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SPECIAL ISSUE ON CONSORTIUM OF STUDENTS IN MANAGEMENT RESEARCH (COSMAR) CONFERENCE 2009

Guest Editors:
Prof. R Srinivasan
Dr. Parameshwar P Iyer

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Mathew J. Manimala

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EDITORIAL

COSMAR 2009-Special Issue of South Asian Journal of Management

Consortium of Students in Management Research (COSMAR), the brainchild of Department of Management Studies, Indian Institute of Science, was conceptualized as a forum to promote better understanding and appreciation for the cutting-edge research done by students across the globe. The uniqueness of COSMAR is that it provides a platform for research students to present their original research work and acquire critical and valuable inputs from an expert panel consisting of renowned academicians and practitioners in the industry.

The objectives of COSMAR are:

To provide a quality and interactive forum for students involved in management and allied areas of research.

To provide an opportunity for professional networking among management research students, academicians and practitioners.

To evolve into a credible thought center for management theorists and practitioners.

This issue of the South Asian Journal of Management (SAJM) is dedicated to the 9th International COSMAR. From the papers that were received from various parts of the globe, 28 papers were finally selected for presentation at COSMAR held at IISc on November 5-6, 2009 and were also submitted to SAJM for review for publication. Out of the 28 papers, 7 papers were accepted as full papers, 6 papers as research notes and 1 paper as a case study.

The papers published in this issue cover a realm of topics on International Marketing, Strategy, Economics, Econometrics, Human Resources, Operations Research, Systems, Finance, Knowledge Management, Urban Planning and Organizational Behavior.

The paper on International Marketing discusses the marketing issues involved in this fast developing and advanced space related business of space-borne remote sensing. The paper on Organizational Behavior identifies the critical predictors of extra-organizational life in the Indian service sector. The paper on Human Resources aims at testing a conceptual model connecting variables of the demographical characteristics of the employees, internal and external work environment to ITES/BPO employee turnover. The paper on Econometrics discusses a new demand model for air passenger traffic on international sectors. The paper on Optimization aims at measuring environmental efficiency of Indian cement industry within a joint production framework of both desirable and undesirable output. The paper on Finance, studies the impact of firm specific announcements providing information on technological developments

like patents, research achievements and new product introductions and corporate news related to joint ventures, mergers and acquisitions and change of top executives on the Indian capital market. The paper on Strategy investigates the interrelationships and the effect of Total Quality Management (TQM) and innovations on organizational performance.

The research note on Economics examines the responses of various macroeconomic variables to a shock in remittance inflow. The research note on Urban Planning talks about fusion of multi resolution remote sensing data for urban sprawl analysis. There are three research notes on Optimization. One of the research notes discusses the classical batch processor scheduling problem. A numerical example is developed and presented to illustrate the workability of the model; the second note addresses another classical problem of transporting a shipment from a single point of origin to a single destination using an *n node* time constrained transportation network. It develops a solution procedure to minimize the transportation cost subject to a total time constraint. The last research note discusses optimizing tardiness of job and tool in a flexible manufacturing system using Particle Swarm Optimization Algorithm. The research note on Marketing discusses issues pertaining to sub-contracting, market certainty and efficiency of the informal sector in India.

Finally, the case study concentrates on Knowledge Management (KM). It argues that KM can become a process to develop sustainable competitive advantage.

This issue is a fusion of papers, research notes and case study. It gives the author various perspectives of cutting-edge research around the world. It is the firm belief of the editors that the reader will find this issue interesting, highly educative and an idea generating experience. Any comments on the papers can be directly addressed to the guest editors of this special issue at the below given e-mail addresses.

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Total Quality Management and Innovation Performance: An Empirical Study on the Interrelationships and Effects

Satish K P and R Srinivasan***

Total Quality Management (TQM) is considered as the foundation of improving productivity, profitability and customer satisfaction in organizations. Then again the factors of market competition, cost pressures, customer demands, etc., are forcing organizations to be innovative in all their activities. While a quality performance is imperative to attain the competitive advantage, innovation is the catalyst for further growth. Hence organizations cannot dispense with any of these. Consequently, it is important to investigate on how these two could be taken up together. This paper attempts to investigate the interrelationships and the effect of one on another through an empirical approach. The literature review reveals that studies in this direction are scarce as far as Indian Organizations are concerned. To examine further, constructs describing both were identified. A research framework, which explores the relationship between them, was developed. With the assistance of Confederation of Indian Industry, large and medium scale TQM organizations in the manufacturing sector were identified. The study consisted of two stages—a pilot study and a main study. In the main study data, first, a confirmatory factor analysis was carried out for reconfirming the validity and a summated scale of data created for further analysis. Second, this data was analyzed using multiple regression method. The different assumptions underlying multiple regression were verified. The regression models were estimated and hypothesis was tested. Overall, the findings indicated that there exists a positive correlation between TQM and innovation performance. Further, the significant variables were identified from the individual regression models. They were interpreted and the models were validated. The Strategy of focusing on the identified significant variables of TQM was suggested.

INTRODUCTION

Total Quality Management (TQM) is considered as a comprehensive approach for achieving business excellence. TQM as a strategy has been adopted by organizations around the world and it has an effect on various aspects of the

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organization. Organizations had observed that, the basis for competitive advantage is not only quality but also innovation. Hence, it is important to investigate the relationship between them and to evaluate the effect of TQM in achieving innovation performance. Studies with respect to Indian organizations are scarce in this area and this study aims to fill that necessitated gap, to build an understanding of how TQM and innovation are related in the Indian organizations.

LITERATURE REVIEW

A conceptual definition to TQM given by International Organization for Standardization (ISO), says 'TQM is the management approach of an organization centered on quality based on the participation of all members and aiming at long-term success through customer satisfaction and benefits to all members of organization and society'. It is a philosophy committed to customer satisfaction and continuous improvement (Srinivasan, 2008). Regarding innovation Paul (2002) has defined it as the 'management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment'.

Dinh *et al*. (2006) in their empirical study on the Vietnamese industry, developed a measurement system for TQM. It confirmed that only some TQM practices like leadership, people management, process management and strategic management has a positive impact on the firm's innovativeness. The empirical study by Daniel and Amrik (2003) found that TQM positively relates to product quality and product innovation. Again in another study Daniel and Amrik (2004) examined the multidimensionality of TQM in association with organizational performance but results; however, fail to support the proposition that organizations need to configure TQM practices in different ways for achieving different types of performance. In a further study Daniel and Amrik (2006) examined the co-alignment between TQM and R&D management in predicting organizational performance in terms of quality and innovation and found R&D management to be strongly related to innovation. Jesu's *et al*. (2006) tackled the relationship by analyzing the links between the broader concepts of TQM and Business Innovation Capability (BIC) and found TQM can favor BIC. Prakash and Alan (2004) conducted a study to find out whether TQM is enabling organizations to be innovative and could not get sufficient statistical evidence for that. Angel *et al*. (1999) in their study discuss the advantages and disadvantages of TQM as a means of developing and facilitating business innovations. Rodney *et al*. (1998) found that organizations which have a history of continuous improvement are more likely to go on and build a successful innovative culture. Kanji (1996) investigated the various types of innovation and its linkage with the TQM process by means of examples and cases. Anupam Das *et al*. (2008) conducted a study to provide reliable and valid constructs of TQM and identified

10 reliable and valid TQM constructs for gaining better understanding to develop applicable TQM theory. Satish and Sampath (2008), conducted a study to examine the role of TQM towards enhancing customer satisfaction and found that TQM substantially increases customer satisfaction but other TQM focus areas are not covered in this paper.

All the above studies identified the relevant variables and adopted various multivariate analysis techniques. The various dimensions of TQM were explored and related to various organizational aspects. The studies have not taken into consideration the factor of time lag between TQM and innovation performance as well as the congruence and incompatibility of TQM and Innovation. Again the factors like, education and training, firms business results which are also TQM aspects and their effect on innovation was not seen addressed. Also such studies with respect to Indian organizations were scarce. Hence a research gap persists with respect to studies on Indian Organizations. This study works towards addressing some of the above gaps.

OBJECTIVES

This research focuses on large and medium manufacturing organizations of India, with the following specific objectives:

- Developing measures of TQM and Innovation performance and a research framework for investigating the relationship between the two.
- Developing a reliable and valid measuring instrument using these measures.
- Studying the relationship existing between TQM and Innovation performance within organizations and the effect of TQM on Innovation performance.
- Studying the effect of different dimensions of TQM on different types of innovation performance.
- Make appropriate suggestions on the need for adoption of TQM as a Strategic Management Model in the future, by Indian manufacturing organizations.

DEVELOPMENT OF MEASURES AND THE MEASURING INSTRUMENT

An assessment of the organization by the top management was the primary data collected and analyzed. Information and opinion about past, present or current events are captured effectively by a field survey (Krishnaswamy *et al.*, 2006). To evaluate TQM and Innovation, it is required to develop certain constructs and further research was carried out as follows:

- Examining the evaluation criteria used for various national and international awards for TQM and Innovation like Malcom Baldrige National Quality Program (2007), Confederation of Indian Industry (CII)—Exim Bank Award, Rajiv Gandhi National Quality Award, etc.
- Study of Journal Literature, Reports by Boston Consulting Group (BCG) and Confederation of Indian Industry (CII), Books of TQM,

Strategic Management, Innovation, Research Methodology, etc.

- Visits to TQM Organizations and discussions with senior managers for availing first hand information on implementation of TQM practices and their innovation performance.
- Study of organization activities in the area of TQM and innovation for a few organizations by referring to their web pages.
- Information obtained from the Quality Summit organized by CII and other conferences and discussions with fellow researchers.

As the outcome, the constructs of TQM and Innovation were identified. The Constructs, corresponding variables and their descriptions are given in Table 1. The constructs given in Table 1 are the variables of TQM and Innovation which are subjected to evaluation and

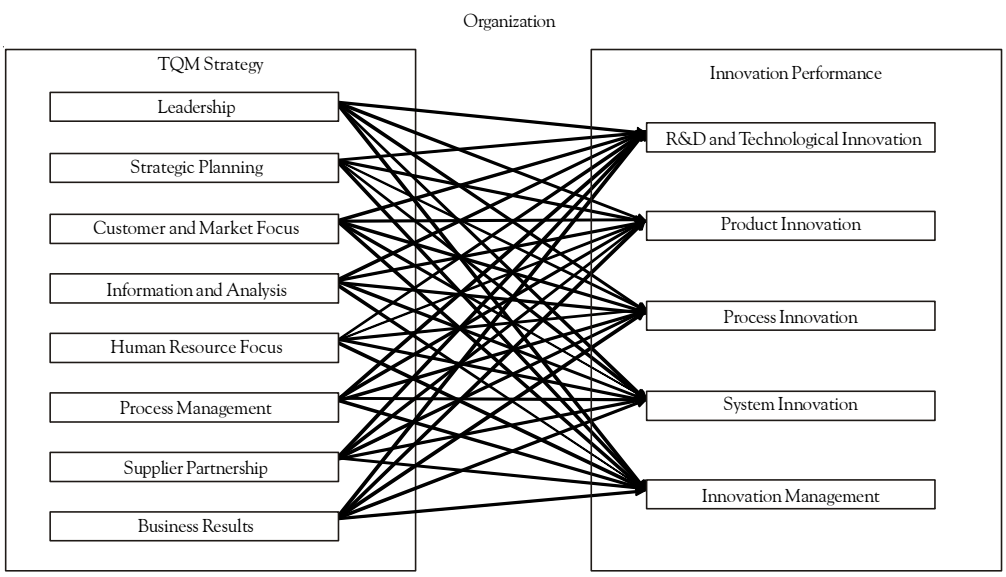
Table 1: Constructs and Variables of TQM and Innovation

Construct	Var.	The Construct Examines
Leadership	X_1	How the organization's senior leaders guide and sustain the organization.
Strategic Planning	X_2	How the organization develops strategic objectives and action plans.
Customer and Market Focus	X_3	How the organization determines the requirements, needs, expectations, and preferences of customers and markets.
Information and Analysis	X_4	How the organization selects, gathers, analyzes, manages and improves its data, information, and knowledge assets.
Human Resource Focus	X_5	How the organization engages, manages and develops the workforce to utilize its full potential in alignment with the organization's overall strategy.
Process Management	X_6	How the organization designs, manages and improves its key processes to deliver customer value and achieve organizational success and sustainability.
Supplier Partnership	X_7	How the organization works with its suppliers in a partnering atmosphere to achieve the same quality level as attained within the organization.
Business Results	X_8	The organization's performance and improvement in all key areas.
R&D and Technological Innovation	Y_1	The organizations ability to adapt to new technology, its full utilization, strength of R&D and technological capability acquisition programs.
Product Innovation	Y_2	The novelty of new products, new product development capabilities and its pace, leadership in product innovation, responsiveness to customers, etc.
Process Innovation	Y_3	The novelty of new processes, speed of process innovation and capability to develop new processes
System Innovation	Y_4	The learning capability, proactive approach to innovation by overcoming barriers, adaptability to new ways of organizing, problem solving skills, etc.
Innovation Management	Y_5	The top management commitment to innovation, creative culture, activities to improve the creativity of its people and resource provision for innovation.

measurement. Each and every construct is measured and captured by a set of statements or attributes derived from the definitions of the construct which form the items to describe the variables.

A questionnaire was developed for primary data collection consisting of these statements to which the respondents were to indicate the level of agreement with respect to their organization. Each construct of TQM and innovation have items ranging from 7 to 20 with a response scale from 1 to 5. The evaluation of constructs indicates the level of TQM implementation or innovation performance within an organization. Figure 1 gives the research framework.

Figure 1: Framework of Research



DATA ANALYSIS METHODOLOGY

Evaluation of the eight constructs of TQM considered as independent variables and the five constructs of Innovation Performance considered as dependent variables, indicates the level of TQM implementation and the Innovation Performance within an organization. Here the evaluation of dependency relationship of one dependent variable of Innovation to eight independent variables of TQM at a time is carried out. The appropriate methodology to study such relationships is the Multiple Regression Analysis (Krishnaswamy *et al*, 2006, Joseph *et al.*, 2007). Consider the following hypothesis as an example:

H_o: *The various variables of TQM performance haven't got any effect on Product Innovation performance of the organization.*

H_a: *At least one variable of TQM performance has got an effect on Product Innovation performance of the organization.*

Product innovation Y_2 becomes the dependent variable and variables of TQM becomes the independent variables.

Hence, Product Innovation, Y_2 = function of (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) or

$$Y_2 = \beta_{30} + \beta_{31}X_1 + \beta_{32}X_2 + \beta_{33}X_3 + \beta_{34}X_4 + \beta_{35}X_5 + \beta_{36}X_6 + \beta_{37}X_7 + \beta_{38}X_8 + \varepsilon_3$$

And the Hypothesis becomes,

H_o: $\beta = 0$ and H_a: $\beta \neq 0$

In the same way considering each dependent variable separately as a function of independent variables five regression models come out.

PILOT STUDY – EVALUATION OF RELIABILITY AND VALIDITY

For the pilot study the questionnaire was administered to a sample of 10 randomly selected organizations to assess the reliability and validity of the questionnaire. Cronbach alpha is a measure of reliability that ranges from 0 to 1, with values of 0.6 to 0.7 regarded as the lower limits of acceptability (Joseph, *et al.*, 2007). Cronbach alpha values estimated using Statistical Package for the Social Sciences (SPSS) yielded high values for all the 13 variables with minimum value being 0.7937.

A widely used method for assessing construct validity by simultaneously establishing convergent and discriminant validity is the Multitrait and Multimethod Matrix (MTMM) (Krishnaswamy *et al.*, 2006). In MTMM, the basic concept is that correlation among the scores of the same construct should be the largest correlations in the matrix. The matrix of average correlation obtained using Excel yielded the largest average correlation among the scores of the same construct for all the 13 variables ensuring the validity.

MAIN STUDY – A DETAILED STATISTICAL ANALYSIS

The non probability sampling technique was used in the current research to identify the organizations with assistance from Confederation of Indian Industry. Primary data from the top management of the organization regarding their TQM and innovation performance are obtained on the questionnaire developed, restricted by one feedback from one organization. For the main study, 180 organizations were contacted. Out of this 72 organizations responded, which yielded a response rate of 40%.

CONFIRMATORY FACTOR ANALYSIS

In confirmatory factor analysis, the factor loadings indicate the degree of correspondence between the variable and the factor, with higher loadings making the variable representative of the factor. Loadings exceeding ± 0.7 indicate well defined structure (Joseph *et al.*, 2007).

Hence in the current research only items for which the factor loading is more

Table 2: Confirmatory Factor Analysis – Number of Items and Minimum Factor Loading

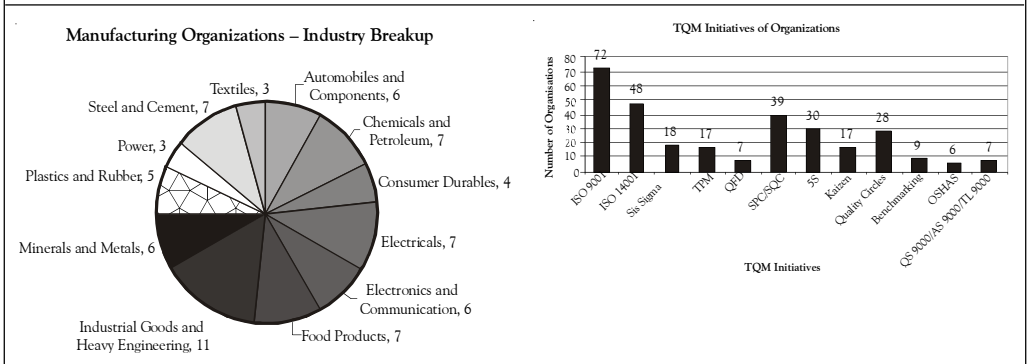
Total Quality Management			Innovation Performance		
Independent Variables	Retained Items	Minimum Factor Loading	Dependent Variables	Retained Items	Minimum Factor Loading
X_1	11	0.72	Y_1	10	0.76
X_2	8	0.72	Y_2	9	0.73
X_3	13	0.72	Y_3	6	0.78
X_4	12	0.73	Y_4	12	0.74
X_5	16	0.74	Y_5	12	0.74
X_6	11	0.70			
X_7	8	0.73			
X_8	6	0.70			
Total	**85**		**Total**	**49**	

than or equal to 0.7 are identified and included for further analysis as given in Table 2.

