shops or myriad other locations. Telework is a broader term, referring to substituting telecommunications for any form of work-related travel, thereby eliminating the distance restrictions of telecommuting. All telecommuters are teleworkers but not all teleworkers are telecommuters. A frequently repeated motto is that "work is something you do, not something you travel to". A successful telecommuting program requires a management style which is based on results and not on close scrutiny of individual employees. This is referred to as management by objectives as opposed to management by observation. The terms *telecommuting* and *telework* were coined by American Jack Nilles in 1973.

Long distance telework is facilitated by such tools as virtual private networks, videoconferencing, and Voice over IP. It can be efficient and useful for companies as it allows staff and workers to communicate over a large distance, saving significant amounts of travel time and cost. As broadband Internet connections become more commonplace, more and more workers have enough bandwidth at home to use these tools to link their home office to their corporate intranet and internal phone networks.

FIG. 2. VOICE OVER INTERNET PROTOCOL (VoIP)



Voice over Internet Protocol (VoIP) is a general term for a family of transmission technologies for delivery of voice communications over the Internet or other packet-switched networks. The reduction in telephone wiring will obviously lead to decreasing costs because of Voice-Over-Internet protocol. Voice over IP (VoIP) reduces the telephony wiring infrastructure by sharing the existing Ethernet copper, thus reduce the use of metallic waste. VoIP and phone extension mobility also made Hot-disking and more practical.

## 5. ROLES OF IT VENDORS

### 5.1 APPLE

Four areas of particular attention are product and packaging design, materials, energy efficiency, and recycling. Each aspect of the design cycle provides significant challenges, yet our efforts in these areas have resulted in some impressive results.

FIG. 3: APPLE PRODUCTIVITY



#### 5.1.1 Product design:

It all begins here. Reducing the environmental impact of our products starts with the product design phase. Design dictates the quantity of raw materials as well as the type and recyclability of materials used. It also determines how much energy is consumed during manufacturing and product use. For example, the amazingly slim 20-inch iMac is made from highly recyclable glass and aluminum and it is so energy efficient it consumes about the same amount of power as a standard light bulb when on.

#### 5.1.2 Materials:

Apple helps to safeguard the environment - as well as consumers' safety - by restricting the use of environmentally harmful compounds in our materials and manufacturing processes. In addition to the substances that have already been restricted or eliminated, Apple is removing elemental forms of bromine and chlorine from our products, not just polyvinyl chloride (PVC) and brominated flame retardants (BFRs). The new MacBook family also uses mercury-free light-emitting diode (LED) displays, with arsenic-free display glass.

#### 5.1.3 Energy efficiency:

A device's greatest contribution to greenhouse gas emissions comes from its consumption of energy over time. Apple has made great strides in recent years to optimize the energy efficiency of our hardware and create tools, such as the Energy Saver feature in Mac OS X, that allow consumers to manage the power consumption of their computers. Since 2001, Apple desktop computers, portable computers, and displays have earned the ENERGY STAR rating.

#### 5.1.4 Recycling:

Apple's holistic, lifecycle approach to recycling includes using highly recyclable materials in products in addition to providing extensive take-back programs that enable consumers and businesses to safely dispose of used Apple equipment. Since our first take-back initiative began in Germany in 1994, we have instituted recycling programs in 95 percent of the countries where our products are sold - diverting over 53 million pounds of electronic equipment from landfills worldwide. Apple is on track to eliminate toxic chemicals from our products. In the 2008 Environmental Update Steve Jobs provides an overview on Apple's

progress to eliminate mercury and arsenic from displays and Brominated Flame Retardants (BFR's) and Polyvinyl Chloride (PVC) from internal components. Steve Jobs also talks about Apple's policy on climate change, steps taken to improve product energy-efficiency as well as overall recycling performance during 2007.

## 5.2 WIPRO

Wipro Limited, a leading player in Global IT and R&D services, is committed towards environmental sustainability by minimizing the usage of hazardous substances and chemicals which have potential impact on the ecology. It has joined hands with WWF India, one of the largest conservation organizations in the country, to directly deal with issues of climate change, water and waste management and bio diversity and conservation.

### 5.2.1 Green Lighting Solutions:

Complete range of Brightness Management Products for Green Buildings. Ability to integrate lighting and lighting management systems for Green Building performance standards. Role of Lighting for GREEN buildings: 17% – 20% of the overall building's energy usage. Optimize Energy Performance. High efficiency luminaries design.

FIG.4: WIPRO PORTFOLIO OF GREEN SOLUTIONS



High efficiency light sources - Compact Fluorescent Lamp, LED, etc.

1. Lighting controls
2. High efficiency control gear
3. Personalized controls through task lighting Intelligent lighting systems

### 5.2.2 Green IT Solutions Applications:

E-Freight – An innovative application for the Air Cargo industry that enables efficient, multi-format & paperless interaction between Airlines, Freight Forwarder and Customs

1. Emission Compliance Management System
2. An application developed for manufacturing companies
3. Helps them to control pollution & reduce carbon monoxide emissions

### 5.2.3 Products:

1. Wipro Green ware
2. RoHS Compliant (Restriction of Hazardous Substances)
3. Energy star certification
4. Energy Conservation mechanism in electronic components compliant with environment & safety standards and statutory regulations
5. Recyclable & degradable packing materials
6. MPR II certified radiation free monitors
7. Wipro WEEE Statement

Part of 'Quick Start Guide' shipped with all systems from factory WEEE – Waste from Electrical and Electronic Equipment

### 5.2.4 Services:

1. E-Waste Disposal Service.
2. Offering a facility to collect retired computers, laptops & servers from willing customers and to dispose them off in a responsible manner.
3. Eco-friendly Product Engineering Designs.
4. Eco-friendly Engineering Designs that are RoHS compliant & energy efficient.
5. For Telecom & Embedded solution customers.
6. With state-of-the-art labs for environmental testing.
7. Green Data Center Energy consumption & Cost are the drivers due to:
  - a. Increase in computing demand.
  - b. Changing cost dynamics.
  - c. Data Centre Life Cycle Mismatch.
  - d. Wipro's service offering – Build / upgrade into a Green Data Centre.

### 5.2.5 Manage IT Infrastructure

Optimize server operations & reduce floor footprint Implement remote monitoring for increased efficiency and improved management.

### 5.2.6 Green Testing Lab

1. Wipro has set up a hardware lab in its Sarjapur campus that will exclusively test products to confirm that they are "green" compliant. The idea is to maintain & uphold the environmental standards by the Government & Society.
2. Virtualization Of Testing.
3. Server Consolidation.

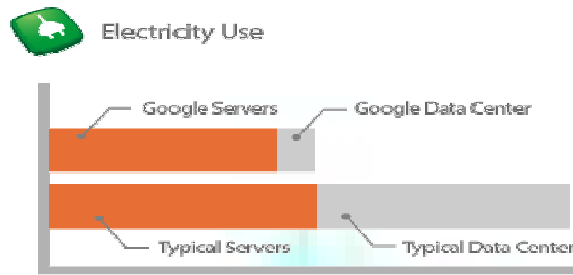
## 5.3 GOOGLE

Google's mission is to organize the world's information and make it universally accessible and useful. Hundreds of millions of users access our services through the web, and supporting this traffic requires lots of computers. We strive to offer great internet services while taking our energy use very seriously. That's why, almost a decade ago; we started our efforts to make our computing infrastructure as sustainable as possible. Today we are operating what we believe to be the world's most efficient data centers.

The graph below shows that our Google-designed data centers use considerably less energy - both for the servers and the facility itself - than a typical data center. As a result, the energy used per Google search is minimal. In fact, in the time it takes to do a Google search, your own personal computer will use more energy than we will use to answer your query.

But sustainability is about more than electricity, so we've gone beyond just reducing our energy consumption.

FIG.5: GOOGLE ELECTRICITY USE



Before the end of 2008 two of our facilities will run on 100% recycled water, and by 2010 we expect recycled water to provide 80% of our total water consumption. We also carefully manage the retirement of our servers to ensure that 100% of this material is either reused or recycled. Finally, we are engaging our users and peers to help build a clean and efficient energy future. This broader impact could be significant; if all data centers operated at the same efficiency as ours, the U.S. alone would save enough electricity to power every household within the city limits of Atlanta, Los Angeles, Chicago, and Washington, D.C. Sustainability is good for the environment, but it makes good business sense too. Most of our work is focused on saving resources such as electricity and water and, more often than not, we find that these actions lead to reduced operating costs. Being "green" is essential to keeping our business competitive. It is this economic advantage that makes our efforts truly sustainable.

#### 5.3.1 Google's five step plan:

1. Minimize electricity used by servers.
2. Reduce the energy used by the data center facilities themselves.
3. Conserve precious fresh water by using recycled water instead.
4. Reuse or recycle all electronic equipment that leaves our data centers.
5. Engage with our peers to advance smarter energy practices.

#### 5.4 VIA

VIA Technologies, a Taiwanese company that manufactures motherboard chipsets, CPUs, and other computer hardware, introduced its initiative for "green computing" in 2001. With this green vision, the company has been focusing on power efficiency throughout the design and manufacturing process of its products. Its environmentally friendly products are manufactured using a range of clean-computing strategies, and the company is striving to educate markets on the benefits of green computing for the sake of the environment, as well as productivity and overall user experience.

#### 5.4.1 Carbon-free computing:

One of the VIA Technologies' ideas is to reduce the "carbon footprint" of users — the amount of greenhouse gases produced, measured in units of carbon dioxide (CO<sub>2</sub>) VIA aims to offer the world's first PC products certified carbon free, taking responsibility for the amounts of CO<sub>2</sub> they emit. The company works with environmental experts to calculate the electricity used by the device over its lifetime, generally three years.

#### 5.4.2 Solar computing:

Amid the international race toward alternative-energy sources, VIA is setting its eyes on the sun, and the company's Solar Computing initiative is a significant part of its green-computing projects. For that purpose, VIA partnered with Motech Industries, one of the largest producers of solar cells worldwide. Solar cells fit VIA are power-efficient silicon, platform, and system technologies and enable the company to develop fully solar-powered devices that are nonpolluting, silent, and highly reliable. Solar cells require very little maintenance throughout their lifetime, and once initial installation costs are covered, they provide energy at virtually no cost. Worldwide production of solar cells has increased rapidly over the last few years; and as more governments begin to recognize the benefits of solar power, and the development of photovoltaic technologies goes on, costs are expected to continue to decline. As part of VIA's "pc-1" initiative, the company established the first-ever solar-powered cyber community center in the South Pacific, powered entirely by solar technology.

#### 5.4.3 Lead-Free and RoHS computing:

In February 2003, the European Union adopted the Restriction of Hazardous Substances Directive (RoHS). The legislation restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. The directive is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE), which sets collection, recycling, and recovery targets for electrical goods and is part of a legislative initiative that aims to reduce the huge amounts of toxic e-waste. Driven by these directives, VIA implemented a set of internal regulations in order to develop products that are compliant with these accepted policies, including the use of nonhazardous materials in its production of chipsets, processors, and companion chips. In 2001, they focused on lead-free manufacturing, introducing the Enhanced Ball Grid Array (EBGA) package for power efficient VIA processors and the Heat Sink Ball Grid Array (HSBGA) package for their chipsets. In traditional manufacturing processes, lead is used to attach the silicon core to the inside of the package and to facilitate integration onto the motherboard through tiny solder balls on the underside of the package. VIA's lead-free manufacturing technologies do not require a lead bead, and the solder balls now consist of a tin, silver, and copper composite

#### 5.5 IBM

FIG.6. IBM SOLAR ENERGY PLANT



In May 2007, IBM unveiled Project Big Green -- a re-direction of \$1 billion USD per year across its businesses to increase energy efficiency. New products and services are expected to reduce data center energy consumption and transform clients' technology infrastructure into "green" data centers, with energy savings of approximately 42 percent for an average data center. As part of Project Big Green, IBM is building an \$86 million green data center expansion at its Boulder, Colorado location and will consolidate nearly 4,000 computer servers in six locations worldwide onto about 30 refrigerator-sized mainframes running the Linux operating system.

## 6. GREEN COMPUTING TIPS

1. Use LCD monitors instead of CRT monitors, which consume a lot more electricity. LCD monitors use three times less when active, and ten times less energy when in sleep mode.
2. Use laptops instead of desktop computers, also cuts down on energy usage. The Everex Step Note NC1501 is touted as the world's most energy efficient notebook computer, using only 12W peak power. By comparison, a desktop model uses 200-400 watts.
3. If a laptop is not feasible, look for the Energy Star label when purchasing a computer. New US government regulations make this more important than it's been for the past fifteen years.
4. Disable your screen saver. Burn-in is not an issue with modern monitors, and screen savers can prevent your monitor and computer from going into idle/sleep mode.
5. Enable the power management features on your computer, to turn off components such as the monitor, fans and hard drive when idle. On Windows, go to Control Panel / Power Options. On OS X, go to System Preferences / Energy Saver.
6. Switch off the monitor, printer, scanner and other peripherals when not in use.
7. Don't check your email on a PC as far as possible -- use a mobile device.
8. Never leave your PC switched on at the wall, or on standby.
9. Take that CRT monitor to the recycling centre. Always switch off speakers, modem, monitor at the wall socket if not using.
10. Use natural ventilation in the computer room.
11. Only connect to the internet when you know you will use the connection.
12. Get all family members to log on to the WiFi network at the same time.
13. Consider buying a newer, more energy efficient computer or low power notebook.
14. Surfaces where they only have a single WiFi modem.
15. Use blade servers that run very low temperature chips to save cooling.
16. Tell employees to switch everything off at night.
17. Use smart thermostats in the server room to save cost.
18. Use low power thin client PCs that use on-demand applications.
19. Switch to LCD screens to cut power usage.
20. Only buy Green label PCs and hardware that can be completely recycled.
21. Recycle all internal paper, and reprint on the back of used single side waste.

## 7. FUTURE (is Green) ENHANCEMENTS

India Inc is already facing an energy crisis. Today most large Data Centers (DC) consume 10-100 times more energy per square foot than a typical office building and most of these data centers have become chillers (over cooled), which again eats into power needed to cool them. Now, emerging high density computer systems and consolidation of IT resources into fewer DCs are stretching the limits. That is why one would witness that DCs are evolving at a faster rate due to which customers have to modify or redesign their DC every five years. Customers are looking for solutions that adapt to the changing needs of the data center without needing additional investment. The existing scenario for DC includes reviewing installed power sources and finding any technical solutions that can reduce the energy demand. For DCs that are in the design stage, it is vital to provision for such devices, or to use the latest power conditioning equipment. One should not go only by the specifications; it is a good idea to measure the power output from a sample device and monitor it. A deep study on the efficiency of the devices being used can prove helpful. Even a one or two percent drop in power consumption can result in substantial cost savings in the long run. It is this scenario that is forcing many IT departments to evaluate their DC power consumption and find ways to become more energy-efficient. In today's 24x7 world of information availability, on-demand services, and round-the-clock commerce sites, companies increasingly are adding high-performance servers, storage and other equipment to their data centers to satisfy user and customer demand. As a result, companies find that they need more and more power to run and cool this equipment. At the same time, the cost of electricity is on the rise. Many companies are trying to be good corporate citizens by becoming green (or at least greener).

Large DCs are looking at pocketing more green into their pocket. It is primarily because they want to minimize the risk in the DC as heat generation goes higher, leading to greater power consumption. So DCs need to go in for optimization of power as well as cooling. There is a strong possibility that organizations will look at green technologies to reduce their data center costs without even knowing it and that because most of the bigger and multiple

One thing that each and every DC manager agrees upon is that power and cooling are the two important factors required for the smooth functioning of a DC. Data center power and cooling go hand-in-hand. And it will be right to say that based on the requirement per rack, the cooling and power management must be designed at the rack level to avoid any wastage of energy within a data center. Today cooling contributes nearly 35 to 40% of total DC energy consumption and if we see the distribution of IT servers within a rack in a data center, we will find that the loads are unequally distributed. This means that there may be a few racks that generate 3/4 kW to 15 kW per rack of heat load. The racks with more than 10 kW load are the extreme density racks and are required to be cooled for reliability within the DC. Since the temperature in the room is not evenly distributed, it needs supplemental cooling at the source where the heat is being generated. Several trends are driving up DC power requirements significantly. First, most companies need more computing power to run their Web sites and business and financial applications, for which servers often must run round-the-clock. Second, newer computers use higher performing processors that consume more electricity. And third, there is a trend to physically consolidate servers by moving to high-density rack and blade servers, packing more processing power into smaller spaces within data centers. It has been noted that up to 40% of the operating costs of a building that houses a DC could be power- and cooling-related expenses. If nothing changes, power and cooling issues (and costs) are likely to get worse in the future. That's because the price of electricity is expected to rise, and many newer systems are expected to require more power. Faced with growing power consumption requirements to run and cool DC equipment, companies are looking for ways to reduce electrical usage and costs. To figure out where to focus attention on energy, one must understand what contributes to power consumption.

DCs are very different today than they were a few years ago. Equipment that used to fill an entire room is now contained in a single rack, concentrating extreme power and heat densities--a situation that must be addressed to assure reliability. This has caused a shift in focus from "Watt per square foot" to "KW per rack" when creating cooling solutions. The DCs are expected to operate at a maximum of 125 watts per square foot and a significant amount of cost and energy is spent in order to keep these solutions up and running 24x7.

To meet the requirements and limitations on power and cooling for each data center, it is important to consider the thermal footprint of each DC or server room by figuring how much critical load can you power; how much can you cool before you start to have problems like downtime or failure; and how much computing capacity you need vs. power/cooling capacity you can not exceed before you incur the expense of overhauling the data center. Unfortunately, many data centers are now stuck in a heat loop. Creating heat by powering cooling to offset heat dissipated by servers entails creating new heat to get rid of existing heat. This is a problem irrespective of the platform being used be it rack, tower, blade; all data centers have to address it. In fact, a Google engineer warned that, if the performance per watt of today's computers does not improve, the electrical costs of running them could end up exceeding the initial hardware price tag.

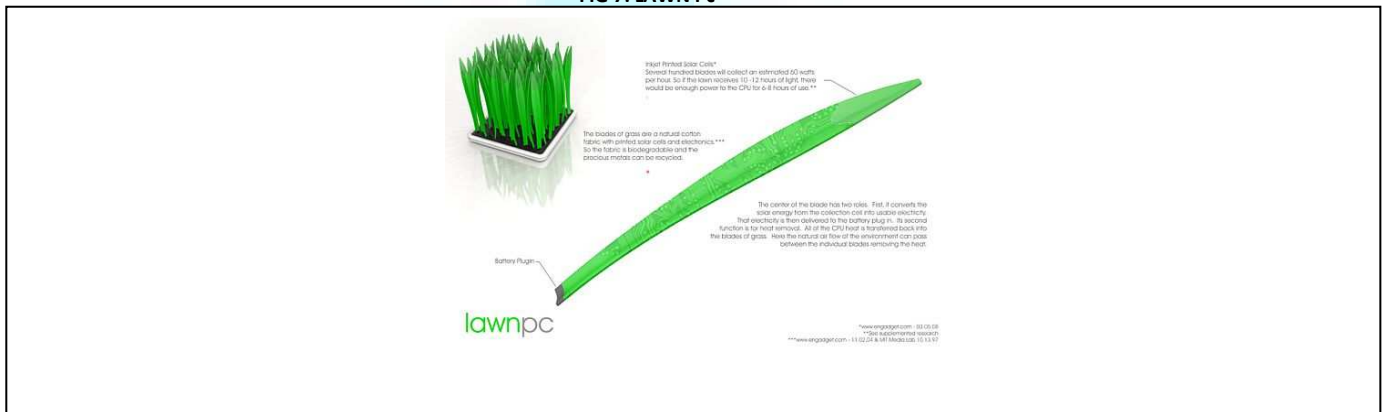
Today many a large DC is looking at including liquid cooling as an option as many companies are running out of room to ventilate racks. The next step is to put liquid cooling next to the rack. Improved energy efficiency is just one of the many benefits that this technology brings to the table and it's a lot easier to pump liquid, than air, to where it's needed. Liquid cooling is not new; it's been used from the days of the mainframe. Mainframes generated a lot of heat. So much so that it was too much for air cooling to handle. Air cooling is not as effective as liquid cooling for the same volume. As computers and servers become smaller and their density goes up, at some point we will not be able to cool data center racks with air anymore. They will have to be cooled with liquid directly. That's what happened in the case of the mainframes where vendors were forced to resort to liquid cooling. A migration from air to direct liquid cooling is being used to address surging DC energy costs and allow the power densities of servers to continue to increase into the next decade. Some DC managers may not fully grasp the problem, because over the past eight years, server performance has increased by a factor of 75 while performance per watt of power has increased 16 times and the data centers are using more number of processors than ever. Meanwhile, the power density of equipment has increased to the point where power and cooling plays a critical role. That creates two problems. First, energy costs are spiraling upward. Many DC managers don't see that today, because their power use isn't metered separately and isn't part of the IT budget. There is no hard and fast rule as to which technology to use to optimize DC. What is important is to undertake a full exercise to see the hot zones and chill zone and then use appropriate technologies to reduce the operational cost of DC.

### 7.1 Lawn PC

Technology isn't always on the same page with sustainability. Still when green innovation transforms the trajectory, even we find ourselves inclining towards the novelty. Such is the LawnPC, which visions to transform computing in the near future. The concept PC from David Veldkamp is powered by the solar cells attached to the grass like lawn on the PC, made from natural cotton fabric these blades transfer the generated 60 watts of energy down to the plug-in button at the bottom each blade. The concept requires no cooling fans, just put it where natural light and air are readily available and then leave rest on this wirelessly functional device that'll give you the cleanest computing all the time.

Renewable energy is the need of the hour and the form in which it has been used here is simply stunning. 60 Watts of solar energy per hour gets a thumb up from our side. Geeks like us on that side wouldn't be satisfied with the concept we know, but then guys, just give Designer David Veldkamp the breather to have initiated in making something with a likely future.

FIG 7. LAWN Pc



## 8. CONCLUSION

Green Computing is on the radar screens of CIOs, but its not primarily motivated by eco-friendliness," says Jim Noble, CIO of Altria, parent company of Philip Morris and Kraft Foods. "The primary motivation is technology's cost". The good news for Mother Earth is that there are a lot of money-saving, eco-friendly steps just waiting for IT execs to take.

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5. <http://www.computeruser.com/articles/view/d27d8d1be45167c9af38a434a81e7496>
6. <http://www.expresscomputeronline.com/20080428/datacentrespecial02.shtml>
7. [www.wipro.in/Products/greenpc/index.htm](http://www.wipro.in/Products/greenpc/index.htm)
8. [www.google.com/corporate/datacenters/](http://www.google.com/corporate/datacenters/)



## EFFECTIVE DYNAMIC ROUTING PROTOCOL: ANALYSIS OF VARIOUS SECURE DATA ROUTING PROTOCOL AND DATA AGGREGATION IN WIRELESS SENSOR NETWORKS

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### ABSTRACT

In wireless sensor networks, adversaries can inject false data reports via compromised nodes and launch DoS attacks against legitimate reports. Recently, a number of filtering schemes against false reports have been proposed. However, they either lack strong filtering capacity or cannot support highly dynamic sensor networks very well. Moreover, few of them can deal with DoS attacks simultaneously. In this paper, we propose a dynamic en-route filtering scheme that addresses both false report injection and DoS attacks in wireless sensor networks. In our scheme, each node has a hash chain of authentication keys used to endorse reports; meanwhile, a legitimate report should be authenticated by a certain number of nodes. First, each node disseminates its key to forwarding nodes. Then, after sending reports, the sending nodes disclose their keys, allowing the forwarding nodes to verify their reports. We design the Hill Climbing key dissemination approach that ensures the nodes closer to data sources have stronger filtering capacity. Moreover, we exploit the broadcast property of wireless communication to defeat DoS attacks and adopt multipath routing to deal with the topology changes of sensor networks. Simulation results show that compared to existing solutions, our scheme can drop false reports earlier with a lower memory requirement, especially in highly dynamic sensor networks.

### KEYWORDS

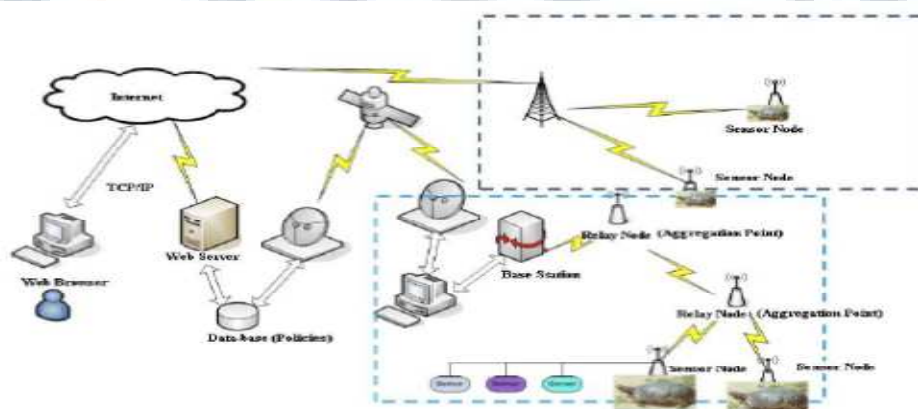
Wireless Sensor Network, Security Routing protocol, Intrusion Detection System (IDS), Data Authenticity and Attacks on sensor network.

### 1. INTRODUCTION

Wireless Sensor Networks (WSNs) are homogeneous or heterogeneous systems consist of many small devices, called sensor nodes, that monitoring different environments in cooperative; i.e. sensor nodes cooperate to each other and compose their local data to reach a global view of the operational environment; they also can operate autonomously. In WSNs there are two other components, called "aggregation points" (i.e. cluster-heads and CIDSs' deployment locations) and "base stations" (i.e. central server and the WSNIDS's deployment location), which have more powerful resources and capabilities than normal sensor nodes. As shown in Figure1, aggregation points collect information from their nearby sensors, integrate and aggregate them and then forward to the base stations to process gathered data. In these large sensor network systems, we need nodes to be able to locate themselves in various environments, and on different distance scales. This problem, which we refer to as localization<sup>1</sup>, is a challenging one, and yet extremely crucial for many applications of very large networks of devices. For example, localization opens up new ways of reducing power consumed in multi-hop wireless networks. In context-aware applications, localization enables the intelligent selection of appropriate devices, and may support useful coordination among devices. The desired granularity of localization is itself application dependent. GPS solves the problem of localization in outdoor environments for PC class nodes. However, for large networks of very small, cheap and low power devices, practical considerations such as size, form factor, cost and power constraints of the nodes preclude the use of GPS on all nodes.

In this paper, we address the problem of localization for such devices, with the following design goals. RF-based: We focus on small nodes which have some kind of short-range radio frequency (RF) transceiver. Our primary goal is to leverage this radio for localization, thereby eliminating the cost, power and size requirements of a GPS receiver. Receiver based: In order to scale well to large distributed networks, the responsibility for localization must lie with the receiver node that needs to be localized and not with the reference points. Adhoc: In order to ease deployment, we desire a solution that does not require pre-planning, extensive infrastructure. Responsiveness: We need to be able to localize within a fairly low response time. Low Energy: Small, un-tethered nodes have modest processing capabilities, and limited energy resources. If a device uses all of its energy localizing itself, it will have none left to perform its task. Therefore, we desire to minimize computation and message costs to reduce power consumption. Adaptive Fidelity: In addition, we want the accuracy of our localization algorithms to be adaptive to the granularity of available reference points.