TQM INITIATIVES AND TQM AND INNOVATION PERFORMANCE

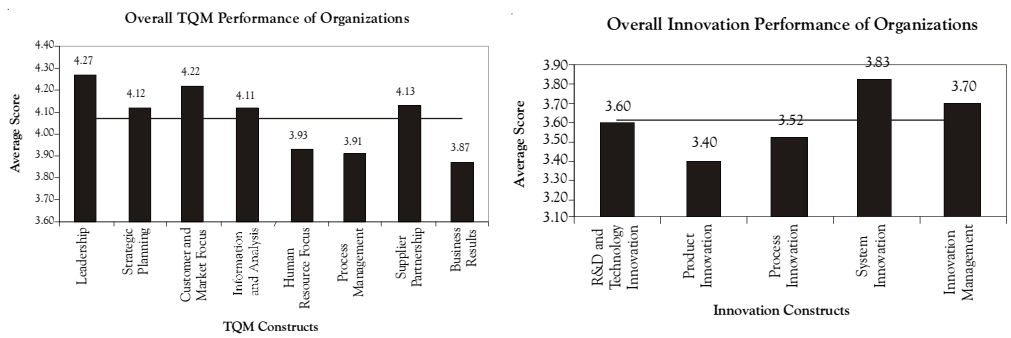
All the variables loading highly on a factor are combined and the average score of the variables is used as replacement variable. Such summated scale overcomes the measurement error and it also represents the multiple aspects of a concept (Joseph *et al.*, 2007). Industry wise breakup of organizations is given in Figure 2, which indicates that almost all the manufacturing sectors are evenly represented. Regarding TQM initiatives (Figure 2), all the organizations covered are at least ISO 9001 certified followed by other practices.

Figure 2: TQM Initiatives and Industry Breakup



The average score of TQM constructs shown in Figure 3 indicates that TQM organizations are extremely good as far as leadership aspect is concerned and are wanting as far as process management aspect is concerned. Also from chart of average score of innovation constructs it

Figure 3: General TQM Innovation Performance



can be seen that TQM organizations are doing extremely well as far as system innovation is concerned and are wanting as far as product innovation is concerned.

DATA ANALYSIS USING MULTIPLE REGRESSION

In multiple regression analysis, it is required to ensure that the data is meeting the basic assumptions of regression analysis—linearity, homoscedasticity and normality which involves two steps—testing the individual variables and testing the overall relationship after model estimation. This was accomplished using *R* (a language for statistical computing).

The scatter plots (e.g., Figure 4) of individual variables do not indicate any nonlinear relationships between the dependent variables and independent variables justifying the assumption of linearity. The normal probability plots (e.g., Figure 4) though slightly in favor of normality by a linear trend, showed some departures from normal distribution for some variables. Since the skewness and kurtosis values were very low ($< \pm 3$), it was decided to

Figure 4: Normal Probability Plot and Scatter Plot (Example)

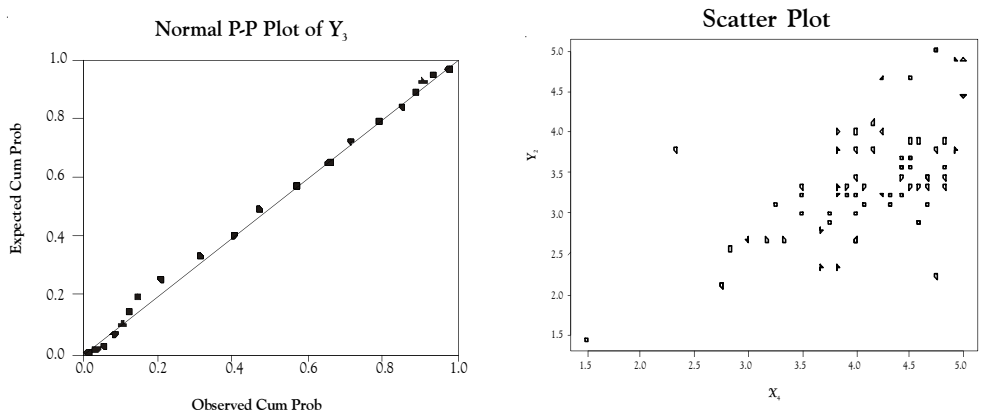
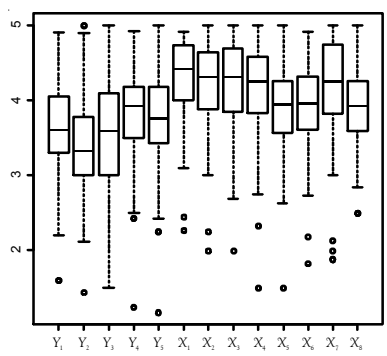


Figure 5: Variables Box Plots



proceed further with caution since the regression analysis has been shown to be quite robust even when this assumption is not met.

The box plots (Figure 5) of all variables has not indicated any substantial differences in the length of the boxes and whiskers between the groups representing the dispersion of observations in each group confirming homoscedasticity (Joseph *et al.*, 2007). This is again confirmed by the formal tests for homoscedasticity, of all the five groups of variables, the Bartlett Test with a Bartlett's *K*-squared value of 13.0484 (maximum) and a *p*-value of 0.1102 (minimum).

REGRESSION MODEL ESTIMATION

The full confirmatory regression models involving all the variables are given below;

$$\text{Model 1} \quad Y_1 = \beta_{10}+\beta_{11}X_1+\beta_{12}X_2 +\beta_{13}X_3+\beta_{14}X_4+\beta_{15}X_5 +\beta_{16}X_6+\beta_{17}X_7 +\beta_{18}X_8+u$$

$$\text{Model 2} \quad Y_2 = \beta_{20}+\beta_{21}X_1+\beta_{22}X_2 +\beta_{23}X_3+\beta_{24}X_4+\beta_{25}X_5 +\beta_{26}X_6+\beta_{27}X_7 +\beta_{28}X_8+u$$

$$\text{Model 3} \quad Y_3 = \beta_{30}+\beta_{31}X_1+\beta_{32}X_2 +\beta_{33}X_3+\beta_{34}X_4 +\beta_{35}X_5+\beta_{36}X_6+\beta_{37}X_7 +\beta_{38}X_8+u$$

$$\text{Model 4} \quad Y_4 = \beta_{40}+\beta_{41}X_1+\beta_{42}X_2 +\beta_{43}X_3+\beta_{44}X_4+\beta_{45}X_5 +\beta_{46}X_6+\beta_{47}X_7 +\beta_{48}X_8+u$$

$$\text{Model 5} \quad Y_5 = \beta_{50}+\beta_{51}X_1+\beta_{52}X_2 +\beta_{53}X_3+\beta_{54}X_4+\beta_{55}X_5 +\beta_{56}X_6+\beta_{57}X_7 +\beta_{58}X_8+u$$

With the aim of eliminating the effect of outliers and influential cases in regression analysis, cases were selected based on the criteria of the Cook's distance, Mahalanobi's D^2 and studentized residual. Table 3 gives the number of valid cases in each model after this selection.

After removing outliers and influential cases, the proportion of variance among all the five models in the dependent variable, explained by the independent variable increased by at least 2%. Hence the regression analysis with omitted

Table 3: Cases Valid After Excluding Outliers and Influencers

Model	1	2	3	4	5
Valid Cases	65	68	68	69	66

outliers and influential cases was interpreted. The estimates of the multiple regression analysis carried for the collected data from organizations using SPSS is given in Table 4. The analysis indicates that all the models are reasonably good ($p \leq 0.001$) leading to the rejection of the null hypothesis.

H_o: $b = 0$.

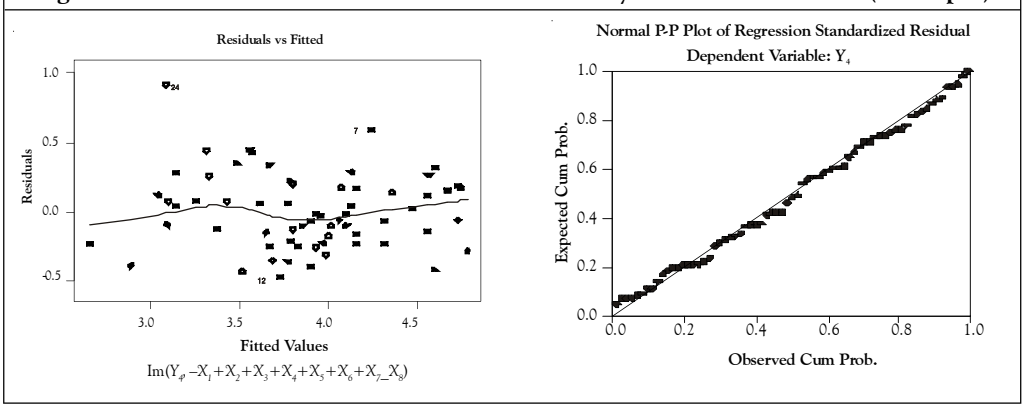
Table 4: Regression Model Estimates

Model	R	R^2	Adjusted R^2	ANOVA Sig.
1	0.801	0.642	0.591	0.000
2	0.771	0.594	0.539	0.000
3	0.786	0.618	0.566	0.000
4	0.888	0.788	0.760	0.000
5	0.884	0.781	0.750	0.000

RESIDUAL ANALYSIS

The residual plots (e.g., Figure 6) for all the models do not exhibit any non liner pattern to the residuals thus ensuring the linearity of overall equation. Again the residual plots show no pattern of increasing or decreasing residuals which indicates homoscedsaticity in the multivariate case. In the normal probability plots of residuals (e.g., Figure 6) for all models, the values fall along the diagonal with no substantial or systematic departures representing a normal distribution. This is further verified by the Shapiro Wilks normality test for all the error terms for the 5 models with *p*-values of all models greater than 0.05 with minimum being 0.1154 for model 5.

Figure 6: Residual Plot and Normal Probability Plot of Residuals (Example)



Any variable with tolerance values below 0.10 meaning a Variance Inflation Factor (VIF) of more than 10 would have a correlation more than 0.95 indicating high multicollinearity (Joseph *et al.*, 2007). The values of VIF for the independent variables was between 5.554 and 8.319, which are less than 10 for all models indicating the absence of multicolinearity.

DELIBERATIONS AND CONCLUSIONS

The overall model fit and R^2 values of all five models which are in the range of 60% to 79% (Table 4) indicate that TQM has

effect on innovation performance. The results support the model validity and the R^2 values are quite substantial enough to motivate organizations for adopting TQM as a Strategic Management model in the future, to achieve a high innovation performance.

Interpretation of the variate relies on any of the three perspectives—importance of the independent variables, types of relationships found and interrelationship among the independent variables (Joseph *et al.*, 2007). Since both the confirmatory and stepwise approaches have strengths and weaknesses, both methods were used in order to capture the strengths of each. The regression analysis carried out for all models using SPSS yielded the significant coefficient ($p \leq 0.05$) of the models as summarized in Table 5.

perceptions of these TQM variables increase the corresponding innovation performance. Regarding the constant it is improbable that any organization would have zero ratings for all the independent variables, the constant provides no insight for interpretation.

From a general comparison, it can be seen that, out of the eight variables of TQM considered, as many as five variables viz. Strategic Planning (X_2), Customer and Market focus (X_3), Human Resource Focus (X_5), Process Management (X_6) and Business Results (X_8) are quite significant and are having a strong impact on the innovation performance of organization. Regarding other variables of TQM the variables are not significant irrespective of whether the coefficients are positive or negative and, sufficient evidence is not there to support their

Table 5: Model Coefficients and Significance Summary

Model	Dependent Variable		Strongly Influencing Independent Variable		β	Sig.
1	R&D and Tech. Innovation	Y_1	Strategic Planning	X_2	0.420	0.019
2	Product Innovation	Y_2	Process Management	X_6	0.333	0.078
3	Process Innovation	Y_3	Customer Market Focus	X_3	0.395	0.046
			Process Management	X_6	0.435	0.040
			Business Results	X_8	0.421	0.014
4	System Innovation	Y_4	Human Resource Focus	X_5	0.583	0.000
5	Innovation Management	Y_5	Strategic Planning	X_2	0.328	0.022
			Human Resource Focus	X_5	0.322	0.050
			Business results	X_8	0.398	0.001

All the variables listed are significant at $p \leq 0.05$ and one variable X_6 for model 2 is significant at $p \leq 0.1$. It can be considered that, all these significant variables are having a direct impact on the corresponding innovation performance (Y). All significant coefficients are positive, indicating that more positive

impact on innovation performance. Across all models it can be seen that the TQM variables Strategic Planning (X_2), Human Resource Focus (X_5), Process Management (X_6) and Business Results (X_8) are having a positive impact on atleast two types of Innovation performance, which indicates the multiple

contribution of these TQM variables in improving the Innovation performance. On the other hand across all models the TQM variables—Leadership (X_1), Information and analysis (X_4) and Supplier partnership (X_7) are not seen significant at all in any of the models. Hence an evidence for the contribution of these TQM variables towards the innovation performance of organization could not be traced.

RESULTS VALIDATION

For generality, the split sample validation process was adopted which was accomplished using SPSS. Summary of validation results given in Table 6 indicates that all the models are statistically significant indicated by the ANOVA Significance values. The percentage variation in R^2 is within 5% for models 2 and 5 and within a maximum of 8.88% for models 1, 3 and 4. Since there are common significant variables for the full data set as well as the two split samples the models are considered valid with the variation in R^2. From the summary it can be seen that by and large all the five models exhibit validity and could be generalized.

Table 6: Summary of Validation

Model	1	2	3	4	5
ANOVA Significance ($p \leq 0.05$) Maximum	0.000	0.000	0.000	0.000	0.000
% Variation in R^2 (Split 1)	7.01	3.37	8.25	7.87	3.97
% Variation in R^2 (Split 2)	8.88	2.19	2.27	5.71	1.28
Common Significant Coefficients ($p \leq 0.05$)	X_2	*Nil*	X_6	X_5	X_8
Common Significant Coefficients ($p \leq 0.10$)	X_2	X_6	X_6, X_3	X_5	X_8

IMPORTANT FINDINGS

A detailed insight into the various variables involved in TQM and innovation performance within an organization were obtained through this research which are backed by exhaustive literature and investigations. A reliable and valid questionnaire (measuring instrument) to assess the TQM and innovation performance was developed. The relationship established between TQM and Innovation performance clearly indicates that TQM in general has a strong impact on the innovation performance of an organization irrespective of whatever may be the type of innovation. The important role played by the strategic planning activity which is an element of TQM for the improved R&D and Technological innovation performance as well as the innovation management performance within an organization is very well revealed by the research. This conclusion emphasizes the need to strengthen the important strategic planning activities like development of strategic objectives, its deployment and its monitoring. Process management being an important element of TQM has got a significant role in improving the product and process innovation performance of the organization and needs to be strengthened. Process management activities are directed towards improving processes within an organization. The research revealed that the effect of good process management activity can

improve the product or process innovation. The impact of customer and market focus which is an element of TQM, on Process innovation indicates that a customer and market focused organization can understand the pulse of customer. This facilitates process innovation, since customer requirements are largely met by organizations processes. The impact of human resource focus which is an element of TQM on system innovation and innovation management is significant. Human resource focused organizations lays lot of emphasis on human resource development. Thus many of the elements of system innovation and innovation management are having a strong impact in a human resource focused organization. Business results impact on process and system innovation is significant. This indicates that if an organization is capable of showing a quantifiable improvement in areas like on time performance, delivery times, rework, etc. it can lead to the improvement of process innovation and system innovation performance. The non significance of certain TQM variables does not necessarily mean that these variables are not at all contributing to the innovation performance but contribute with a very weak significance and it requires further investigation. The substantial impact of Human Resource Focus and Process Management is a strong evidence to support the argument that innovation is basically people and process dependent wherein TQM also emphasizes these two aspects. Some of the common ideas of TQM and innovation well revealed by the research consist of the need for involvement of people and the consideration of customer needs for both.

LIMITATIONS OF RESEARCH AND DIRECTION FOR FUTURE RESEARCH

This ex post facto research is an empirical study involving primary data collection from organizations and its statistical analysis by multivariate techniques and is not an experimental research. Hence all the limitations applicable to multivariate statistical technique are applicable here. Sampling methodology for the research is non probability sampling which is non random. Though the collected primary data may be sufficient for purposes of analysis, response rate has limited the sample size leading to difficulties in accurate generalizations. To understand more about the findings of this research, a detailed study on each one of this relationship identified and the reasons underlying them can be taken up by case study approach. Also this research study could be replicated and refined in other research contexts covering this category.

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Measuring Environmental Efficiency and Cost of Pollution Abatement: An Application of Directional Distance Function to Indian Cement Industry

*Sabuj Kumar Mandal**

Production of desirable output often generates undesirable by-product which has detrimental impact on the environment. This paper, considering carbon dioxide as an undesirable by product of cement, aims at measuring environmental efficiency of Indian cement industry within a joint production framework of both desirable and undesirable output. Environmental efficiency is defined as the ability of a producer to simultaneously increase the desirable output and reduce the undesirable one. We use 3 digit state level data from the Annual Survey of Industries for the years 2000-01 through 2004-05 and apply Directional Distance Function for the empirical analysis. The empirical results show that Indian cement industry, with environmental regulation, has the potential of expanding desirable output and contracting undesirable one from the given inputs. However, regulation has a cost in terms of lower feasible expansion of desirable output as compared to the unregulated scenario.