FIG.1: WSNS' COMMUNICATION ARCHITECTURE

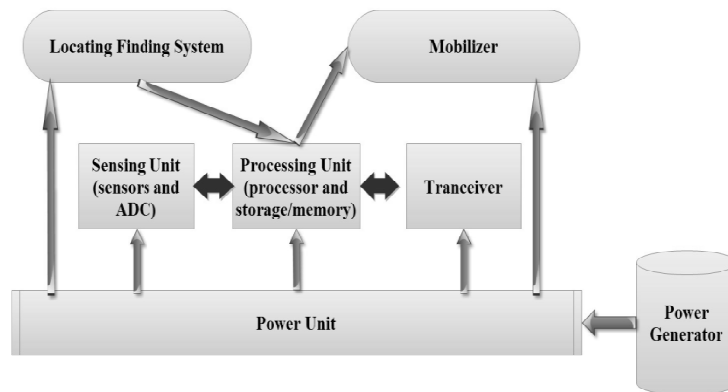


**A. WSNs characteristics**

A WSN is a homogenous or heterogeneous system consisting of hundreds or thousands of low-cost and low-power tiny sensors to monitor and gather real-time information from deployment environment. Common functionalities of WSNs' nodes are broadcasting and multicasting, routing, forwarding and route maintenance. The sensor's components are: sensor unit, processing unit, memory unit, power supply unit and wireless radio transceiver; these units are communicating to each other, as shown in Figure2. Some of most important characteristics of these networks are:

- Wireless and weak connections
- Low reliability of sensor nodes;
- Dynamic topology and self-organization (unpredictable WSN's topology);
- Ad-hoc based networks and hop-by-hop communications (multi-hop routing);
- Open/hostile nature of deployment environment
- Inter-nodes broadcast-nature communications
- Ease of extendibility (scalability);
- Direct communication, contact and interaction with physical environment

**FIG.2: WSN'S NODE ARCHITECTURE**



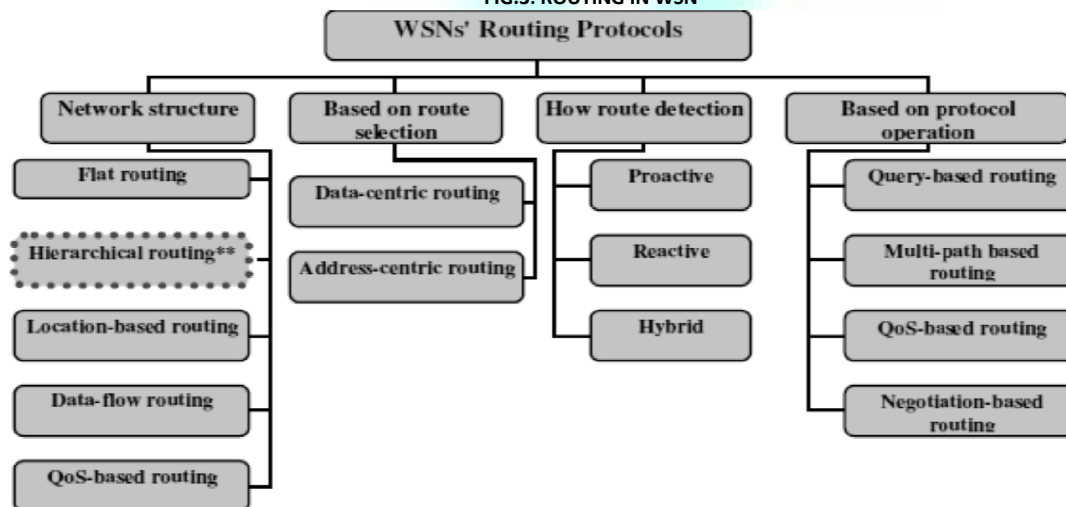
**2. ROUTING IN WSNs**

**A. Effective parameters on designing WSNs' routing protocols**

Some of most important desirable criteria in designing WSNs' routing protocols are:

- WSNs' variable and different configurations and dynamic topology
- Different addressing design
- Method of sensor nodes' deployment on the WSN
- Amount of energy consumption/waste
- The most important issue in designing WSNs' different protocols, like routing protocols, is the cost of energy consumption factor. On WSNs, each node usually consumes energy to measure the goal parameter (gather information), transmit and process the raw data. But, the step of data transmission consumes more energy than others.
- Used data transmission and reporting method this is including following models; i.e. time-driven model, event-driven model, query-driven model and combinational model
- Data aggregation In attending to the most energy consumption step of the WSN's processes is data transmission, protocols designers usually try to using data aggregation and processing, compression, compaction and combination techniques to decrease the volume of sent data
- Consistency with operating environment
- Matching with communication channel frequency and transmission media;
- Fairness

**FIG.3: ROUTING IN WSN**



**3. SCHEMES OF LOCALIZATION**

Many existing systems and protocols attempt to solve the problem of determining a node's location within its environment. The approaches taken to solve this localization problem differ in the assumptions that they make about their respective network and device capabilities. These include assumptions on device hardware, signal propagation models, timing and energy requirements, network makeup (homogeneous vs. heterogeneous), the nature of the environment (indoor vs. outdoor), node or beacon density, time synchronization of devices, communication costs, error requirements, and device mobility. In

this section, we discuss prior work in localization with regard to these network characteristics, device restrictions, and application requirements. We divide our discussion into two subsections where we present both range-based and range free solutions.

#### A. RANGE-BASED LOCALIZATION SCHEMES

Time of Arrival (TOA) technology is commonly used as a means of obtaining range information via signal propagation time. The most basic localization system to use TOA techniques is GPS. GPS systems require expensive and energy-consuming electronics to precisely synchronize with a satellite's clock. With hardware limitations and the inherent energy constraints of sensor network devices, GPS and other TOA technology present a costly solution for localization in wireless sensor networks. The Time Difference of Arrival (TDOA) technique for ranging (estimating the distance between two communicating nodes) has been widely proposed as a necessary ingredient in localization solutions for wireless sensor networks. While many infrastructure-based systems have been proposed that use TDOA, additional work such as AHLoS has employed such technology in infrastructure-free sensor networks.

Like TOA technology, TDOA also relies on extensive hardware that is expensive and energy consuming, making it less suitable for low-power sensor network devices. In addition, TDOA techniques using ultrasound require dense deployment as ultrasound signals usually only propagate 20-30 feet. To augment and complement TDOA and TOA technologies, an Angle of Arrival (AOA) technique has been proposed that allows nodes to estimate and map relative angles between neighbors. Similar to TOA and TDOA, AOA estimates require additional hardware too expensive to be used in large scale sensor networks. Received Signal Strength Indicator (RSSI) technology such as RADAR and Spot On has been proposed for hardware constrained systems. In RSSI techniques, either theoretical or empirical models are used to translate signal strength into distance estimates. For RF systems, problems such as multi-path fading, background interference, and irregular signal propagation characteristic make range estimates inaccurate. Work to mitigate such errors such as robust range estimation, two-phase refinement positioning, and parameter calibration have been proposed to take advantage of averaging, smoothing, and alternate hybrid techniques to reduce error to within some acceptable limit. While solutions based on RSSI have demonstrated efficacy in simulation and in a controlled laboratory environment, the premise that distance can be determined based on signal strength, propagation patterns, and fading models remains questionable, creating a demand for alternate localization solutions that work independent of this assumption.

#### B. RANGE-FREE LOCALIZATION SCHEMES

In sensor networks and other distributed systems, errors can often be masked through fault tolerance, redundancy, aggregation, or by other means. Depending on the behavior and requirements of protocols using location information, varying granularities of error may be appropriate from system to system. Acknowledging that the cost of hardware required by range-based solutions maybe inappropriate in relation to the required location precision, researchers have sought alternate range-free solutions to the localization problem in sensor networks. In a heterogeneous network containing powerful nodes with established location information is considered. In this work, anchors beacon their position to neighbors that keep an account of all received beacons. Using this proximity information, a simple Centro id model is applied to estimate the listening nodes' location. We refer to this protocol as the Centro id algorithm. An alternate solution, DV-HOP assumes a heterogeneous network consisting of sensing nodes and anchors. Instead of single hop broadcasts, anchors flood their location throughout the network maintaining a running hop-count at each node along the way. Nodes calculate their position based on the received anchor locations, the hop-count from the corresponding anchor and the average-distance per hop; a value obtained through anchor communication. Like DV-Hop, an Amorphous Positioning algorithm proposed in uses offline hop-distance estimations, improving location estimates through neighbor information exchange. These range-free techniques are described in more depth in section 4, and are used in our analysis for comparison with our work.

#### C. APIT LOCALIZATION SCHEME

In this section, we describe our novel area-based range-free localization scheme, which we call APIT. APIT requires a heterogeneous network of sensing devices where a small percentage of these devices (percentages vary depending on network and node density) are equipped with high-powered transmitters and location information obtained via GPS or some other mechanism. We refer to these location-equipped devices as anchors. Using beacons from these anchors, APIT employs a novel *area-based* approach to perform location estimation by isolating the environment into triangular regions between beaconing nodes (Figure 1). A node's presence inside or outside of these triangular regions allows a node to narrow down the area in which it can potentially reside. By utilizing combinations of anchor positions, the diameter of the estimated area in which a node resides can be reduced, to provide a good location estimate.

## 4. SECURITY ISSUES AND GOALS

### A. DATA CONFIDENTIALITY

Confidentiality means keeping information secret from unauthorized parties. A sensor network should not leak sensor readings to neighboring networks. In many applications (e.g. key distribution) nodes communicate highly sensitive data. The standard approach for keeping sensitive data secret is to encrypt the data with a secret key that only intended receivers possess, hence achieving confidentiality. Since public-key cryptography is too expensive to be used in the resource constrained sensor networks, most of the proposed protocols use symmetric key encryption methods. The creators of tiny Sec argue that cipher block chaining (CBC) is the most appropriate encryption scheme for sensor networks. They found RC5 and Skipjack to be most appropriate for software implementation on embedded microcontrollers. The default block cipher in tiny Sec is Skipjack. SPINS uses RC6 as its cipher.

### B. DATA AUTHENTICITY

In a sensor network, an adversary can easily inject messages, so the receiver needs to make sure that the data used in any decision-making process originates from the correct source. Data authentication prevents unauthorized parties from participating in the network and legitimate nodes should be able to detect messages from unauthorized nodes and reject them. In the two-party communication case, data authentication can be achieved through a purely symmetric mechanism: The sender and the receiver share a secret key to compute a message authentication code (MAC) of all communicated data. When a message with a correct MAC arrives, the receiver knows that it must have been sent by the sender. However, authentication for broadcast messages requires stronger trust assumptions on the network nodes. The creators of SPINS contend that if one sender wants to send authentic data to mutually trusted receivers, using a symmetric MAC is insecure since any one of the receivers know the MAC key, and hence could impersonate the sender and forge messages to other receivers. SPINS constructs authenticated broadcast from symmetric primitives, but introduces asymmetry with delayed key disclosure and one-way function key chains. LEAP uses a globally shared symmetric key for broadcast messages to the whole group. However, since the group key is shared among all the nodes in the network, an efficient rekeying mechanism is defined for updating this key after a compromised node is revoked. This means that LEAP has also defined an efficient mechanism to verify whether a node has been compromised.

### C. DATA INTEGRITY

Data integrity ensures the receiver that the received data is not altered in transit by an adversary. Note that Data Authentication can provide Data Integrity also.

### D. DATA FRESHNESS

Data freshness implies that the data is recent, and it ensures that an adversary has not replayed old messages. A common defense is to include a monotonically increasing counter with every message and reject messages with old counter values. With this policy, every recipient must maintain a table of the last value from every sender it receives. Some Researchers contend that protection against the replay of data packets should be provided at the application layer and not by a secure routing protocol as only the application can fully and accurately detect the replay of data packets (as opposed to retransmissions, for example). Whereas some authors reason that by using information about the network's topology and communication patterns, the application and routing layers can properly and efficiently manage a limited amount of memory devoted to replay detection. Mostly Researchers have identified two types of freshness: weak freshness, which provides partial message ordering, but carries no delay information, and strong freshness, which provides a total order on a request-response pair, and allows for delay estimation. Weak freshness is required by sensor measurements, while strong freshness is useful foretime synchronization within the network.

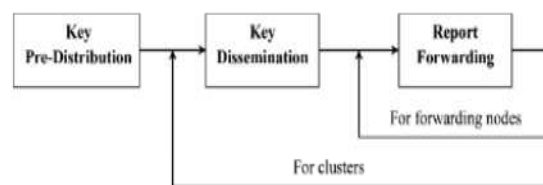
**E. ROBUSTNESS AND SURVIVABILITY**

The sensor network should be robust against various security attacks, and if an attack succeeds, its impact should be minimized. The compromise of a single node should not break the security of the entire network.

**5. OVERVIEW OF THE WORK**

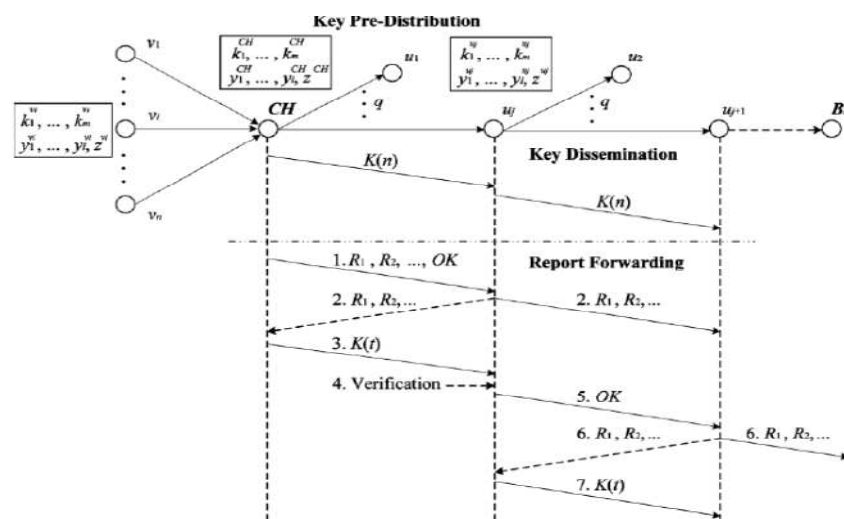
When an event occurs within some cluster, the cluster-head collects the sensing reports from sensing nodes and aggregates them into the aggregated reports. Then, it forwards the aggregated reports to the base station through forwarding nodes. In our scheme, each sensing report contains one MAC that is produced by a sensing node using its authentication key (called auth-key for short), while each aggregated report contains distinct MACs, where is the maximum number of compromised nodes allowed in each cluster. In our scheme, each node possesses a sequence of auth-keys that form a hash chain. Before sending the reports, the cluster-head disseminates the first auth-keys of all nodes to the forwarding nodes that are located on multiple paths from the cluster-head to the base station. The reports are organized into rounds, each containing a fixed number of reports. In every round, each sensing node chooses a new auth-key to authenticate its reports. The processes of verification, overhearing, and key disclosure are repeated by the forwarding nodes at every hop until the reports are dropped or delivered to the base station. Specifically, our scheme can be divided into three phases: key pre distribution phase, key dissemination phase, and report forwarding phase. In the key pre distribution phase, each node is preloaded with a distinct seed key from which it can generate a hash chain of its auth-keys. In the key dissemination phase, the cluster-head disseminates each node's first auth-key to the forwarding nodes, which will be able to filter false reports later. In the report forwarding phase, each forwarding node verifies the reports using the disclosed auth-keys and disseminated ones. If the reports are valid, the forwarding node discloses the auth-keys to its next-hop node after overhearing that node's broadcast. Otherwise, it informs the next-hop node to drop the invalid reports. This process is repeated by every forwarding node until the reports are dropped or delivered to the base station.

**FIG.4: THE RELATIONSHIP BETWEEN THREE PHASES OF OUR SCHEME**



Key pre distribution is performed before the nodes are deployed, e.g., it can be done offline. Key dissemination happens before the sensing nodes begin to send the reports. It may be executed periodically depending on how often the topology is changed. Every time the latest (unused) auth-key of sensing nodes will be disseminated. Report forwarding occurs at each forwarding node in every round.

**FIG.5: THE DETAILED PROCEDURE OF THREE PHASES**



In the key pre distribution phase, each node is preloaded with  $l+1$  secret keys  $y_1, \dots, y_n$  and  $z$ , and can generate a hash chain of auth-keys  $k_1, \dots, k_n$  from the seed key  $k_m$ . In the key dissemination phase, the cluster-head disseminates the auth-keys of all nodes by message  $k(n)$  to  $q$  downstream neighbor nodes. Every downstream node decrypts some auth-keys from  $k(n)$ , and further forwards  $K(n)$  to  $q$  more downstream neighbor nodes, which then repeat the same operation. In the report forwarding phase, each forwarding node en-route performs the following steps: 1) It receives the reports from its upstream node. 2) If it receives confirmation message OK then forwards the reports to its next-hop node. Otherwise, it discards the reports. 3) It receives the disclosed auth-keys within message  $k(t)$  and verifies the reports by using the disclosed keys. 4) It informs its next-hop node the verification result.

**6. THE PROPOSED INTRUSION DETECTION ARCHITECTURE (IDA) FOR WIRELESS SENSOR NETWORKS**

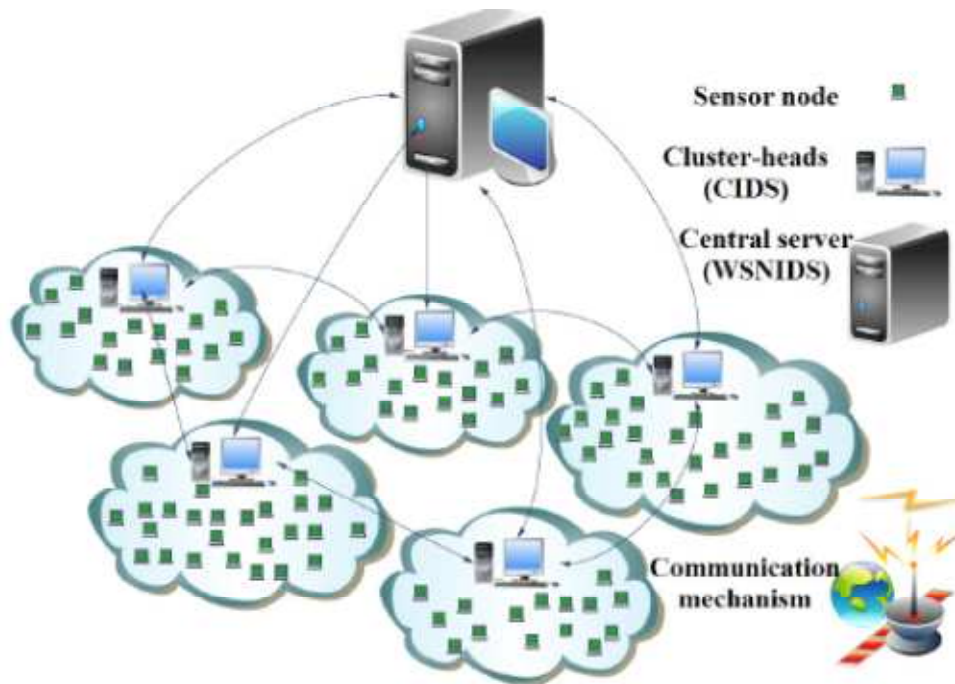
As Figure 6 is showing, the suggestion architecture has a combinational (distributed and centralized) and hierarchical structure; thus, the proposed approach can be used in 1 or 2 levels of IDSs:

**A. Cluster-based Intrusion Detection System (CIDS)**

CIDS place on the low level of the proposed architecture (according to the Figure 6); i.e. they install and deploy on the heterogeneous cluster-heads. There is a cluster-head per each cluster of sensor nodes which it covers its radio range nodes; so, the intrusion detection process does by cluster-heads. There is a small and low-size policy-base (Cluster-Based Policy Base: CBPB) on each cluster-head that includes the most common patterns of attacks on this domain, along with special and limited preprocessing capabilities such as requirement data field extraction from the network packets and packets filtering. If an attack detects, according to the predefined action in policy and corresponding security rule, the IDS is responding to it. In this level, decision making does in combinational; so, if the current traffic be from the internal of the cluster, the appropriate decision takes autonomously and independently; also, if the current traffic be from the

boundary nodes (between different adjacent clusters), the collector be selected and then, the collector enforces the majority rule to takes the final decision; finally, if the current traffic not be about an intrusion or the collector can not take a decision (if the majority rule be inefficient), for more consideration, that traffic labeled (for example, rely on the attack estimation severity by current node) and will forward to the central server (centralized-cooperative decision making by CIDSs and WSNIDS).

FIG.6: THE PROPOSED INTRUSION DETECTION ARCHITECTURE (IDA) FOR WSN



## 7. SIMULATION RESULTS

In summary, simulation results show that our scheme has the following advantages when compared with others:

- 1) Our scheme drops false reports earlier even with a lower memory requirement. In some scenario, it can drop false reports in 6 hops with only 25 keys stored in each node, but another scheme needs 12 hops even with 50 keys stored.
- 2) Our scheme can better deal with the dynamic topology of sensor networks.
- It achieves a higher filtering capacity and filters out more false reports than others in dynamic net - work.
- 3) Hill Climbing increases the filtering capacity of our scheme greatly and balances the memory requirement among sensor nodes.

## 8. CONCLUSION

In this paper, we propose a dynamic en-route quarantine scheme for filtering false data injection attacks and DoS attacks in wireless sensor networks. In our scheme, each node uses its own auth-keys to authenticate their reports and a legitimate report should be endorsed by nodes. The auth-keys of each node form a hash chain and are updated in each round. Secure routing is vital to the acceptance and use of sensor networks for many applications, but we have demonstrated that currently proposed routing protocols for these networks are insecure. We leave it as an open problem to design a sensor network routing protocol that satisfies our proposed security goals. Link layer encryption and authentication mechanisms may be a reasonable first approximation for defense against mote-class outsiders, but cryptography alone is not enough. The possible presence of laptop-class adversaries and insiders and the limited applicability of end-to-end security mechanisms necessitate careful protocol design as well. The cluster-head disseminates the first auth-key of every node to forwarding nodes and then sends the reports followed by disclosed auth-keys. The forwarding nodes verify the authenticity of the disclosed keys by hashing the disseminated keys and then check the integrity and validity of the reports using the disclosed keys. According to the verification results, they inform the next-hop nodes to either drop or keep on forwarding the reports. This process is repeated by each forwarding node at every hop.

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**HEAT TRANSFER ENHANCEMENT IN AIR CONDITIONING SYSTEM USING NANOFUIDS****R. REJI KUMAR****LECTURER****SCHOOL OF MECHANICAL & INDUSTRIAL ENGINEERING****BAHIR DAR UNIVERSITY****BAHIR DAR****M. NARASIMHA****LECTURER****SCHOOL OF MECHANICAL & INDUSTRIAL ENGINEERING****BAHIR DAR UNIVERSITY****BAHIR DAR****K. SRIDHAR****LECTURER****SCHOOL OF MECHANICAL & INDUSTRIAL ENGINEERING****BAHIR DAR UNIVERSITY****BAHIR DAR****ABSTRACT**

The experimental apparatus was build according to the National Standards of India. For providing comfort condition, the air conditioning system uses refrigerant for heat transfer. The performance of the air conditioning system depends upon the heat transfer capacity of the refrigerant. Normally R12, R22 are used as a refrigerant. This refrigerant heat transfer capacity is not so good and increase power consumption. Due to these limitation nanofluids are enhanced with the normal refrigerant and increases the heat transfer capacity and reduces the power consumption. Titanium dioxide nanofluid is used for enhancing the heat transfer capacity of the refrigerant in the air conditioning System. In this experiment heat transfer enhancement was investigated numerically on the surface of a air conditioner by using  $TiO_2$ -R22 refrigerants where nanofluids could be a significant factor in maintaining the surface temperature within a required range. The air conditioner performance was then investigated by operating the unit continuously for 24 hours. In the case of air conditioner a series of parametric studies is presented in order to examine the effects of important parameters such as compressor suction pressure, discharge pressure and evaporation temperature. It is found that nanofluid is used to increase in thermal conductivity, improve heat transfer stability, saving of power consumption and minimal clogging. Thus using  $TiO_2$ -R22 nano-refrigerant in air conditioning system is feasible.

**KEYWORDS**

Air conditioner test rig, Nano- refrigerant,  $TiO_2$  nanoparticle, Thermal conductivity, Viscosity, R22, Heat rejection ratio, Energy consumption.

**LIST OF SYMBOLS**

Symbol	Description	Unit
<b>Nomenclature</b>		
A	Cross sectional area	$m^2$
$C_p$	Specific heat	J/Kg k
D	Diameter	m
h	Heat transfer coefficient	$w/m^2 k$
$K_m$	Thermal conductivity of base refrigerant	w/m k
$K_2$	Thermal conductivity of nanoparticle	w/m k
m	Mass flow rate	Kg/s
T	Temperature	$^{\circ}C$
v	Velocity	m/s
n	Particle shape factor	
$n_f$	Nanofluid	
<b>Greek symbols</b>		
$\nu$	Mass fraction	
$\rho_r$	Density of refrigerant	$Kg/m^3$
$\rho_p$	Density of nanoparticle	$Kg/m^3$
$\mu$	Dynamic viscosity	Kg/ms
$\psi$	Sphericity	
<b>Abbreviation</b>		
HTC	Heat transfer coefficient	
TR	Tonne of refrigeration	

## 1. INTRODUCTION

**N**ano refrigerant was proposed on the basis of the concept of the nanofluids, which was prepared by mass fraction of nanoparticles and traditional refrigerant.

The air conditioning is that branch of engineering science which deals with the study of conditioning of air is supplying and maintaining desirable internal atmospheric conditions for human comfort irrespective of external conditions. In air conditioning system the space to be cooled or heated by way of transferring heat from the place to another. Air conditioning in homes may account for up to one third of electricity use during periods in the summer when the most energy is required in large cities, according to a study carried out by Carlos III University of Madrid (UC3M) and the Consejo Superior de Investigaciones Científicas (Spanish national research Council- CSIC)[1]. Sometimes the peak electric supply cannot meet the load demands for air conditioning systems. Regarding this issue, thermal storage use secondary refrigerants of phase change materials can relieve or eliminate the peak electric power load for buildings [2-4]. In addition, also the nano-refrigerants/fluids can reduce power consumption by enhanced heat transfer characteristic. They can also relieve the issue of sedimentation, erosion, clogging and high pressure drop caused by the particles use.

## 2. LITERATURE SURVEY

Nano-refrigerant was proposed on the basis of the concept of the nanofluids, which was prepared by mixing the nanoparticles and traditional refrigerant. There were three main advantages followed for the nanoparticle used in the air conditioner.

Firstly, nanoparticles can enhance the solubility between the lubricant and the refrigerant. For example, Wang and Xie [5] found that TiO<sub>2</sub> nanoparticles could be used as additives to enhance the solubility between mineral oil and hydrofluorocarbon (HFC) refrigerant. The refrigeration systems using the mixture of R134a and mineral oil appended with nanoparticles TiO<sub>2</sub>, appeared to give better performance by returning more lubricant oil back to the compressor, and had the similar performance compared to the systems using polyol-ester (POE) and R134a.

Secondly, the thermal conductivity and heat transfer characteristics of the refrigerants should be increased, which have been approved by a lot of investigations. For instance, Jiang et al. [6] measured the thermal conductivities of CNT-R113 nano-refrigerants and found that the measured thermal conductivities of four kinds of 1.0 vol.% CNT-R113 nano-refrigerants increase 82%, 104%, 43% and 50%, respectively. Wang et al. [7] carried out an experimental study of boiling heat transfer characteristics of Al<sub>2</sub>O<sub>3</sub> nanoparticles dispersed in R22 refrigerant, and found that nanoparticles can enhance the heat transfer characteristic of the refrigerant, and the bubble size diminish and move quickly near the heat transfer surface. Wu et al. [8] investigated the pool boiling heat transfer of the R11 refrigerant mixed with nanoparticles TiO<sub>2</sub>, and the results indicated that the heat transfer enhancement reached 20% at a particle loading of 0.01 g/L. Park and Jung [9] investigated the effect of carbon nanotubes (CNTs) on nucleate boiling heat transfer of halocarbon refrigerants of R123 and R134a. Test results showed that CNTs increase nucleate boiling heat transfer coefficients for these refrigerants. Especially, large enhancement up to 36.6% was observed at low heat fluxes of less than 30 kW/m<sup>2</sup>. Peng et al. [10] found that the heat transfer coefficient of CuO-R113 was larger than that of pure refrigerant R113, and the maximum enhancement of heat transfer coefficient was 29.7%. Ding et al. [11] investigated the migrated mass of nanoparticles in the pool boiling process of both nano-refrigerant and nano-refrigerant-oil mixture, and found that the migrated mass of nanoparticles and migration ratio in the nano-refrigerant were larger than those in the nano-refrigerant-oil mixture.

Finally, nanoparticles dispersed in lubricant should decrease the friction coefficient and wear rate. Lee et al. [12] investigated the friction coefficient of the mineral oil mixed with 0.1 vol.% fullerene nanoparticles, and the results indicated that the friction coefficient decreased by 90% in comparison with raw lubricant, which lead us to the conclusion that nanoparticles can improve the efficiency and reliability of the compressor. Jwo et al. [13] carried out the performance experiment of a domestic refrigerator using hydrocarbon refrigerant and 0.1 wt.% Al<sub>2</sub>O<sub>3</sub>-mineral oil as working fluid, the results indicated that the power consumption was reduced by about 2.4%, and the coefficient of performance was increased by 4.4%.

In the previous work, the author has investigated the basic characteristics of the TiO<sub>2</sub>-R134a nano-refrigerants, including the dispersion behavior [14], thermal conductivity and flow boiling heat transfer [15,16]. The performance of a domestic refrigerator with nanoparticles added was also investigated. In the former experiment, the nanoparticles were added into the refrigeration system in two different ways. In one way the nanoparticles were added to the refrigeration system by first adding them into the lubricant to make a nanoparticle-lubricant mixture. Then, the mixtures were put into the compressor as the lubricant [17]. In the other way nanoparticles and traditional refrigerant were mixed directly to make nano-refrigerant [18]. The results of both of the ways had showed the better performance of the air conditioner with nanoparticles added.

Mono Chloro DiFluoro Methane (R22) is more widely adopted in air conditioner because of its better environmental and energy performances. In this paper, a new air conditioner test rig system was built up according to the National Standard of India. A air conditioner R22 system was selected. TiO<sub>2</sub>-R22 nano-refrigerant was prepared and used as working fluid. The energy consumption test and COP test were conducted to compare the performance of the air conditioner with nano-refrigerant and pure refrigerant so as to provide the basic data for the application of the nanoparticles in the air conditioning system.

In the project the base fluid is Difluoro mono chloro methane CHF<sub>2</sub>Cl (R22). To enhance the heat transfer rate of the above said base fluid the nanoparticle TiO<sub>2</sub> is chosen. The properties of the nanofluids are calculated by formulas. The thermo physical properties of Difluoro mono chloro methane, Titanium dioxide are tabulated and it is substituted in the formulas for finding the properties of nanofluids. In order to analyze the heat transfer rate and the power consumption of the base refrigerant and nano refrigerant were calculated by experimental methods. And also a comparative work done is done between the thermal conductivity models namely Maxwell, Hamilton, Crosser, Jeffrey, Davis, Bruggeman models.

## 3. PHYSICAL PROPERTIES OF NANOFLUIDS

### 3.1. THERMOPHYSICAL PROPERTIES OF BASE REFRIGERANT

Its numerical designation is R22 or CFC-22 or F22. It is an organic refrigerant comes under methane series. It is a derivative of saturated hydro carbons of HCFCs group. R22 is a man-made refrigerant developed for refrigeration installations that need a low evaporating temperature, as in fact freezing of -19°C to -40°C. It is used reciprocating and centrifugal compressors.

Normal boiling point	=	-40.8°C at atm pressure
Freezing point	=	-160°C
Critical Temperature	=	96°C
Critical pressure	=	49.38 bar
Evaporative Pressure	=	2.967 bar at -15°C
Condenser pressure	=	12.034 bar at 30°C
Compression ratio	=	4.05
Latent heat	=	216.5 kJ/kg at -15°C
Specific heat at con. Pressure C <sub>p</sub>	=	0.980 J/kgK
Density	=	1413 Kg/m <sup>3</sup>
Specific heat ratio (C <sub>p</sub> /C <sub>v</sub> )	=	1.16
Coefficient of performance	=	4.66
Thermal conductivity	=	0.0715 W/mK at 40°C
Viscosity	=	0.00001256 Kg/ms
Ozone depleting potential (ODP)	=	0.07
Global Warming potential (GWP)	=	1700
Atmospheric life data	=	15 years
Total phase out data	=	1 <sup>st</sup> January 2030

Assigned colour code = Light green

**Properties**

- Stable at high temperature
- Non flammable
- Non explosive
- Non irritating
- Good stability in oil
- Leaks may be easily detected

**3.2. THERMOPHYSICAL PROPERTIES OF NANOPARTICLES**

Its molecular formula is TiO<sub>2</sub>.

Melting Point	=	1843°C
Boiling Point	=	2972°C
Flash Point	=	Non flammable
Colour	=	White pigment
Density	=	4.23 kg/m <sup>3</sup> at 20°C
Specific heat at con. Pressure C <sub>p</sub> :	=	711 J/kgK
Thermal conductivity	=	11.7 w/mk
Molecular mass	=	9.9 g/mol
Specific Surface Area	=	35-65m <sup>2</sup> /g
Average Primary Particle size	=	50nm
Appearance	=	White powder
Composition	=	70% Anatase, 30% Rutile
Specific gravity	=	4.26

**PROPERTIES**

- It is insoluble in water.
- Stable under normal, temperature and pressures.
- It is non combustible.
- It is odorless.

**3.3. THERMOPHYSICAL PROPERTIES OF NANOFLUID**

**3.3.1. Density**

The density of nanofluid can be calculated by using mass balance as.

$$\rho_{nf} = (1 - v_s) \rho_f + v_s \rho_p \quad (3.1)$$

Using the above equation one can predict the small decreases in density will typically result when solid particles are dispersed in liquids.

**3.3.2. Specific heat**

The specific heat of nanofluid can be calculated by using mass balance as:

$$(1 - v_s) \rho_f c_f + v_s \rho_p c_p$$

$$C_{nf} = \frac{\rho_{nf}}{\rho_f} \quad (3.2)$$

Using the above equation one can predict the small decreases in specific heat will typically result when solid particles are dispersed in liquids.

**3.13. Dynamic Viscosity**

The effective dynamic viscosity of nanofluid can be calculated using obtained for two phase mixtures. It can be calculated as.

$$\mu = \mu_o (123v_s^2 + 7.3v_s + 1) \quad (3.3)$$

**3.3.4. Thermal Conductivity**

Many theoretical and empirical models have been proposed to predict the effective thermal conductivity of nano-refrigerants. The commonly used models are listed below with their formulas.

The expressions of the conventional models of the effective thermal conductivity of a solid/liquid suspension are as follows:

- Maxwell

$$\frac{k_{eff}}{k_m} = 1 + \frac{3(\alpha - 1)v}{(\alpha + 2) - (\alpha - 1)v} \quad (3.4)$$

- Hamilton and Crosser

$$\frac{k_{eff}}{k_m} = \frac{\alpha + (n - 1) - (n - 1)1 - \alpha)v}{a + (n - 1) + (1 - \alpha)v} \quad (3.5)$$

Where n depends of particle shape factor given by

n = 3/ψ for

K<sub>2</sub> / K<sub>m</sub> > 100.

ψ = sphericity (ψ = 1 for spherical particles)

n = 3 for other cases

- Jeffery

$$\frac{k_{eff}}{k_m} = 1 + 3\beta v + \left(3\beta^2 + \frac{3\beta^2}{4} + \frac{9\beta^3}{16} \frac{\alpha + 2}{2\alpha + 3} + \dots\right) v^2 \quad (3.6)$$

- Davis

$$\frac{k_{eff}}{k_m} = 1 + \frac{3(\alpha - 1)}{(\alpha + 2) - (\alpha - 1)v} [v + f(\alpha)v^2 + 0(v^3)] \quad (3.7)$$

- Bruggeman

$$\frac{k_{eff}}{k_m} = \frac{[(3r - 1)\alpha + (2 - 3v) + \Delta^{0.5}]}{4} \quad (3.8)$$

$$\Delta = (3v - 1)^2 \alpha^2 + (2 - 3v)^2 + 2(2 + 9v - 9v^2)\alpha$$

model

(3.8)



Where  $k_{eff}$  is the effective thermal conductivity of solid/liquid suspensions,  $k_m$  and  $k_2$  are the thermal conductivity of the base fluid and particle, respectively,  $n$  and  $\nu$  are the particle shape factor and particle volume fraction, respectively, and  $\alpha = k_2/k_m$ ,  $\beta = (\alpha-1)/(\alpha+2)$ . All the existing theoretical models and theories are only depended on the thermal conductivity of the solid and liquid and their relative volume fraction, not on the particle size and interface between the particles and fluid.

Using the formula in equation 3.4 to 3.8 the thermal conductivity is calculated for nanoparticles percentages from 0.1 to 30 for all six models. Nano refrigerants containing small amounts of nanoparticles have substantially higher thermal conductivity than those of base refrigerants.

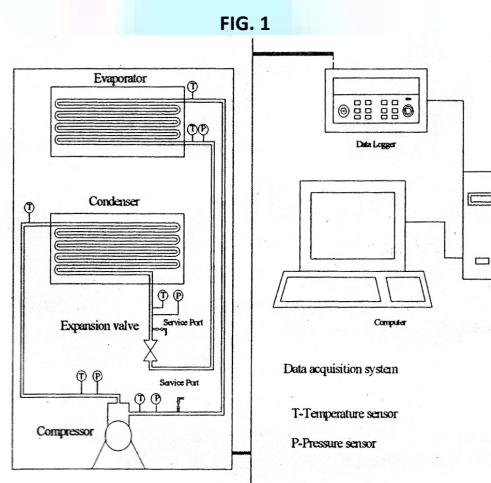
#### 4. EXPERIMENTAL SETUP AND TEST PROCEDURE

This section provides a description of the facilities developed for conduction experimental work on a Air Conditioner. The technique of charging and Evacuation of the system is also discussed here.

##### 4.1. EXPERIMENTAL METHODOLOGY

The temperature of the refrigerant inlet/outlet of each component of the refrigerator was measured with copper – constantan thermocouples (T type). The thermocouple sensors fitted at inlet and outlet of the compressor, condenser, and thermocouples/temperature sensors were interfaced with a HP data logger via a PC through the GPIB cable for data storage. Temperature measurement is necessary to find out the enthalpy in and out of each component of the system to, investigate the performance. The inlet and outlet pressure of refrigerant for each of the component is also necessary to find out their enthalpy at corresponding state.

The pressure transducer was fitted at the inlet and outlet of the compressor and expansion valve as shown in Fig.1. The pressure transducers were fitted with the T-joint and then brazed with the tube to measure the pressure at desired position. The range of the pressure transducer is -1 to + 39 bars. The pressure transducers also been interfaced with computer via data logger to store data. A service port was installed at the inlet of expansion valve and compressor for charging and recovering the refrigerant. The location of the service port is shown in Fig. 1. The evacuation has also been carried out through this service port. A power meter was connected with compressor to measure the power and energy consumption.



##### 4.2. PREPARATION OF THE TiO<sub>2</sub>- R22 NANOFUID

Nano-refrigerant was prepared in a recommended method for nanofluid, the nanoparticles were mixed into the refrigerant and then the mixture was kept vibrated with an ultrasonic oscillator to fully separate nanoparticles. The purity of the R22 used in the tests, which was supplied by the Dupont Company, was higher than 99.8%. The TiO<sub>2</sub> nanoparticles were provided by Zhejiang Hongsheng Nanotech Co. Ltd. The average particle diameters were about 50nm and the mass purity was about 99.5%. The nanoparticles masses were measured on an AB204-N balance manufactured by Mettler (Switzerland) with a precision of 0.1 mg.

The stability of the nano-refrigerant was an important and basic problem, on the basis of the former study on the dispersion of nanoparticles in the refrigerant, 0.1 and 0.5 g/L concentration were selected for the further investigations.

##### 4.3. SYSTEM EVACUATION

Moisture combines in varying degree with most of the commonly used refrigerants and reacts with the lubricating oil and with other materials in the system, producing highly corrosive compound.

The resulting chemical reaction often produces pitting and other damage on the valves seals, cylinder wall and other polished surface of the system. It may cause the deterioration of the lubricating oil and the formation of sludge that can gum up valves, clog oil passages, score bearing surface and produce other effect that reduce the life of the system. Moisture in the system may exist in solution or as free water. Free water can freeze into the ice crystals inside the metering device and in the evaporator tubes of system that operate below the freezing point of the water. This reaction is called freeze up. When freeze up occurs, the formation of ice within the orifice of the metering device temporarily stops the flow of the liquid refrigerant.

To get rid of the detrimental effect of moisture Yellow jacket 4cfm vacuum pump was used to evacuate the system. This system evacuates fast and better which is deep enough to get rid of contaminant that could cause system failure.. The hoses were connected with the service port to remove the moisture from the system. When the pump is turned on the internal the pressure gauge shows the pressure inside the refrigerator system.

##### 4.4. SYSTEM CHARGING

Yellow jacket digital electronic charging scale has been used to charges R22 and TiO<sub>2</sub>- R22 into the system. This is an automatic digital charging system that can charge the desired amount accurately and automatically.

The charging system consists of a platform, an LCD, an electronic controlled valve and charging hose. The refrigerant cylinder was placed on the platform which measures the weight of the cylinder. The LCD displays the weight and also acts as a control panel. One charging hose was connected with the outlet of the cylinder and inlet of the electronic valve and another one was connected with the outlet of electronic valve and inlet of the service port. Using this charging system refrigerants were charged into the system according to desired amount.

##### 4.5. TEST PROCEDURE

The system was evacuated with the help of vacuum pump to remove the moisture and charged with the help of charging system. The pressure transducers and thermocouples fitted with the system were connected with the data logger. The data logger was interfaced with the computer and software has been installed to operate the data logger from the computer and to store the data. The data logger was set to scan the data from the temperature sensor and pressure sensor at an interval of 30 seconds. A power meter was connected with the refrigerator and interfaced with the computer and power meter software was installed. The power meter stores the instantaneous power and cumulative energy consumption of the refrigerator and cumulative energy consumption of the air conditioner. The pressures and temperatures of the refrigerants from the data logger were used to determine the enthalpy of the refrigerant. All equipments and test unit

was installed inside the environment control chamber where the temperature and humidity was controlled. The dehumidifier has been used to maintain desired level of humidity at the control chamber. The experiment has been conducted of the air-conditioning test rig.

**5. WORKING PRINCIPLE**

The experimental apparatus was build according to the National Standards of India. The testing environment is at room temperature. Air conditioning unit's place in a room at constant room temperature. The temperature of room is cooled by normal refrigerant R22 and data's are collected. Then by adding nanofluids Titanium oxide (TiO<sub>2</sub>) by volume and mass fraction the working performance of air condition unit is analyzed.

During the study the performance of energy consumption, cooling performance are measured by operating the unit under a steady operating conditions. During performance test the operating parameters were recorded such as compression suction pressure, discharge pressure, air inlet dry bulb temperature, wet bulb temperature, air outlet dry bulb temperature, wet bulb temperature are noted and adding nano-refrigerants variations in parameters are noted with different percentage addition of nano- refrigerant along with usual refrigerant.

**6. RESULTS AND DISCUSSION**

The comparison of the performance parameters of the refrigerants and energy consumption by the air conditioner is discussed in this section. The comparison of energy consumption and performance is given below for pure R22 Refrigerant and TiO<sub>2</sub>-R22 refrigerant.

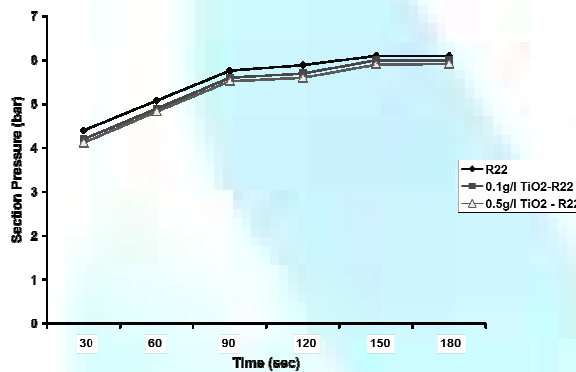
**6.1. ENERGY CONSUMPTION BY THE COMPRESSOR**

The energy consumption by the compressor during on hours was measured and stored in computer. The test was carried out maintain a temperature of 14°C. The energy consumption by the air condition is presented in the table.

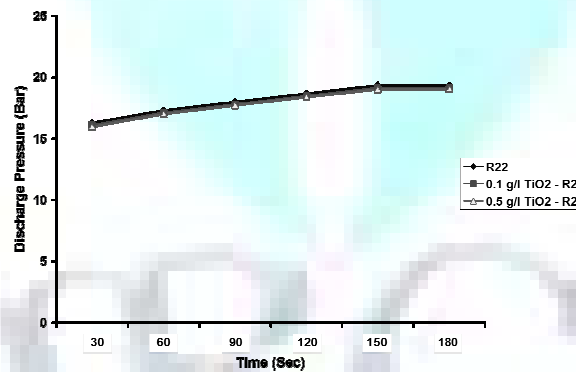
**ENERGY CONSUMPTION RESULTS**

Concentration g/l	0	0.1	0.5
Energy consumption kw/hr	0.06	0.055	0.053
Energy saving %	-	8.3	11.66

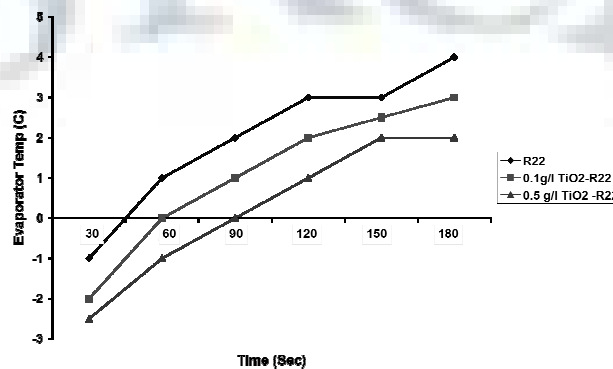
**6.2. EFFECT OF SUCTION PRESSURE VS TIME**



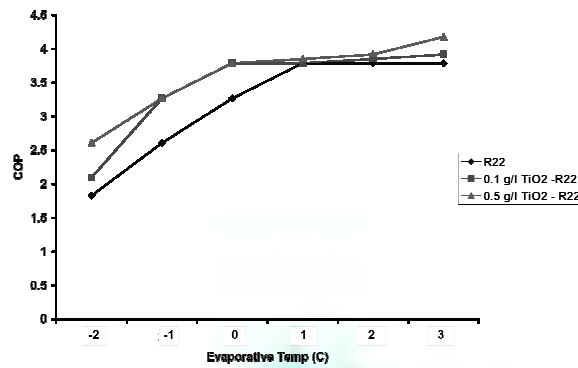
**6.3. EFFECT OF DISCHARGE PRESSURE VS TIME**



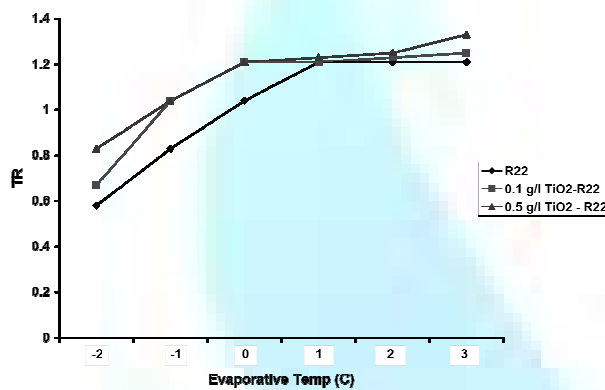
**6.4. EFFECT OF EVAPORATOR TEMPERATURE VS TIME**



## 6.5. EFFECT OF EVAPORATOR TEMPERATURE VS COP



## 6.6 EFFECT OF EVAPORATOR TEMPERATURE VS TR



## 7. CONCLUSION

In this project TiO<sub>2</sub>-R22 nano-refrigerants were used as a working fluid of air conditioning. The results indicated that TiO<sub>2</sub>-R22 can work normally and efficiently in air conditioner compared with air conditioner using pure R22 as a working fluids, 0.1 and 0.5 g/l concentrations of TiO<sub>2</sub>-R22 can save 8.3 and 11.66 % energy consumption respectively. In addition the results were similar to the author's early research of using TiO<sub>2</sub>-134a as a working fluids. So the above work have demonstrated that nanoparticles can improve the performance and save the energy consumption of the air conditioner.

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**E-COMMERCE: AN ANALYSIS OF CONCEPTUAL FRAMEWORK****ABU ZAFAR AHMED MUKUL****LECTURER****SCHOOL OF BUSINESS & ECONOMICS****UNITED INTERNATIONAL UNIVERSITY****DHAKA****SABRINA HOQUE CHOWDHURY****LECTURER****SCHOOL OF BUSINESS & ECONOMICS****UNITED INTERNATIONAL UNIVERSITY****DHAKA****ABSTRACT**

The internet has opened up a new horizon for trade and commerce, namely E-Commerce. Now days, E-commerce is no longer a technological issue, but is also a business issue. E-commerce involves a number of forms and varying levels of cost and complexity, depending on the needs of business. For the past few years, across the globe, e-commerce has improved significantly, but some issues remain elusive. At present, many companies in Bangladesh are using this e-commerce to operate their essential business activities. But the rate of development of e-commerce remains limited in Bangladesh. This explanatory and conceptual paper presents the ways and framework in which e-commerce gives information to the consumers. It further highlights some critical issues in e-commerce, provides suggestions and future strategies for e-commerce in years to come.

**KEYWORDS**

E-commerce, E-mail, EDI, E-Merchants.

**INTRODUCTION**

Electronic Commerce (e-commerce) has become a popular word. The idea of Electronic Commerce – using the Internet and the Web for commercial purposes – is expanding day by day. Without doubt, the Internet is ushering in an era of sweeping changes that will leave no business or industry untouched. Like a central nervous system, the information highway courses around the Globe, making all types of commercial activities instantly possible. With the digital revolution continuing and the Internet becoming more popular with each passing day, electronic commerce (e-commerce), which has taken the world market to the consumer's doorstep, has emerged as the fastest growing form of business today. E-commerce is the most important application of the new communication technology. Manufacturers, traders and consumers can now reach the market more quickly and get more information than they could ever before. The electronic commerce has penetrated the businesses in many ways. E-commerce has tremendously reduced the transaction costs entailed in purchases, sales, operating, holding inventory and financial cost (Talha, 2003). The application of e-commerce to the development of web site enhances the potential global market and sales revenue, production, potential new customers, services and geographical areas. In terms of non-financial benefits, e-commerce has significantly helped improving human resources and punctuality, quality of services, customers' satisfaction and some other indirect effects. But in Bangladesh, e-commerce is just evolving; the ball has been set rolling for an Internet revolution. E-commerce is no longer a luxury but a reality. In the year 2000, there were about 1000pc sold in the country but it has risen to more than one lakh. Now, it is estimated that more than 180 ISP have been working in this country ([www.ispabd.org/news.php](http://www.ispabd.org/news.php)) and there are more than 450,000 Internet users in the country (UNDESA report 2007). So, there is a vast chance for the expansion of e-commerce in Bangladesh.

**OBJECTIVES OF THE STUDY**

The objectives of the study are

1. To conceptualize e-commerce
2. To analyze cost-benefit of e-commerce.
3. To present the existing framework and the proposed framework for e-commerce.
4. To recommend some policies for future improvement of e-commerce.

**METHODOLOGY**

The study has been conducted mainly on the basis of literature survey and secondary information. Various seminar papers and summary of discussions in those seminars, taskforce report of research organizations, journals and some periodicals on computer and information technology such as eBiz, computer tomorrow and computer Jagat have been surveyed for the purpose of the study. Some computer specialists have also been personally interviewed in order to collect some primary information used in this study.

**E-COMMERCE**

E-Commerce refers to the use of communications technology, particularly the internet, to buy, sell and market goods and services to customers. The internet has brought about a fundamental shift in national economies that are isolated from each other by barriers to cross border trade and investment; isolated by distance, time zones and language; and isolated by national differences, in government regulations, culture and business systems (Mohammad, 2004). Electronic commerce (e-commerce) is defined as the conduct of commerce in goods and services via electronic devices and telecommunications tools. In other words, e-commerce includes purchases of goods, services and other financial transactions in which the interactive process is mediated by information or digital technology both locationally separate ends of the interchange. Here 'transactions' include both specification of goods and services required and commitment to buy. According to Bajaj and Nag, "E-commerce refers to the paperless exchange of business information using EDI, Electronic mail, Electronic Bulletin Boards, Electronic Funds Transfer and other network-based technologies. It does not only automate manual processes and paper transactions, but also help organizations move to a fully electronic environment and change the way they operate".

**E-COMMERCE: COST-BENEFIT ANALYSIS**

e-Commerce is occupying a primary place in today's business for improving the business environment. It is important as it helps the organizations to gain a competitive edge over the competitors and is enabling business to analyze details of customers' buying patterns, taste and preferences so that they can efficiently pitch advertising and marketing campaigns to smaller target market (Bakar 2001). Benefits of e-commerce can be summarized as reduced transaction

costs, improved cash flows, reduced inventory level, higher information quality, increased operational efficiency, better customer service, increased ability to complete and improve trading partnership, etc (Rahman 2002). According to Kalakota and Whinston (1998), most companies are building commercial sites on the web to achieve four major business objectives: (i) attracting new customers via web marketing and advertising, (ii) improving service to existing customers via web customer service and support functions, (iii) developing new web based market and distribution channels for existing products, and (iv) developing new information based products accessible on the web (O'Brien, 2000: 314).