INTRODUCTION

Indian cement industry witnessed an unprecedented growth as a sequel to government's liberalization policy initiated in the form of partial decontrol policy adopted in 1982, culminated in total decontrol in 1989. India has progressed from being the world's eighth largest cement producer in 1979-80 to being the second largest at present. However, this huge growth in cement production has been associated with a price to pay. Among the energy intensive industries in India, cement industry has the highest energy intensity with second highest share in fuel consumption (15.60%), after Iron and Steel (18.10%), mostly in the form of coal utilization. Its expansion could not have been achieved without a very large increase in energy input, especially in the form of coal combustion.

This has resulted in severe environmental problems in the coal mining regions and around the cement producing plants. In addition, India's annual emission of green house gases from the cement industry has been increased from 7.32 m in 1993 to 16.73 m in 2003 and its share in total carbon dioxide

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(CO_2) emission by India has increased from 3.3% to 4.8% during this period (ICRA, 2006). This raises the question of how environmentally efficient Indian cement industry is with respect to CO_2 emission.

Globally, cement industry contributes 5% of the total CO_2 gas. Among all other green house gases, CO_2 contributes the largest amount to the global warming process. Anthropogenic activities, primarily the combustion of fossil fuels and the resultant carbon emission cause a significant warming of the global climate (IPCC[1], 1995). If India wants to further develop this industry without creating much pressure on its scarce resource as well as on its environment, it is necessary to put substantial efforts on increasing energy use efficiency and thereby reducing CO_2 emission.

In the Indian context, not much attention has been devoted to examine the issue of energy related CO_2 emission in general and industrial emission analysis in particular. Paul and Bhattacharya (2004) used decomposition method to decompose the observed changes in the energy-related CO_2 emissions into four factors: pollution coefficient, energy intensity, structural changes and economic activity. The results of their study show that economic growth has the largest positive effect in CO_2 emission changes in all the major economic sectors. Emissions of CO_2 in industrial and transport sectors show a decreasing trend due to improved efficiency and fuel switching. The study of Nag and Parikh (2000) also tries to analyze the impact of different factors such as activity levels, structural changes, energy intensity and fuel mix and fuel quality on the changes in aggregate carbon intensity of the economy for the period 1970-1995. Srivastava (1997) presents some indicators of energy use in India including per capita energy consumption levels, the structure of energy consumption as well as efficiency of its utilization over the recent decades.

Thus, the existing studies of energy related CO_2 emission in Indian context have considered the observed level of CO_2 emission as given and try to identify the factors affecting this emission. Since CO_2 is an undesirable by-product generated due to the combustion of fossil fuel, efficiency in CO_2 management can be better analyzed within a joint production framework of both desirable and undesirable output. Following the recent development in Data Envelopment Analysis (DEA) literature, CO_2 can be incorporated in the production function either as an input or as an undesirable output. To the best of our knowledge none of the studies in India examined the issue of energy related CO_2 emission in this fashion. The present study makes an attempt to construct environmental performance index, in terms of CO_2 emission, which we are considering as environmental efficiency of the Indian cement industry for different states using production theoretic framework. Within the production theoretic framework, we consider CO_2 as an undesirable by-product and define environmental efficiency accordingly.

[1] Intergovernmental Panel for Climate Change.

This paper presents different approaches for measuring environmental efficiency, discusses the data and modeling issues and presents empirical results. The paper ends with a conclusion.

METHODOLOGY FOR MEASURING ENVIRONMENTAL EFFICIENCY

CARBON DIOXIDE AS AN ENVIRONMENTALLY DETRIMENTAL INPUT

One strand of literature considers emitted CO_2 as one of the inputs in the production function. Reinhard *et al.* (2000) and Cropper and Oates (1992) followed this approach. They specified a production function which includes a vector of conventional inputs and the quantity of waste discharge. Waste emissions are treated simply as another factor of production. Reduction in these emissions results in reduced output. Pittman (1981) also modeled pollution as an input in the production function. In the second case CO_2 is treated as an undesirable by-product in the production process.

CARBON DIOXIDE AS AN UNDESIRABLE BAD OUTPUT

However, considering pollution as an input is not consistent with the neoclassical theory of production function because according to neoclassical production theory all inputs should have some productive uses. But CO_2 does not have any productive uses. Moreover, considering pollution as an input implies that infinite much can be produced with finite resources. So, recent economic literature does not consider pollution as an input in the production process. Another body of literature (e.g., Taskin and Zaim, 2000; and Zaim and Taskin, 2000) estimates environmental efficiency (considering only undesirable output) and industrial efficiency (considering only desirable output) separately and then takes a ratio of the two to calculate efficiency of the production unit in presence of undesirable output. But this method implicitly assumes that production of undesirable output is independent of the production of desirable output, which calls for further improvements (Watanabe and Tanaka, 2007).

The other strand of literature models the production of desirable and undesirable output in a joint production theoretic framework and extends the traditional analysis of efficiency (Farrell, 1957). The notable contributions include the pioneering work done by Färe *et al.* (1989). They treated environmental effects as undesirable outputs and developed a hyperbolic efficiency measure defined as ability of a producer to simultaneous increase desirable outputs and reduce undesirable output by same proportion. They assumed both strong and weak disposability condition regarding the undesirable output and used nonparametric Data Envelopment Analysis (DEA) to construct the best-practice production frontier and to calculate their hyperbolic efficiency (i.e., graph efficiency) measure based on the Färe *et al.* (1993) also treated pollution as an undesirable output and introduced the use of parametric mathematical programming to calculate hyperbolic

efficiency measure and to calculate shadow prices of undesirable output. But the hyperbolic efficiency measure does not assume 'null-jointness' of desirable and undesirable output which is the more realistic assumption to reflect any production of desirable output that should be accompanied by a positive production of undesirable also.

More recently, the Directional (Technology) Distance Function has been applied in the literature to represent the technology. It is based on Luenberger's benefit function (see Chambers *et al.*, 1996a; and Färe and Grosskopf, 2000 and 2005). The directional distance function is an extension of Shephard's input and output distance function (Chambers *et al.*, 1996b), which provide a basis to represent the joint production of *desirables* and *undesirables*. In this study we also employ the directional distance function to estimate the environmental efficiency of the firms where environmental efficiency is defined as the ability of the producer to expand the desirable output and to contract the undesirable one by same proportion without increasing the inputs. Advantage of directional distance function is that it helps not only measuring environmental performance but also estimating pollution abatement cost arising from environmental regulation. Färe *et al.* (2003) interpret cost of regulation as the foregone output for diverting some of the productive resources to pollution abatement activities. Picazo-Tadeo *et al.* (2005) also define cost of regulation in terms of lower feasible expansion of good output resulting from environmental regulation which prevent free disposal of undesirables outputs. This paper differs from Färe *et al.* (2003) and Picazo-Tadeo *et al.* (2005) by scaling both *desirable* output and *undesirable* output instead of scaling only *desirable* output (as done by Färe *et al.*, 2003) or scaling *desirable* output and *inputs* (as done by Picazo-Tadeo *et al.*, 2005).

Let us consider a production process that uses a vector of N input $x=(x_1,x_2,.....,x_N)\in\Re_+^N$ to produce a vector of desirable output $y=(y_1,y_2,....y_M)\in\Re_+^M$ and a vector of undesirable output $b=(b_1,b_2,...b_J)\in\Re_+^J$. The relationship between input and output is represented by the following output set:

$$P(x)=\{(y,b): x \text{ can produce } (y,b)\}, x\in\Re_+^N. \quad ...(a)$$

The output set is assumed to have the following properties. The first is 'null-jointness' which implies production of a positive amount of desirable output which must be accompanied by some amount of undesirable one. Formally, null-jointness implies that:

$$(y,b)\in P(x); b=0 \Rightarrow y=0 \quad ...(b)$$

The second assumption is that desirable and undesirable outputs are jointly weakly disposable:

$$(y,b)\in P(x) \text{ and } 0\le\theta\le 1, \text{ then } \theta(y,b)\in P(x) \quad ...(c)$$

This implies that a reduction in undesirable output is not possible without

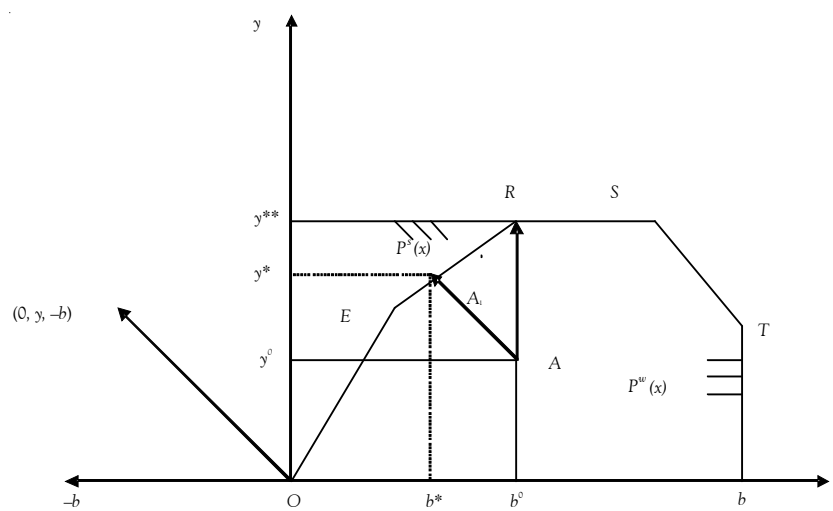
reducing the desirable output. So disposal of undesirable output may not be a free activity. So when firms face environmental regulation, reducing undesirable output involves a cost in terms of forgone desirable output. The third assumption is known as strong disposability of desirable:

$$(y,b) \in P(x) \text{ and } y^0 \leq y, \quad \text{then } (y^0,b) \in P(x) \qquad \ldots(d)$$

This implies that desirable output can be reduced without reducing the desirable one. So in our model desirable and undesirable outputs are treated asymmetrically in terms of their disposal. Figure 1 depicts the output set,, for a case of one desirable output and one undesirable output. Both weak and strong disposability are assumed regarding the undesirable output and it is assumed that under weak disposability of undesirable output firms face environmental regulation operate under regulated technology, whereas strong disposability of undesirable output implies disposal of undesirable is cost free and firms operate under unregulated technology.

In Figure 1, y denotes *desirable* output and b denotes *undesirable* one. The region $P^s(x) = Oy^{**}RSTb$ denotes output set, $P^s(x)$, under unregulated technology and OERSTb denotes output set, $P^w(x)$, under regulated technology. The output set, under regulated technology, satisfies the 'null-jointness' property because the only point in common between the good output (y-axis) and the output set $P^w(x)$ is the origin O and b is a by product of y. On the other hand, output set under unregulated technology does not satisfy the 'null-jointness' property because there are so many other common points (between O and y**) between the good output (y-axis) and the output set $P^s(x)$. So any production plan between O and y** is not associated with a positive production of bad, implying that

Figure 1: Directional Technology Distance Function and Environmental Regulation



unregulated technology may not always be consistent with joint production of good and bad output. Suppose, the initial production plan is at A, where y^0, amount of desirables and b^0 amount of undesirables is produced. The directional technology distance function locates the productive plan A on the boundary of the regulated output set at A_1. So the distance A_1A_1 measures productive technical inefficiency (Picazo-Tadeo *et al*. 2005). Now assume that firms face no environmental regulation, i.e., undesirable output is freely disposable. Under this no regulation scenario firms' strategy would be increasing the good output while maintaining b^0 same amount of undesirable output. So, directional technology distance function, under free disposability condition, locates the productive plan A at R which is on the boundary of unregulated output set. It is clear from the diagram that efficient output (y**) under unregulated technology is larger than the efficient output (y*) under regulated technology. So the difference between y** and y* measures the cost of regulation in terms of foregone output. If this difference nullifies to zero, then regulation turns out to be non-binding for that particular productive plan.

In presence of undesirable output if our objective is to a simultaneous expansion of the desirable output and reduction of the undesirable one by same proportion without increasing the input, the directional technology distance function becomes,

$$\overrightarrow{D_T}(x,y,b;0,y,-b) = \sup\left[\beta : \left[(1+\beta)y,(1-\beta)b\right] \in P(x)\right] \quad \ldots(e)$$

The value β represents technical inefficiency denoted by the distance A_1A_1in Figure 1. The direction vector $g = (g_x, g_y, -g_b) = (0, y, -b)$ determines the direction in which efficiency is measured. Given the technology and direction vector, the directional distance function measures the maximum feasible expansion of desirable output and contraction of undesirable output. For an efficient firm, operating on the frontier, the value of directional distance function, β, is zero. The directional distance function, β, is obtained by solving the maximization problem in model (1):

Maximize β

Subject to,

$$\sum_{j=1}^{n} \lambda_j y^j - \beta y^0 \geq y^0 \; ; \quad \text{(i)}$$

$$\sum_{j=1}^{n} \lambda_j b^j + \beta b^0 = b^0 \; ; \quad \text{(ii)} \qquad \ldots(1)$$

$$\sum_{j=1}^{n} \lambda_j x^j \leq x^0 \; ; \quad \text{(iii)}$$

$$\sum_{j=1}^{n} \lambda_j = 1 \quad \text{(iv)}$$

$$\lambda_j \geq 0 \left(j = 1,2,\ldots..,n\right) \quad \text{(v)}$$

Strong disposability of desirable output and weak disposability of undesirable output are imposed through inequality (i) and equality (ii) respectively in Model (1).

Next, we consider that firms face no environmental regulation in terms of disposability of undesirable output. Under

no regulation, disposal of undesirable is a free activity, i.e., strong disposability applies to both desirable and undesirable output. In this new scenario, the distance function, β, is obtained by solving the following programming problem:

Maximize β

Subject to,

$$\sum_{j=1}^{n} \lambda_j y^j - \beta y^0 \geq y^0 ; \quad \text{(i)}$$

$$\sum_{j=1}^{n} \lambda_j b^j + \beta b^0 \leq b^0 \quad \text{(ii)} \qquad \ldots(2)$$

$$\sum_{j=1}^{n} \lambda_j x^j \leq x^0 \quad \text{(iii)}$$

$$\sum_{j=1}^{n} \lambda_j = 1 \quad \text{(iv)}$$

$$\lambda_j \geq 0 \left(j = 1, 2, \ldots\ldots, n \right) \quad \text{(v)}$$

where strong disposability of undesirable has been introduced transforming the equality (1)-(ii) to the inequality (2)-(ii).

CONSTRUCTION OF THE PRODUCTION FRONTIER

Now, we need to discuss the construction of the production frontier based on which efficiency is measured. First of all, we assume that constant returns to scale hold. Secondly, for each year we construct a '*sequential frontier*' which assumes all current and past observations as feasible.[2] Starting with a reference sample of 20 observations for the year 2000-01, we successively enlarge the reference sample by including the observations of one more year. For example, sample firms of 2001-02 consist of firms that were available in 2000-01 plus the existing firms in 2001-02. Conceptually, a sequential frontier amounts to assuming that there is no technical regress, any technical regress will be assimilated with inefficiency by this construction.[3]

DATA CONSOLIDATION

The state-level data from the Indian cement industry for the years 2000-01 through 2004-05 is extracted from the Annual Survey of Industries for cement industry (code 269) for the relevant years. The study covers 20 major states in terms of cement production. We conceptualize a single output, four input production function for the cement industry in India. Output is measured by value of ex-factory products and by-products in the state, deflated by the whole sale price index for cement. The inputs include (i) capital, (ii) energy, (iii) labor, and (iv) materials. Undesirable by-product is measured by Carbon dioxide (CO_2).[4] The capital input is measured as a stock by taking the value of fixed capital, deflated by the wholesale

[2] The concept of '*sequential frontier*' has been used by Mukherjee (2008a) also.

[3] The assumption of no technical regress seems to make sense for the sample years under study during which the Indian industrial sector has mostly achieved significant improvement in technology (Mukherjee, 2008a).

[4] In our study CO_2 emissions data has been constructed from fuel consumption data and emission factor. So level of emission is a linear function of fuel used. This may raise some doubt about the rationale for including both energy and emission in a DEA model. Since emission is a major by product of energy use, we are including both in a production framework to offer more characterization of the production process (Zhou and Aug, 2008).

price index for machinery and machine tools. Labor is measured by total number of persons employed. Energy is measured by the expenditure on fuels deflated by the wholesale price index for fuel, power, light and lubricant. Similarly, the material input is measured by the expenditure on materials, deflated by wholesale price index for non-metallic mineral products. All inputs and outputs are divided by the total number of factories in a particular state so that we can examine environmental efficiency of a 'typical firm' within each state.[5] Descriptive statistics of the variable is presented in Table 1.

Table 1: Descriptive Statistics of the Variables

Variable	Mean	Std. Dev.	Min	Max
Output	3.46	4.74	0.19	23.09
CO_2	0.24	0.45	0.0025	1.84
Capital	3.82	9.05	0.12	72.62
Energy	0.62	1.02	0.0035	4.34
Labor	41.00	22.00	15.00	87.00
Material	1.33	1.13	0.049	5.23

Note: All nominal variables are converted into real variables with 1993-94 as base. Output, capital, energy and material variables are in Rs. Lakh and labor is in number, CO_2 in tons.

CALCULATION OF EMISSIONS[6]

In the present study, CO_2 emission is estimated from the coal use because coal constitutes the major share in total fuel consumption by the cement industry and share of other fuels, which also can produce CO_2, is negligible. The CO_2 emission is estimated by taking into account the carbon emission factor of coal (25.8), the fraction of oxidized carbon of coal (0.98) and molecular weight ratio of CO_2 to carbon (44/12). Following the method of the Intergovernmental Panel for Climate Change (IPCC) (1995), the sectoral CO_2 emission of the ith fuel is obtained from the following relationship:

$$EC_i(t) = C_i(t) \times O_i \times N_i \times M,$$

where $EC_i(t)$ is the CO_2 emission of the ith fuel at time t; $C_i(t)$ is the consumption of ith fuel at time t; O_i is the carbon emission factor of the ith fuel; N_i is the fraction of carbon oxidized of the ith fuel and M is the molecular weight ratio of CO_2 to carbon (44/12).

According to IPCC (1995) guidelines, the following steps are performed to calculate CO_2 emissions from particular fuel consumption.

- Energy consumption data in Million Tons of Oil Equivalent (MTOE) is converted to Terajoules (TJ) unit using standard conversion factors.
- Total Carbon (TC) emission (tons of carbon), TC, is estimated by multiplying fuel the fuel

[5] This approximation of getting firm level data from the industry is not absolutely perfect because, here we are assuming that all firms in a particular state are producing equally using equal amount of inputs. In absence of firm level data within the states, we are using this kind of approximation. Mukherjee (2008a, in the context of Indian manufacturing, also used the same approximation.

[6] This section is borrowed from Paul and Battacharya (2004).

consumption (terajoules) by the carbon emission factor (TC/TJ) of the corresponding fuel.

- Total carbon emission is then multiplied by the fraction of carbon oxidized and the molecular weight ratio of CO_2 to carbon to find the total CO_2 emitted from fuel combustion.

EMPIRICAL RESULTS

We have next estimated environmental efficiency of the firms by considering emission as an undesirable output using model (1) and model (2). These models estimate the value of directional distance function representing environmental inefficiency. Table 2 and Table 3 present values of directional distance function under weak and strong disposability assumption respectively. The average value of the distance function obtained from model (1), which assumes weak disposability of undesirable output, is 0.0782 implying that it is possible to increase the good output by 7.82% and contract the bad by 7.82% without increasing the inputs. States like Gujarat, Kerala, Punjab, Uttaranchal, Uttar Pradesh, Himachal Pradesh, and West Bengal achieved 100% environmental efficiency in each year because the average values of directional distance function in each year was zero for these states and Tamil Nadu and Jammu and Kashmir achieved environmental efficiency close to 100% with average value of distance function 0.0144 and 0.0005 respectively.

On the other hand, model (2) assumes strong disposability of the undesirable output and average value of the distance function obtained is 0.0883 implying a possibility of increasing the good output by 8.83% and reducing the bad by 8.83% without increasing the inputs. The states, which were 100% efficient in earlier

Table 2: Values of Directional Distance Function Based on Weak Disposability Assumption

State	2000-01	2001-02	2002-03	2003-04	2004-05	Annual Average
AP	0.1347	0.7228	0.6351	0.2675	0.2719	0.4064
AS	0.0000	0.1150	0.1592	0.1495	0.0000	0.0847
BI	0.0000	0.0000	0.3511	0.2304	0.0000	0.1163
CT	0.0000	0.3874	0.0000	0.0000	0.0000	0.0775
GU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HA	0.0000	0.0919	0.0000	0.0000	0.0000	0.0184
HP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JK	0.0000	0.0000	0.0000	0.0000	0.0024	0.0005
JH	0.2384	0.1527	0.0728	0.0534	0.0000	0.1034
KA	0.1845	0.2121	0.2502	0.2381	0.1405	0.2051
KE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MP	0.2478	0.2934	0.2048	0.2163	0.1614	0.2247
MA	0.0376	0.2625	0.1046	0.0000	0.2153	0.1240
OR	0.0000	0.2665	0.0390	0.0032	0.2117	0.1041

Table 2 (Cont.)

State	2000-01	2001-02	2002-03	2003-04	2004-05	Annual Average
PU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RA	0.1172	0.0000	0.0764	0.1561	0.0686	0.0836
TN	0.0000	0.0141	0.0000	0.0000	0.0579	0.0144
UP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
WB	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
State Average	0.0480	0.1259	0.0947	0.0657	0.0565	0.0782

Note: 1. State: AP – Andhra Pradesh, AS – Assam, BI– Bihar, CT – Chattisgarh, GU – Gujarat, HA – Haryana, HP – Himachal Pradesh, JK – Jammu & Kashmir, JH – Jharkhand, KA – Karnataka, KE – Kerala, MP – Madhya Pradesh, MA – Maharashtra, OR – Orissa, PU – Punjab, RA – Rajasthan, TA – Tamil Nadu, UP – Uttar Pradesh, UT – Uttaranchal, WB – West Bengal.

2. State average is the average efficiency of the 20 states for a given year. Annual average is the average for a given state over 5 years.

3. A zero value of Directional Distance Function (DDF) implies 100% efficiency, i.e., neither desirable output can be increased nor undesirable output can be reduced.

Table 3: Values of Directional Distance Function Under Strong Disposability Assumption

State	2000-01	2001-02	2002-03	2003-04	2004-05	Annual Average
AP	0.1347	0.7228	0.6351	0.2675	0.2719	0.4064
AS	0.0000	0.1434	0.1592	0.1495	0.0115	0.0927
BI	0.0000	0.1083	0.3511	0.2304	0.0000	0.1379
CT	0.0648	0.3909	0.2412	0.2208	0.1274	0.2090
GU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HA	0.0000	0.0919	0.0000	0.0000	0.0000	0.0184
HP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JK	0.0000	0.0000	0.0000	0.0000	0.0024	0.0005
JH	0.2384	0.1527	0.0728	0.0592	0.0000	0.1046
KA	0.1845	0.2121	0.2502	0.2381	0.1793	0.2128
KE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MP	0.2478	0.2934	0.2048	0.2163	0.1919	0.2308
MA	0.0935	0.2625	0.1046	0.0211	0.2153	0.1394
OR	0.0000	0.2665	0.0515	0.0272	0.2282	0.1147
PU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RA	0.1172	0.0000	0.0764	0.1561	0.0686	0.0836
TN	0.0000	0.0141	0.0000	0.0000	0.0579	0.0144
UP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 3 (Cont.)

State	2000-01	2001-02	2002-03	2003-04	2004-05	Annual Average
UT	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
WB	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
State Average	0.0540	0.1329	0.1073	0.0793	0.0677	0.0883

model, are efficient in this model also. But states like Andhra Pradesh (AP), Madhya Pradesh (MP), Karnataka (KA) and Bihar (BI) are showing lowest level of environmental efficiency in both model (1) and model (2). In both the models, average value of the directional distance function increased in 2004-05 as compared to the value in initial year implying an increase in inefficiency or decrease in efficiency.

COST OF ENVIRONMENTAL REGULATION

We have assumed both weak and strong disposability regarding the disposal of undesirable output in order to estimate cost of environmental regulation which is measured by the difference in average efficiency scores estimated from two alternative assumptions of disposability of undesirable output. In order to verify whether efficiency scores, based on weak disposability assumption, are different from those obtained from strong disposability assumption, the Wilcoxon Rank Sum test[7] is conducted. The null hypothesis is that efficiency scores obtained from the two models have the same population of relative frequency distribution. The value of Wilcoxon statistic is 3 and the value of two tailed '*p*' statistic is 0.0024. So the null hypothesis can be rejected at 1% level, implying that assumption regarding the disposability of the bad brings about significant difference in the value of directional distance function. Under strong disposability assumption the good output, on an average, can be increased by 8.83% while that can be increased by 7.82% under weak disposability assumption. So, environmental regulation, in the form of costly disposal of undesirable output, causes a reduction in the capability of expanding good output which can be viewed as the cost of regulation in terms of lower feasible expansion of desirable output.

IMPLICATIONS OF THE RESULTS ON MANAGEMENT PRACTICES

Apart from financial performance, environmental performance has also become a major matter of concern for firms' managers as a result of growing public awareness of the environment as a public good in recent times. Firms' managers are now more inclined to make their production process environment friendly as a part of their *corporate social responsibilities*. Better the environmental performance, brighter would be the image and reputation of the companies to their different stakeholders, which would help

[7] Wilcoxon Rank-Sum test is a nonparametric alternative to the two sample *t*-test. This test is based solely on the order in which the observations from the two samples fall. Since DEA efficiency scored are obtained from nonparametric liner programming model, we are using this nonparametric alternative of *t*-test.

them raise financial resources from the shareholders of the companies. A better environmental performance would make the company competitive as well. A growing number of companies, in a wide range of activities, realized competitive advantage from environmental initiatives like pollution control, energy efficiency, etc. For example, cement production requires intensive utilization of energy, mostly in the form of coal, which results in generation of environmentally detrimental CO_2 emissions to the atmosphere. That is why eco-efficiency—producing more cement with lower utilization of energy and generating less pollution to the environment—has become a core to corporate decision making in most of the cement companies in India. In this context, an important empirical question that needs to be examined is whether it is necessary for the firms to reduce their production of desirable output in order to abate pollution, or in other words, do they need to sacrifice financial performance in order to achieve better environmental performance? Picazo-Tadeo and Prior (2009), with their theoretical model, identify technologies where the biggest good output producer is not always the greatest polluter. This theoretical proposition is in line with our empirical findings. Gujarat, being the largest producer of cement in India, has been operating on the frontier, implying 100% environmental efficiency throughout the years. This result could be replicated at the firm level also. Therefore, my empirical findings demonstrate that it is possible for the managers of Indian cement firms to simultaneously increase their production of desirable output and reduce the undesirable ones and in turn, regulating authorities also could achieve an effective environmental regulation without affecting firms' performance in terms of producing desirable output.

CONCLUSION

Cement production requires massive use of energy, mostly in the form of coal, which results in the generation of considerable amount of CO_2 as an undesirable by-product. This paper estimates environmental efficiency of the Indian cement industry within a joint production framework of desirable as well as undesirable output and uses Directional Distance Function. CO_2 is considered as an undesirable by-product and environmental efficiency is defined as the ability of the producer to simultaneously expand the desirable output and contract the undesirable output by same proportion without increasing inputs. Using 3 digit sate level data from the Annual Survey of Industries for the years 2000-01 through 2004-05, the proposed models are applied to estimate environmental efficiency of Indian cement industry. The empirical results show that compared to the initial year, 2000-01, the average environmental efficiency measures declined in 2004-05. Regarding the correlation between availability of coal in a state and its environmental performance, results show that, larger the availability of coal in a particular state, lower is the environmental efficiency experienced by it. Results also show that Indian cement industry, if subjected to environmental regulation, has the potential of expanding desirable output and reducing undesirable

one from the given inputs. However, regulation has a cost in terms of lower feasible expansion of desirable output as compared to unregulated technology because for controlling pollution, firms are bound to divert some of their productive resources that could, otherwise, have been used for producing desirable output.

There are two major limitations of the paper. The first limitation is that I am unable to explain the interstate variation in environmental efficiency using a second stage regression analysis due to two reasons. *Firstly*, lack of systematic state specific data regarding environmental regulation, monitoring and abatement expenditure specifically for controlling CO_2 emission. *Secondly,* in the present context, second stage regression analysis may not be permissible because I have constructed the CO_2 emission data indirectly from the fuel consumption data. So, it is not an actual observed data regarding CO_2 emission. Different states may take different measures to reduce CO_2 emission and in that case our indirectly constructed data may not be a true representation of actual CO_2 emission. The second limitation is that I have used state level data and assume state as a proxy for firm. However, frontier approach is better applicable in the context of unit level data wherein we would be able to capture the inter-firm heterogeneity within a particular state and explain inter-firm variation in environmental efficiency. Therefore, future researchers can take this opportunity of using unit level data while estimating environmental efficiency of industrial units and produce more precise results. Moreover, in my present study I have considered only CO_2 as undesirable output, whereas there several other serious pollutants, like particulate matter, sulfur dioxide, produced from cement industry. Therefore, there is a scope for extending my study by considering multiple undesirable outputs.

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Stock Price Response to Firm Specific Events: Indian Evidence

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This research is a study of the impact of firm specific announcements providing information on technological developments like patents, research achievements and new product introductions and corporate news related to joint ventures, mergers and acquisitions and change of top executives on the Indian capital market. The study assumes academic significance, as there is no evidence of investor response to firm specific events other than announcements of earnings, rights, bonus and dividends in India. The results found from standard event study procedures are in general agreement with the extant empirical evidence reported in various literatures, indicating that the Indian stock market also conforms to the Efficient Market Hypothesis (EMH) whereby the investors exhibit an informed and rational behavior.

INTRODUCTION

The Indian economy has taken on a new meaning ever since the country decided to globalize her markets and liberalize her trade policies, way back in 1991. Since then she has witnessed a steady evolution of corporate research environment and a sophisticated market capable of appraising the technology and other strategic aspects of a firm. This study has been attempted with a view to avail of the opportunity to observe and analyze the behavior of the Indian stock market valuation of a firm in response to various developments pertaining to technology and business during this time.

The value of a firm is a dynamic variable, ever changing under the influence of various economic activities, both internal as well as external to the organization. In academic literature, these economic activities are termed as events, which are examined with respect to stock price movements in order to determine their effect on firm value. Such studies are known as Event-Studies, which try to measure the effect of an event as reflected immediately in asset prices, given rationality in the marketplace.

In both accounting and finance, event-study methodology has been applied to a variety of firm-specific and industry-wide events. In finance, the main interest has been whether prices adjust in a rapid and unbiased manner to new information. In accounting, the focus has

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been more on whether different accounting disclosures have information content, Jennings and Stark (1985). When the events pertain to macro economic issues, the effects are experienced across the industries, whereas, events pertaining to microeconomic factors specific to a firm, affect the valuation of that firm. Some examples include Mergers & Acquisitions (M&As), earnings announcements, issues of new debt/equity, etc.

Moreover, event-studies find application in fields other than accounting and finance as well. To cite a few of such papers, we may consider the reports on stock price reactions to release of data on pollution, Hamilton (1995), evidence of stock price increase for firms winning quality awards, Hendricks and Singhal (1996) and impact of e-commerce initiatives on the value of the firm, Subramani and Walden (2001).

BRIEF LITERATURE REVIEW

This paper focuses on the behavior of the Indian stock market when responding to various firm specific news regarding technological developments and corporate decisions. The Indian economical setup went through a large scale revamping since the globalization of markets in 1991. To investigate these changes, various firm-specific events pertaining to technology and corporate news were chosen for this study. Technology announcements are comprised of announcements on Patents, Research Achievements and New Product Introductions, whereas, Corporate Announcements consider events related to Joint-Ventures/Alliances (JV/As), M&As and Changes of Top Executives. Though such firm specific events have not been studied in the Indian context, there exist extensive empirical evidence for such events from the developed markets like US and Europe. Most of the financial literature referred for this study present evidence from the US markets as most of the academic journals on the subject are based there and also as most of the research methodologies used in this area originated thence.

This literature survey indicated that technology announcements generate positive above-normal returns as investors favor research endeavors which culminate in higher profitability for the technology driven firms, either by revenue generation or by cost saving (Chan *et al.*, 1990; and Chaney *et al.*, 1991. Similarly, for corporate announcements, markets have been found to react favorably to formations of synergistic JVs as these lead to wealth generation through sharing of knowledge and expertise and increased economies of scale (Park and Kim, 1997; Hanvanich Çavusgil, 2001). However, disintegration of existing JVs might signal loss of profits due to cessation of the benefits arising from the partnership and also due to possible conversion of former allies into competitors (Park *et al.*, 2003). Positive market response was recorded for mergers of large firms with other large firms, functioning in related area of business, as these lead to enhanced firm value through increased knowledge base, additional capacities and economies of scale (Jensen and Ruback, 1983; and Wilcox *et al.*, 2001. However, when smaller firms are

merged with larger firms then the benefits of the merger are reaped by the target firms while the large acquiring firms at best experience insignificant gains (Wilcox *et al.*, 2001). In case of vertical integration, mergers result in increased profitability due to cost saving or value addition, as the case may be (Morck and Yeung, 1992). The change of CEO of an under performing firm is expected to improve the financial performance of the firm by way of improved business administration (Bonnier and Bruner, 1989) The need of a competent CEO was found to be directly proportional with the increase in the size of the firm. However, certain studies reported no average stock price reaction to the announcements on changes of top management (Warner *et al.*, 1988).

DATA COLLECTION AND METHODOLOGY

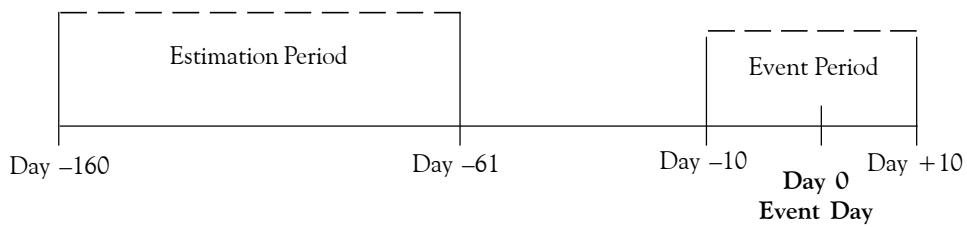
The time period being considered for the collection of news-items and corporate announcements for this study is from 1996 to 2003. The 125 events that are being considered for this study are classified under six categories as follows:

- Technology Development Group: There are three subcategories of events under this group: Patent filings and awards (22 events); Research Achievements (24 events); and New Product Introductions (12 events).
- Corporate Decisions Group: This group also considers three subcategories of events: (a) Joint-Ventures/Alliances (JV/As-17 events); (b) Mergers and Acquisitions (M&As-25 events); and (c) Change of Top Executives (CTEs-18 events).

The information regarding announcements on Research and Patents were collected from the archives maintained by the Center for Education and Documentation, Mumbai. The news items on New Product Introductions, JVs and Change of Top Executives have been collected from the computerized news archives of Times of India, Mumbai. The announcements on M&As have been collected from the events section on Prowess Database (Center for Monitoring Indian Economy). The relevant financial data have been taken from the Prowess database. The selection of events was based on a few filtering criteria. Firstly, the information conveyed in the event had to spell out the implications clearly for ascertaining the nature of the contents to be positive or negative according to rational market expectations as indicated in literature review. Secondly, the firms have to be public limited companies, incorporated in India and listed on BSE. The stock should account for at least 80% of the trading days during the time frame being considered for the analysis. Similarly, the closing price of the stock should be available for at least 80% of the days during the period of interest. The events should not have any other confounding event of economic importance during a 11 days interval centered on the event day, so that the impact of the event in question can be studied in isolation and the results obtained be attributed fully to the event.