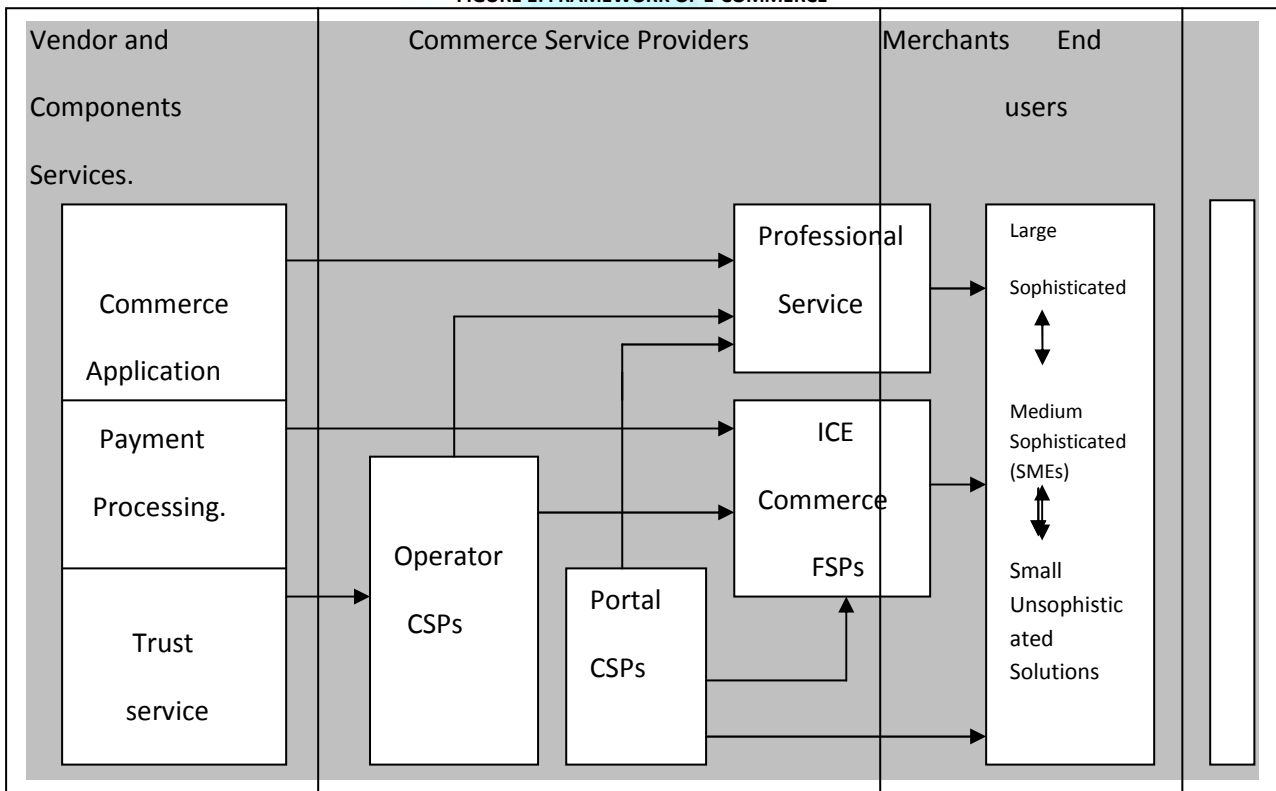
However, the internet and e-commerce present many problems to the business users, because most of the technology and functions are relatively immature. The major problems e-commerce faces are: (i) security, (ii) technology problems, (iii) legal problems, since laws governing e-commerce are mostly non-existent or are just being written; and (iv) the traditional internet culture, where Net users have usually shown themselves unwilling to receive electronic "junk mail" (Laudon and Laudon, 2000: 361-364). There is also a cost for registration of domain name.

Due to computer crime, cyber fraud, and internet invasion, e-commerce may be a nightmare. In this regard, Cheney (1999: 38): says *They (cyber criminals) can rob you blind. They can steal your identity. They can swipe your deepest secrets and sell them to the competition. They can read your e-mail, talk to your vendors, contact your customers, replicate your website, and take orders for your products. They can tap your treasury. They can clog your systems to the point of paralysis. They can sniff through your personal files. If they run off with your laptop they might extort you till you weep. They might be 13 years old.*

**EXISTING FRAMEWORK OF E-COMMERCE**

E-Commerce framework is a structure where a business is selling online to individuals, consumers, business, and government. The purpose of an e-commerce framework is to support the implementation of tailored solutions based on commercial components in a very cost effective manner. It allows even small companies to implement a customized e-commerce site. A framework provides the necessary standards and interfaces as well as a reference architecture which gives a general idea how to build up a complete e-commerce solution. It will be complemented by a list of available components and a procedural model describing how to apply the framework in order to get the e-commerce solution. For the development of an e-commerce framework a careful analysis of the environment wherein the framework will be used is required.

FIGURE 1: FRAMEWORK OF E-COMMERCE



Source: Adapted from Andreas Bohm, Elisabeth Felt and Stefan Uellner, 2001, T-Nova, Deutsche telekom.

Figure 1 depicts the framework of an e-commerce. There are four parts in this framework. These are vendors, commerce service provider (CSP), merchants and end users.

**Vendors:** Vendors and components of e-commerce systems include commerce applications, payment processing and trust service.

**Commerce service providers (CSP):** They plan, build, and run e-commerce solutions for merchants. We are to make distinctions among operator CSPs, portal CSPs, and professional services CSPs. The service operation CSPs build and operate e-commerce application services, selling them on a wholesale basis to other service providers that operate customer pull. The portal CSPs give access for e-merchants to potential buyers. E-merchant services with a large customer base and strong brand identity can exploit these assets by providing their merchant customers with customer pull. The professional services CSPs providing merchant services customize the application to the needs of each merchant. Some of these customizations include design of the storefront, configuration of the applications and integration of the commerce application into other systems operated by the merchants.

**E-Merchants:** E-Merchants (companies, merchants, distributors etc.) want to sell products by means of electronic media. They are using different CSP services to get a more or less sophisticated e-commerce solution. Within the group of e-merchants SMEs should be particularly regarded because they could be the main target for applying an e-commerce framework.

**End users:** This is the group which ought to buy products by means of an e-commerce system. Its requirements has to be analyzed very carefully. E-commerce solutions tend to treat different user groups as well as different users individually (personalization).

PROPOSED FRAMEWORK FOR E-COMMERCE

FIGURE 2: PROPOSED FRAMEWORK OF E-COMMERCE

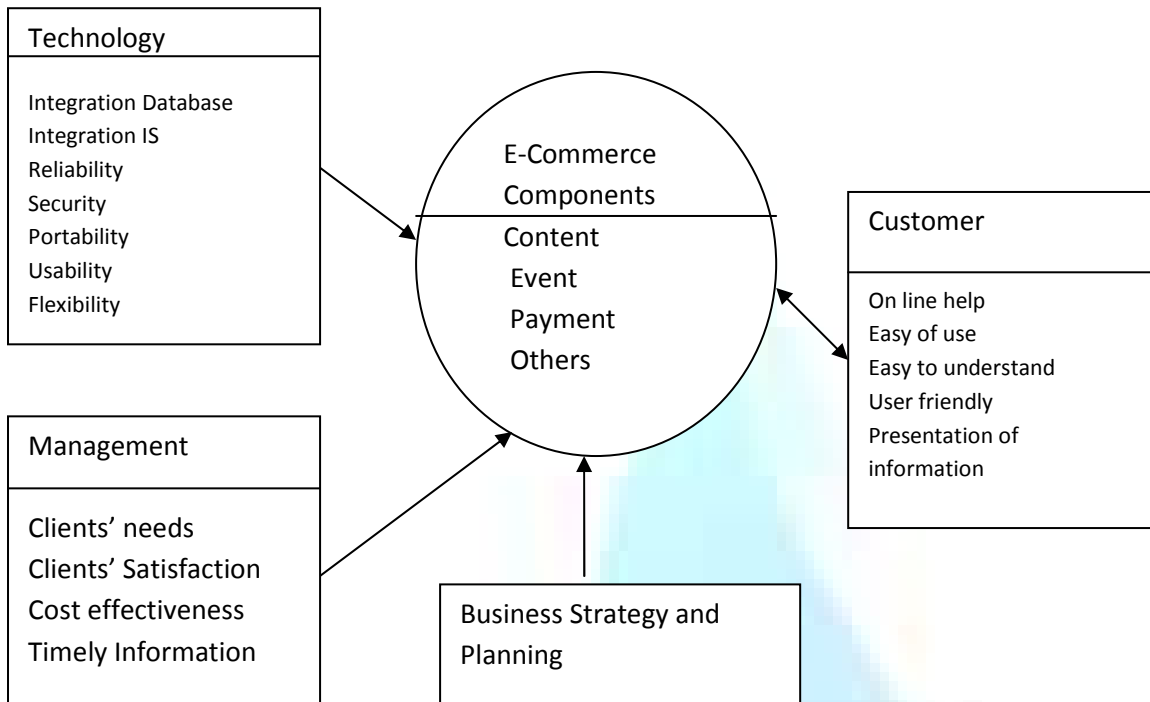


Figure 2 depicts proposed e-commerce framework for e-commerce organizations. Such a framework is not intended to be used as a step-by-step approach that is doggedly followed from start to finish. There are five parts in this framework. These are technology, management, business strategy, and planning e-commerce components and customers.

**Management:** Management includes several determinants or factors such as the clients' needs and satisfaction as shown in figure 2. Client satisfaction means the satisfaction of somebody who repeats Web purchases on a continuous basis (brand loyalty) and get a good service using an EC application. If the client is not satisfied with buying online and his needs are not met, top management will have great difficulties to justify the e-commerce components.

**Technology:** Technology includes several factors such as reliability, integration, portability and others as shown in figure 2. The technology includes quality factors that can be broadly categorized into three classes: 1) the first class contains those criteria (reliability, usability) that pertain to the use of E-commerce after it has become operational; 2) the second class pertains to the maintainability (flexibility) of E-commerce system that integrates all business applications; and 3) the third class includes factors (portability) that reflect the ease with which a transition to a new environment can be made.

**Customer:** A Customer requires to assess key elements in users interface design with respect to the presentation of information (quality, quantity, accessibility), display of presentation (quality, text appearance, colors and graphics), and usability (ease of navigation, effective task completion, effectiveness of the business link). These determinants, presented in figure 2, must be evaluated carefully to encourage users of E-Commerce.

**Business Strategy and planning:** Business strategy and planning for e-commerce aim to consider major trends occurring in the utilization of e-commerce and equip the organization to take advantages of appropriate e-commerce.

**E-Commerce components:** E-commerce components include content, event, payment and others. The objective of this section is to identify and analyze the key components in order to define a common categorization scheme valid for diverse e-commerce solutions.

**COMPARING EXISTING FRAMEWORK AND PROPOSED FRAMEWORK**

The main focus of the proposed framework for e-commerce is to add to the existing business strategy and planning. Business strategy and planning are the most important factors for every kind of organization for implementing e-commerce for maximizing its profit. In developing an e-commerce strategy, it is important that managers are clear on how organizations can leverage the connectivity, speed and accessibility created by the internet and associated technologies to extend, enhance and/ or enable business vision and strategy. In the proposed framework, management is considered for e-commerce framework, because success of any kind of organization depends on the right decision. So, success of e-commerce depends on the successful e-commerce decision made by the managers. Management domain includes clients' needs, clients' satisfaction, cost effectiveness and timely information. Customer is the main factor for any kind of commerce. Customer is defined more specifically in this proposed framework. By using this proposed framework, the owner of e-commerce can easily provide online help, become user friendly and easy of use services that ultimately increase the level of customer satisfaction and increase the market share.

**E-COMMERCE: BANGLADESH PERSPECTIVE**

We have to illustrate the state of IT (Information Technology) sector if we want to know the status of e-commerce infrastructure in Bangladesh. The IT sector in Bangladesh is still in a developing stage. Government-run universities' annual student intake is 512. The private universities enroll 745 students per annum. More than a dozen foreign affiliated and locally incorporated training centers' total annual enrollment is 11,000 students (Uddin, Md.Sharif "Current Situation of E-commerce in Bangladesh-2001) They provide computer literacy and basic knowledge on computer. The usage of computer in Bangladesh is shown in table1.

TABLE 1: USAGES OF COMPUTER

Business	PC/Employee	Internet user/PC	LAN	WAN	WWW
Garments industry(woven)	0.168	0.51	22%	15%	31%
Garments industry(Knitwear)	0.047	0.53	27%	18%	18%
Buying house	0.737	0.5	20%	10%	20%
Health	0.089	0.3	44%	6%	6%
Trading	0.04	0.83	10%	2%	8%
Real Estate	0.281	0.42	33%	0%	33%
Pharmaceuticals	0.047	0.09	100%	10%	30%
Courier	0.084	0.25	10%	10%	0%
Media	0.184	0.3	67%	0%	53%
Handicrafts	0.059	0.79	11%	0%	22%

Source: Uddin, Md. Sharif, "Current Situation of E-commerce in Bangladesh", <http://www.aptsec.org/seminar/meeting-2001/cs2001/EC-06-a-BTTB-BGD.ppt> p-3.

According to this table, the usage of computer in Bangladesh is very low. Besides this, the speed of the Internet is very slow as the necessary advancement of telecommunication infrastructure has not achieved.. Bangladesh is yet to be connected with the rest of the world over a fibre-optic backbone. Currently ISPs in Bangladesh are providing Internet services via VSATs from Singapore. The internet is the heart of e-commerce. Bangladesh has entered the internet age in 1996. At present there are roughly 450,000 thousand subscribers in the country. Many companies have acquired proficiencies in web page development.

E-Commerce in Bangladesh was actually started in the year 1999 by some non-resident Bangladeshi (Ishtiaque, Habib and Khan, 2002). In Bangladesh, the first B2C e-commerce site is [www.munshigi.com](http://www.munshigi.com) and it started in 1999. After that in 2000, [www.deshigreetings.com](http://www.deshigreetings.com) and [www.homeviewbangladesh.com](http://www.homeviewbangladesh.com) opened e-commerce sites. The first B2B e-commerce in Bangladesh is [www.bgmea.com](http://www.bgmea.com). Now, there are more than thirty companies who are using e-commerce application to provide easier services for the consumers. The most popular e-commerce sites in Bangladesh are described below.

**(1) www.munshigi.com:** Munshigi is the first ever Bangladeshi e-commerce web site. It was established in 1999 with a view to making the facilities of e-commerce available to the manufacturers, businessmen and general consumers of Bangladesh. It has another goal of introducing and promoting the indigenous products of Bangladesh world wide with a target to capture substantial portion of world market.

**(2) www.bajna.com :** Bajna is the Bengali music and books superstore, offering the largest selection of Bengali CD and book titles online. All transactions are completed through a secure connection. Items in stock are shipped within two business days.

**(3) www.bdjobs.com:** BdJobs.com Ltd. is the first and leading career management site in the country. Eight young business and IT professionals backed by strong command over e-business and in-depth understanding of the needs of job seekers and employers in the country's context started this venture in July 2000. The aim of bdjobs is to explore maximum benefits of the Internet

**(4) www.deshigift.com:** Deshigift.com is a safe and secures shopping site and Sister Company of Cimtech Inc whose head office is in the USA. It adopts strict security measures to ensure critically sensitive information, such as personal information and credit card details. At deshigift.com, consumers are its priority. It is dedicated to helping the consumers and delivers the quality gift of their choice, at a competitive price.

**(5) www.bangladeshgarments.info:** In Bangladesh, there still remains a vast scope for the development of building industrial capacity for B2B. The garment sector has led the way with BGMEA's launching of the first B2B portal in Bangladesh. However, due to inadequate emphasis on orientation and training of individual companies to update company information in the portal, its effectiveness has yet to meet initial expectations.

A number of e-commerce sites are developing in Bangladesh to serve the Bangladeshi people living within the country and abroad. It is a good sign and indicative of the growth of e-commerce in Bangladesh. But there are some constraints that affect the development of e-commerce in Bangladesh. These are lack of appropriate framework, education, limited accessibility to computers and internet, general awareness about e-commerce, lack of government awareness, lack of sufficient infrastructure, limitations of supportive legal systems, lack of online payment systems and inadequacy in banking infrastructure and low quality service provided by e-commerce company. These lacks have to be effectively removed for making e-commerce successful in Bangladesh.

## CONCLUSION & POLICY RECOMMENDATION

E-Commerce, as a vehicle to boost up trade, especially international trade, has already been recognized by international business community, especially in European Union, North American Markets and some of the other nations like Japan, Singapore, Hong Kong etc. The boom in e-commerce includes increased use of other media for trade, such as the telephone, television, fax, and electronic payment. Nevertheless, the problem of securing components for e-commerce and appropriate framework are the most significant barrier blocking its success. E-commerce could very well become a driving force in the consumer market and the software distribution industry, if appropriate framework is developed and security problems are solved. From the current points of view, the proposed framework is very promising for use an e-commerce for customized e-commerce solutions. There are a number of recommendations for development of e-commerce. These are: (i) Creation of consciousness about the business profit from e-commerce and develop appropriate framework; (ii) The government should take steps towards creating a legal framework conducive for e-commerce; (iii) All subject companies must develop websites to provide their customers with convenient online shopping/business purchasing transactions; (iv) Establishment of cyber café in the business association and chambers of traders and industrial entrepreneurs; (v) Encourage medium and small firms to prepare websites for selling their product through e-commerce; (vi) Government should establish proper educational institutions to create efficient IT professionals to support e-commerce. They can arrange training programs to increase the skill of IT professionals who are involved in e-commerce; (vii) To increase the use of computers and internet facilities, government should withdraw all taxes from computers and its accessories.

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**e-COUNSELING FOR INSTITUTIONS OF HIGHER LEARNING IN GHANA: WHAT ARE THE REQUIREMENTS?**

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**ABSTRACT**

*Institutions of higher learning in Ghana set up special counselling units to cater for the psychological needs of students. There are physical access to the units but preliminary investigations indicates that, most students are not comfortable having physical interaction with counselors or being seen visiting the unit for fear of stigmatization. It is therefore significant to find a way of maintaining high confidentiality, privacy and even allow students to receive counseling services on anonymity. This paper therefore looks at the requirements that could be used to develop an e-counseling system for institutions of higher learning in Ghana. Existing online counseling requirements were gathered through literature review and confirmed with interviews with counselors and questionnaires administered to students. The following requirements were elicited: Video conferencing capabilities, Stored History of Students and Sessions, Asynchronous and Synchronous Session mix, Anonymous Counseling capabilities, High Security and Ability to track the responses of students to treatment. These requirements were obtained from literature and confirmed empirically. Three new requirements were gathered from the study. These were: High internet availability, peer counseling capabilities and ability for the e-Counseling system to integrate with other student records systems.*

**KEYWORDS**

e-Counseling, educational technology, Ghana, Online Counseling, requirements.

**1.0 INTRODUCTION**

In Ghana, Institutions of higher learning set up special units to cater for the needs of students. One of such units is the Counseling unit. The Counseling unit is responsible for meeting the psychological and mental needs of students. Counselors try to advise students on matters that can harm their studies and hamper their academic achievements. The realities on the ground, however is that, students seldom visit the unit. According to records from the counseling unit, about 90% of students who visit the unit for counseling sessions have been referred there for their involvement in some antisocial activities. There are a lot of students whose academic performance keep on getting worse from semester to semester. If these students have access to counseling, the trend could be reversed. Ineffective counseling, however, can lead to students making uninformed or incorrect academic choices, thus contributing to lower academic performance or even desertion (Soulsby, 1999; Simpson, 2004; Kuittinen, et. al., 2001). There is physical access to the unit but preliminary investigations show that, most students are not comfortable having physical interaction with counselors or being seen visiting the unit for fear of stigmatization. It is therefore significant to find a way of increasing access to counseling services for students in Institutions of Higher Learning.

Institutions of higher learning are adopting various technologies to improve on the efficiency of their processes. Such systems include e-learning (Kevor and Asiedu, 2010) online admission and registration, computerized accounting, etc.

e-Counseling is the use of technology to administer counseling services to clients and it is one of the emerging technology aided services being adopted by various institutions. Online counseling is popular in the non-educational field like the mental health but less known in the educational field. This paper therefore looks at the requirements of an e-counseling system in institution of Higher Learning in Ghana.

**2.0 REVIEW OF LITERATURE**

e-Counseling is an emerging domain in the field of e-Services. It has other synonyms that include e-therapy (Manhal-Baugus, 2001), cybertherapy (Suler, 2000), online or Internet therapy (Rochlen, Zack & Speyer, 2004), e-mail therapy (Shapiro & Schulman, 1996), Internet counseling (Pollock, 2006), web counseling (Urbis Keys Young, 2002), cybercounseling (Maples and Han, 2008), and therap-e-mail (Murphy & Mitchell, 1998), internet supported interventions (Barak, Klein & Proudfoot, 2009) and online counseling (Shiller, 2009).

A number of definitions of e-Counseling and its related terms have been proposed, including the following. Bloom (1998) defines online counseling as "the practice of professional counseling that occurs when client and counselor are in separate or remote locations and utilize electronic means to communicate with each other" (p.53). Alleman (2002) refers to online counseling as "ongoing, interactive, text-based, electronic communication between a client and a mental health professional aimed at behavioral or mental health improvement" (p. 200). Mallen and Vogel (2005) define online counseling as: Any delivery of mental and behavioural health services, including but not limited to therapy, consultation, and psycho education, by a licensed practitioner to a client in a non-[face-to-face] setting through distance communication technologies such as the telephone, asynchronous e-mail, synchronous chat, and videoconferencing (p. 764).

The above definitions have also been taken in the context of mental health therapies which is beyond the scope of this thesis. In our context, counseling is "a system of relationships and processes designed to help people make choices and solve problems," (George & Cristiani, 1995) and its goals are "to facilitate behavior change, improve the client's ability to establish and maintain relationships, enhance the client's effectiveness and ability to cope, promote the decision-making process and facilitate client potential and development (Fujino, 2003)."

In the university environment, the client is the student. Even though, most implementations of e-Counseling have been outside the university environment, there is evidence to show that it can be successfully implemented in the university. The online counseling service appears to attract youth who are too shy or too scared to use other resources (shiller, 2009) and most university students fall within this class.

e-Counseling in this paper refers to the use of internet technologies to administer counseling services to students.

e-Counseling implementation in most universities in Ghana and some part of Africa have rather been too slow. The websites of university of Lagos (UniLag), Ibadan (UI) and Benin (UniBen) in Nigeria were selected. In Ghana, University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), University of Cape Coast (UCC), Ashesi and Central University College (CUC) were also analysed. University of Pretoria in South Africa was also looked at. UniLag, UI and UniBen, just like UG, KNUST and UCC, are traditional, public universities in Nigeria with large student populations and strong administrative structures. In UniLag, the official website gives information to both prospective and continuing students on upcoming and past events. There is no online counseling service, whether synchronous or asynchronous. The only online student services available were student records, transcripts and online admission. UI website had all the capabilities of UniLag. The website also has a page dedicated to the careers placement and counseling unit but the page was still under construction (as of 21<sup>st</sup> February 2013) and there is no indication of what form it is going to take. Most of their online services also work only within the campus of UI. UniBen has an online registration system besides the other capabilities offered by the websites of UI and UniLag. UniBen do not offer online counseling in any form. KNUST offer a number of online services to students which include registration, results checking, admission, forums and a social network known as holla! Even though it is possible to receive peer counseling through such a social network, there is no evidence to support its use for such a purpose. KNUST has also implemented e-Learning across several faculties. The page dedicated to counseling only gives information on the existence of such a unit, the period of contact and the direction to the physical location of the unit.

In PUCG, all students' online services are developed in-house with open source tools. This is not the case with UG whose online services is outsourced to Integrated Tertiary Software (ITS) Pty Ltd., a South African company. The ITS package include online fee payment and registration, admission, results checking,

and provision of general information to both prospective and continuing students on financial aid acquisition. Financial aid acquisition may fall under a wider scope of counseling, but the mode in which it is administered cannot be considered to be online, since one still needs physical appearance to obtain the service. The KEWL system is used by UG as its e-Learning engine. Again conspicuously missing is the counseling module of the ITS. The UCC also has similar online service capabilities embodied in the Online Student Information Services (UCCOSIS) only accessible on campus. The University of Pretoria's Department of Student Affairs is its counseling unit and has a web presence that gives information on the vision and mission of the department. Its counseling services are however obtainable directly offline from the departments physical offices. The requirements of e-counseling are summarized in table 2.1.

TABLE 2.1 LITERATURE REVIEW OF e-COUNSELING REQUIREMENTS

Requirements of e-Counseling	Main research findings
Video Conferencing	Bouchard et al. (2004) studied the effectiveness of video conferencing against face-to-face sessions for certain types of counselling. Another study (Nelson, Barnard & Cain, 2003) also confirms that video conferencing is as effective as face-to-face session. Day and Schneider (2002) also compared face-to-face, video conferencing and two way audio and concluded that differences in process and outcome among the three treatments were small and clinically promising in comparison with the untreated control group. Video conferencing enhances a two way audio session.
Stored History of Clients and Sessions	Murphy and Mitchell, 1998 explains the importance of a permanent record as a tool for both counselor and client. Barak, 1999 suggest that, stored history of sessions can be used to remind both clients and therapists of things they had previously expressed and also to allow both the client and the therapist time to fully reflect on issues discussed in previous correspondence (Manhal-Baugus, 2001). Pollock, 2006 indicates that the value of online counselling is in its ability to store history of clients and sessions.
ASynchronous/Synchronous session mix	Suler, 2000 and Fenichel et al., 2002 points out the benefits and need for a synchronous communication, such as chats and instant messaging complementing asynchronous modes like emails.
Allow counseling by Anonymity	Suler, 2000 suggests that, allowing clients to receive online counselling as an "invisible client" can reduce or eliminate the stigma associated with receiving certain forms of counselling. Also Under anonymity, clients do not have to contend with the therapist's immediate emotional feedback signals (Bailey, Yager, & Jenson, 2002). According to Tate & Zabinski (2004), anonymity may also make it easier for patients to disclose information about themselves via the computer since certain social markers such as age, gender and ethnicity are removed. Clients also become less defensive, more honest and candid (Maples & Han, 2008).
High Security	It is suggested in Fisher & Fried (2003) that threats to confidentiality must be mitigated.
Treatment tracking	Oravec, 2000 suggest a requirement for counsellor to be able to explore the client's progress at various stages in the course of treatment.

### 3.0 IMPORTANCE OF THE STUDY

Online counseling research and practice is not new in the field of mental health and other domains outside institutions of higher learning but less known in educational institutions. This paper attempts to open the study of online counseling in institutions of Higher learning by first identifying the requirements from students and counselors. e-Counseling is relevant especially as a compliment to e-learning which has enjoyed wide research. Institutions of Higher Learning who are offering degrees through Open Distance Learning will benefit from this research. Researchers in educational technology are looking at ways of integrating information systems into educational processes and looking at the efficiency and improvements such systems could bring. This research may also fall under broader topics like educational technologies. Most institutions of higher learning in Ghana have as part of their core values, the training of the whole individual which goes beyond academics. For such institutions, this research is also very relevant.

### 4.0 STATEMENT OF THE PROBLEM

The main research question being considered in this paper is:

*What are the requirements for an e-counseling system for Institutions of Higher Learning in Ghana?*

Institutions of higher learning train students to be successful to be able to fit into society. Students may have psychological problems which may retard their academic success. If these problems are noticed earlier, they may be rectified and may improve on students' performance.

### 5.0 OBJECTIVES

The objectives of this research is to empirically test existing e-Counseling requirements obtained from literature of other domains in a higher educational setting and solicit for other e-Counseling requirements from students and counselors. These requirements will become bases for future e-counseling development in institutions of higher learning.

### 6.0 RESEARCH METHODOLOGY

The study started with literature review of requirements for e-counseling systems in general. Six main requirements were identified. These requirements were largely obtained from the non-educational domain. Questionnaires were then developed to test the requirements in institutions of higher learning. The Presbyterian University College, Ghana (PUCG) was selected as a case study. The PUCG is a typical institution of higher learning in Ghana with traditional counseling facilities. Hundred students who had previous experience with the traditional face to face counseling were selected randomly from the records of the Life Values Promotion Center (LVPC), the counseling center, of PUCG. These students were contacted through email to respond to the questionnaire. On a 1 to 5 likert scale, students were asked to respond to the extent of agreement (5=strongly agree, 4=agree, 3=neutral, 2=disagree and 1=strongly disagree) of requirement issues relating to video conferencing, synchronous and asynchronous session mix, anonymous counseling and security. There was also an open question for students to indicate what they need in an e-Counseling system. In all, 78 valid responses were received. The means and standard deviations were computed and used to analyze the closed questions whiles categorization and proportions were used to analyze the open questions. Three Counselors from the LVPC were also interviewed on issues relating to treatment tracking and stored history of clients and sessions.