After the identification of an event, a suitable time-frame is decided within which the market response to the event is scrutinized. Based on the empirical evidence, it has been found that the market incorporates the information into its prices almost entirely within an 11-day event window centered on the announcement day (Brown and Warner, 1985; and Lee *et al.*, 2002). Similarly, this study also considered an event period of eleven days to capture the complete financial impact of the event while avoiding contamination from other confounding events as depicted in Figure 1.

Figure 1: Time Scale Showing the Event and Estimation Periods



The stock price returns for security i on day t are given by,

$$R_{i,t} = \log_e[(P_{i,t} + D_i)P_{i,t}] \quad \ldots(1)$$

where, $P_{i,t}$ and $P_{i,t-1}$ are the closing prices of security i on day 't' and t–1, respectively. D_i denotes cash dividends on the security i on day 't'. The abnormal or excess return for security i on day 't' is estimated by using three parametric models used by Brown and Warner (1985):

Mean Adjusted Model –

$$AR_{i,t} = \overline{R}_{i,t} - R'_i \quad \ldots(2)$$

Market Adjusted Model

$$AR_{i,t} = R_{i,t} - R_{m,t}$$

where $R_{m,t} = \log_e[S_t / S_{t-1}]$ ...(3)

Market Model or OLS Model –

$$AR_{i,t} = R_{i,t} - (\alpha'_i + \beta'_i R_{m,t}) \quad \ldots(4)$$

where, $AR_{i,t}$ denotes the excess return for security i on day 't'. The statistical significance of the Abnormal Return (AR) is verified through hypothesis testing as follows:

$$H_0 : E[AR_{i,t}] = 0; \quad H_1 : E[AR_{i,t}] \neq 0,$$

$$\alpha = 0.05 \quad \ldots(5)$$

$V[AR_i]$ is expected to be same for both event and estimation windows as both these windows represent the same population of stock returns, assuming that there is no effect due to the event. The null hypothesis is accepted if the test statistic $t_{(observed)} < t_{(99)}$ (= 1.984), where

$$t_{(df)} = [AR_{i,t} / \sigma(AR'_{i,t})] \quad \ldots(6)$$

The assumptions used for conducting the above hypothesis tests for the expected value of ARs are:

- The ARs are random variables;
- They are independent of each other;
- They are identically distributed with the same mean and variance; and

- Their distributions are normal in characteristics.

In actual evidence some of the above assumptions may not be tenable. However, these models being discussed have been found to be empirically robust to most of these assumptions and their possible violations (Brown and Warner, 1985). The main limitation of this methodology however is that of event induced variance (Brown and Warner, 1985), resulting sometimes in increased variance during the event window as compared to the estimation period, which may give rise to misspecifications of the test statistic and a tendency towards rejecting the null hypothesis even when it is true. This drawback may be compensated for by corroborating the findings of these parametric tests by the results obtained through non-parametric tests which are relatively free from the restrictions imposed by various assumptions.

A similar procedure is repeated for testing the statistical significance of the Cumulative Abnormal Returns (*CAR*) over a time period over which the CAR achieve their maximum value within the event window.

$CAR_i = \Sigma AR_{i,t}$, for $t = L - Q + 1$ day to L day. ... (7)

The statistical significance of the CAR is ascertained through hypothesis testing:

$H_0 : E[CAR_i] = 0;\ \ H_1 : E[CAR_i] \neq 0,$

at $\alpha = 0.05$ ...(8)

The null hypothesis is accepted if the test statistic, as defined below, is < 1.984

$t = [CAR_i]/\{\sigma(AR'i,t)\sqrt{Q}\}]$ ...(9)

After testing for the impact of each event on the market (a procedure also used by Adams *et al*., 1999), the general effect of a category of events on the market is found out by evaluating the market response for the whole sample of events belonging to a category. It may be noted that in order to keep the results homogenous for all events, the signs of the above normal returns for negative news are inverted, representing decreased returns for negative news as increased returns for positive news and vice-versa. The Abnormal Return AR_t for the sample on a day t is the aggregate of the ARs for all the events in the sample of 'N' events. The day 't' may be different calendar days for different events but is the same day with respect to the chronology within the sample.

$$AR_t = \frac{1}{N_t}\sum_{i=1}^{N_t} AR_{i,t} \quad \text{... (10)}$$

The statistical significance of the AR is ascertained through hypothesis testing:

$H_0 : E[AR_i] = 0;\ \ H_1 : E[AR_t] \neq 0,$

at $\alpha = 0.05$ ... (11)

where $t = [AR_t / \sigma(AR'_t)]$ ...(12)

Further, the *CAR*s, during the event period, for a sample of events are given by,

$CAR_N = \Sigma AR_t,$

for $t = L - Q + 1$ day to L day....(13)

The statistical significance of these *CAR*s for the sample are ascertained through hypothesis testing:

$$H_0 : E[CAR_i] = 0; \; H_1 : E[CAR_i] \neq 0, \; at \; \alpha = 0.05 \quad ...(14)$$

The null hypothesis is accepted or rejected by the test statistic '*t*' given by

$$t = [CAR_N / \sigma(AR'_t)\sqrt{Q}\}] \quad ...(15)$$

In order to avoid misspecifications and inconsistencies due to non-normal distribution of returns and increase in variance around the event days, a non-parametric Rank-test developed by Corrado (1989) using the same analytical logic as above was also performed for testing the significance of the *AR*s. The significance of the *CAR*s were tested non-parametrically through Wilcoxon's Rank-Sum test.

RESULTS AND CONCLUSIONS

The data set for this study has a total of 125 events, considered during 1996 to 2003. As already discussed there are six different sub-categories of announcements: Patents, Research Achievements, New Product Introductions, JV/As, M&As and Change of Top Executives which are included under two broad groups: (1) Technology Development, and (2) Corporate Decisions. The findings of this study are reported for the two groups separately as follows:

1. Technology Development Group: This group of events considers three subcategories of events which reflect the technology profile of the firm. These subcategories are Patents, Research Achievements and Introduction of New Products.
   - Patents: A total number of 22 events have been considered. All the events contained positive information. The sample as a whole registered increased *CAR* for α = 0.05.
   - Research Achievements: Total number of events are 24. All the events contained positive information. The sample as a whole registered increased *CAR* for α = 0.05.
   - New Product Introductions: Total number of events are 12. All the events contained positive information. The sample as a whole registered increased *CAR* for α = 0.05.
2. Corporate Decisions Group: This group of events considers another three subcategories of events which consider the business and strategic decisions of the firm. These subcategories are: Joint Venture and other Alliances, M&As and Change of Top Executives.
   - Joint Ventures: Total number of events are 17 out of which 2 events were observed for both the partner firms. Thus there are a total of 19 observations. All the observations were for positive news. The sample as a whole registered increased *CAR*, for α = 0.05.
   - Mergers and Acquisitions: There are a total of 25 events generating 30 observations as both the acquirer and the target firms were studied for 5 events. Of these 26 observations were for positive news

and 4 observations were for negative news. The returns for negative news were inverted before being added to the sample returns as a whole as these could otherwise reduce the value of the responses obtained from the positive news. The results thus obtained showed that there was an increased sample *CAR* for $\alpha = 0.05$.

– Changes in Top Executive Positions: Total number of events are 18. Of these, 11 events contained positive information and 7 events contained negative information in terms of exits of executives having good track records. Again after inverting the returns for negative news before adding it to the sample total, the *CAR* registered a significant increase for $\alpha = 0.05$.

The individual counts of increase, decrease or no significant change in the *CAR*s for the various events have been tabulated under Table 1.

Development category (consisting of Patents, Research Achievements and New Product Introductions), the Corporate Decision group (consisting of JV/As, M&As and Change of Top Executives) and finally the Overall Sample consisting of all the observations. The *CAR*s obtained for all these super-groups of events were found to be significantly increased for $\alpha = 0.05$. The detailed statistics obtained for the *AR*s and the *CAR*s during the event window for the various categories and the groups have been listed under the Tables 2a and b, respectively.

The graphs of the *CAR*s of the Overall Sample obtained by the three different models enumerated under Equations (2), (3) and (4) have been shown in Figure 2.

From the foregoing enumeration of the results and the graphs for the Overall Sample shown in Figure 2, it may be said that the Indian stock market responds as per a priory expectations formed on the basis of market rationality and from the empirical evidence reported by developed

Table 1: Results of Change in Relative Volumes for the Various Events

Event Group	Stock Returns			Total
	Increase	No Change	Decrease	
Patents	13	3	4	20
Research	10	7	5	22
NPI	5	3	1	9
JV	6	4	3	13
Top Executives	5	4	2	11
M&A	16	4	5	25
Total	**55**	**25**	**20**	**100**

The sample results obtained from the above categories of events were then further grouped for the Technology

countries like US, UK and Australia. This indicates that the efficiency of the Indian market is comparable to its more

Table 2a: Abnormal Returns (ARs) During the Event Window

Day	Patents		Research Achievements		New Product Introduction		Joint Venture		M&A		CEO Sucsession		Technology Events		Non-Technology Events		Overall Sample	
	AR(%)	*t*	AR(%)	*t*	AR(%)	*t*	AR(%)	*t*	**AR (%)**	*t*	AR(%)	*t*	AR(%)	***t***	AR(%)	*t*	AR(%)	*t*
–5	–0.52	–0.56	0.10	0.16	0.22	0.39	–0.45	–0.40	–0.47	–0.60	0.77	0.88	–0.17	–0.29	–0.14	–0.21	–0.15	–0.30
–4	–0.29	–0.31	–0.30	–0.47	0.83	1.50	0.93	0.83	0.18	0.23	1.08	1.23	–0.03	–0.05	0.63	0.97	0.33	0.65
–3	0.68	0.73	0.46	0.73	–0.14	–0.25	0.09	0.08	1.11	1.43	–0.16	–0.19	0.42	0.72	0.50	0.76	0.46	0.92
–2	0.61	0.66	0.42	0.66	–0.01	–0.02	–1.29	–1.16	1.21	1.55	0.92	1.05	0.41	0.70	0.44	0.67	0.42	0.85
–1	–0.22	–0.24	0.98	1.54	0.47	0.85	1.59	1.43	2.33	3.00	1.64	1.87	0.29	0.49	1.97	3.02	1.18	2.36
0	1.76	1.89	1.80	2.85	0.88	1.59	1.57	1.41	0.98	1.26	0.67	0.76	1.56	2.67	1.08	1.65	1.31	2.60
1	0.72	0.77	–0.29	–0.45	1.20	2.17	0.84	0.75	0.87	1.12	2.79	3.18	0.54	0.93	1.39	2.13	0.99	1.98
2	–1.45	–1.55	0.35	0.56	0.44	0.79	–0.95	–0.85	0.84	1.08	2.14	2.43	–0.48	–0.82	0.70	1.06	0.14	0.29
3	0.60	0.64	–0.39	–0.61	0.12	0.22	–0.75	–0.67	0.25	0.32	–0.06	–0.07	0.20	0.34	–0.12	–0.18	0.03	0.06
4	–0.98	–1.05	0.14	0.22	0.02	0.04	1.71	1.53	0.70	0.90	1.32	1.50	–0.42	–0.71	1.16	1.78	0.42	0.84
5	–0.65	–0.70	0.45	0.71	–0.79	–1.42	–0.55	–0.50	–0.29	–0.37	1.54	1.75	–0.37	–0.63	0.12	0.19	–0.11	–0.21

developed counterparts. Based on the results discussed as above, the following general conclusions were drawn:

- The results of this study are in agreement with the extant empirical evidence reported in the literature. The market encourages research and innovation in technology driven firms as evident by the positive investor response to announcements on Research Achievements, Patents and New Product Introductions that were expected to enhance profitability.
- For the events in Technology Development category, the abnormal gains were maximum for the announcements on Research Achievements followed by those for Patents and finally for New Product Introductions.
- The market responded positively when the JV/As announcements informed of coming together of the partners towards a synergistic alliance.
- The market response was significantly positive where the merging firms were comparable in size. When the target firm was small, the acquiring firms

Table 2b: Cumulative Abnormal Returns (CARs) during the Event Window

Day	Patents		Research Achievements		New Product Introduction		Joint Venture		Merger & Acquisition		CEO Sucsession		Technology Events		Non-Technology Events		Overall Sample	
	CAR (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*	*CAR* (%)	*t*
–5																	–0.15	–0.09
–4															0.63	0.37	0.17	0.10
–3			0.46	0.37					1.11	0.51			0.42	0.32	1.13	0.66	0.64	0.38
–2			0.88	0.70					2.32	1.05	0.92	0.47	0.83	0.63	1.57	0.91	1.06	0.64
–1			1.86	1.47	0.47	0.43	1.59	0.82	4.65	2.12	2.56	1.30	1.12	0.85	3.54	2.05	2.24	1.35
0	1.76	1.33	3.66	2.89	1.35	1.22	3.17	1.64	5.63	2.56	3.23	1.65	2.68	2.05	4.62	2.68	3.55	2.13
1	2.48	1.88			2.55	2.31	4.00	2.07	6.50	2.96	6.02	3.07	3.23	2.46	6.01	3.48	4.54	2.73
2					2.98	2.70			7.35	3.34	8.15	4.16			6.71	3.88	4.69	2.81
3									7.59	3.45							4.72	2.83
4									8.29	3.77							5.14	3.09
5																	5.04	3.02

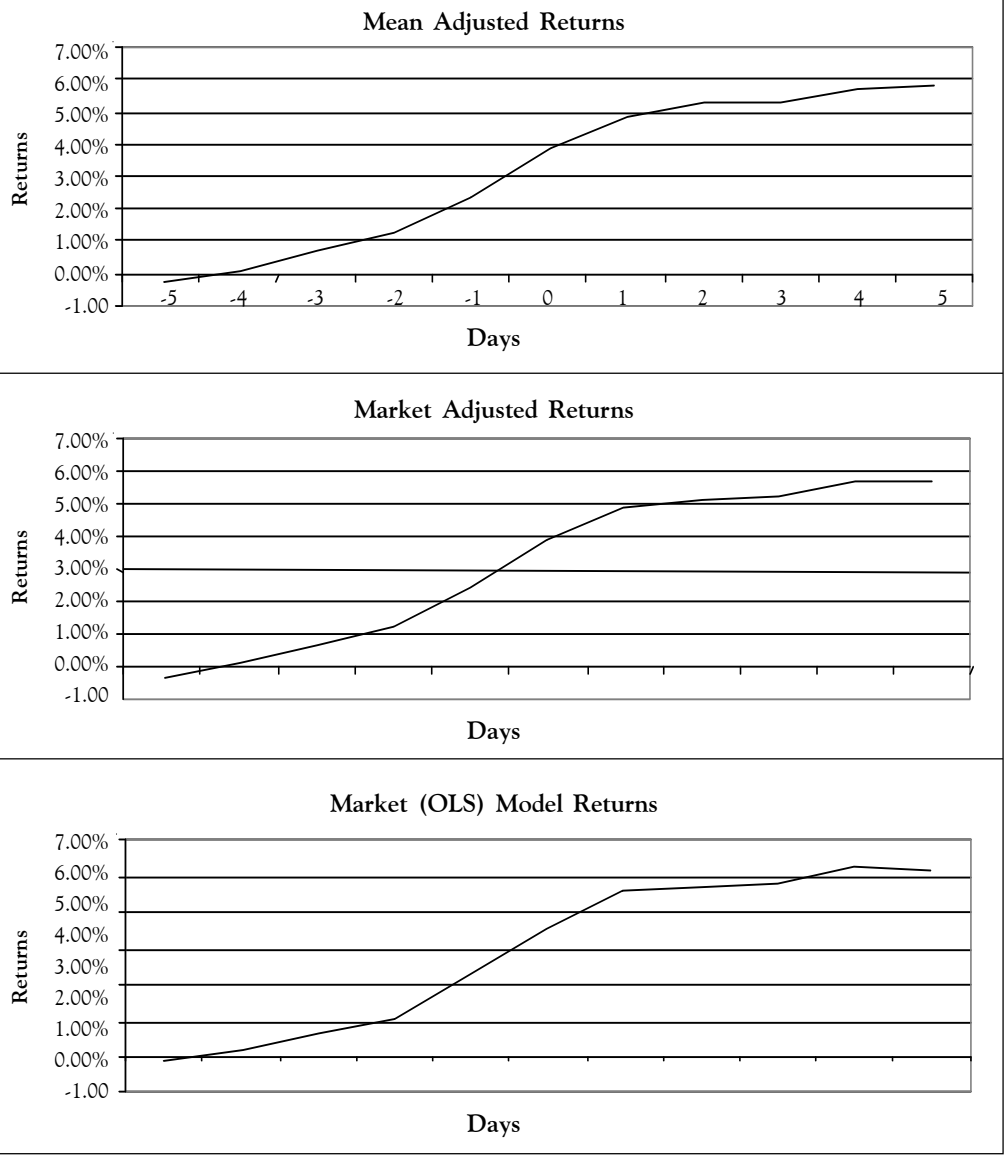
experienced insignificant returns.

- For Change of Top Executives, the news obtained were very mixed and the sample size small. However for the sample as a whole, the market responded as per rational expectations.
- The *CAR*s were higher for Corporate events at 6.71% compared to Technology events at 3.33%. Among the Technology events, the Research Achievements had highest returns followed by Patents and then by New Product Introductions. Among the Corporate events, the M&As had the highest returns.
- These results for the Parametric Tests were further corroborated by Rank Tests and Sensitivity Analysis and were found to hold. The Sensitivity Analysis was carried out to test the window specification with estimation window being located within day –160 to day –11.

LIMITATIONS OF THIS STUDY

This study is one of the initial empirical studies being carried

Figure 2: Graphs of CARs for the Overall Sample Consisting of All Events



out for the Indian stock market for such firm specific events. One of the reasons for the existence of such a research gap may be due to the challenges faced in data collection as proper events (on research achievements, patents, etc.), are limited and then too the events have to be pure in the event window frame (i.e., without any other accompanying confounding events).