### 7.0 RESULTS, FINDINGS AND DISCUSSIONS

From Table 4.1, students agree that all the identified requirements of e-Counseling in institutions of higher learning are valid. More importantly, they consider video conferencing and security as a stronger requirement than the others. The findings also suggest that students may prefer synchronous sessions to asynchronous sessions but prefer both to any one of the sessions alone.

TABLE 4.1: MEAN AND STANDARD DEVIATIONS OF REQUIREMENTS OF e-COUNSELING

No	Requirement of e-Counseling	n=77	
		Mean	standard deviation
1	Video Conferencing is required in an e-Counseling system	3.79	0.97
2	Emails are required in an e-Counseling system	3.38	0.8
3	Live Online Chats are required in an e-Counseling System	3.48	0.93
4	Both emails and live chats are required in an e-Counseling System	3.58	0.98
5	An e-Counseling System should allow students to receive counselling without identification	3.69	0.91
6	Counselling information of students must be protected from unauthorised access	3.74	0.91

Source: Field Data, 2012

(5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree)

From the results from the open questions, two new requirements were suggested by the students. These were the need for peer counseling and the need for high availability of internet. In all, 65 students responded to the open question: *what else will you need in an e-Counseling System?* Out of the 65 students, 51 (representing 78.46%) said they required some form of a peer counseling system or its related systems which they can use to access support from their colleague students. Some suggested the use of forums or some social networking capabilities. Fifty eight students (representing 89.23%) suggested the high availability of the internet since the system runs on internet. Other suggestions were made by less than 30% of the students and were therefore ignored.

Based on interviews held with 3 counselors, they independently confirmed that, it was necessary to be able to track how students were responding to counseling treatment. It was also important to store the history of students and sessions held by a particular counselor with a student. Apart from these two requirements which confirm existing literature, a third requirement also ran through the views of the counselors. There was the need for an e-Counseling system to integrate with other systems that generate student's data. A counselor should for example, be able to access a student's academic record or financial record from the e-Counseling platform to enable him take certain decisions on the student.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

This paper sought to find the requirements of an e-Counseling System for institutions of Higher Learning in Ghana. From the studies, the following requirements were elicited:

Video conferencing capabilities, Stored History of Students and Sessions, Asynchronous and Synchronous Session mix, Anonymous Counseling capabilities, High Security, Ability to track the responses of students to treatment. These requirements were obtained from literature and confirmed empirically. Three new requirements were gathered from the study. These were: High internet availability, peer counseling capabilities and ability for the e-Counseling system to integrate with other student records systems. These requirements could be prototyped into a web based system.

## 9.0 LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

This research is limited to Institutions of Higher Learning in Ghana and the requirements identified are constrained by the practice of counseling in Ghana as required by Law. These individual requirements have also been claimed to be efficacious by various authors in the literature reviewed. The three new requirements elicited through the empirical study can be implemented. In future, the requirements gathered in this paper can be collectively implemented in an institution of Higher Learning. Researchers can also use the Technology Acceptance Model (TAM) to assess the acceptability of such a technology from both students and counselors perspectives. Future research can also look at whether e-Counseling in institutions of higher learning is as efficacious as face-to-face counseling.

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## TAX INCENTIVES AND INVESTMENT BEHAVIOUR: AN EMPIRICAL REVIEW OF THE TAX PAYERS PERCEPTIONS

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### ABSTRACT

*This paper focused on tax incentives and investment behaviour via the taxpayer's perspective in Nigeria. In achieving this data for this paper were gathered from primary source, and these data gathered from elite respondents (firms and investors) with use of questionnaire duly administered and in analysing these data the Z-test was used. And the paper concluded that tax incentives do not significantly influences operational behaviour among firm in Nigeria. while on recommendations the paper recommended Nigeria government should publish tax incentives bulletins for distributions to companies so as to promote greater awareness, the government should ensure massive public enlightenment through the ministry of commerce, also that the government should make legal basis for incentives, their economic consequences and their administration procedures transparent and use simple qualifying criteria to ease enforcement and monitoring*

### KEYWORDS

Taxation, Tax Incentives and Investment Decision.

### INTRODUCTION

Taxation is an important part of every contemporary civil society. In particular, tax law plays a crucial role in economics by generating revenue for governments to finance public services, facilitates growth, increase productivity, improve their investment climate and enhance the overall quality of life of their people Obaretin (2010). Yet tax generally raises the cost of doing business and weakens the link between investment activities and the resultant economic rewards, thereby impeding economic growth and development. Tax incentives laws have consequently been used by government as a tool for accelerating investment in specific economic sectors, shaping the investment environment of a country or economic region and so overcoming some of the challenges posed by adverse investment condition.

The question that arises on this issue of the incentives, are firms fully aware of relevant existing incentives and if aware to what extent are they utilizing them? With this on hand, it become essential that government of every country to put in place or set up institution to ensure proper dissemination of this available information. So as to attract the right type of investors as well as encourage the existing business to expand their operation by taking advantage of these incentives

However, to say that countries engage in battle in attracting these investors, retain existing once within their border would not be an oversight. Countries (i.e government) are aware that firms do not invest arbitrarily nut rather engage in serious internal research and evaluation before taking investment decisions. Firms due to their limited resources would determine amongst several nations or countries where their investment would be most profitable, secured, safe and have greater future prospects.

In making these countries investment friendly, government among other things would put in place fiscal instrument more precisely favourably tax system to achieved such a purpose. Taxes incentive are perhaps the most popular inducement within the tax system offered to firms operating within an economy, as well as investors of foreign firms yet to come. Most government, especially of the less developed countries (LOCs) believe that they would attract foreign direct investment, revitalise their economy, promote employment and reduce inflation though the use of tax incentives

However, Aguolu (1999:17) defined tax incentives as an exemption or relief granted to an individual or a company to reduce the effect of taxation and thus encourage saving and investment. While in the opinion of Oyetude (2006) tax incentives typically utilized in sub-Saharan African economies were describe and they include tax holidays, investment allowances, tax credit, reduced corporate taxes, VAT and duty exemption, subsidies, special regulatory exemption and investment zones and accelerated investment write offs. He further stated that if these incentives are misconceived or ineptly handled, tax incentives laws might hinder the very ends their wielders seek to advance. Interactions between host country tax concessions and alterative tax laws in capital exporting home countries may distort or negate the incentive value of such initiatives if there are not carefully considered.

The objective of this paper is to examine the relationship between tax incentives and investment behaviour in Nigeria from the taxpayer's perspective and in achieving this, the paper is divided into five section, closely following this, is the review of literatures while three is on research method, four on empirical result and discussion and five on conclusion and recommendation.

### LITERATURE REVIEW

Firms see tax incentives as cost saving devices. These incentives appear to be one of the most enticing devices for investment and organisation growth and expansion. But whether organisations are actually taken full advantage of them is another issue entirely. However, incentives are things that motivate or encourage action, work or performance such as extra money paid to a worker to increase his level; of productivity. Tax incentives according to ifeuko (2009) can be seen as deliberate acts of government to motivate or encourage action as would support the development of an industry. They are designed to stipulate investment on certain preferential sector of the economy and are also at times geared towards attracting inflows of foreign income to complement the domestic supplies for rapid economic growth and development.

She stated further that not many people, firms truly advantage of the incentives existing in their sector of operation as even when they do, they rather suggest an individual corporate approach rather than an industry wide approach

In a study conducted by Alter, Rolfe & Frederic(1993) it reveals that all firm convert tax incentives but however, differ in the type they desire depending on the timing of the investment and the type of process (manufacturing or services). He opines that start up firms prefer incentives that reduce their initial expenses or start up cost, while expanding firms will prefer tax related incentives that affect profit, manufacturing firm requiring large investments in fixed assets are more likely to appreciate incentives relating to depreciable assets than those in the service industries.

Bergsman (1991) states that a significant number of multinational companies have policies of making investment decision in complete disregard of existing taxes and fiscal incentives, in his opinion multinational companies take into account only what they consider to be more basic factors and after a positive internal decision, bargain as hard as possible for any incentives available.

Tax incentives are exemption or relief which are not part of the essential structure of the tax system but have been introduced to achieve a purpose other than raising revenue. There are basically two categories of tax incentives; direct and indirect incentives. Direct tax incentives; these incentives generally fall within two broad types which are corporate profit and more attractive term for recovering investment costs. However, both share the same goal, which is lower effective corporate income tax burden on business investment but have very different policy and investment and administration implications. While the indirect tax incentives are incentives which can take the form of partial or full exemption from import tariffs; excises and sales tax (including the value added tax) on imports. Though these incentives are commonly provided to export-oriented industry, the drawback of indirect tax incentives is many and serious; they are prone to abuse and are difficult to justify on policy grounds

### THE NIGERIA BUSINESS OPPORTUNITIES AND INVESTMENT INCENTIVES IN NIGERIA

Nigeria is the most populous African country with a population of over 150 million in fact, in short it is believed that for every four Africans is a Nigerian. It should therefore be appreciated that business opportunities exist in virtually all sectors of the economy such as oil and gas, banking, agriculture, manufacturing, construction, transportation, information technology, telecommunication, education; health and water resources as well as professional services. The return of democracy and civil rule to Nigeria in May 1999 has brought with it a welcome boost to business friendly legislation which had hitherto remained comatose in nation's statute books

As a part of the effort to provide an enabling environment that is conducive to the growth and development of industries, inflow of foreign direct investment (FDI), shield existing investment from unfair competition, and stimulate the expansion of domestic production capacity. Federal government of Nigeria has developed a package of incentive for various sectors of the economy. These incentives, it is hoped will help revive the economy, accelerate growth and development and reduce poverty.

In Nigeria, government accept the private sector as the engine of growth and the creator of wealth, while government's major responsibility is to promote the enabling environment for the private investors to operate. However, laws which had hitherto hindered private sector investments have been either amended or repealed and a national council on privatisation has been established to oversee orderly divestment to private operators in vital areas of the economy such as mining, transportation, electricity, telecommunications, petroleum and gas. In addition, the government policy on economic deregulation and liberalization has opened up new windows of opportunity to all investors wishing to invest in the country's economy's in this connection.

In addition, the Nigeria investment promotion council (NIPC) has been strengthened, to enable it serve as a one stop office for clearing all the requirements for investment in the country. The tariff structure is being reformed with a view to boosting local production. Complementing the above is the fact that the government has introduced a new visa policy to enable genuine foreign investors to procure entry visa to Nigeria within 48 hours of submission of required documentations.

### TAX INCENTIVES IN THE SERVICE AND MANUFACTURING SECTORS

Tax incentives granted companies could be as numerous as necessary to achieve a timely, effective and successive implementation of government's schedule and policy for economic growth through private investments. To achieve this, each country has total and utmost prerogative to enact and institute adequate tax incentives that would encourage, attract and increase investment by firms. Some of the incentives in the services industry include;

- Tax relief for research and development (R&D) up to 120% of the expenses on R&D are tax deductible provided that such R&D activities are carried out in Nigeria and are connected with businesses to which allowances are granted. The result of such research could be patented and protected and accordance with internationally accepted property and copy right laws
- Labour intensive mode of production ; 15 % of tax concession for five years, the rate is granted in such a way that an industry employing one thousand persons or more will enjoy 15 % tax concession while an industry employing one hundred people will enjoy 6% while those employing two hundred will enjoy 75 % and so on
- In-plant training; 2 % tax concession for five years of the cost of the facilities for training
- Infrastructure : 20 % of the cost of providing basic infrastructure such as roads, water, electricity, where they do not exist is tax deductible once and for all
- Investment in economical disadvantage area; 100% tax holiday for seven years and additional 5 % depreciation
- Guarantees against Expropriation: by the provision of section 25 of the NIPC decree, no enterprise shall be nationalised or expropriated by any government of the federation, unless the acquisition is in the national interest or for public purpose, and no person who owns either wholly or in part the capital of any enterprise should be compelled by law to surrender his interest in the capital to any other person. However, it can only be possible when payment of fair and adequate compensation is made, right of access to the courts for the determination of the investor's interest or right and the amount of determination to which he is entitled in addition to all safeguards, the Nigerian government is prepaid to enter into investment protection agreement with foreign enterprises wishing to invest in Nigeria
- Access to land : any company incorporated in Nigeria is allowed access to land rights for the purpose of its activity in any state in the country. It is, however, a requirement that industrial companies comply with regulation on use of land for industrial purposes and with environmental regulations. Land lease is usually for a term of 99 years unless the company stipulates a shorter duration
- Tourism ; this sector was accorded preferential status since 1991. This makes it qualify for such incentives as tax holidays, longer year of moratorium and import duty expansion on tourism related equipment, state government are prepared to facilitate acquisition of land through the issuance of certificate of occupancy for the purpose of tourism development; 25 % of income derived from tourist by hotels in convertible currencies are tax exempt provided such income is put in a reserve fund to be utilized within 5 years for expansion or the construction of new hotels, conferences centre, etc that are useful for tourism development
- Telecommunications: government provides non-fiscal incentives to private investors in addition to a tariff. Structure that ensures that investors recover their investment over a reasonable period of time, bearing in mind the need for differential tariffs between urban and rural areas. Rebate and tax relief are provided for the local manufacture of telecommunication equipment and provision for the local manufacturer of telecommunication equipments and provision of telecommunication services. This sector is rapidly being deregulated and privatised. This has led to the emergence of many operators amongst are MTN, GLOBACOM, ETISALAT, AIRTEL and so on. Teledensity has now expanded as a result, in leaps and bounds. On the manufacturing sector they include;
- Pioneer status; this is a concession to pioneer companies located in economically disadvantage areas; providing a tax holiday period of five to seven years. These incentives must be considered by the government to be beneficial to the country's economy and in the interest of the public. Also, companies that are involved in local raw material development; local value added, labour intensive processing, export oriented activities in plant training are also qualified for additional concessions.
- Local raw material utilisation; 3% tax concession for five years to industries that attain minimum local raw materials utilization as follows; agro 80%, agro allied 70%, engineering 65% chemical 60% petrol chemical 70%
- Local value added; 10% tax concession for five years. This applies essentially to engineering industries, while some finished imported products serve as inputs. This is aimed at encourage local fabrication rather than the mere assembly of completely knocked down parts.
- Export oriented industries; 10% tax concession for five years. This concession will apply to industries that export not less 6% of their products.

- Import duty rebate: a 25% import duty rebate was introduced in 1995 to ameliorate the adverse effect of inflation and to ensure an increase in capacity utilisation in the manufacturing sector. Investors are however, advised to ascertain the current operative figures at the time of making an investment, because there concession have undergo some amendment in the past few years.
- Re-investment allowance; this incentive is given to manufacturing companies that incur capital expenditure for purpose of approved expansion of production capacity; modernization of production facilities, diversification into related products. It is aimed at encouraging reinvestment of products.

**HYPOTHESIS**

Ho; Tax incentives do not influence operational behaviour among firms in Nigeria

**METHODOLOGY**

This paper adopted the survey design, data were gathered from primary source with the aid of a well structured questionnaire duly administered to elite respondents in the service and manufacturing firms located in Edo State, Delta State, and Rivers State as well as investors (existing and potential) in these area of operations. In selecting firm for this studies the simple random (lottery method) was used. A total of one hundred (100) questionnaires were administered to these respondents and a total of seventy (70) questionnaires were retrieved. Thereafter, the binomial test (Z test) statistics which tests the association between two variables was used to analyze the data generated. The decision rule for this test statistics is that the null hypothesis was rejected where the calculated value of Z-cal was found to have exceeded the table value at 5% level of significance.

**EMPIRICAL RESULTS**

This section of the study provides the relevant data for validating or rejecting the null hypothesis:

Ho; Tax incentives do not influence operational behaviour among firms in Nigeria

TABLE 1: RESPONSE TO QUESTION TWO (INVESTMENT DECISIONS IN NIGERIA ARE STRONGLY MOTIVATED BY THE EXISTING TAX INCENTIVES IN THE AREA OF OPERATIONS)

RESPONSES	NUMBER	PERCENTAGES (%)
Strongly Agree	10	14
Agree	17	24
Undecided	1	1
Disagree	22	32
Strongly Disagree	20	29
Total	70	100

Source: Field Survey, 2011

From above table, it reveals that thirty-eight (38) percent of the respondents agree that investment decisions are motivated by presence of tax incentives in that area of operation, while one percent is undecided and the remaining sixty- one (61) percent disagree to the question asked.

Using Binomial P, the null hypothesis (Ho) as regarding the above table is tested using one tail test as follows and given level of significance used in this test is 5% or 0.05:

Ho:  $P \leq 0.05$ , Hi:  $P > 0.05$ , Z cal is computed using

$$Z = \frac{x - npo}{\sqrt{npo(1 - po)}}$$

Where: Z = Symbol used to denote z-test, x = number of positive response received, n = number of response analyzed and po = critical value of the level of significance

$$Z = \frac{27 - (70 \times 0.5)}{\sqrt{70 \times 0.5(1 - 0.5)}} = \frac{27 - 35}{4.18} = -1.89 \approx -1.91$$

= Z cal = -1.91 and  $Z_{0.05} = 1.645$

**Decision:** Since Z cal is -1.91 and is lesser than z value at 5% which is 1.645, we accept the null hypothesis which states that tax incentives do not influence operational behavior among firms in Nigeria and reject the alternate hypothesis.

**CONCLUSION, DISCUSSION AND RECOMMENDATIONS**

The essence of this paper was to ascertain the operational effect of tax incentive on investment behavior among the Nigeria firms via the taxpayer’s perspective. In order to achieve this objective relevant data were gathered from both the primary source and these data were further analysis using the Z- test a binomial test statistics

And from the analysis, it was reveal that tax incentives are not major determinant of investment behavior among firms operating in Nigeria and on the basis of the above the paper recommended that; the Nigeria government should make legal basis for incentives, their economic consequences and their administration procedures transparent and used simple qualifying criteria to ease enforcement and monitoring, that the government should ensure massive public enlightenment through the ministry of commerce, in choosing appropriate tax incentives, only tax incentives that ensure a faster recovery of investment costs should be adopted and also that the government should publish tax incentives bulletins for distributions to companies so as to promote greater awareness.

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**ABSTRACT**

The paper is intended to discuss the need of data security in computer network and to explore the different methods available in this connection. The paper basically deals with the different methods and techniques available for securing data to a large extent on a computer network.

**KEYWORDS**

Data security, Authentication, Authorization, Cryptography, Symmetric encryption, Asymmetric encryption, Hashing and Digital signature

**1.0 INTRODUCTION**

Nowadays man has been increasingly becoming dependent on internet and web surfing. People are really enjoying this technology because of the fact that it has increased the work efficiency at a tremendous rate. But at the same time, the growing popularity of this technology in public domain led some serious issues like virus infection, tampering of data, spooling and leakage of private information to some unauthorised hands. Therefore, in order to provide data security data encryption is necessary and mandatory. The paper lucidly introduces the major security issues and how these can be dealt that arises while sending data or message from one point to another on a computer network.

**1.1 DEFINITION**

**Data security** refers to the practice of keeping data protected from tampering, corruption and unauthorised access.

**1.2 IMPORTANCE OF DATA SECURITY**

Data security is needed to ensure privacy of personal or corporate/business data. Data security methods/techniques prevent virtual attack, physical attack, flexibility and transparency of data in a firm. The information like client information, payment information, personal files and bank account details need standard security system to a large extent because of the fact that these information can be hard to replace and potentially dangerous if it falls into the wrong hands like hackers or predators.

**2.0 METHODS OF DATA SECURITY USED IN COMPUTER NETWORK ARE AS ENUMERATED****2.1 AUTHENTICATION**

It refers to the process of identifying an individual, usually based on a username and password. In general, it verifies "who you are". The process of authentication is usually required to login into a UNIX server or accessing mail server using POP3 and SMTP client. This method facilitates username/password validation using users own premises Active Directory/LDAP server. Authentication service is installed as a virtual appliance and communicates with user's local directory using LDAP over SSL. When the user is authenticated, a session token is usually placed into the user's browser. Usually, PAM (Pluggable Authentication Modules) is used as low authentication schemes into a high level application programming interface (API).

**2.2 TYPES OF AUTHENTICATION**

- **User authentication** ----- refers to the process of determining that a user is who he/she claims to be.
- **Entity authentication** ----- refers to the process of identifying an individual usually based on a username and password.

**2.3 APPLICATION OF AUTHENTICATION IN DAILY LIFE**

- Demanding voter ID or photo ID.
- Entering a country with a passport.
- Logging in to a computer.
- Using a confirmation e-mail to verify ownership of an e-mail address.
- Using internet banking system.
- Withdrawing cash from an ATM.

**3.0 AUTHORIZATION**

It refers to the process of giving individuals access to system objects based on their identity. In general, it verifies "what the user is authorised to do". Here the user is allowed to login into the (UNIX) system but the user is restricted or not authorised to use or access browser or any other file system. Authorization is usually controlled at file system level.

**4.0 CRYPTOGRAPHY**

It refers to the practice and study of techniques for secure communication in the presence of third parties (called adversaries). The term cryptography comes from Greek words meaning "hidden writing". It is the science of hiding information so that unauthorised users cannot read it. Cryptography is synonymous with the term data encryption which means the conversion of information from a readable state to apparent nonsense.

**4.1 DATA ENCRYPTION**

It refers to mathematical calculations and algorithmic schemes that transform plaintext into cipher text, a form that is non readable and unusable to unauthorized parties. Modern cryptography is heavily based on mathematical theory and computer science practice. These cryptographic algorithms are to break in practice by any adversary. Cryptographic algorithms and analysing protocols are designed/ constructed to overcome the influence of adversaries. Cryptography or data encryption is directly related to various aspects of information security such as data confidentiality, data integrity, authentication and non repudiation. Historically, encryption systems used symmetric cryptography. As far as computer network is concerned, data encryption is absolutely necessary because it transmits sensitive data over unsecure mediums like the internet.

**4.2 TYPES OF ALGORITHMS USED FOR DATA ENCRYPTION ARE:**

- Symmetric encryption or cryptography and
- Asymmetric encryption or cryptography

Now, each one is discussed as under:

**4.2.1 SYMMETRIC CRYPTOGRAPHY** ----- refers to encryption methods in which both the sender and receiver share the same key. It is also known as secret key cryptography. Symmetric cryptography uses the same key for both encryption and decryption.

**KEY** ----- In cryptographic systems, the term key refers to a numerical value used by an algorithm to alter information, making that information secure and visible only to individuals who have the corresponding key to recover the information. Therefore, the key has the ability to encrypt or decrypt the data.



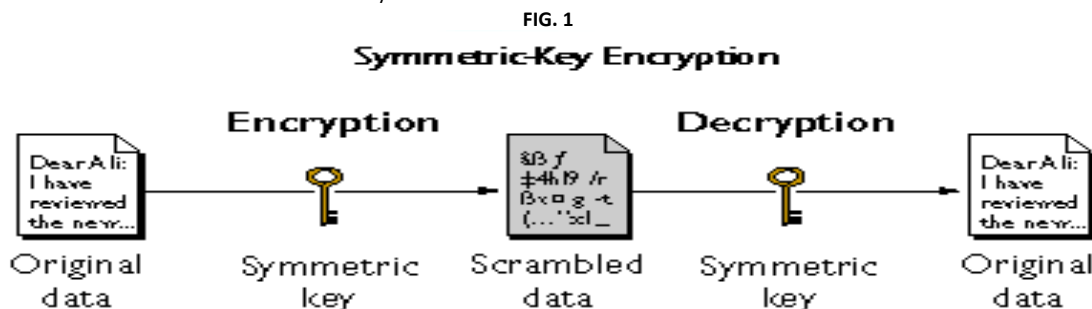
**KEY MANAGEMENT** ----- refers to the secure administration of keys to provide them to users where and when they are required.

**CIPHER TEXT** ---- Cryptography converts readable data or clear text into encoded data called cipher text.

**4.2.2 Types of symmetric key cryptography (data encryption)**

- Block cipher
- Stream cipher
- Hashing or cryptographic hash functions

**4.2.2.1 Block cipher** ----- refers to the method of encrypting text to produce cipher text. In this method cryptographic key and algorithm are applied to a block of data. Block ciphers generally convert a fixed length block of plaintext into cipher text of the same length, which is under the control of the secret key. Decryption is effected using the reverse transformation and the same key.



Different techniques used to cipher plaintext messages are:

- **ECB** ----- Electronic Code book
- **CBC** ----- Cipher block chaining
- **CFB** ----- Cipher feedback
- **OFB** ----- Output feedback mode

Block ciphers include DES, IDEA, AES, FEAL, SAFER, BLOWFISH, RIVEST CIPHER (RC) and SKIPJACK

**DES (DATA ENCRYPTION STANDARD)** ----- It is the main standard for encrypting data using symmetric algorithm. It is a widely used method of data encryption using a private (secret) key. Earlier it was difficult to break. There are 72 quadrillion or more possible encryption keys that can be used. For each given message, the key is chosen at random from this enormous number of keys. In this case both the sender and the receiver must know and use the same private key. DES applies 56 bit key to each 64 bit block of data. The process can run in several modes and involves 16 rounds or operations.

**APPLICATIONS OF DES** ----- ATM (Automated teller machine) encryption commonly used in banks, e-mail privacy and secure remote access.

**DEMERIT**

DES can be broken. DES is vulnerable or prone to brute force attack or exhaustive key search, a repeated trying of keys until one fits. Example FEAL

**IDEA (INTERNATIONAL DATA ENCRYPTION ALGORITHM)** ----- refers to an iterative block cipher and uses 128 bit keys and eight rounds. This gives much more security.

**ADVANCED ENCRYPTION STANDARD (AES)** ----- This is the newest encryption standard which allows a maximum of 256 bits. AES has not been cracked. Therefore, it is widely used by the US government.

**FEAL** ----- Stands for Fast Data Encipherment algorithm (FEAL). Examples are FEAL-4, FEAL-8 and FEAL-N. They are very insecure.

**SAFER** ----- refers to a symmetric cipher coming with 40, 64 and 128 bit keys.

**BLOWFISH** ----- It is a combination of Fiestal network, key dependent S-boxes and a non invertible F function. It is considered as a strong open source symmetric algorithm.

**RIVEST CIPHER** ----- refers to a group of algorithms that can take on a variable block size, key size and number of rounds. The block size is generally dependent on the word size of the machine. For example, RC5 was designed to run on 32 bit processors. Some of the popular Rivest cipher are RC-2, RC-5 and RC-6.

**SKIPJACK** ----- refers to a symmetric cipher coming with 80 bit keys.

**64-BIT BLOCK CIPHER** ----- refers to the DES (Data Encryption Standard) that encrypts data 64 bits at a time.

**4.2.2.2 STREAM CIPHERS** ----- In a stream cipher, the output stream is created based on a hidden internal state which changes as the cipher operates. For example, RC4. It is a widely used stream cipher.

**4.2.2.3 Hashing or cryptographic hash functions** ----- refers to the function that transforms data of arbitrary length into a smaller fixed length, more commonly known as a message digest. These cryptographic hash functions generally take a message of any length as input and output a short, fixed length hash. It can be used in a digital signature. For good hash functions, an attacker cannot find two messages that produce the same hash. Hash algorithms are often generated by the DES algorithm to encrypt online banking transactions and other communications where messages can't afford to be corrupted. MD4 and MD5 are widely used hash function but now broken.

**WORKING OF HASHING ALGORITHMS** ----- this algorithm generally transforms a text string into an alphanumeric string. Hashes are typically referred to as one way hashes and are difficult to reverse. Usually hash values never need to be decoded, when a user log onto his/her computer. Then the hash value is compared with the hash value stored on the server. When hashing is done, the resulting hash is normally smaller than the original.

Some popular hashing algorithms are: SHA (Secure Hash algorithm) and MD (Message Digest) algorithms.

The following table lists different types of hashing algorithms:

**TABLE 1**

Hash	No. of bits	Cracked	Developer	Introduced
SHA- 1	160	Yes	NSA	1995
SHA- 2		None	NSA	2000
SHA- 256	256	None	NSA	2000
SHA- 384	384	None	NSA	2000
SHA- 512	512	None	NSA	2000
MD- 2	128	Yes	Ronald Rivest	1989
MD- 5	128	Yes	Ronald Rivest	1991
HAVAL	128	No	Yuliang Zheng	1992
RIPEND- 320	320	No	Hans Dobbartin	1996
Gost	64	No	Soviet union	1970
Whirlpool	512	No	Paulo Barreto	2001

**USE OF HASH CODE**

- **Maintaining integrity of messages** ----- a hash code is generally used for comparison purposes to make sure that data has not been changed.
- A hash code is used as a digital signature for the data.

**Digital signature** ----- refers to a mathematical scheme for demonstrating the authenticity of a digital message or document. Digital signatures are commonly used for software distribution, financial transactions to detect and prevent forgery or tampering.

#### 4.2.2.4 Advantages of symmetric cryptography

- It is safe to send encrypted messages without fear of interception.
- Symmetric cryptography is much faster and is suitable for encrypting large amount of information.

#### 4.2.2.5 Disadvantage of symmetric cryptography

- Key management
- As the number of user increases on a network, the number of keys required to provide secure communications among those user increases rapidly. For instance, a network of hundred users would require almost five thousand (500) keys.

**4.3.1 Asymmetric cryptography** ----- refers to the encryption algorithms that involve a pair of relative keys to encode and decode messages. Generally, one key is used to encrypt data into cipher text while the other key is used to decrypt cipher text back into plaintext or clear text. This cryptography uses a pair of keys called a private key and a public key. The public key is generally used to encrypt data before sending it to the recipient. When the message is encrypted it becomes viewable only for the owner of the private key, which will allow him to decrypt the information. Also, asymmetric cryptography algorithms are commonly known as public key cryptography.

#### 4.3.2 Types of asymmetric cryptography

**RSA (Rivest Shamir- Adleman) algorithm** ----- refers to a message that can be securely signed by a specific sender. If the sender encrypts the message using their private key, then the message can be decrypted only using that sender's public key, authenticating the sender.

**PKI (Public Key Infrastructure)** ----- refers to the most common public key cryptographic method used on the internet for authenticating a message sender. PKI enables users of an unsecure public network like internet to securely and privately exchange data and money through the use of a public key and a private key pair that is obtained through a trusted authority. This method provide for a digital certificate that can identify an individual or an organisation. A PKI includes the following:

- CA (Certificate authority) ----- is an individual or a person that generally issues and verifies digital certificates. A digital certificate means an electronic "credit card" that establishes users credentials when doing business or other transactions on the web. A digital certificate basically contains username, a serial number, expiration dates and a copy of the certificate holder's public key (used for encrypting messages and digital signatures).
- RA (registration authority) ----- is an individual or a person that generally acts as the verifier for the CA before a digital certificate is issued to a requestor.
- One or more directories where the certificates (with the public keys) are held.
- A certificate management system.

#### 4.3.3 Application of asymmetric encryption

- **Making digital certificates** ----- Here certificate refers to a package of information that identifies a user or a server, and contains information such as the organisation name, the organisation that issued the certificate, the user's e-mail address and country and the user's public key.

#### 4.3.4 Advantages of asymmetric key cryptography

- It is used to solve the problem of delivering the symmetric encryption key to the bank in a secure manner.
- It is considered to be more secure encryption method as its private key is not shared.

#### 4.3.5 Disadvantages of asymmetric key cryptography

- Public key cryptography is relatively slow and is only suitable for encrypting small amounts of information such as symmetric keys.
- It did not provide a comprehensive solution to the key management problem.

## 5.0 ADVANTAGES OF CRYPTOGRAPHIC METHOD

- In the past, Julius Caesar was credited with creating one of the earliest cryptographic systems to send military messages to his generals.
- Nowadays, banking, online shopping and even home users uses the method of cryptography to protect data.
- In computer, a web browser automatically encrypts data to prevent intruders from stealing and intercepting private communications.

## 6.0 MODERN CRYPTOGRAPHY APPLICATIONS

- ATM cards
- Computer passwords
- Electronic commerce

## 7.0 CONCLUSION

The paper defines, describes and explains the different cryptographic method and techniques available to encode or decode any text or message to provide reliable privacy and security.

## 8.0 ACKNOWLEDGEMENT

I would like to express my deep gratitude to people around me (especially students and computer users) who most often raise security issues whenever their message passes through public domain using computer. At last I would like to thank the great almighty who has given wisdom, strength and knowledge to visualise and explore things from grass root level and put on papers for the benefit of mankind and promote safe invention and new discoveries.

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**CONSUMERS CHOICE OF RETAIL STORES WITH REFERENCE TO THEIR DEMOGRAPHIC INFLUENCERS**

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**ABSTRACT**

Many research has concentrated on the impact of consumers' perceived value on the attitude to purchase rather than on the resulting behavior itself. In this article we address the substantive retailing issue of whether consumers' demographic factor (i.e., occupation, education and income) actually affects their choice of retail store. This paper discusses an approach to modeling consumer choice behavior (buy/not buy from the given store) based on the type of occupation, their education level and their income status. The consumer market is assumed to consist of wide variety of products and therefore have both Conventional and Modern Retail Stores. The research paper emphasize on finding the association between the type of consumers visiting conventional and modern retail stores with their demographic characteristics. It results also help to find out whether these factors are significant or not. The study aims to discover the factors influencing the customer buying behavior in modern retail malls vis-à-vis in conventional shopping stores. It will introduce new concept in the existing literature on retail marketing and buying behavior study.

**KEYWORDS**

perceived value, retailing, demographic factor, Conventional, Modern Retail.

**1. INTRODUCTION**

The Indian retail industry is the fifth largest in the world. Comprising of organized and unorganized sectors, India retail industry is one of the fastest growing industries in India, especially over the last few years. Though initially, the retail industry in India was mostly unorganized, however with the change of tastes and preferences of the consumers, the industry is getting more popular these days and getting organized as well. Retailing in India is gradually inching its way to becoming the next boom industry. The whole concept of shopping has altered in terms of format and consumer buying behavior, ushering in a revolution in shopping. Modern retail has entered India as seen in sprawling shopping centers, multi-storied malls and huge complexes offer shopping, entertainment and food all under one roof.

Before making an analysis of consumer demographic factors that affect buying decision in conventional stores and modern retail mall, let us go through a glimpse of retail industry which emphasize on concept of retail and retailing, type of retailing, type of retail stores, major players in Indian retail market and the demographic factors which affect the buying decision of the customers.

According to [managementstudyguide.com](http://www.managementstudyguide.com), (2012) Retail involves the sale of goods from a single point (malls, markets, department stores etc) directly to the consumer in small quantities for his end use. In a layman's language, retailing is nothing but transaction of goods between the seller and the end user as a single unit (piece) or in small quantities to satisfy the needs of the individual and for his direct consumption.

According to Philip Kotler (2003),

*"Retailing includes all the activities involved in selling goods or services to the final consumes, for personal, non-business use".*

**TYPES OF RETAIL STORES IN INDIA AS STUDIED****1. MODERN RETAIL MALLS**

A shopping mall, shopping center/centre, shopping arcade, shopping precinct, or simply mall is one or more buildings forming a complex of shops representing merchandisers, with interconnecting walkways enabling visitors to easily walk from unit to unit, along with a parking area – a modern, indoor version of the traditional marketplace.

**2. CONVENTIONAL SHOPPING STORES**

Conventional shops and stores are those who sells wieners such as candy, ice-cream, soft drinks, lottery tickets, cigarettes and other tobacco products, newspapers, magazines, along with a selection of processed food and perhaps some groceries. Stores particularly having different brands of travelling bags under one roof or different electronic brands etc. Often toiletries and other hygiene products are stocked, and some of these stores also offer money orders and wire transfer services or liquor products. They are often located alongside busy roads, in densely-populated areas.

**DEMOGRAPHIC FACTORS WHICH AFFECT THE BUYING DECISION OF THE CUSTOMERS-**

There are various personal characteristics/demographic factors that play major role in influencing the consumer perception in the choice of retail store from where they shop. The most common influencers are their occupation, education and income level

**2. RESEARCH METHODOLOGY**

The study is limited to the investigation of consumer buying behavior in retail industry. Major emphasis is placed on demographic factors that influence the Behavior in modern Retail Format vis-a-vis Conventional Shopping Stores. The geographical coverage is restricted to Udaipur and Kota. The sampling unit is 600 respondents {300 from Udaipur (Raj.) and 300 from Kota (Raj.)}

**3. RESEARCH FINDINGS**

The data collected and analyzed pertains to the respondents' occupation who visit Modern and Conventional Stores. The data table shows that in Modern retail store maximum no. of respondents that is 34.33% are service people whereas 26.33% are housewives, 20.67% are in business, 13.67% are student and remaining 5% are retired people.

The data also depicts that in Conventional store maximum no. of respondents that is 46.33% are service people whereas 24.67% are in business, 16.00% are student, 8.67% are housewives, and remaining 4.33% are retired people.

For analyzing the association between occupation of the respondent and their from their choice of retail store, he/she is using the following Null hypothesis as stated:

**H<sub>0</sub>3: There is no association between occupation of the respondent and their choice of retail store.**

The hypothesis that there is an association between occupation of the respondent and their choice of retail store holds non-significant on the basis of the respondents of the sample.

The data distribution exhibits the respondents' Education who visit Modern and Conventional Stores. The majority people visiting Modern Malls are Professionals i.e. 26.67% and very close to that are post graduate 24.00%, graduate 23.00% and higher secondary 22.00% and remaining are secondary i.e. only 4.33%.

While in Conventional Stores, majority of respondents are post graduate i.e. 36.00%, then 25.00% are graduate, 22.00% are higher secondary, 9.33% are professionals and remaining 70.67% are secondary.

For analyzing the association between education of the respondent and their choice of retail store, he/she is using the following Null hypothesis as stated:

**H<sub>0</sub>3: There is no association between education of the respondent and their choice of retail store.**

The hypothesis that there is an association between education of the respondent and their choice of retail store holds highly-significant on the basis of the respondents of the sample.

The data also depicts the distribution of respondents in Modern and Conventional Stores according to their Monthly Family Income. In Modern Retail Malls major buyers that is 34.67% having monthly family income between Rs. 20000-40000 and very close to that is 33.67% respondents having monthly family income between Rs. 40000-60000, then 12.67% respondents' upto Rs. 20000, 6.67% between Rs. 60000-80000, 6.33% above Rs. 100000 and remaining 6.00% is between Rs. 80000-100000.

In Conventional Stores 53.67% respondents have their Monthly Family Income between Rs. 20000-40000, 26.67% respondents having monthly family income between Rs. 40000-60000, then 8.00% respondents' upto Rs. 20000, 5.00% between Rs. 60000-80000, 4.67% above Rs. 100000 and remaining 2.00% is between Rs. 80000-100000.

For analyzing the association between income of the respondent and their choice of retail store, he/she is using the following Null hypothesis as stated:

**H<sub>0</sub>3: There is no association between income of the respondent and their choice of retail store.**

The hypothesis that there is an association between income of the respondent and their choice of retail store holds non-significant on the basis of the respondents of the sample.

#### 4. CONCLUSION

After making a descriptive and in-depth analysis of the research we come to the conclusion that demographic factors like occupation, income and education also plays important role in influencing the purchase decisions while their degree and level of influence differs.

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**GRID COMPUTING: INTRODUCTION AND APPLICATION****ANUDEEP RANDHAWA****STUDENT****DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY****RAYAT INSTITUTE OF ENGINEERING & TECHNOLOGY****ROPAR****HEENA GULATI****ASST. PROFESSOR****DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY****RAYAT INSTITUTE OF ENGINEERING & TECHNOLOGY****ROPAR****HARISH KUNDRA****HEAD****DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY****RAYAT INSTITUTE OF ENGINEERING & TECHNOLOGY****ROPAR****ABSTRACT**

Computational grids are a promising platform for solving large-scale intensive problems. [4] Because grid based computational infrastructure involves a variety of geographically distributed computational resources, storage systems, data sources and databases and presents them as a unified integrated resource, the mutual relationship needs to be established and removed in a dynamic manner in grid environments. [1] Despite the wide adoption by the scientific community, grid technologies have not been given the appropriate attention by enterprises. This is merely due to the lack of enough studying and defining security requirements of grid computing systems. More specifically, access control in grid systems has been addressed with the same models for collaborative systems based on distributed computing across multiple administrative domains. However, existing solutions are not based on a foundation for a holistic approach in grid access control. This paper aims to provide an adequate approach in this direction. Additionally, a comparative review of current access control models is provided in the context of our proposed four-layer conceptual grid categorization.

**KEYWORDS**

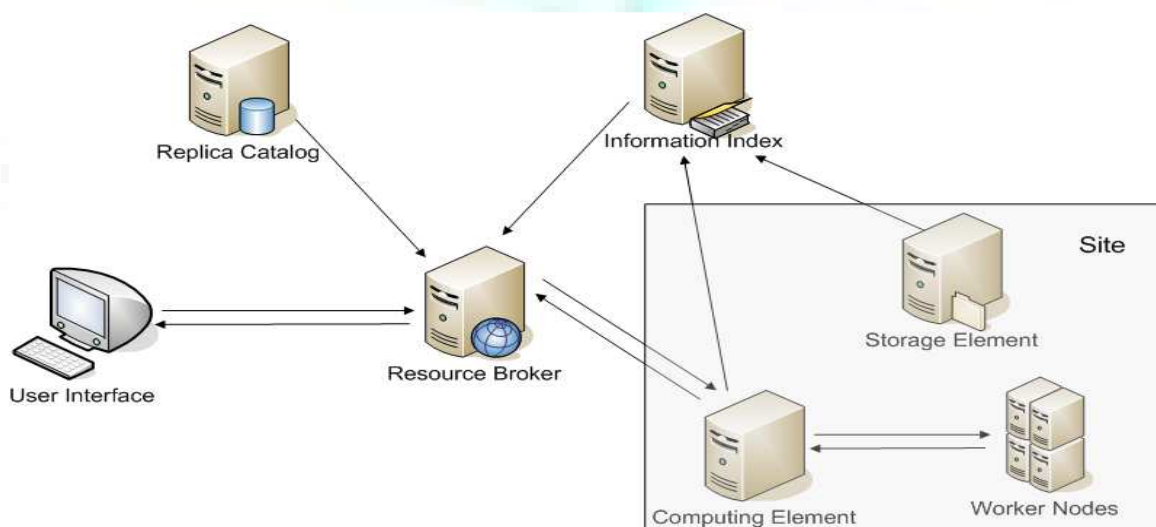
Grid Access to Secondary Storage (GASS), Grid Resource Allocation Manager (GRAM), Grid Security Infrastructure (GSI), Monitoring and Discovery Service (MDS).

**INTRODUCTION**

**Grid computing** [2] combines computers from multiple administrative domains to reach a common goal. The grid can be thought of as a distributed system with non-interactive workloads that involve a large number of files. Grids tend to be more loosely coupled, heterogeneous, and geographically dispersed. Although a single grid can be dedicated to a particular application, commonly a grid is used for a variety of purposes. Grid computing finds its application in go fight against malaria, computing for clean water, discovering dengue drugs, help fight childhood cancer, help conquer cancer, fight aids nutritious rice for the world.

**EUINDIAGRID**

[6] Started on 1st of october 2006 and sponsored by EU, aims at enabling the interconnection between the most relevant European Grid infrastructure, EGEE, and the Indian Grid infrastructure, GARUDA INDIA.

**USER INTERFACE**

This machine runs the User Interface (UI) software which allows the end-user to interact with the grid system. This is typically the machine the end-user uses to submit jobs to the grid system and retrieve output of the completed jobs. The interface is also used to monitor the execution of jobs after submission.

**COMPUTING ELEMENT**

A Computing Element (CE) can be described as a gatekeeper machine with a number of worker nodes, A gatekeeper is the front-end of a computing element. It handles the interaction with the rest of the grid environment accepting jobs, dispatching them for execution and returning the output. An actual CE should consist of a gatekeeper machine and a number of worker nodes however; in some sites, you will find only a gatekeeper machine acting also as worker node. The gatekeeper hides the details of WNs from the end-user; however, these are the nodes on which user computations are actually performed.

**STORAGE ELEMENT**

The Storage Element (SE) provides access to large storage spaces. This element hides the details of the backend storage systems.

**SHARED SERVICES**

The resources within a grid site and the total number of sites change over time as new resources are added to the grid or are temporarily withdrawn for reasons such as maintenance.

There are also several nodes which provide shared services and are not site-specific but shared by various subgroups of the grid users. Resource Broker, File Catalog are some of the common services.

**RESOURCE BROKER**

The Resource Broker (RB) accepts jobs from users (via the User Interface), match the jobs' requirements to the available resources at the various sites within the grid, and dispatch them.

**THE LOGICAL FILENAME CATALOG**

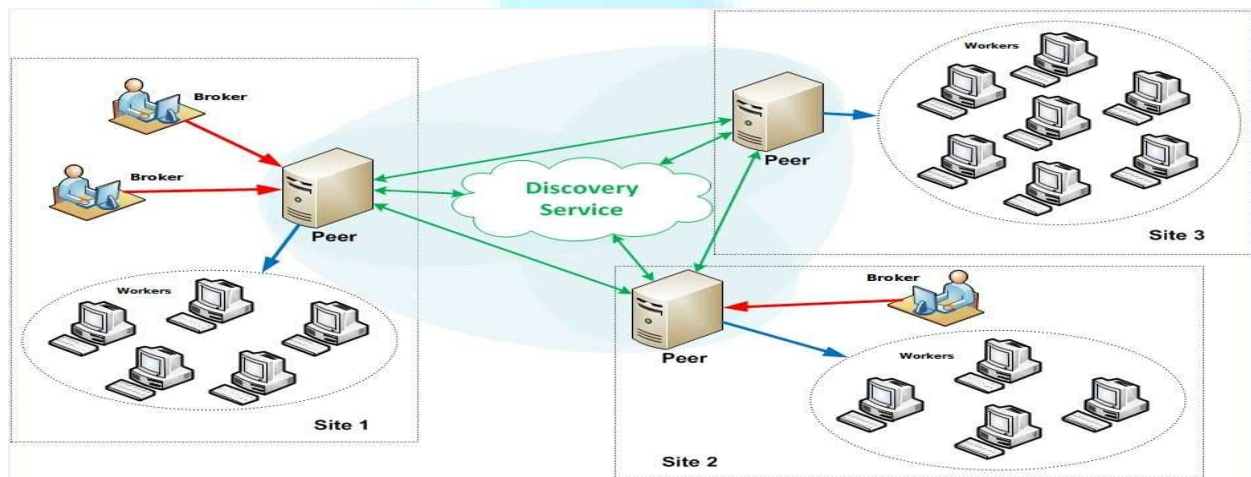
The Logical Filename Catalog (LFC) maintains a database of the locations of master copies of files and the locations of any replicas for a Virtual Organization. They do not hold the actual data only the database describing them (metadata). These machines are used by users and grid services to locate appropriate copies of data files.

**THE INFORMATION SYSTEM**

Infrastructure used to propagate local information to the whole grid.

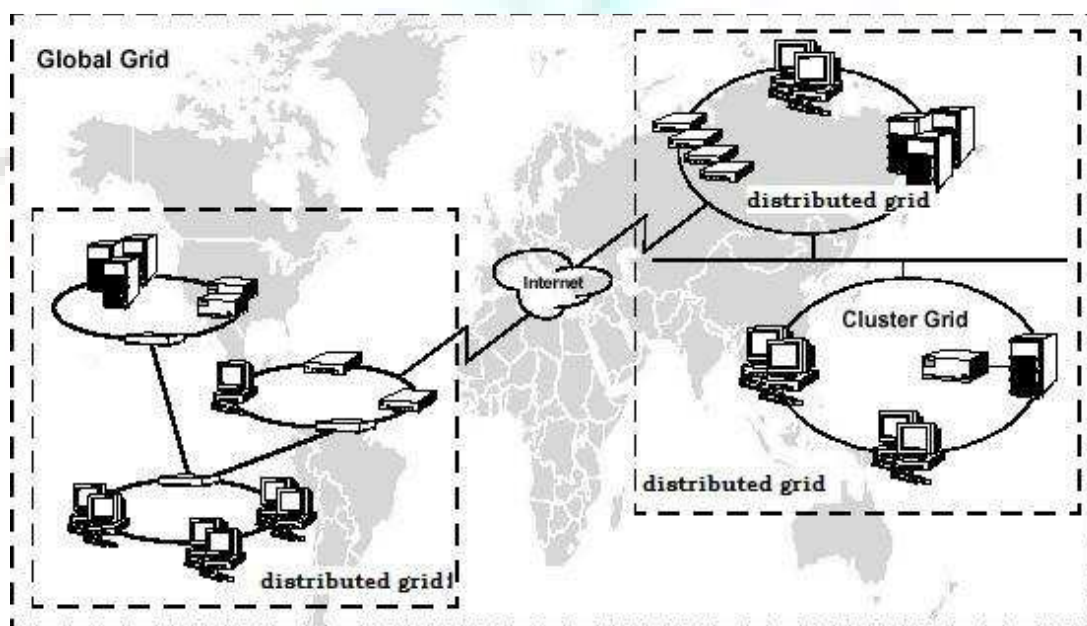
**THE GRID NETWORK**

The Grid network has three main components: the Grid workers (individual computers that run grid jobs), the peer (responsible for managing local workers, interacting with the other peers to donate computer resources and use remote resources), and the broker (the Grid software client for users). Peers use a 'Discovery Service' to find each other in the P2P network.



**DIFFERENCE BETWEEN DISTRIBUTED GRID AND CLOUD COMPUTING**

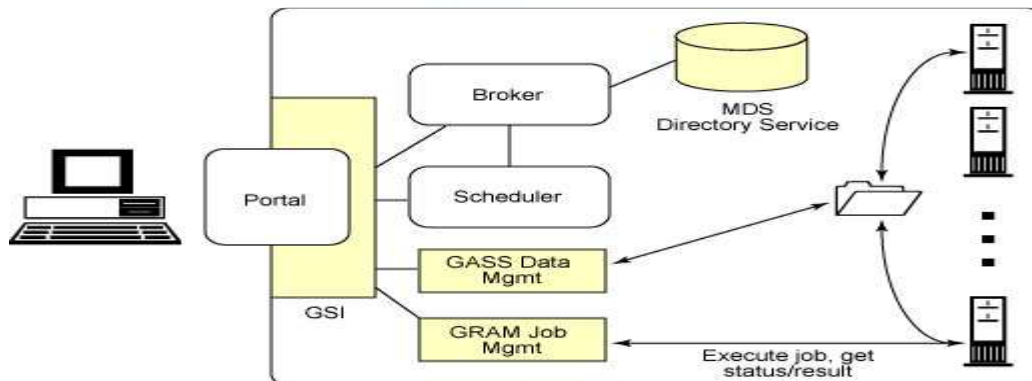
Distributed Computing normally refers to managing the hundreds or thousands of computer systems which individually are more limited in their memory and processing power. On the other hand, grid computing has some extra characteristics. It is concerned to efficient utilization of a pool of heterogeneous systems with optimal workload management utilizing an enterprise's entire computational resources (servers, networks, storage, and information). There is no limitation of users, departments or originations in grid computing.



**NEED BEHIND GRID COMPUTING**

- Low Cost
- Resource sharing on a global scale: Sharing is the very essence of grid computing.
- Secure access: There must be a high level of trust between resource providers and users, who often don't know each other. Sharing resources is fundamentally in conflict with the conservative security policies being applied at individual computer centers and on individual PCs. So getting grid security right is crucial.
- Resource use : Demand for grid resources should be balanced, so that computers everywhere are used more efficiently.
- The death of distance: For grids to work, we need to ensure that distance makes no difference to efficient access to computer resources.

**HOW IT WORKS**



Security [5]A major requirement for Grid computing is security. At the base of any grid environment, there must be mechanisms to provide security, including authentication, authorization, data encryption, and so on

Portal A user log in to the grid through a portal, the portal acts as a user interface, through which user can log in and use the grid. After identification verification of the user he/she can submit its task to the task manager.

Scheduler Next the scheduler is responsible for scheduling submitted tasks on the resources identified by resource broker, which sets rules and priorities for scheduling task on a grid infrastructure.

Job manager Job manager supplies the user task, data to the selected resources and after execution of the task it returns the computed result to the user.

Monitoring and Discovery Service (MDS). This service provides information about the available resources within the grid and their status. A broker service could be developed that utilizes MDS.

**APPLICATIONS**

[3]Perhaps the most ambitious is Oxford University's Centre for Computational Drug Discovery's project that utilizes more than one million PCs to look for a cancer cure. People around the world donate a few CPU cycles from their PCs through "screensaver time." The project eventually will analyze 3.5 billion molecules for cancer fighting potential.

**CASE STUDY**



Help Defeat Cancer Project

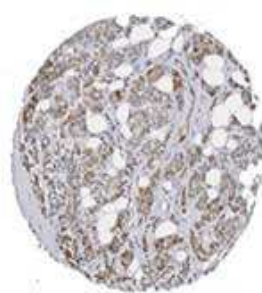
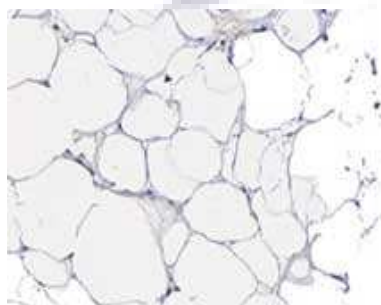
Dr. David Foran, Principal Investigator

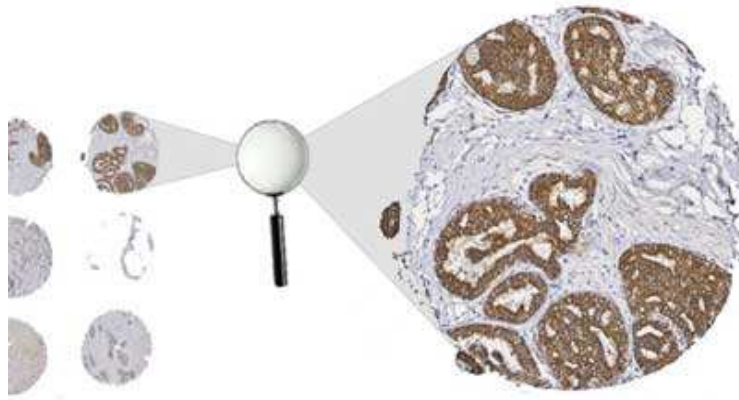
IBM's World Community Grid will enable the most computationally expensive components of the software to run at optimal speed, By harnessing the collective computational power of World Community Grid, researchers will be able to analyze a larger set of cancer tissue specimens and conduct experiments using a much broader ensemble of biomarkers and stains than is possible using traditional computer resources. To date, only a fraction of the known biomarkers have been examined. The long-term goal is to create a library of biomarkers and their expression patterns so that, in the future, physicians can consult the library to help them in rendering diagnoses and providing the most effective treatment for patients with cancer. In the absence of World Community Grid, TMA's are processed in individual or small batches. Using World Community Grid, analysis can be carried out for hundreds of arrays in parallel, allowing multiple experiments to be conducted simultaneously.