Methodologically, the main limitations of the analysis as discussed in Brown and Warner (1985) are that the assumptions used for hypothesis testing through parametric models are not tenable empirically. Especially, the assumptions of normality and independence of the returns are not found to hold most of the time but the methodology has been found to

be robust to the violations of these assumptions. However, the events sometimes induce an increase in variance of the returns around the event day as compared to the estimation window, which may give rise to misspecification of the test statistic and a tendency towards rejecting the null hypothesis even when it is true (Brown and Warner, 1985). One way to overcome all these limitations would be to corroborate the results of the parametric tests through non parametric rank tests, as we have done here. Corrado's Rank test (1989), which basically uses the same analytical logic as the parametric tests after transforming the ARs of each stock to their ranks within the concerned time-window, can be used to test for the abnormal changes in the returns for single day event window specifications. Similarly, rank-sum tests like Wilcoxon's rank sum test or Mann-Whitney's U-test may be used for testing for the significance of *CAR*s over multi-day window specifications.

APPLICATIONS OF THE FINDINGS OF THIS STUDY

Event studies have found numerous applications in the daily corporate management of various firms as well as in the economic policy formulation on a macroeconomic scale. The main utility of the event study methodology lies in its ability to determine the impact of an event on the value of a firm or an industry by using financial market data within a relatively short period of time as compared to traditional productivity related methods. These valuations of various firm specific as well as macro-economic events provide important information about the psyche of the investors as also about the financial logic governing the decisions being studied with reference to its environment. Some such examples include firm specific decisions on M&As, issue of new debt or equity, increase in capital expenditure, etc., and announcements of macro-economic variables such as trade deficits. However, event studies have found applications in fields other than finance and economics as well. For instance, event studies have been used in the legal profession to settle liability cases by assessing damages (Mitchell and Netter, 1994) as also to measure the impact of a change in the regulatory environment on the value of a firm (Schwert, 1981). The most successful application of the event studies have been in the area of corporate finance, where this method has a major share of the total quantum of the empirical studies carried out. The most important examples include studies of the wealth effects of M&As and the price effects of the financing decisions by the firms. Studies of such firm specific events typically capture the market sentiments around the date of first announcements, just as we have considered in our study.

The event studies have, in general, shown that prices do respond to new information of economic significance in a logical and rational manner thus enabling the investigator to evaluate the financial and economic impact of various decisions. Such retrospective studies have become increasingly important due to the fast pace of economic changes wrought about on a global scale in the last decade. Apart from liberalizing the markets leading to entirely new kind of inter-firm relationships ruling

both domestic as well as global competition, these changes have also shown that technology is to become the deciding factor for success in the future. R&D has now become imperative for excellence as well as sustenance. The difference in the strategy used for marketing products or services in terms of large volumes on one hand and that used for marketing innovative products or services on the other, lies mainly in the product pricing. On moving up the value chain in the market, the degree of innovativeness in developing the product increases. On the lower rungs of this chain, strong marketing and competitive pricing are important for products/services with low technology content while higher up the chain, research and innovation become the selling factors for the technology driven firms. The findings of this study reflect on the attitude of the Indian investors towards the firm specific events that have been considered here and help us to understand the financial effect of technological developments and corporate decisions. Thus, this study should interest investors, financial analysts, corporate managers, policymakers, as well as to the academia.

The findings of this study may be further discussed specifically with reference to their applications for various categories of end users as follows:

- Corporate Managers: The main objective of the corporate managers is to maximize the wealth of the firm and its shareholders by taking value-enhancing decisions. The event studies pertaining to any financial market indicate the various firm specific announcements that lead to positive investor response in that country, given the investment opportunities available there and the laws governing them. Accordingly, this study indicates that during the late nineties of the last century and the first couple of years of this decade, the investors here were developing the necessary awareness and sophistication required to appreciate the technological advancements essential to make the economy globally competitive. This is indicated by the fact that even though the investor responses to the technology announcements were positive on an average, the average *CAR*s for corporate announcements were higher. Thus, this study indicates that the investment and expansion strategies for an emerging market should have judicious proportions of technological investments along with the right business strategies. Further, the broad indications of the sample results are that the managers should make value enhancing announcements related to positive news like patent filings or patent awards, research achievements, formation of JV/As, M&As, etc., while refraining from releasing negative news that are not in the public domain, like failures of research endeavors, rejection of patent applications, etc., Similarly, the event studies can be used for formulating the right kind of investment or business strategies,

whereby such studies would help in assessing the chances of success in takeovers and acquisitions by indicating the investor moods ruling the market at a given time. Such studies coupled with the fundamental analyses of the financials of the firms would go a long way in helping make the right business decisions at the right time. Another important application of the event study methodology is that it can be used for valuation purposes. Thus the managers could use the event studies to find out the *CAR*s generated by an announcement on patent or research or an acquisition, made in the recent past, to find out its economic value by multiplying the returns with the outstanding number of shares (Klassen and McLaughlin, 1996) and could use these values for negotiating over the same assets or for comparable assets, whether tangible or intangible.

- Policymakers – The policymakers formulating the regulatory guidelines governing the investment policies in the economy as well as the market operations, may use these event studies to evaluate the investor acceptance of various kinds of news. As this study points out that the investor response to progressive news regarding research, patents, domestic as well as foreign JVs and M&As—both domestic and foreign have generated positive investor response, the policymakers could similarly take cognizance of the increasing levels of investor awareness and progressively liberalize the investment policies leading to fairer trade practices and promoting growth of the economy.
- Investors: The investors could use the findings of this study in order to study the behavior of the Indian capital market on the whole, with reference to various firm specific news considered here in order to devise their own investment strategies more effectively on an individual basis. Accordingly, they could conclude from this study that there are no assured routes of gaining through arbitrage in the Indian markets as the Efficient Market Hypothesis (EMH) appears to hold good here also, just like in more developed economies elsewhere. Further, in order to gain from positive firm specific announcements, they should invest in the stock within a couple of days from the day of announcement. They could also conclude that the Indian investors on the whole, are becoming more technologically aware with passing time and hence it is now rewarding to invest in stocks making research and patent announcements, given they have the competence to utilize it. Though the investors collectively are supposed to be educated and aware enough according to the EMH, this study would further help in validating this hypothesis empirically for the Indian market and disseminate the information about the collective investor response to the individual investors.

- Academia: This study is expected to find most significant application in the academic world, by spurring future academic work, similar or related to this. The academicians interested in the Indian capital market could use the findings of this study to use the empirical evidence as well as the methodology discussed here for carrying out similar studies about other categories of announcements or study the same kinds of announcements for different time periods using same or improved methodology. They could also develop new applications for such studies that would lead to new interdisciplinary work in the areas of finance, statistics, economics, mathematics etc by improving upon the analytical logic used herewith.

SCOPE FOR FUTURE WORK

- To conduct similar studies for other categories of events.
- To study the changes in Trading Volumes due to various events.
- To investigate the presence of any Causal relationships between the Price and Volume changes in response to events.
- To extend this analysis for assessing the economic value of various events of significance and thus corroborate the market valuations reported by events on M&As, Sale or Licensing of intangible assets like patents or research outputs, etc.

Thus, it is hoped that this study will help shape the beliefs and expectations of the various players, regulators and the students of the Indian financial markets regarding the market dynamics and the investor behavior by providing empirical evidence to that extent. It should also incite an academic interest for conducting similar or related studies in the future that would improve upon the current methodology and/ or develop new applications.

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Demand Model for Air Passenger Traffic on International Sectors

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The economic liberalization in 1991 followed by the deregulation of Indian skies is witnessing exponential growth of the airline industry in India. Near-perfect competition scenario has gifted concerns for the airlines in terms of demand reductions, thereby stressing the requirement to provide superior customer service in order to entice maximum customers. In the above context, in this paper, we present a Passenger Traffic Demand (PTD) forecasting model on international routes operating from India. The PTD model encapsulate the concepts of gravity model of physics and micro-economic theoretic model that links demand to price. The model is validated using the data provided by International Civil Aviation Organization (ICAO) on high demand routes. This research highlights that there are factors outside service that could play an important role in demand growth. The model will find applicability in aviation sector and can be used by any individual airline contemplating operations on international sectors.

INTRODUCTION

Prior to 1991, the air space was monopolized by Air India with respect to international travel from India. This does not mean non-existence of international players, but the pulverizing effects of market competition was not a hard hitting factor for the national carrier. Customers mainly were government officials, who formed more than 50%, rest, partly students traveling for their education abroad and few private visitors. But, this trend lasted only till the economic reforms took full effect on the country, thereby allowing easy market entry and in-turn, near-perfect competition. Many European and other international airlines have not only increased the number of destinations in India, but also their frequencies. Presently, the Indian traveler finds more options available to him. This is particularly so in the case of international routes which are above 1500 miles. In this paper, we present the development of a Passenger-Traffic Demand (PTD) forecasting model on International routes for airlines. The routes presently operated from India are selected for the purpose of the study, the sample spreading over 14 countries in Asia, Europe and the United States. The model combines concepts of the traditional gravity model in physics and micro-economic theoretic model that links demand to price.

In a society of increasing social and economic interactions, from the seller's

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perspective, the rate of transfer of private information can become unpredictable with increase in the number of service providers—including airline services, political alliances—a seller's well-being depends not only on his own set of actions but also on the actions taken by the buyers (customers) that directly originate from their preference sets. For example, the decision of the seller to change some of the elements in his set of offerings is influenced by the preferences of his customer, which in-turn is influenced by total utility derived. The empirical evidence identifying the diminishing monopoly of Air India and dynamic demand splits with respect to international travel from India has motivated this study. In this work, we develop a model to forecast the passenger traffic that can originate along a given route in a year.

Similar to interaction amongst agents, airlines do exhibit proclivity to cooperate with foreign players, but it is important to have complete information before action. For instance, it may be favorable to find a partner airline in cases of political barriers or operational barriers such as shortage of fleet, thereby not missing the expected demand. On the other hand, pairing with partial information may lead to unfavorable results that in-turn may consume sufficient time to rectify. For these kinds of environments, it is requisite for the airline to have an estimate of the demand that could be generated on that respective route.

DEMAND MODELS: A REVIEW

Attempts at modeling air travel demand originated by expressing schedule delay[1] as a function of aircraft size and frequency. This approach was modified through a more generic term of service quality expressed in terms of ticket price, apart from former two, a concept modeled convincingly by Abrahams (1983), Vilton (1986), and Russon and Hollingshead (1989). However, in the context of our work, there is no uncertainty to eliminate the above variables, apart from ticket price, which encapsulates many other service attributes. At times, there are many decisions made by the airlines which affect the ticket price and hence lead to demand take away/loss, may be due to incomplete information of others' actions.

Air travel demand models have also been addressed from a microscopic perspective. Norman and Strandens (1990) have come up with a probabilistic demand model based on assumptions that passengers desired departure times are uniformly distributed. Nikulainen (1992) assumes that passenger demand during a specific time period is a function of distribution of departure times of all flights. Logit model has been used extensively to study air travel demand. Adib and Atef (1988), Hansen and Kanafani (2001), Dobson and Lederer (1993). Proussaloglou and Koppelman (1995) and Nako (1992) build logit models based on the survey data from

[1] The first is frequency delay, which represents the elapsed time between an individual traveler's preferred time and the time of a scheduled flight. The second component is stochastic delay, which represents the additional elapsed time when preferred flights are fully booked. For a comprehensive overview of schedule delay refer Douglas and Miller (1974).

individual passenger. Coldren *et al*. (2003) apply the aggregate multinomial logit methodology to build an itinerary-level market share model. Hsu and Wen (2003) apply a similar model to estimate market share by integrating joint probability density distribution functions of time value in the utility function.

Although there has been a lot of effort in the study of air travel demand at the segment market levels, there is little progress, either in research literature or in industry practice, in modeling air travel demand from a network perspective. Travel demand at the network level is usually treated as a summation of the demand in all individual markets involved. Demand study for passengers traveling in the hub-and-spoke network starts with, and stops at, the market level demand modeling. An aggregate demand model in the network level can also capture the impact of airport capacity on passengers travel behavior and thus can be used to valuate the Benet of airport expansion projects.

From the point of view of airlines, they are left with a very small market space to operate and yet sustain profitability. One good move on this front would be to operate more frequently on International routes, or, in other words, exploring the possibility of new hubs in Asia, Europe and rest of the world. In order to decide if a new hub would in-turn be profitable, it is imperative that the company has prior demand estimates for the region concerned which in-turn would depend on factor characterization of the hub concerned.

CHARACTERIZING AIRLINE DEMAND: HOW?

During the last 15 years, considerable number of papers have been published on airline profitability. This surge has been characterized by a greater use of service quality variables, making the exercise even more relevant for airline strategy formulation. However, these studies have mainly addressed the US market. In general, drawing from literature, the demand for airline transportation can be defined as a variable being dependant on two main drivers. These could be:

1. Geo-Economic (GE) Factors: The Geo-economic factors can be characterized by the economic activity and geographical or location features of the area where transport is to take place and few other factors that fall outside the control of airlines.

2. Service Dependant (SD) Factors: The Micro-economic theoretic model hints demand is a variable that directly depends on price. Price, in the context of airline traffic, can be viewed as the charge for service provided. In other words, it can be said that SD factors can be determined by both quality and price, which may not be truly independent components of the airline product. Certainly, not all models have included the same relationships. The structure of respective models requires some variables to be excluded.

GE factors can play bigger role in terms of estimating demand. For example, price for the service could be Rs. X1 from an origin in India to a hub in Asia or Europe, and it could be Rs. Y1 from that respective hub to further destinations. It may be noted here that Y1 could be greater than in some or lesser than in few or equal to X1 in few other cases, irrespective of the distance or travel time to the next destination. In other words, apart from popularity the airline has for its services, it needs to carefully evaluate the GE factors while selecting a hub to obtain maximum possible demand apart from continuing customers.[2]

In order to understand the factors influencing location of hubs, it is first necessary to look at the demand determinants and costs for providing the service. It typically follows that people travel for business or pleasure.[3] Travelers can usually pick from several transportation modes. The primary modes of travel are automobiles, airlines, passenger trains, and buses. However, in our case, a travelers choice of transport is restricted to airlines irrespective of the relative costs of alternative transportation modes (even if were to be available) and the travelers income and opportunity cost of time spent traveling.[4]

As with any firm, airline costs are determined by how much output is produced and by the price of the inputs required to produce that output. Output in the airline industry is usually measured in Revenue Passenger Miles (RPM).[5] Average cost per revenue passenger mile declines as either the average stage length or the average load factor increases.

Under these cost and demand conditions, hubbing has a significant effect on the demand for air travel through its effects on both air fares and the quality of air service. Establishment of a successful hub would not only increase the average load factor, but would also lower the average cost. In other words, an airline would add more reliable entities to its set of interline destinations due to traffic increase from spoke cities. Passengers originating from the hub city thus enjoy a higher level of service quality than would have been possible if spoke travelers were not making connections there. Passengers from the spoke cities may also enjoy better service, because they can now make one-stop flights to many cities that they may have only previously reached by multi-stop flights. In general, the development of a new hub increases the number of nonstop and one-stop flights in a region, while reducing multi-stop flights, which were common on some routes prior to deregulation.

[2] By continuing customers, we mean those business or tourist travelers who have opted to continue with the services until their respective final destinations.

[3] It is important to distinguish between business and tourist travelers. Business travelers include people traveling for business purposes. Non-business travelers can include people traveling for holidays, visiting relatives in foreign countries and for other private purposes. While both generate traffic, business travelers are more time-sensitive and less price-sensitive than tourist travelers. These factors influence the demand for air service.

[4] Literature provides room to accommodate and analyze for both other modes (rail and road). However, since the travel implies crossing seas to all destinations, the latter two modes lose their prominence as probable players.

[5] RPM can be defined as one paying passenger per one mile.

DEVELOPING THE PTD MODEL

The traditional Gravity Model in physics and the relationship in micro-economic theory has provided the base to formulate our PTD model. We start by introducing these concepts.

GRAVITY MODEL

The gravity model is referred to as the modified law of gravitation. It takes into account the population size of two places and their distance. The gravity model incorporates these two features, since larger places attract people, ideas, and commodities more than smaller places and places closer together have a greater attraction. The relative strength of a bond between two places is determined by multiplying the population of city A by the population of city B and then dividing the product by the distance between the two cities squared as shown in Equation (1).

$$\frac{P_a \times P_b}{D^2} \qquad \ldots(1)$$

where P_a and P_b represent the populations of cities A and B, and D represents the distance between them. While the gravity model was created to anticipate migration between cities, it can also be used to anticipate the traffic between two places, the number of telephone calls, the transportation of goods and mail, and other types of movement between places. In our work, the gravity model concept is made use of to anticipate passenger traffic between two cities.

WHAT CAN BE OBTAINED FROM MICRO-ECONOMICS?

In micro-economics, travel is considered as an activity that is dependant on transport, hotel services, time to reach and time spent at the destination. In other words, an activity could be visualized as a combination of market and time inputs. Mathematically, it can be represented as:

$$A_i = f(M_i, T_i) \qquad \ldots(2)$$

A_i represents activity i, M_i and T_i represent the market and time inputs.

$$\sum p_i M_i \leq TI_j \text{ and } \sum T_i \leq T_{aj}$$

The above inequalities look at production of an activity which is influenced by two constraints, the first being the budget constraint, thereby limiting the expenditure of an individual, secondly, the cap on the total time available i.e. the time constraint. In the above constraints, p_i represents the price charged by the market for a service, TI_j is the total income of an individual j and T_{aj} refers to the total time available for j to go through the activity.