**TISSUE MICROARRAYS**

A relatively new investigative tool called tissue microarrays (TMA) holds great promise in helping doctors in selecting proper treatment strategies and providing accurate prognosis for cancer patients. Although TMA is not currently being used by doctors to render primary diagnoses, it does make it possible for researchers to determine the specific type and stage of cancer present and systematically investigate which therapies or combinations of treatments are most likely to be effective for each kind of cancer based upon the known outcomes of individual patients. Specific courses of treatment can then be prescribed for actual cancer patients based on whether a specific set of antigens is present or not.

There is a special type of protein(antigen) that cause cancer when a antibody(usually a protein)is treated with its corresponding antigen the antigen protein get stained and the cancer in the cell is detected which further tells the damage caused by the antigen to the cell. After cancer cell presence is known we treat the antigen with the suitable protein.





Much of the difficulty in rendering consistent evaluation of expression patterns in cancer tissue microarrays arises from subjective impressions of observers. It has been shown that when characterizations are based upon computer-aided analysis, objectivity, reproducibility and sensitivity improve considerably.

#### **WHAT IS TISSUE MICROARRAY TECHNOLOGY?**

Tissue Microarray (TMA) technology is a relatively new investigative tool for harvesting small tissues sections and arranging them on a on a single microscope glass slide in a grid-like manner. The arrays are subsequently treated with antibodies

#### **WHAT DOES A TISSUE MICROARRAY SLIDE LOOK LIKE?**

Below is a photo of an actual Tissue Microarray slide. Each of the colored dots is a tissue slice which was an image for a work unit. That image corresponds to the large circle on the left side.

#### **How long does the scanner take to scan in a whole slide?**

Usually under an hour, but it depends on how many slices are on the specimen.

#### **What is the average number of tissue slices per slide?**

Most slides have 300-40. However some of them only have around 100.

#### **FUTURE SCOPE**

- € GO FIGHT AGAINST MALARIA
- € COMPUTING FOR CLEAN WATER
- € DISCOVERING DENGUE DRUGS
- € HELP FIGHT CHILDHOOD CANCER
- € HELP CONQUER CANCER
- € FIGHT AIDS
- € NUTRITIOUS RICE FOR THE WORLD

#### **CONCLUSION**

Though till now distributed computing has been much in use for various streams including business, research purposes. Grid computing which exploits the collective computational power of global computers more than that of distributed computing and can solve large problem sizes that require ample space and computations. Security measures used in distributed system can easily work with grid computing so it can be applied for different areas.

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**CONSUMER BEHAVIOR TOWARDS e-BANKING IN HDFC BANK****CHANABASAPPA TALAWAR****STUDENT****P G DEPARTMENT OF STUDIES & RESEARCH IN COMMERCE****KARNATAK UNIVERSITY P G CENTER****KODIBAG****ABSTRACT**

*E-banking or Online banking is a generic term for the delivery of banking services and products through the electronic channels such as the telephone, the internet, the cell phone etc. The concept and scope of e-banking is still evolving. It facilitates an effective payment and accounting system thereby enhancing the speed of delivery of banking services considerably. An analysis of technology and its uses show that it has permeated in almost every aspect of our life. Many activities are handled electronically due to the acceptance of information technology at home as well as at workplace. Slowly but steadily, the Indian customer is moving towards the internet banking. The ATM and the Net transactions are becoming popular. But the customer is clear on one thing that he wants net-banking to be simple and the banking sector is matching its steps to the march of technology.*

**KEYWORDS**

E-Banking, Mobile Banking, Phone Banking, Credit cards, and Smart cards.

**INTRODUCTION OF e-BANKING**

The world is changing at a staggering rate and technology is considered to be the key driver for these changes around us. An analysis of technology and its uses show that it has permeated in almost every aspect of our life. Many activities are handled electronically due to the acceptance of information technology at home as well as at workplace. Slowly but steadily, the Indian customer is moving towards the internet banking. The ATM and the Net transactions are becoming popular. But the customer is clear on one thing that he wants net-banking to be simple and the banking sector is matching its steps to the march of technology. E-banking or Online banking is a generic term for the delivery of banking services and products through the electronic channels such as the telephone, the internet, the cell phone etc. The concept and scope of e-banking is still evolving. It facilitates an effective payment and accounting system thereby enhancing the speed of delivery of banking services considerably. Several initiatives have been taken by the Government of India as well as the RBI (Reserve Bank of India); have facilitated the development of e-banking in India.

**e-BANKING**

Electronic banking is one of the truly widespread avatars of E-commerce the world over. Various authors define E-Banking differently but the most definition depicting the meaning and features of E-Banking are as follows:

1. Banking is a combination of two, Electronic technology and Banking.
2. Electronic Banking is a process by which a customer performs banking Transactions electronically without visiting a brick-and-mortar institutions.
3. E-Banking denotes the provision of banking and related service through Extensive use of information technology without direct recourse to the bank by the customer.

**NEED FOR e-BANKING**

One has to approach the branch in person, to withdraw cash or deposit a cheque or request a statement of accounts. In true Internet banking, any inquiry or transaction is processed online without any reference to the branch (anywhere banking) at any time.

Providing Internet banking is increasingly becoming a "need to have" than a "nice to have" service. The net banking, thus, now is more of a norm rather than an exception in many developed countries due to the fact that it is the cheapest way of providing banking services.

Banks have traditionally been in the forefront of harnessing technology to improve their products, services and efficiency. They have, over a long time, been using electronic and telecommunication networks for delivering a wide range of value added products and services. The delivery channels include direct dial – up connections, private networks, public networks etc and the devices include telephone, Personal Computers including the Automated Teller Machines, etc. With the popularity of PCs, easy access to Internet and World Wide Web (WWW), Internet is increasingly used by banks as a channel for receiving instructions and delivering their products and services to their customers. This form of banking is generally referred to as Internet Banking, although the range of products and services offered by different banks vary widely both in their content and sophistication.

**HISTORY OF e-BANKING**

The precursor for the modern home online banking services were the distance banking services over electronic media from the early '80s. The term online became popular in the late '80s and refers to the use of a terminal, keyboard and TV (or monitor) to access the banking system using a phone line. 'Home banking' can also refer to the use of a numeric keypad to send tones down a phone line with instructions to the bank. Online services started in New York in 1981 when four of the city's major banks (Citibank, Chase Manhattan, Chemical and Manufacturers Hanover) offered home banking services using the videotext system. Because of the commercial failure of videotext these banking services never became popular except in France where the use of videotext has subsidized by the telecom provider and the UK, where the Prestel system was used.

**USAGE OF e-BANKING**

The rise in the e-commerce and the use of internet in its facilitation along with the enhanced online security of transactions and sensitive information has been the core reason for the penetration of online banking in everyday life. According to the latest official figures from the office of National Statistics (ONS 2007) indicate that subscriptions to the internet has grown more than 50% from 25 million in 2005 to 45 million in 2007 in India. It has also been estimated that 60% of the population in India use internet in their daily lives. The computerization of the banking operations has made maximum impact on:-

- 1) Internal Accounting System
- 2) Customer service
- 3) Diversification of system

**IMPACT OF e-BANKING ON TRADITIONAL SERVICES**

One of the issues currently being addressed is the impact of e-banking on traditional banking players. After all, if there are risks inherent in going into e-banking there are other risks in not doing so. It is too early to have a firm view on this yet. Even to practitioners the future of e-banking and its implications are unclear. It might be convenient nevertheless to outline briefly two views that are prevalent in the market. The view that the Internet is a revolution that will sweep away the old order holds much sway. Arguments in favor are as follows:

e-banking transactions are much cheaper than branch or even phone transactions. This could turn yesterday's competitive advantage - a large branch network - into a comparative disadvantage, allowing e-banks to undercut bricks-and-mortar banks. This is commonly known as the "beached dinosaur" theory. However, supervisors will need to pay close attention to the impact of e-banks on the traditional banks, for example by surveillance of:

- ☞ Strategy
- ☞ Customer levels
- ☞ Earnings and costs
- ☞ Advertising spending
- ☞ Margins
- ☞ Funding costs
- ☞ Merger opportunities and threats, both in the UK and abroad.

### e-BANKING PRODUCTS

**Automated Teller Machine (ATM):** These are cash dispensing machine, which are frequently seen at banks and other locations such as shopping centers and building societies. Their main purpose is to allow customer to draw cash at any time and to provide banking services where it would not have been viable to open another branch e.g. on university campus.

An automated teller machine or automatic teller machine (ATM) is a computerized telecommunications device that provides a financial institution's customers a method of financial transactions in a public space without the need for a human clerk or bank teller. On most modern ATMs, the customer identifies him or herself by inserting a plastic ATM card with a magnetic stripe or a plastic smartcard with a chip that contains his or her card number and some security information, such as an expiration date or CVC (CVV). Security is provided by the customer entering a personal identification number (PIN).

**Some of the advantages of ATM to customers are:-**

- ◆ Ability to draw cash after normal banking hours
- ◆ Quicker than normal cashier service
- ◆ Complete security as only the card holder knows the PIN
- ◆ Does not just operate as a medium of obtaining cash.
- ◆ Customer can sometimes use the services of other bank ATM's.

**Tele banking or Phone Banking:** Telephone banking is relatively new Electronic Banking Product. However it is fastly becoming one of the most popular products. Customer can perform a number of transactions from the convenience of their own home or office; in fact from anywhere they have access to phone. Customers can do following:-

- Check balances and statement information
- Transfer funds from one account to another
- Pay certain bills
- Order statements or cheque books
- Demand draft request

This facility is available with the help of Voice Response System (VRS). This system basically, accepts only TONE dialed input. Like the ATM customer has to follow particular process, initially account number and telephone PIN are fed for the process to start.

**Mobile Banking:** Mobile banking comes in as a part of the banks initiative to offer multiple channels banking providing convenience for its customer. A versatile multifunctional, free service that is accessible and viewable on the monitor of mobile phone. Mobile phones are playing great role in Indian banking- both directly and indirectly. They are being used both as banking and other channels.

**Internet Banking:** The advent of the Internet and the popularity of personal computers presented both an opportunity and a challenge for the banking industry. For years, financial institutions have used powerful computer networks to automate million of daily transactions; today, often the only paper record is the customer's receipt at the point of sale. Now that their customers are connected to the Internet via personal computers, banks envision similar advantages by adopting those same internal electronic processes to home use. Banks view online banking as a powerful "value added" tool to attract and retain new customers while helping to eliminate costly paper handling and teller interactions in an increasingly competitive banking environment.

### TYPES OF INTERNET BANKING OR e-BANKING

Understanding the various types of Internet banking will help examiners assess the risks involved. Currently, the following three basic kinds of Internet banking are being employed in the marketplace.

- ✓ Informational
- ✓ Communicative
- ✓ Transactional-

### FEATURES OF e-BANKING

**Transactional:** (e.g. performing a financial transaction such as an account to account transfer, paying a bill or applications like applying for a loan, new account, etc.)

- Electronic Bill Presentment and Payment (EBPP)
- Funds transfer between customers own checking and savings accounts, or to another customers account.
- Investment purchase or sale.
- Loan application and transactions such as repayments.

**Non-transactional:** (e.g. online statements, Check links, Chat, Co-browsing etc.)

Financial Institution Administration- features allowing financial institutions to manage the online experience of their end users. ASP/ Hosting Administration – features allowing the hosting company to administer the solution across financial institution.

### ADVANTAGES OF e-BANKING

- ✓ **Convenience** - Unlike your corner bank, online banking sites never close; they're available 24 hours a day, seven days a week and they're only a mouse click away. With pressures on time and longer travelling periods, more and more people find it tiresome waiting in queues. People want flexibility, and Internet banking offers just that.
- ✓ **Ubiquity** - If you're out of state or even out of the country when a money problem arises, you can log on instantly to your online bank and take care of business, 24\7.
- ✓ **Transaction speed** - Online bank sites generally execute and confirm transactions at or quicker than ATM processing speeds.
- ✓ **Efficiency**- You can access and manage all of your bank accounts, including IRA's, CDs, even securities, from one secure site.
- ✓ **Effectiveness**- Many online banking sites now offer sophisticated tools, including account aggregation, stock quotes, rate alert and portfolio managing program to help you manage all of your assets more effectively. Most are also compatible with money managing programs such as quicken and Microsoft money.

- ✓ **Cheaper alternative:** - With increasing competition, it seems to be the cost factor that is driving banks to offer the facility. The Internet is still a very cheap alternative to opening a physical branch, and most of the push seems to be coming from the supply side. The costs of a banking service through the Internet form a fraction of costs through conventional methods.
- ✓ **From snob value to necessity:-** A couple of years ago, there was a belief even among bankers that customers opening new accounts wanted the online banking facility, just to "feel good" and very few of them actually used the services. Today, bankers believe that the trend from 'nice to have' is changing to 'need to have'. The "snob value" of banking with an organisation that could offer service on the Internet has given way to a genuine necessity, he feels. "It all depends on how busy a person is."

### DISADVANTAGES OF INTERNET BANKING

- Start-up may take time -In order to register for your bank's online program, you will probably have to provide ID and sign a form at a bank branch.
- Learning curves - Banking sites can be difficult to navigate at first. Plan to invest some time and/or read the tutorials in order to become comfortable in your virtual lobby.
- Bank site changes- Even the largest banks periodically upgrade their online programs, adding new features in unfamiliar places. In some cases, you may have to re-enter account information.

### INTERNET BANKING IN INDIA

The Reserve Bank of India constituted a working group on Internet Banking. The group divided the internet banking products in India into 3 types based on the levels of access granted. They are:

- **Information Only System:** General purpose information like interest rates, branch location, bank products and their features, loan and deposit calculations are provided in the banks website. There exist facilities for downloading various types of application forms. The communication is normally done through e-mail. There is no interaction between the customer and bank's application system.
- **Electronic Information Transfer System:** The system provides customer- specific information in the form of account balances, transaction details, and statement of accounts. The information is still largely of the 'read only' format.
- **Fully Electronic Transactional System:** This system allows bi-directional capabilities. Transactions can be submitted by the customer for online update. It comprises technology covering computerization, networking and security, inter-bank payment gateway and legal infrastructure. It includes the followings:

- ATM
- Debit cards
- Smart cards
- Mobile banking

### EMERGING CHALLENGES

Information technology analyst firm, the Meta Group, recently reported "financial institutions who don't offer home banking by the year 2000 will become marginalized." By the year of 2002, a large sophisticated and highly competitive Internet Banking Market will develop which will be driven by

- Demand side pressure due to increasing access to low cost electronic services.
- Emergence of open standards for banking functionality.
- Growing customer awareness and need of transparency.
- Global players in the fray
- Close integration of bank services with web based E-commerce or even disintermediation of services through direct electronic payments (E- Cash).
- More convenient international transactions due to the fact that the Internet along with general deregulation trends eliminates geographic boundaries.
- Move from one stop shopping to 'Banking Portfolio' i.e. unbundled product purchases.

### HDFC BANK SERVICES

**NET BANKING:** Net Banking is HDFC Bank's Internet Banking service. Providing up-to-the-second account information, Net Banking lets you manage your account from the comfort of your mouse - anytime, anywhere.

**HDFC Bank Net Banking Secure Access:** HDFC Bank has implemented a new security solution for its customers – Secure Access .As your security is our top priority, we have initiated the Secure Access solution to protect you from fraudsters and hackers - who are looking to find a way to access your account. Currently following transactions are covered under Secure Access

- Transfer from one HDFC Bank account to other HDFC Bank account holders (under distinct customer ID)
- Transfer from HDFC Bank account to any other Bank's account (also known as RTGS & NEFT)
- Visa Money Transfer
- Third Party Demand Draft through Net Banking

**Third Party Transfer:** Third-Party Transfer is a Net Banking feature for which you will need your unique Customer ID and IPIN (password). Login to Net Banking to confirm that your ID is active in our records.

#### CREDIT CARDS ONLINE

We take great pleasure in announcing that the HDFC Bank Net Banking service is now available for Credit Cards also. Now using your HDFC Bank Credit Card has become more convenient and time saving. You can now access your Credit Card account from home or office or even while traveling. With Net Banking you can view your card account information and do much more just at the click of a button.

Currently the following Credit Cards Net banking features are available:-

- Account Information
- Unbilled Transactions
- Credit Card Statement
- Download Card Statement (upto last 6 months)

#### MOBILE BANKING

Your Mobile is now your bank! Now access your bank account and conduct a host of banking transactions through your mobile, with our unique Mobile Banking service. You can check your account level information such as balance details, mini statement, and cheque status as well as carry out financial transactions such as Funds Transfer using HDFC Bank Mobile Banking service.

#### FEATURES OF MOBILE BANKING

Using our Mobile Banking service, you can avail of a host of features at your finger tips

- Perform funds transfers
- Get your balance details
- Obtain your last 3 transaction details
- Request a cheque book
- Stop a cheque payment
- Enquire cheque status

- Request an account statement
- Get Fixed Deposit details
- Request for I-PIN generation
- Request a cheque book

**PHONE BANKING**

Your phone is now your bank. When you dial in to Phone Banking, a voice prompt will guide you through the various transactions. You may also talk to a Phone Banker, who will provide you with the required assistance. Avail of the following services via Phone Banking:

- Check your account balance -Get up-to-the-second details of your Savings or Current Accounts and your Fixed Deposits. You can also get the details of the last 5 transactions on your account, or have a mini statement of last 9 transactions faxed across to you.
- Enquire on the cheque status - You can use Phone Banking to check on the status of cheques issued or deposited from anywhere in India.
- Order a Cheque Book / Account Statement - Just call Phone Banking and get your Cheque Book or latest Account Statement delivered at your doorstep.
- Stop Payment - Stop payment of a single cheque or a series of cheques, 24 hours a day. Loan Related queries - Get details of the outstanding loan amount, enquire about your loan account, request for an interest certificate and repayment schedule, etc
- Open a Fixed deposit or Enquire on your Fixed deposits / TDS - Talk to our Phone Banker to easily open a Fixed Deposit over the phone, by simply authorizing a transfer of funds from your Savings Account.
- Transfer Funds between accounts - You can also transfer money from one of your accounts to another. Both accounts must be linked to your Customer ID. You can transfer amounts upto Rs 1 Lac in a single day.
- Pay your bills - Pay your cellular, telephone, electricity and HDFC Bank Credit Card bills through Phone Banking using Bill Pay, a comprehensive bill payments solution.
- Report loss of your ATM / Debit Card / Forex Plus Card - If your ATM / Debit / Forex plus Card are lost, call any Phone Banking number to deactivate your card(s).
- Learn about all our other products - Get details on HDFC Bank products & services by talking to our Phone Banker.
- Enquire about latest Interest / Exchange rates - Get latest Interest rates on Deposits and Foreign Exchange rates by talking to our Phone Banker.
- Request a Demand Draft / Manager's Cheque Call Phone Banking and get a Demand Draft / Manager's Cheque delivered to your doorstep.
- Demat Related Queries - Get the Account holding details, Transaction details, ISIN Number of a scrip, Status of Depository Slips, details of Client Master list (Dividend account, Charges Debit account, PAN etc.) & others.

**NEED OF THE STUDY**

- To determining growth direction of online banking service.
- Promoting E-banking services in banking industry.
- Customer perception will be taken into consideration about the internet banking.

**OBJECTIVES**

- ☞ To study about the factors that affects the customer perception towards e- banking of HDFC bank.
- ☞ To know about the current and future prospects of E-Banking to the customers.
- ☞ To find out the major problems faced by the customers while using e-banking services.

**RESEARCH METHODOLOGY**

Research is defined as human activity based on intellectual application in the investigation of matter. The primary purpose for applied research is discovering, interpreting, and the development of methods and systems for the advancement of human knowledge on a wide variety of scientific matters of our world and the universe.

**DATA COLLECTION**

Keeping in view the nature of requirements of the study to collect all the relevant information regarding the extent of awareness of the customers using E-banking facilities offered by HDFC bank, direct personal interview method with structured questionnaire was adopted for the collection of primary data. Secondary data has been collected through the various internet sites by surfing on Internet and from the records available with the bank.

**SECONDARY DATA:** Articles on E-Banking taken from journals, magazines published from time to time.

- Through internet.

**PRIMARY DATA:** Questionnaire was used to collect primary data from respondents. The questionnaire was structured type and contained questions relating to different dimensions of e- banking preferences among service class such as level of usage, factors influencing the usage of e-banking services, benefits accruing to the users of e-banking services, problems encountered. An attempt was also made to elicit reasons for its non-usage. The questions included in the questionnaire were open-ended, dichotomous and offering multiple choices.

**SAMPLE DESIGN AND SIZE** In this research project Descriptive research design is used. Judgment and Convenience sampling method will be used to get the information about online banking. This method is used because we are interested in exploring gender, age, or occupation disparities in terms of online banking in the population. For conducting this research, a structured questionnaire is prepared and sample of 150 customers is taken from HDFC bank.

**TABLE 1: RESPONDENTS OF GENDER**

Gender	Samples
Male	144
Female	36
<b>Total</b>	<b>150</b>

Table No 1 is indicate The result shows that majority of respondents i.e. 76% are males who are using the E-banking services and 24% are the female who are using E-banking services. Female are not using this service because they have less knowledge about the internet and they trust face to face interaction more. So it shows that E-banking is more famous among male.

**TABLE 2: RESPONDENTS OF AGES**

Age	Total no
Below 20	34
21-30	40
31-40	32
41-50	27
Above 50	17
<b>Total</b>	<b>150</b>

Table No 2 shows that result that majority of respondents i.e. 27% falls under the category of 21-30 years and 23% falls under below 20years it shows that E-banking is mainly famous among youngsters as they are the major users of E-banking and least comes under above 50years.

TABLE 3: RESPONDENTS OF OCCUPATION

Occupation	Total no
Government	37
Private	40
Business	48
other	25
<b>total</b>	<b>150</b>

Table No 3 is Interpret The result shows that majority of respondents that are using E- banking are Businessman i.e. 32% they are using E-banking services because it results in time saving. And 27% respondents are working in private sector and 24% respondents are working in government organizations and 17% are others which include students and housewives they are using E-banking because it saves time and students they have complete knowledge of internet.

TABLE 4: RESPONDENTS OF INCOME

Income	Total no
Below 10000	23
10000-25000	48
25000-50000	45
More then 50000	34
<b>Total</b>	<b>150</b>

Table No 4 is indicate that result of this study shows that 32% of the respondents who are using E-banking fall under the income category of 10,000-25,000 and 30% falls under the income category of 25,000 to 50,000 and 23% % falls under the income category of more than 50,000 and 15% % falls under the income category of below 10,000.

## CONCLUSION

This study attempted to identify key quality attributes of internet banking services by analyzing internet banking customers & their comments on banking experience. The findings of this study show that despite of many advantages of online banking. The main factors which persuade people to use online banking are comfort & convenience & the facility which attracts them most is quality & quantity of information. It is a successful strategic weapon for banks to remain profitable in a volatile and competitive marketplace of today. If proper training should be given to customer by the bank employs to open an account will be beneficial secondly the website should be made friendlier from where the first time customers can directly make and access their accounts. In future, the availability of technology to ensure safety and privacy of e-transactions and the RBI guidelines on various aspects of internet banking will definitely help in rapid growth of internet banking in India.

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## ROLE OF SMALL INDUSTRIES DEVELOPMENT BANK OF INDIA (SIDBI) IN THE PROMOTION OF ENTREPRENEURSHIP IN U.P.

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### ABSTRACT

*The word 'entrepreneur' has an interesting history and it appeared first in French, long before the emergence of any general concept of entrepreneurial function. In the early sixteenth century man engaged in leading military expeditions was referred to as entrepreneur. In simple words it can be explained that the term entrepreneur was used for army leaders. Precisely, finance is to industry what blood is for body and the leading financial Institutions act as blood banks to the ' large and medium scale sectors. The transfusion of blood enriches the recipient but does not impoverish the donor. Financial support from institutional sources is not only essential for the growth of industry but is perhaps even necessary for its very survival. When finance is easily available, industrial development can be accelerated as the participation. The Small Scale Industries Development Bank of India has been a pioneer in the field of small scale industries and development of entrepreneurship in India. It is an important financial institution in India with regard to entrepreneurship development. The study highlights the working of SIDBI in the promotion of entrepreneurship and SMEs in the state of Uttar Pradesh. SIDBI is one of the best managed financial institutions working for the development of entrepreneurship. Hence, it was made to study the role of SIDBI in the promotion of entrepreneurship in U.P. The research and scope of the study is wide and bright in the sense that due to the lack of attention from government and non availability of finance to MSMEs and entrepreneurs hinders the development of entrepreneurship, but the study has made an attempt to overcome the obstacles of entrepreneurship development by bringing valuable suggestions to the limelight. The present study is based on primary and secondary data. For the purpose of the study, primary data is obtained through well designed questionnaire from Entrepreneurs, SIDBI officials as well as government functionaries. In addition to this the researcher held discussions with the official of the banks of the sample areas to elicit required and relevant information.*

### KEYWORDS

SIDBI, finance, entrepreneurship, MSME'S, SSI's.

### INTRODUCTION

With a view to ensuring larger flow of financial and non-financial assistance to S.S.I. the Small Industries Development Bank of India (SIDBI) was set up by the Government of India under special Act passed by Parliament in October 1989 but SIDBI has been starting the work since April 2, 1990. It is the wholly-owned subsidiary of Industrial Development Bank of India (IDBI). SIDBI became operational on April 2, 1990. SIDBI has taken over the outstanding portfolio of IDBI relating to Small Scale Sector worth over Rs. 4,000 Crore. The authorized capital of SIDBI is Rs. 250 Crore which could be increased to Rs. 1,000 Crore.

Since in inception, SIDBI has been endeavoring to meet the diverse needs of the Small and Medium Enterprises (SME) sectors through various tailor-made schemes and fulfill its vision i.e. "To emerge as a single window for meeting the financial and developmental needs of the Micro Small Medium Enterprises (MSME) sector to make it strong, vibrant and globally competitive, to position SIDBI Brand as the preferred and customer - friendly institution and for enhancement of share-holder wealth and highest corporate values through modern technology platform.

While extending financial assistance to the small units all over the country SIDBI makes use of the existing banking and financial institutions, such as the commercial banks, cooperative banks and RRBs, SFCs and SIDCs which have vast network of branches all over the country. As many as 870 institutions are eligible for assistance from SIDBI.

In the northern zone, SIDBI has opened its branch offices at Uttar Pradesh (U.P.). With its tremendous potential, the U.P. offers several opportunities for the growth of the operations of SIDBI in financing the Small Scale Industries. Besides undertaking the new projects SIDBI also helps in the modernisation and technology upgradation of existing ones. In U.P. several small-scale units are operating by using obsolete technology. Their productivity and profitability may be raised through modernisation and upgradation of technology. Moreover, it helps in expansion of well- run units, diversification of these units for enhancing their competitiveness. Marketing is another area where the small-scale units of U.P. need special attention. This would increase their profitability.

Since SSIs units are engaged in different types of activity in U.P. they are covered by the eligible entities category of SIDBI where small and medium manufacturing units and service sector entities like hotels, hospitals, nursing homes, filling stations, retail chains, health and fitness centers, IT and IT enabled services are growing very fast. By helping the growth of all these activities, SIDBI can act as a catalyst of the development of U.P. Further, the experience may be replicated in other small cities of U.P. and other parts of the country.

SIDBI should not be seen as a competitor but it should supplement the efforts of the State Government and other agencies, which are engaged in the development of SSIs of U.P. SIDBI, can be helpful in helping the growth of industries. Besides the direct credit Schemes, SIDBI can also provide assistance for industrial infrastructure for small units. It can also help to strengthen and foster the existing close relationship between Original Equipment Manufacturers/Sub-Assembly Manufacturers and their dedicated vendors in the small scale sector through a package of financial assistance to such vendors so that their operational capabilities may be upgraded.

U.P. has a large scope for the operations of micro-finance agencies. However, the desired degree of success has not been achieved. SIDBI is one of the pioneering Micro Finance Agencies in India. SIDBI provides assistance to Micro Finance Institutions with 5 year proven track record for Micro Finance Operations along with attractive capacity building grants. A large number of households, which make parts of manufacturing units, may be benefited through these Micro Finance Operations of SIDBI. This would be an indirect help in the growth of SSIs in U.P.

SIDBI is also a nodal agency for some Government sponsored schemes such as Credit Linked Capital Subsidy Scheme (CLCSS) and Technology Upgradation Fund Scheme (TUFSS). By providing the benefits of these Schemes, the small-scale units of U.P. may be helped in a big way.

### LITERATURE REVIEW

The article titled, '*Financing for Entrepreneurship and SMEs- An Indian Perspective*' by Vepa Kamesam, the Deputy Governor of Reserve Bank of India deals with the challenges faced by the Indian Small Scale Industries in getting loans. The paper identifies certain major hurdles which include: availability of collateral free loan, cost of loans, delayed payments, industrial sickness and a host of other factors responsible for current financing problems. The paper highlights the initiatives taken by the RBI to improve the situation, and newer forms of financing such as venture capital have been suggested to be future measures.

The article titled, '*Role of Government Agencies in the Development and Financing of Small and Medium Enterprises*' by Shankar, P. Uday focuses on government agencies involved in the promotion, financing and development of SMEs and their functional areas, highlighted the role played by them. The Government of India has promoted a number of agencies for financing and development of SMEs, like SIDO, NIESBUD, IIE, NSIC, NISIET and state level organizations like DICs, IICs, SC, BC corporations, etc., each playing a distinct role. Apart from providing extension services, some agencies are involved in the identification of entrepreneur specific projects vis-à-vis business opportunities and prospects and also in the selection of beneficiaries for finance by banks/financial institutions,

for taking up various productive activities as well as support services like project implementation assistance; hand-holding; monitoring and guidance and follow up. Agencies like SIDCO and SIDBI offer many schemes for financing the entrepreneurs.

Kapur, S.L. Committee (1998) studied the various problems relating to the credit flow to SSI sector and to suggest appropriate measures for their redressal. The Committee found the performance of Commercial Banks unsatisfactory in respect of small-scale industries financing persisted with regard to non-adherence of working capital norms as suggested by Nayak Committee and poor flow of credit to tiny units. The loan application forms prescribed by banks for small loans were complicated. No separate earmarking of funds by Banks for working capital loan existed. Banking staff management was not well trained in the task of appraising small-scale industries projects.

Kaveri, V.S. (1998) in his study '*Financing of Small Scale Industries-Issues and Suggestions*' made an attempt to discuss issues related to bank finance to small-scale industries. He concluded that due to economic liberalization and financial sector reforms small scale industries have a bright future provided they remain economically viable. Modernization is the need of the hour for which they will require increasing credit from the banking sector. Therefore, there should be cordial relationship between banks and borrowers. Moreover, there is need for educating both, for timely and adequate flow of institutional credit to SSI sector. The foregoing comprehensive review of role of SIDBI in the promotion of entrepreneurship in UP., it peters out that very few papers have been found to be relevant.

## PROBLEMS AND ISSUE

The following are the main problems and issues of the study:

1. Lack of support from male members (of the families) as well as banks
2. Large magnitude of the target group of poor people
3. Attitudinal rigidities
4. Difficulty in creating awareness among people
5. Limited resources with the NGOs
6. Large requirements of training and sensitization of issues
7. Limited number of experienced intervention agencies
8. Diversities of situations due to wide coverage

## RESEARCH GAP

Obviously, no doubt, many studies have been conducted on SIDBI, and entrepreneurship, SSIs, banking, marketing, industrialization etc. in reference of Uttar Pradesh by different scholars. As the available literature shows different aspect of these issues are mainly researched/studied so far. There is hardly any thorough and integrated investigation on the Role of SIDBI in promotion of entrepreneurship in Uttar Pradesh. The present study is an attempt in this direction. A deep insight is needed to understand the problems of entrepreneurship development and role of SIDBI and to find out ways and means which can induce more assistance from such financial institutions for the promotion of entrepreneurship, so as to pave the way for overall development of the country.

## AIMS AND OBJECTIVES OF THE STUDY

1. To identify the different sources of financing for entrepreneurship development.
2. To assess the problems of SSIs and entrepreneurs in availing term loans from financial institutions.
3. To examine the problems faced by entrepreneurs in getting their capital requirements from financial institutions.
4. To identify and analyse the role of Small Industries Development Bank of India (SIDBI) in promotion of entrepreneurship in U.P.
5. To suggest suitable measures to improve the role of SIDBI in the promotion of SSI and entrepreneurship in U.P.

## HYPOTHESES

In order to substantiate the above objectives the following hypotheses have been framed:

- Ho<sub>1</sub>** Finance acts as a constraint in the growth of entrepreneurship in U.P.  
**Ho<sub>2</sub>** SIDBI with its tremendous potential can slowly solve the problem of finance of entrepreneurs in U.P.  
**Ho<sub>3</sub>** The institutional arrangements for credit to small scale industries in the U.P. have not been satisfactory.  
**Ho<sub>4</sub>** The supply of credit to SSIs in U.P. had not been significant in relation to the targets.  
**Ho<sub>5</sub>** The utilisation of credit by SSIs has not been satisfactory.

## SCOPE OF THE STUDY

The Small Scale Industries Development Bank of India has been a pioneer in the field of small scale industries and development of entrepreneurship in India. It is an important financial institution in India with regard to entrepreneurship development. The scope of study is to highlight the working of SIDBI in the promotion of entrepreneurship and SMEs in the state of Uttar Pradesh. SIDBI is one of the best managed financial institutions working for the development of entrepreneurship. Hence, it was made to study the role of SIDBI in the promotion of entrepreneurship in U.P. The researcher has considered the Entrepreneurship Development, the Small Scale Industries (SSIs), Micro, Small and Medium Enterprises (MSMEs) and SMEs as same. Until 2005 the SMEs were under the purview of the SSIs but after the enactment of the MSMED Act 2005, the SMEs in India are officially recognised as the Micro, Small and Medium Enterprises (MSMEs). The scope of the study is wide and bright in the sense that due to the lack of attention from government and non availability of finance to MSMEs and entrepreneurs hinders the development of entrepreneurship, but the study has made an attempt to overcome the obstacles of entrepreneurship development by bringing valuable suggestions to the limelight.

## FRAMEWORK OF THE STUDY

The present study is based on primary and secondary data. For the purpose of the study, primary data is obtained through well designed questionnaire from Entrepreneurs, SIDBI officials as well as government functionaries. Primary data were collected through sample survey. The specific schedule designed for the purpose was canvassed through personal interview and the information given by the respondents was thus recorded. In addition to this the researcher held discussions with the official of the banks of the sample areas to elicit required and relevant information.

Secondary data were obtained from Annual reports of SIDBI, Annual Reports of Development Banks, various books, magazines, journals and internet etc. The main sources of secondary data include the publication of Reserve Bank of India viz., Reports on Currency and Finance, RBI Bulletins, statistical tables relating to banks of India, reports on trends and progress, reports of the Banking Commission and Industrial Hand Book. In addition to all these sources, important pieces of information pertaining to the different research journals and reports.

Primary data is collected from 100 respondents through a well structured questionnaire consisting of 40 entrepreneurs, 30 SIDBI employees and 30 MSME employees. Various statistical tools like Mean, Standard Deviation, Skewness, and Chi-Square have been used to analyze and interpret the data in a meaningful manner.

## LIMITATIONS OF THE STUDY

- a) The main limitation is that the entrepreneurs are not cooperative in disclosing their information.

- b) Majority of the entrepreneurs and SSI units never maintain proper accounting records. Similarly most of the financial institutions do not have records of small scale units.
- c) The conclusions of the study may not be universal to all the districts in U.P. as well as other parts of the country because different districts and areas may have different problems and may need different solution.

**ANALYSIS AND INTERPRETATION**

Keeping in view the objectives of the study, opinions of Entrepreneurs, Micro, Small and Medium Enterprises (MSMEs) and SIDBI Employees regarding Role of SIDBI in the Promotion of Entrepreneurship in U.P. has been presented and analysed in Table-1. Analysis has been made by applying suitable statistical tools i.e. Mean, Standard Deviation, Skewness, Standard Error of Skewness and Chi-Square.

It is evident that majority of the respondents are strongly agree with the statement No.1 that the SIDBI is a significant financial institution with regard to entrepreneurship development. The mean value of the respondents is lower than the average standard score i.e. 5 at five- point scale. The variation in the opinion is 1.4333, while skewness is .801. It shows that their opinion is distributed more towards lower side of the average score. The calculated value of  $\chi^2$  is significant at five percent level of significance. It shows that opinion of the respondents is not equally distributed. Thus, the above analysis leads to the conclusion that most of the respondents are strongly agreed with the significance of SIDBI in the promotion of entrepreneurship in the U.P.

As far as capability of financial institutions in providing finance and development assistance to entrepreneurs is concerned, the majority of the respondents are strongly agreed. The mean value of the responses depicts the majority of the responses are lying towards lower side of the mean standard score at 5 point scale. The variation in the opinion and skewness are noted 1.4634 and .430 respectively. It further supports the above statement. Further the  $\chi^2$  value is significant at five percent level of significance. It shows that the opinion of the respondents is not equally distributed. Thus, it can be concluded that they are satisfied with the above statement.

**TABLE-1: SHOWING STATISTICAL ANALYSIS**

No. of Responses	Scaling	Provision for SIDBI as a significant financial institution with regard to Entrepreneurship Development		Provision for institutions to provide finance and development assistance to Entrepreneurs		Provision of EDPs in development and promotion of MSMEs, employment generation, etc.		Provision for Various incentives and concessions provided by the Govt. for the promotion of Entrepreneurship and MEMEs		Provision for assessing the problems of MSMEs and entrepreneurship in getting their capital requirements from financial institutions	
		Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age
Strongly Agree	1	39	39.0	30	30.0	30.0	37.0	18	18.0	32	32.0
Agree	2	30	30.0	29	29.0	29.0	30.0	12	12.0	28	28.0
Uncertain	3	5	5.0	7	7.0	7.0	5.0	8	8.0	12	12.0
Disagree	4	13	13.0	19	19.0	19.0	15.0	30	30.0	19	19.0
Strongly Disagree	5	13	13.0	15	15.0	15.0	13.0	32	32.0	9	9.0
Total		100	100.0	100	100.0	100.0	100.0	100	100.0	100	100.0
Mean		2.3100		2.6000		2.3700		3.4600		2.4500	
S.D.		1.4333		1.4634		1.4401		1.4936		1.3512	
Skewness		.801		.430		.711		-.571		.509	
Standard Error of Skewness		.241		.241		.241		.241		.241	
Chi Square ( $\chi^2$ )		39.200		18.800		34.400		22.800		19.700	
P		0.5		0.5		0.5		0.5		0.5	

No. of Responses	Scaling	Provision to seek remedies and give pragmatic solutions for the promotion of MSMEs and Entrepreneurship		Provision of availability of financial resources for Entrepreneurship Development		Provision of Modern MSMEs is akin to the large scale industries in promotion of entrepreneurship, production facilities etc.		Provisions of Industrial policy should pay special attention to MSMEs to accelerate economic growth and promotion of entrepreneurship		Provision for MSMEs has a catalytic effect on the overall growth of the entrepreneurs and ultimately economic growth	
		Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age	Frequ-ency	%age
Strongly Agree	1	33	33.0	33	33.0	29	29.0	36	36.0	24	24.0
Agree	2	35	35.0	35	35.0	33	33.0	24	24.0	34	34.0
Uncertain	3	10	10.0	10	10.0	8	8.0	12	12.0	9	9.0
Disagree	4	12	12.0	12	12.0	16	16.0	17	17.0	18	18.0
Strongly Disagree	5	10	10.0	10	10.0	14	14.0	11	11.0	15	15.0
Total		100	100.0	100	100.0	100	100.0	100	100.0	100	100.0
Mean		2.3100		2.3100		2.5300		2.4300		2.6600	
S.D.		1.3158		1.3158		1.4175		1.4089		1.4086	
Skewness		.817		.817		.557		.544		.429	
Standard Error of Skewness		.241		.241		.241		.241		.241	
Chi Square ( $\chi^2$ )		32.900		32.900		22.300		21.300		18.100	
P		0.5		0.5		0.5		0.5		0.5	

Source: Primary survey

Table-1 shows that majority of the respondents strongly agree with their opinion regarding success of EDPs in the development and promotion of MSMEs, employment generation, poverty alleviation and balanced regional development etc. The mean value of the responses is lower than the average mean standard



score at 5 point scale. The variation in the opinion and skewness are noted 1.4401 and .711 respectively. It shows that majority of the responses are distributed towards lower side of mean score. The  $\chi^2$  value is significant at five percent level of significance, which shows that the opinion of the respondents is not equally distributed. It leads to the conclusion that majority of the respondents do not have the same opinion over the statement and they are satisfied that EDPS are successful in the development and promotion of MSMEs, employment generation etc.

It is evident that majority of the respondents strongly disagree over the issue that various incentives and concessions provided by the government for the promotion of entrepreneurship and MSMEs are sufficient. The mean value is less than the average standard score, i.e. 5 at five- point scale which shows that opinion of the respondents is distributed more towards higher side. The S.D. in the opinion is 1.4936, while skewness is -.571. The calculated value of  $\chi^2$  is significant at five percent level of significance. It leads to the conclusion that majority of respondents are not satisfied with the various incentives and concessions provided by the government for entrepreneurship and MSMEs promotion.

Table-1 exhibits that majority of the respondents strongly agree about the question of assessing the problems of MSMEs and Entrepreneurs in getting their capital requirements from financial institutions. The mean value of the responses is lower than the average mean standard score at 5 point scale. The variation in the opinion and skewness are noted 1.3512 and .509 respectively. The  $\chi^2$  value is significant at five percent level of significance; it leads to the conclusion that opinion of the respondents is not equally distributed over this issue. It further suggests that majority respondents are strongly agree that the problems of MSMEs and entrepreneurs in getting their capital requirements from financial institutions should be assessed.

Respondents attitude towards the need to seek remedies and give pragmatic solutions having policy implications for the promotion of MSMEs and entrepreneurship has been analysed, on the basis of the opinion of the respondents it is observed that their opinion is distributed more towards lower side i.e. strongly agree. The mean value is noted lower than the average mean standard score at 5 point scale, while variation in the opinion and skewness are noted 1.3158 and .817 respectively. This supports the above analysis. Further  $\chi^2$  test is significant at five percent level of significance. It reveals that the opinion of the respondents is not equally distributed over this issue. Thus, above analysis leads to the conclusion that it is necessary to seek remedies and pragmatic solution for the promotion of entrepreneurship and MSMEs.

Table-1 depicts that majority of the respondents are either agreed or strongly agreed with the issue that availability of financial resources is one of the basic issue of entrepreneurship development. The mean value of the responses is lower than the average mean standard score at five-point scale. The variation in the opinion and skewness are noted 1.3158 and .817 respectively. The  $\chi^2$  value is significant at five percent level of significance. Thus, it can be concluded that majority of respondents are agree that availability of finance is the basic issue of entrepreneurship development.

Further, it is observed from the Table-1 that the majority of the respondents either agree or strongly agree regarding the statement that modern MSMEs is akin to the large scale industries in terms of technology, production facilities, labour intensity and promotion of entrepreneurship etc. The mean score of the responses is less than the average mean standard score at 5 point scale. The variation in the opinion and skewness are noted 1.4175 and .557 respectively. The  $\chi^2$  value is significant at five percent level of significance. This reveals that the responses of respondents are not equally distributed over the issue. It is distributed more towards higher side of the average standard score, which supports the statement.

As far as need towards industrial policy to pay special attention to MSMEs in order to accelerate the economic development and promotion of entrepreneurship most of the respondents strongly agree or agree. The mean value is lower than the average standard score. The S.D. and skewness is observed 1.4089 and .544 respectively. The calculated value of  $\chi^2$  is significant at five percent level of significance which depicts that there is significant variation in the opinion of the respondents over the issue. The above analysis leads to the conclusion that their opinion is distributed more towards lower side. It further concludes that respondents are strongly agreed that industrial policy should pay special attention to MSMEs.

It is evident that majority of the responses are distributed more towards higher side over the statement that MSMEs has a catalytic effect on the overall growth to the entrepreneurs and ultimately economic growth of the country. The mean value of the respondents is lower than the average standard score i.e. 5 at five-point scale support the above opinion. The variation in the opinion is 1.4086, while skewness is .429. The calculated value of  $\chi^2$  is significant at five percent level of significance. It concludes that MSMEs has a catalytic effect on growth of entrepreneurship

## MAIN FINDINGS

Respondents opinion regarding role of SIDBI in the promotion of entrepreneurship in U.P., has been presented and analyzed in table – 1 and it is found that majority of the respondents agree with the questions of the questionnaire that the role of SIDBI is to be considered as an extremely important factor for the promotion of entrepreneurship in U.P. They feel that SIDBI is playing a very important role in the development of MSMEs and entrepreneurship in U.P.

Most of the respondents feel that SIDBI is the principal financial institution for the promotion, financing and development of MSMEs and entrepreneurship and it is also coordinating the activities of the agencies engaged in the promotion of MSMEs and Entrepreneurship in the state according to its pre-determined objectives. They feel that their potentialities are not fully utilized for enhancing productivity of this organization. While government and ministry of MSMEs have been helping SIDBI, the overall performance as regards higher productivity and efficiency has not been so encouraging.

SIDBI has evolved itself to meet the various requirements of MSMEs and entrepreneurship in U.P. by offering various financial products and resources like term loan assistance, working capital term loan, support organs delayed payment, foreign currency loan, and also by micro credit and indirect financial assistance.

During the financial year 2008, SIDBI recorded better operational achievements and strengthened its financial fundamentals. The Bank recorded the highest ever sanctions and disbursements during the year with sanctions increasing by 45.6 percent and disbursements by 47.5 percent over the previous year. While the refinance support, which is a key function of the Bank, was enhanced by 76.4 percent, the Direct Credit flows to MSMEs by SIDBI increased by 18.0 percent during the year under review. The aggregate outstanding portfolio of the Bank crossed the Rs.20, 000 crore mark for the first time and increased by 26.2 percent to Rs.20, 226 crore as at March 31, 2008. As a result, the total assets of the Bank increased sizably to Rs.23, 887 crore at the end of FY 2008.

Micro Finance, by reaching out to the poor, has emerged as a powerful tool for inclusive growth, poverty alleviation and women empowerment. At the same time, it is also a business opportunity for enlarging the credit portfolio of the Bank. The total credit sanctions under Micro finance during FY 2008 surged by 93.8 percent to Rs. 745.95 crore and disbursements by almost 100 percent to Rs.695.80 crore. The Micro credit outstanding as on March 31, 2008 was Rs.950.38 crore which showed a higher growth of 73.3 percent over the previous year. The Bank's Micro Finance support so far has benefited more than 50 lakh persons, mostly women.

During the year, with focused attention on business growth and better pricing of loan products, total income of the Bank increased by 38% to Rs.1,638 crore from Rs.1,187 crore during FY 2007. However, due to treatment of earlier / current year's cumulative contribution to the corpus of CGTMSE of Rs.317 crore as expenditure and providing for interest expenditure of Rs.174 crore on SIDBI Bonds held by Govt. of India which was waived in the previous year, net profit for the current year was lower at Rs.198 crore as against Rs.298 crore in the previous year. The total Reserves and Funds of the Bank increased from Rs.4,691 crore as on March 31, 2007 to Rs.4,810 crore as on March 31, 2008 and the Capital Adequacy Ratio was higher at 41.7 percent.

To conclude data in a meaningful manner and to find out the perceptions and opinions Mean, Standard Deviation, Skewness, Chi-square ( $\chi^2$ ) Test have been used in the Tables 1 There are 10 parameters in the Table 1 which measures these opinions effectively. Statistically there is no difference between the expected and the observed frequencies. According to the results of Chi-square ( $\chi^2$ ), it is observed that the calculated  $\chi^2$  values for almost all these 10 variables are greater than the table value (Table value of Chi-square ( $\chi^2$ ) 40.113) and are significant at 0.05 percent level of significance. Thus the Null Hypothesis ( $H_0$ ) is rejected and Alternate Hypothesis is accepted as already the researcher has analyzed that in many cases the mean value of the respondents is lower than the average standard score i.e. 5 at five- point scale. It shows that their opinion is distributed more towards lower side of the average score and opinions of the respondents are not equally distributed.

## CONCLUSION

It can be concluded that (i) Entrepreneurs are cultivating a culture in SMEs directed towards employee involvement and empowerment; (ii) They are willing to introduce flexibility in the system to react to environmental changes; (iii) On the other hand employees working in the SMEs feel that they are not adequately

empowered and there is a high degree of inflexibility in the internal environment. But all categories of employees do not have their views converging on common parameters; (IV) Thus, although in the view of entrepreneurs their firms leaning organizations, the employees do not feel so. The size and structure of such organizations can facilitate positive growth through a flexible organizational culture, which can help the entrepreneurs convert into learning organizations. But employee involvement through empowerment is a pre-requisite.

Entrepreneurship is a corner stone, which rejuvenates and revitalizes the economy. Entrepreneurs are persons who are industrious and creative thus find way to empower themselves and eventually contribute to the economic development. Indeed, small firms in combination with the large enterprises drive innovation and ultimately economic growth. New firms play a direct role in economic growth, with the introduction of new products. Recent research on entrepreneurship and economic growth reveals that high levels of new growing firms are strongly related with economic growth. Entrepreneurship is important in U.P. with a lot of potential. The U.P. entrepreneurs in micro and small enterprises are trying to use significant portions of their profits for expanding their enterprises, and others have been borrowing from the informal sector. However, the challenges for new and small businesses in U.P. are complex. As stated earlier, entrepreneurship development is often thwarted by a complex mix of economical, political, social and geographic factors. At the macro level, economic and political instability, poor quality of government infrastructure, low levels of support for new enterprise development, underdevelopment or semi skilled work force all contribute to the nation's current economic problems. The national, provincial and local governments should work hard to encourage both the domestic and foreign capital investments, which stimulate the cash flow in the economy and thus develop entrepreneurial class in the country. Making the transition form a traditional subsistence economy to a developed economy is a long and slow process, and it's a journey on which U.P. has a long way to go.

A business incubator was often considered to be an ideal method for encouraging new business development and local economic development. Incubators provided facilities in which a number of new businesses grew with financial support, technical guidance and other supporting assistance. These new innovative businesses resulted in more jobs. Most of these new projects were classified as small businesses. Small businesses were more cost efficient in R&D than larger ones. Uncertainties like undercapitalization and lack of proper manager rent were overcome by the new entrepreneurs while developing their business through incubator.

The incubatees were given exposure in their areas of business, where experts in their respective fields shared experiences and knowledge. With the emergence of new entrepreneurs, job creation increased. This had improved the local economy. Greater opportunities were also created for public-private partnerships through the process. Incubators also lent a helping hand to the incubatees by identifying suppliers for sub-contracting, and purchasers for their products and services. Incubatees were also given opportunities to develop research activities into commercial opportunities for their new-product technologies. This strengthened the potential of the industry and created a competitive environment.

### SUGGESTIONS

On the basis of empirical findings the study makes the following suggestions having policy implications.

1. The SIDBI, banks and financial institutions should provide both the working capital and term loans, without delay to the SSIs.
2. Financial guarantee to a reasonable extent may be given to small entrepreneurs to enable them to secure contracts for supply of goods and to carry out the work undertaken.
3. There must be accountability on the parts of District Industries Centre (DIC) and bank officials and the special tribunal should be established so that stringent action can be taken against the erring officials. There should be greater coordination between SIDBI and DIC.
4. SIDBI should follow uniform policy of providing need-based finance to small units.
5. Besides SIDBI, all the institutions and organizations, which are related with the working of SSIs, should set up a separate customer care department for the benefit of entrepreneurs.
6. SIDBI should provide project reports to the prospective entrepreneurs easily and at affordable cost.
7. The SIDBI in cooperation with banks and financial institutions should conduct specialized training programmes and seminars not only for their staff but also for the borrowers to bring about better understanding and coordination between them.
8. Banks and financial institutions should also take steps to bring about an attitudinal change in their officers and other functionaries dealing with the industrial units so that they adopt helpful attitude from pre-sanction stage and are able to win the confidence of their borrower.
9. The procedure of taking loans from SIDBI, banks and financial institutions should be simplified and more powers should be delegated to the branch manager so that unnecessary delays may be avoided.
10. The Government should be promoting the SSI units to develop Research and Development (R & D) facilities and concession should be given to those units, which have R & D facilities.
11. Efforts should be made by the Government in coordination with SIDBI to revive the sick units in the Industrial Estates and industrial areas.

### RECOMMENDATIONS

1. To encourage SIDBI to take up factoring for micro and small enterprises refinance at concessional rates from SIDBI should be introduced.
2. An exchange with focus on SMEs on relaxed listing requirements may be set up at the earliest, preferably with the involvement of NSE and SIDBI so as to enable the SMEs to come out with IPO at an affordable cost and within a reasonable time..
3. In order to encourage the entrepreneurs to innovate new ideas, it is necessary that venture capital/mezzanine finance should be encouraged. There should be a separate fund with the umbrella organization SIDBI which should help venture capital funds in meeting the finance requirements of small enterprises by way of equity/mezzanine finance/soft loans etc.
4. In rural and semi-urban areas, SIDBI need to play a more active role in the development of micro, small and medium enterprises. RBI/GOI may encourage SIDBI to take up micro, small and medium enterprise financing in a big way. However, the officers and staff of SIDBI posted in the branches have little knowledge of MSNEs financing and proper training needs to be imparted to them. RBI/Govt. may be requested for providing the necessary training and infrastructure to SIDBI for the same.
5. SIDBI should set up credit counseling centers which may offer free counseling on curative measures mainly to entrepreneurs or retail borrowers, exclusively for MSMEs. Such centers may be setup in major industrial towns/clusters of U.P.
6. In order to equip the MSMEs with the capacity to manage their business effectively and efficiently, all the stakeholders may set up enterprise development centers (EDC), providing comprehensive guidance and training not only for setting up new units but also provides continuing education on different aspects of successful management of existing business enterprises. The EDCs may provide Entrepreneurship development programmes for first generation entrepreneurs. The Govt. may provide grant upto Rs. 2.5 crores. The state Govt. may provide land for setting up such EDCs free of cost and SIDBI may defray a part of the training costs @Rs. 5000 per trainee out of a fund to be created within SIDBI from out of contribution from Govt.
7. Being the apex financial institution for MSMEs, SIDBI may provide advisory services and participate in appraisal and financing of rehabilitation packages of MSMEs, even if it had no prior exposure in the same.
8. Although the Ministry of MSMEs, RBI and SIDBI, have taken several initiatives in promotion, financing and development of MSMEs in the country, the researcher feels that there should be an umbrella organization for overseeing the development of MSMEs sector with review to fully exploit entrepreneurial growth potential of our country, specially U.P.
9. It is suggested that the Ministry of MSMEs should be set-up in hall states on the lines of center.
10. Since power shortage is one of the reasons for sickness in SMEs, it is suggested that Industrial Estate for SMEs should be provided independent power source.

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30. [www.upfcindia.com](http://www.upfcindia.com)
31. [www.upgov.nic.in](http://www.upgov.nic.in)
32. [www.upside.com](http://www.upside.com)
33. [www.xime.org](http://www.xime.org)

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