Let us assume interest in an individual for an activity; in the context of this discussion, his objective would be to maximize his utility U_j he derives from that activity A_i, which assumes the mathematical form as follows:

$$\textit{Maximize } U_j(A_{1\cdots n}) \qquad \ldots(3)$$

If the following two conditions hold for an individual i, $\Sigma p_i M_i = TI_j$ and $\Sigma T_i = T_{aj}$, then by making use of Lagrange's method we have,

$$L = U\left(A_{1\ldots n}\right) + \Phi\left(TI_j - \sum p_i M_i\right) + \Psi\left(T_{aj} - \sum T_i\right) \quad \ldots(4)$$

where Φ and Ψ are marginal utilities derived from Income (*INCM*) and time respectively. Differentiating Equation (4) partially w.r.t A_i we get,

$$\frac{\partial L}{\partial A_i} = \frac{\partial U}{\partial A_i} - \Phi p_i \frac{\partial M_i}{\partial A_i} - \Psi \frac{\partial T_i}{\partial A_i} \quad \ldots(5)$$

which would provide us,

$$= u_i - \Phi p_i m_i - \Psi t_i \quad \ldots(6)$$

where u_i is the marginal utility of activity i, m_i, t_i are the marginal values of market and time respectively.

Time assumes importance if there existed an alternative mode of transport competent to air travel. In other words, Ψt_i could then be viewed as 'value of time' from the customer's perspective. In our model, the term 'value for time' would be considered 'constant' for all practical purposes. Hence Equation (6) be modified as:

$$= u_i - \Phi p_i m_i \quad \ldots(7)$$

The necessary conditions for maximization are,

$$\frac{\partial L}{\partial A_i} = 0 \text{ or}$$

$$= u_i - \Phi p_i m_i \; \forall i = 1, \ldots, n \quad \ldots(8)$$

where n is the number of customers. We solve for M_i in Equation (8) which results in,

$$M_i = f\left(p_{i,(i \in n)}, INCM\right) \quad \ldots(9)$$

where $p_1, p_2, \ldots, p_n$ are the money costs of traveling, INCM is the income.

Equation (9) would be of the form of the demand function we would have obtained from micro-economic theory by using a measure of price. Micro-economic theory also assumes that the function is linear homogenous, which would yield a demand function that can be aggregated over individuals in a geographic area, served by a route to obtain:

$$Z_i = f\left(p_{i,(i \in n)}, INCM, T_{aj} = 0\right) \quad \ldots(10)$$

where Z_i now represents the demand in a particular zone under consideration, and INCM the zonal income. The value of time, which is assumed to be constant, is considered to be zero. We make use of the above variables in our forecasting model. In the next section we provide an intuitive explanation for our choice of variables selected to capture demand.

FACTORS INFLUENCING PTD

Geo-economic factors can be further divided into two sub-factors. They can be:

1. Activity: Activity factors refer to the commercial, cultural and industrial activities in the area of transportation. These activities can be further influenced by population and income of the respective area. In addition, these variables can themselves be useful proxies for all other activities.
2. Location: As for the location factors, the prime factor would be distance, that affects demand in two opposite directions. There are

both positive and negative effects for the above connotation. Firstly, there is a positive effect, in that as distance increases, the relative competitiveness in air transport improves in terms of travel time. The negative effect is that, as distance increases, we can expect narrowing social and commercial interaction between the respective destinations.

SERVICE DEPENDENT FACTORS

As discussed, the service of an airline is made up of both the quality of the product and the price a passenger has to pay for it. An exhaustive literature review has defined quality of an airline service in terms of three main variables:

1. The Frequency of Departures: The delay occurring to the differences between a customers preferred departure time and the nearest departure time available (that is optimal for him);
2. Load Factor: The stochastic delay arising from the preferred flight being fully booked. The displacement to later flights would involve further disability for the passenger. Whereas frequency has repeatedly proven to be a significant determinant of air traffic pattern, evidence on negative impact of high load factors remains ambiguous;[6] and
3. Aircraft Size or Technology: Jet vs. Propeller aircraft (Treated as insignificant due to modern technologies).

Finally, the money cost of traveling, as determined by fares, has consistently proven to be a significant explanatory variable of airline traffic throughout literature.

Higher the fare, lower the expected volume of traffic, other factors being equal. Fares have so far been assumed exogenous. That is, the airlines do not adjust at least in short run, their pricing policies to demand changes, responding merely through increases in supply and particularly, frequency. Since our study focusses on International sectors, we assume the frequency to be 1. In other words, airlines operate one flight per day between an origin-destination. As far as aircraft size is concerned, it may not prove to be a significant factor.

REPRESENTING THE PTD MODEL

DEPENDENT VARIABLE

This study considers the total passenger demand between two cities as the dependant variable. Here, we highlight three aspects of the demand measure:

1. Firstly, it aggregates both origin and destination traffic.
2. No distinction is made between business and non-business traffic.
3. Lastly, this study does not make any distinction for a city

[6] Literature suggests this variable only performs when aggregated with frequency delay or with both frequency delay and price. But it has so far proven to be statistically significant with the wrong (positive) sign or with the right sign but insignificant.

comprising of more than one airport, since a destination is defined as a city, not an airport.

INDEPENDENT VARIABLES

Aggregating up from individual travelers to the city level, the flow of airline passengers between any two cities is largely explained by the following factors.

- The Air Fare between the two cities (A_j),
- The income—Per Capita (real) Income of the cities (INCM)[7],
- The Population of both cities (POP_i, POP_j),
- The quality of air service (primarily the number of intermediate stops and the Frequency of the flights) (FREQ) (assumed to be 1 in our model), and
- The Distance between the two cities (DIST).

Now, we can specify our model as below:

$$PASS - TRAFFIC(PT)_{i-j} = \alpha \times A_{fi,j}^{\gamma_1} \times INCM_{i,j}^{\gamma_2} \times POP_i POP_j^{\gamma_3} \times DIST_{i-j}^{\gamma_4} \times a^{\in} \quad ...(11)$$

where,

- PT_{i-j} represents the Passenger (PASS) demand from city i to city j.
- $A_{fi,j}$ is the air fare charged to fly from i to j.
- $INCM_k$ is the kth passenger's income that decides his travel.
- $DIST_{i-j}$ represents the distance between origin (i) and destination (j).

In addition to the above, we make use of two dummy variables, one to capture the respective hub's customer enticing capability D_{hl}, and the other being an airport specific variable A_h. A graph of Traffic vs. Income indicated that the demand was high on a few routes and low on a few other sectors. Hence, the dummy variable D_{hl} assumes importance in our modeling. The other dummy is used to control for the possibility that an airport considered could be a hub for one of the major airlines (A_h).[8]

$$D_{hl} = \begin{cases} 1 & \text{if the hub generates high demand due to business/tourist centers} \\ 0 & \text{otherwise} \end{cases}$$

- H_1 is a dummy variable controlling the issue of an airport being a hub for one of the major airline. It is represented as follows:

[7] Many previous studies have omitted real income from the demand function and estimated demand as a function of generalized cost alone. This is done since these studies are disaggregative in nature and access to income data at the individual consumer level is difficult. However, it is hard to justify such demand functions on theoretical grounds.

[8] Major airlines considered for the purpose of the study are Air India, Air France, American Airlines, British Airways, Cathay Pacific, Lufthansa and Singapore Airlines.

$$A_h = \begin{cases} 0 & \text{if the respective airport is a hub for a major airline} \\ 1 & \text{otherwise} \end{cases}$$

and finally,

- $\in$ is the noise term.

The variables in the model have a multiplicative relationship between them. We expect the same to prevail between the variables and noise term as well, hence the noise term is also multiplicative in nature.

The product of the populations POP_i, POP_j is introduced for the generation effects that income alone does not cover, such as social needs, tourist importance or unexpected travel. POP_i and POP_j are not considered separately since we are interested in studying the effects of population changes of both cities *i* and *j* and not POP_i and POP_j alone. Also, the gravity model suggests POP_i, POP_j for generation factors and not POP_i or POP_j. Our PTD model is also a fusion between the gravity model and the micro-economic theoretic model. By linearizing Equation (11) through logarithms, we get:

$$\begin{aligned} \log PT_{i-j} = \alpha &+ \gamma_1 \log A_f \\ &+ \gamma_2 \log INCM_{i,j} \\ &+ \gamma_3 \log POP_i POP_j \\ &+ \gamma_4 \log DIST_{i-j} \\ &+ \gamma_5 D_{hl} + A_h + \in \end{aligned} \quad \ldots(12)$$

In addition the above predictors, two other dummy variables H_b and S_a were tried as follows:

$$H_b = \begin{cases} 1 & \text{if there exists another major hub within 250 kms} \\ 0 & \text{otherwise} \end{cases}$$

$$S_a = \begin{cases} 1 & \text{if the city posesses special attractive tourist spots or industrial hubs} \\ 0 & \text{otherwise} \end{cases}$$

However, the latter two variables were removed from final model since they did not prove significant, and also the improvement in R^2 was negligible.

MODEL ESTIMATION

DATA NEEDS AND SOURCES

This study requires data on routes that were operational from India in 2005 for the purpose of model formation and routes existent during 2007 for model validation. It also requires data on A_f, *INCM* of the cities concerned, POP_i, POP_j and *DIST*. The data on the routes A_{fare} and demand were obtained from International Civil Aviation Organization (ICAO's) Traffic by Flight Stage Survey (TFS) and Onflight Origin-Destination (OFOD) databases. The data on POP_i and POP_j was obtained through sources from World Bank and CIA world fact book. The per capita income of cities *INCM* was accessed through IMF/World Bank sources. Data on the distance between two cities was obtained from Ministry of Civil Aviation, Government of India.

Measurement of Variables

The data set used for the purpose of model estimation is 2005-06 aggregative cross-sectional data for 54 existing routes operated by various Indian and International carriers.

The demand (PTD) for any route represents the total number of passengers flying that respective route for the year. Populations (POP_i, POP_j) is measured in millions. The actual variable used is the product of the populations. Distance (*DIST*) is measured in kilometers whereas Income (*INCM*) is measured in million US dollars.

EXPECTED SIGNS AND MAGNITUDES

We expect positive sign for the Population (POP). The reason being that as population of the connecting cities increase, there is an increase in demand due to generation or attraction.

We are not sure about the sign of Income. For a study that addresses a local market, income is expected to have a positive coefficient, the reason being as the regional income increases we can expect greater consumption of commodities.

On the other hand, for a study that addresses international markets, we cannot generalize the above result since currency exchange rates and volatilities have a role to play.

Again, distance (*DIST*) may have positive or negative coefficients. This uncertainty is due to the fact that as distance increases (with given fare level) there is a fall in fare per kilometer even though consumers have no choice of an alternative mode. The net effect renders the sign of coefficient of *DIST* uncertain.

Finally, as the fare (A_f) increases there is a chance of decrease in the total demand. Hence we expect negative sign for A_f.

RESULTS

As many as 100 regressions were run using different combinations of the variables *POP*, *DIST*, A_f, *INCM*, D_{hl}, H_b, S_a and A_h before zero origin on the final model. Of these only 24 merit presentation and they are tabulated in Tables 1-4.

There are 54 observations in the data set. All the regressions are run with two sets of observations: the original 54 observations and a set of 52 observations, dropping two routes Bangalore-London and Mumbai-Paris. Regressions estimated with 52 observations is used to test the predictive power of the model.

DISCUSSION

When we fit our model using all the variables except A_h, we obtain regression 2 in Table 1. The value of R^2 is 0.672 or the model explains 67.2% variation in traffic. We also note that population, distance and air fare are not significant at 5%. Keeping *INCM* and removing few other variables makes little difference to R^2. The explained variance is generally around 68%. A detailed study of important international airports around the world shows demand is turned away from competitors to the airline which has the respective airport as its operating hub. Therefore, we considered the possibility of introducing one more dummy variable A_h to improve the value of R^2. The value improved to 70.9%. In this forecast, D_{hl}

Table 1: Using All Predictors, $N = 54$

		Coefficient of							
S. No.	Constant	*POP*	*INCM*	*DIST*	A_f	D_{hl}	A_h	R^2	MSE
1	4.732	0.158**	–0.329*	0.040	–0.172	1.057*	–0.265*	0.709	0.1274
t-value	4.950	1.615	–2.249	0.509	–0.484	8.985	–2.450		
2	4.682*	0.113	–0.171	0.040	–0.364	1.068*		0.672	0.1406
t-value	4.666	1.118	–1.240	0.482	–1.001	8.650			
3	5.577*		–0.199**		–0.206	1.010*	–0.233*	0.692	0.1289
t-value	6.932		–1.612		–0.608	8.878	–2.177		
4	4.053*	0.007		–0.037		1.054*	–0.166	0.647	0.1489
t-value	5.107	0.084		–0.464		8.247	–1.545		
5	5.373*				–0.508	1.005*	–0.162	0.676	0.1332
t-value	6.659				–1.775	8.710	–1.635		
6	5.211*		–0.242	0.005		1.031*	–0.247*	0.690	0.1303
t-value	8.994		–2.278	0.061		9.121	–2.345		

Note: * Significance Level = 0.05.
** Significance Level = 0.10 .

Table 2: Model Validation; Observations: 52

		Coefficient of							
S. No.	Constant	*POP*	*INCM*	*DIST*	A_f	D_{hl}	A_h	R^2	MSE
7	4.689*	0.161**	–0.333*	0.040	–0.157	1.060*	–0.269*	0.698	0.1296
t-value	4.670	1.589	–2.207	0.496	–0.420	8.552	–2.372		
8	5.584*		–0.200**	0.020	–0.233	1.012*	–0.233	0.682	0.1369
t-value	6.611		–1.569	0.243	–0.620	8.288	–2.062		

Table 2 (Cont.)

S. No.	Constant	*POP*	*INCM*	*DIST*	A_f	D_{hl}	A_h	R^2	MSE
	Coefficient of								
9	5.160*	0.037		0.019	–0.567**	1.017*	–0.157**	0.667	0.1444
t-value	5.055	0.423		0.227	–1.678	7.984	–1.486		
10	4.053*	0.007		–0.037		1.054*	–0.166	0.647	0.1489
t-value	5.107	0.084		–0.464		8.247	–1.545		
11	3.964*					1.068*	–0.164**	0.645	0.1436
t-value	34.009					9.163	–1.557		
12	4.652*		–0.155	–0.002		1.067*		0.644	0.1474
t-value	8.267		–1.453	–0.021		8.719			

Note: * Significance Level = 0.05.
** Significance Level = 0.10.

Table 3: Introducing Two More Dummy Variables H_b and S_a, N = 54

S. No.	Constant	*POP*	*INCM*	*DIST*	A_f	D_{hl}	A_h	H_b	S_a	R^2	MSE
	Coefficient of										
13	4.733*	0.149**	–0.328*	0.039	–0.177	1.054*	–0.261*	–0.001	0.012	0.709	0.1324
t-value	4.742	1.554	–2.182	0.470	–0.476	8.533	–2.166	–0.010	0.101		
14	3.969*					1.072*	–0.162**	–0.022	0.001	0.657	0.1444
t-value	24.751					9.322	–1.439	–0.199	0.007		
15	5.402*				–0.532**	0.998*	–0.147	0.015	0.034	0.677	0.1383
t-value	6.518				–1.760**	8.304	–1.337	0.140	0.281		
16	5.609*		–0.200**		–0.226	1.007*	–0.223*	–0.029	0.012	0.693	0.1339
t-value	6.782		–1.575		–0.637	8.490	–1.876	0.275	0.104		

Table 3 (Cont.)

	Coefficient of										
S. No.	**Constant**	***POP***	***INCM***	***DIST***	A_f	D_{hl}	A_h	H_b	S_a	R^2	**MSE**
17	4.513*	0.159	–0.349			1.056*	–0.271*	–0.010	0.015	0.706	0.1281
t-value	6.353	1.620	–2.849			9.504	–2.404	–0.096	0.132		
18	4.766*	0.152	–0.319*		–0.132	1.041*	–0.258*	–0.004	0.023	0.707	0.1303
t-value	4.825	1.517	–2.157		–0.372	8.736	–2.161	–0.040	0.195		

Note: * Significance Level = 0.05.
** Significance Level = 0.10.

Table 4: Dropping H_b, $N = 54$

	Coefficient of									
S. No.	**Constant**	***POP***	***INCM***	***DIST***	A_f	D_{hl}	A_h	S_a	R^2	**MSE**
19	4.736*	0.158**	–0.328*	0.039	–0.177	1.054*	–0.261*	0.012	0.709	0.1303
t-value	4.900	1.600	–2.207	0.477	–0.489	8.627	–2.223	0.102		
20	4.523*	0.157	–0.350*			1.056*	–0.270	0.014	0.706	0.1253
t-value	6.509	1.647	–2.896			9.604	–2.441	0.122		
21	5.160*	0.037		0.019	–0.567**	1.017*	–0.157**		0.667	0.1444
t-value	5.055	0.423		0.227	–1.678	7.984	–1.486			
22	5.583*		–0.197		–0.215	1.006*	–0.227**	0.015	0.692	0.1317
t-value	6.862		–1.573		–0.615	8.570	–1.957	0.129		
23	5.388*			0.011	–0.538**	1.002*	–0.151	0.032	0.677	0.1383
t-value	6.538			–1.700	0.133	8.151	–1.396	0.264		
24	4.101*			–0.039		1.054*	–0.156	0.012	0.658	0.1436
t-value	12.400			–0.488		8.705	–1.415	0.099		

Note: * Significance Level = 0.05.
** Significance Level = 0.10.

turns out to be the most reliable predictor, in fact when D_{hl} is used alone it explains 59% of the variance.[9]

The results of the regressions when we tried other two dummy variables H_b, S_a is presented in Table 3 and Table 4 respectively.

It turns out that travel demand could arise due to special attractions a city possesses, which may be major ports, industrial hubs, tourist spots or military bases. We therefore considered the possibility of introducing one more dummy variable S_a to represent this fact, along with the former two dummies. But, we noticed that there was negligible improvement in the value of R^2 as presented in Table 3. The variation explained were mainly due to the former two dummies and the other predictor variables. Due to clustering of major international airports which is witnessed in Europe and United States, we considered introducing one more dummy H_b to control this constraint (Table 3: Regressions 13-18). We noted that the change in R^2 is nil with this dummy as well. We also note in most of the regressions that neither H_b nor S_a turn out to be significant at 5%. Also, D_{hl} alone explains 59% of the variation as compared to 46% when A_h, H_b and S_a were used together, but we noted marginal improvement in R^2 by introducing A_h. We may therefore say that there is a structural difference between the routes characterized by high demand as they provide connections with major metros of the world, ports, industrial hubs and attractive tourist destinations. Also, the Mean Square residual Error (MSE) is the least with when H_b and S_a were excluded together (regression 7). Being led from above inferences, we may then take regression 7 (N = 52)as our final model which can be represented as:

$$\begin{aligned}\log(PT)_{i-j} = {} & 0.161 \log POP \\ & - 0.333 \log INCM \\ & + 0.040 \log DIST \\ & - 0.157 \log A_f \\ & + 1.060 BT_{chub} \\ & - 0.269 A_f\end{aligned} \qquad \ldots(13)$$

with R^2 = 0.698 or 69.8%, N = 52.

All the signs of coefficients are as expected. This contrasts with earlier experience with aggregative studies where it has been difficult to get the correct signs and magnitudes. The regression explains 69.8% of the variation in traffic.

Looking at the results, one may contemplate endogeneity in the model due to negative coefficient of income. We had indicated earlier that we are not sure of the sign of income, mainly because our study focusses on international travel and it is important to understand that currency exchange rates also influence travel, and not merely a raise in the per capita income. Many studies indicate that consumption levels go up with per capita income, but

[9] There appears to be some circularity in the definition of D_{hl}. To measure D_{hl} for a new route, we need to classify it as a high/low demand route, but it is this demand we are trying to forecast. We tried another dummy variable that classified routes according to major city connections but did not obtain positive results.

these studies have been specific to the local market where the volatility of currency hardly becomes relevant.

If for example, there is an increase in the per capita income in India by 2%, but the American dollar may become stronger against the Indian rupee by 4%. In this case, the higher levels of income to the Indian consumer may not fetch him an international travel to the United States, as he may have to spend more than earlier when the American dollar was relatively weaker.

Here, one may contemplate an increase in demand when the Indian rupee becomes stronger against the American dollar. If we observe the strength of both the currencies over the past few years, it is the American dollar that turns out to be the dominant partner by a clear majority ratio. There have been a few time periods where the Indian rupee has fared well against the American dollar, but this has not remained constant for a long time period, may be due to constant devaluation of the Indian rupee during the 1970s and 1980s.

However, it can be hard to capture the volatility of currency exchanges over a given time period and hence the past trend in the currencies have been considered for this study.

Another factor is the income used is the sum of incomes of the origin and destination. The income in Indian cities when measured in US dollars, though can earn a decent life style in India, appears to be very small when compared to European or an American city. There could be many people from Europe, USA and other regions traveling to India for business and pleasure. Accordingly, the demand from an Indian city may consist of recognizable foreign travelers flying back to their home towns. Accordingly, we state that rise in income levels in India may not necessarily lead to an increase the demand for International travel, thus the negative sign of coefficient is justified.

MANAGERIAL IMPLICATIONS

Our detailed study of airline operations has enabled us to draw policy conclusions.

They are as provided below:

- Airlines are too tightly involved in dynamic pricing. However, our results suggest that pricing decisions need to be more accurate as present prices (industry average prices) lead them only close to or slightly more than the break-even point.
- For international operations, aircrafts with seating capacities in excess of 350 (such as Boeing 747-400, or Airbus A360) are used. These have to be purchased from the world market which involves considerable foreign exchange. The shadow cost of the foreign exchange has to be considered before arriving at a decision.
- Decisions such as purchase of new aircrafts like Airbus A380 brings into picture the 'social cost' of investment. In addition, operational costs for a A380 are far more than present aircrafts which calls for increase in prices. This

leads to a decrease in demand. But, on the other hand, stable prices lead to decrease in profits. A thorough analysis is required as to which section of the society will benefit and at whose cost, prior to making any decision.

- Early bird fares have no rationale in economics. From a larger view point, there may be internal obligations for the airline to sell maximum possible seats. But, this again implies providing service at a lower cost to a section of passengers. An increase in the fare as and when the date of departure approaches again calls for a deterministic number of seats to be sold, given the air fare. This calls for a careful policy decision. In other words, dynamic pricing need not always lead to profits. This is also illustrated by the fact that many major airlines such as Air India are making heavy losses whereas only a few top airlines such as Emirates, Lufthansa are able to locate themselves in the profit region.
- The design of service sets must allow for dynamic modifications as per changing preferences of the consumer. Rather than coping with price wars, airlines must set the trend of hovering their prices around the SOF which, eventually will lead them to the profit zone.

CONCLUSION

In this paper, we presented the development methodology for passenger traffic model on international routes. We estimated the model using 2005 data provided by ICAO. We highlighted the importance of variables in predicting the total demand and also obtained correct signs and magnitudes. Forecasts are not made available yet, how ever we are confident that the model would perform well given the total variance explained by the regression. The model can be used by airline for effective route-planning on international sectors. It can help them in formulating policy decisions and push them towards design of a superior service set thereby trying for more mappings to the set of customer preferences.

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Identifying the Critical Predictors of Extra-Organizational Life in the Indian Service Sector

*Mousumi Padhi**

This study, based on the spillover relationship between work and extra-organizational life, examines specific management practices which affect extra-organizational life. The emotional response triggered in the work domain by the management practices psychologically spills over to affect the extra-organizational life. Using data from service sector employees, it identifies seven critical predictors of extra-organizational life. The paper argues that by controlling these predictors, a harmony between work and life can be attained.

INTRODUCTION

The Indian workforce is in a state of flux. The number of people who combine work and family responsibilities has increased over the last decade as more and more women are participating in the labor force (Datt and Sundaram, 1999; United Nations, 2000; and Das, 2003). Consequently, Work Life Balance (WLB) which was earlier thought to be a 'Western' problem is now common in Corporate India. About 80% of employees who now seek help through Employee Assistance Programs (EAP) quote "inability to manage relationships, both personal and professional, as their biggest weakness" reports the *Hindu Business Line*.

Modern communication devices have compounded the WLB problem by making it impossible for employees to get 'away' from office in real terms. At the same time flexible work arrangements have made it possible for employees to work from home and complete work tasks. As a result boundary between work and non work is becoming fuzzier, increasing the likelihood of life and non work spillover (Ilies *et al.*, 2009).

Not surprisingly therefore, in recent years, research into linkages between work and non-work has grown considerably (Burke and Greenglass, 1987; Eckenrode and Gore, 1990; and Zedeck, 1992). This research has debunked the myth that work and non work are independent (Blood and Wolfe, 1960; and Dubin, 1973), signifying instead that work and non work are closely interconnected domains of human life (Kanter, 1977; Burke and Greenglass, 1987; and Voydanoff, 1987). There is therefore a need to understand the

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opportunities for interference between these domains especially in the Indian context, as most of the studies have been in the Western context.

This paper seeks to answer two different but related questions pertaining to work and life outside workplace. Based on the spillover model, it attempts to find the predictors of extra-organizational life as affected by specific management practices for the service sector employees.

DEFINING TERMS

Extra-organizational life in the paper refers to non work life. It includes the three domains of life namely family, community, self (Friedman, 2008; Poelmans *et al.*, 2008) and is not restricted to family alone. Leisure time as used in the study refers to the time spent in pursuing activities such as sports, music, etc.

LITERATURE REVIEW

WORK EXTRA-ORGANIZATIONAL LIFE SPILLOVER

With the shattering of the myth of separate work and non work worlds (Kanter, 1977) the work life literature is replete with the nature of relationship between work and extra-organizational life. Zedeck and Mosier (1990) and more recently O'Driscoll (1996) opine that the relationship between work and extra-organizational life can be explained by the five models given below:

i) Segmentation Model: Conjectures that work and non work are two distinct domains of life that have no influence on each other.

ii) Compensation Model: Proposes that what may be lacking in one domain, in terms of demands or satisfactions can be made up in the other.

iii) Conflict Model: Proposes that with high levels of demand in all domains of life, some difficult choices have to be made and some conflicts can occur.

iv) Instrumental Model: Conjectures activities in one sphere facilitate success in the other.

v) Spillover Model: Hypothesizes that one domain can influence the other in either a positive or negative way.

This influence or spillover happens through a transmission process in which conditions in one domain create psychological responses which are then transferred into attitudes and behaviors in another domain (Voydonaff, 2007).

This particular study adopts the spillover model to study the relationship between work and extra-organizational life. There is evidence in literature that this relationship is moderated by organizational factors and personal factors (Greenhaus and Beutell, 1985; Kirchmeyer and Cohen, 1999; and Moen *et al.*, 2008). This study looks at one aspect of organizational factor namely management practices and isolates its effect on extra-organizational life. The variables in management practices are adapted from a study by Bloom *et al.* (2006).

MANAGEMENT PRACTICES

Fairness in Internal Promotion

Perceptions of unfairness in promotion at work may lead to physiological stress and sickness in employees thus affecting the

extra-organizational life of employees (Sashkin and Williams, 1990). Those who perceive the procedures used during promotional processes to be unfair, might most likely demonstrate negative attitudes or behaviors (Lemons and Jones, 2001) and this negative attitude in the domain of work can psychologically spillover to the extra-organizational life (Voydonaff, 2007).

Realistic Targets

By realistic targets one means that employees are involved and have a say in setting targets which makes the targets more realistic and achievable. Perceived unrealistic targets or aggressive targets can impact role performance and quality and this can spillover to the role performance and quality in extra-organizational life (Daniels and Harris, 2000).

Compensation and Non-Monetary Incentives

Inequitable distribution of benefits with respect to the efforts put in can lead to negative attitudes and behavior at work (Adams, 1965; Warr, 1999; and Frey and Stutzer, 2002). The role of non-monetary incentives in acknowledging the efforts and ability of employees and acting as positive triggers of emotions cannot be belittled as suggested by Herzberg's 'Two Factor Theory'. These emotions can then spillover into the extra-organizational domain.

Participative Performance Management

This refers to continuous performance tracking and openness in communication in performance achievement. It also includes performance counseling and coaching. Performance management has been seen to significantly affect employee attitudes (Taylor and Pierce, 1999).

EMOTIONAL LIFE AND MANAGEMENT PRACTICES

Research suggests that employment is an important factor in emotional life among the working-age population (Winkelman and Winkelman, 1998; Clark and Oswald, 1994; and Ahn *et al.*, 2004). Studies have predominantly examined the effect of wage on emotional life (Warr 1999; and Frey and Stutzer, 2002). However, there are no studies which examine the effect of intangible subjective organizational characteristics, such as flexibility, work environment, independence, stress, relationships and trust in workplace, etc., on overall emotional life (Ahn, 2004). This study responds to this gap in literature by finding the critical factors affecting emotional life as one component of extra-organizational life.

RESEARCH OBJECTIVE

This study is an exploratory study attempted as a part of my doctoral course work. The purpose is to use the findings as a stepping stone to a more pragmatic study on work life linkage which forms the subject of my doctoral thesis.

Many work-life balance studies have put emphasis on work and family thus narrowing the scope of extra-organizational life (Greenhaus and Beutell, 1985; and Pichler, 2009). Even in studies looking at the larger domain of non work life, the emic dimension of life as specific to subgroups of employees

needs further investigation (Pichler, 2009). It is therefore a rationale to study extra-organizational life as it is understood in the Indian context. This study focuses on employees in the service sector and tries to understand the emic dimension of extra-organizational life as it is for them. In the Indian service sector where the median age of employee is lower, the young employee might need to balance different domains (friends and self) other than family. This is because majority of them may be unmarried or newly married and family may not be the priority domain.

Work life balance of an employee is affected by organizational and personal factors. This study tries to find out the critical management practices, a subset of organizational factors, which impact extra-organizational life. This understanding can aid managers in bringing about suitable interventions in these practices to help an employee achieve harmony between work and life outside work.

Drawing from the above insight, the paper seeks to discover the predictors that by a process of spillover are critical to the extra-organizational life of the employee. Thus the objectives of the study are as stated below.

Research Objective 1: To identify the critical factors that describes extra-organizational life in relation to management practices.

Research Objective 2: To operationalize and confirm the variables comprising the factors identified as the critical management practice predictors of extra organizational life.

METHOD

DESIGN

A bi-phasic study was conducted. In the first phase in-depth interviews were conducted to find out how employees in the service sector described extra-organizational life. Content analysis of the responses resulted in two variables. In the second phase, data was collected through the survey method.

To answer the questions, the variables identified have been measured on a five-point Likert Scale, where respondents were asked to state whether they strongly agree or disagree with a statement. The unit of analysis was defined as the individual. As the scale was adapted from literature, several steps were taken to take care of question wording, question sequence and appearance to maintain better flow with clarity. The content validity of the questionnaire was established by asking experts to assess whether a particular question was measuring what the researcher was interested in. The questionnaire was circulated for pilot study taking respondents across occupations to remove any ambiguity.

SAMPLE

A non-probable purposive sample, consisting of employees of various private and public institutions in the service sector, working in their organizations for at least two years, was selected for the study. The period of 'two years' was selected as a benchmark for selecting employees from whom the responses had to be taken since it gives ample scope for

the employee to get himself/herself oriented to the day-to-day functioning of the organization and experience its impact on her/his extra- organizational life. Data was collected using the survey method from a sample of 100 respondents. 84 responses were retained; others were not used due to partial non-responses. Of these, the percentage of female respondents was 42%. The average age of the respondent was 27 years. The average work experience was 4.3 years.

MEASURES

Management Practices

The study focuses on four management practices that are taken from a larger set of critical HR practices consisting of selection practices and internal recruitment; employee voice; employee involvement and information sharing; high compensation contingent on performance; extensive training, learning and development; and involvement in decision making and work teams (Marchington and Wilkinson 2005; and Pfeffer, 2005) that are generally accepted to produce spillover effect. The four management practices taken in this study are adapted from Bloom and Van (2006) and are realistic target setting, participative performance management, compensation and non-monetary incentives and fair promotion practices. The psychometric properties of the scale have been reported elsewhere (Bloom and Van, 2006). Respondents were asked to indicate the extent to which they strongly agree or disagree with the statements relating to management practices using a five-point Likert scale.

Realistic target setting has been measured through four items which check whether the targets are perceived to be realistic and not aggressive and unachievable and set in consultation with the employee. Participative performance management has been checked through the availability of coaching, counseling and continuous feedback. Fair promotion practice is measured through availability of merit based timely promotions. Compensation and non-monetary incentives have been measured through perceived equity in pay availability of letters of appreciation, bonuses, etc.

Extra-Organizational Life

The variables describing extra-organizational life were generated through an in-depth interview of a representative sample. Two variables namely emotional life and leisure were obtained. The variable emotional life was measured through three items: level of stress, ability to handle crises situations outside work and perception of self-efficacy in life outside work. Leisure was measured through three items—time: available for activities such as sports, music, etc.; efficiency and effectiveness in the leisure activities; and being able to avail paid and unpaid leaves.

ANALYSIS AND RESULTS

Initially the alpha values of each of the construct were calculated to ensure the reliability of the measures used (Table 1). Then the reliability of the scale as a whole was taken. The alpha value of the scale is 0.7340. It can be noticed that the values calculated were more than the acceptable alpha limit of 0.6 (Sekaran, 1992) (Table 2).

The Kaiser-Meyer-Olkin (KMO) measure of adequacy at a measure of 0.696 indicates that the sample can subject itself to factor analysis and indicates that 69.6% of the variance in the 20 variables is explained by the underlying factors. The Bartlett's test of sphericity indicates that the chi square

Table 1: Scale Reliability

Name of Construct	Alpha Value
Realistic Targets	0.6362
Participative Performance Management	0.7281
Perceived Fair Promotion Practices	0.6444
Compensation and Non Monetary Incentives	0.6310

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.693
Bartlett's Test of Sphericity	Approx. Chi-Square	519.630
	df	190.000
	Sig.	0.000

Table 3: Communalities (Principal Component Analysis)

	Initial	Extraction
V1	1.000	0.602
V2	1.000	0.649
V3	1.000	0.525
V4	1.000	0.695
V5	1.000	0.678
V6	1.000	0.727
V7	1.000	0.526
V8	1.000	0.709
V9	1.000	0.428
V10	1.000	0.620
V11	1.000	0.720
V12	1.000	0.806
V13	1.000	0.573
V14	1.000	0.759
V15	1.000	0.748
V16	1.000	0.761
V17	1.000	0.787
V18	1.000	0.802
V19	1.000	0.781
V20	1.000	0.744

Note: Extraction Method: Principal Component Analysis.

Table 4: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative (%)	Total	% of Variance	Cumulative (%)	Total	% of Variance	Cumulative (%)
1	4.661	23.304	23.304	4.661	23.304	23.304	2.414	12.069	12.069
2	1.910	9.551	32.854	1.910	9.551	32.854	2.225	11.125	23.194
3	1.690	8.450	41.305	1.690	8.450	41.305	2.155	10.773	33.967
4	1.649	8.246	49.551	1.649	8.246	49.551	2.080	10.399	44.366
5	1.402	7.010	56.561	1.402	7.010	56.561	1.777	8.885	53.250
6	1.273	6.367	62.927	1.273	6.367	62.927	1.738	8.692	61.943
7	1.057	5.284	68.212	1.057	5.284	68.212	1.254	6.269	68.212
8	.955	4.774	72.986						
9	.846	4.230	77.216						
10	.660	3.301	80.516						
11	.589	2.947	83.463						
12	.576	2.879	86.342						
13	.524	2.620	88.962						
14	.449	2.247	91.210						
15	.378	1.888	93.097						
16	.346	1.731	94.828						
17	.340	1.701	96.529						
18	.283	1.413	97.942						
19	.244	1.219	99.161						
20	.168	.839	100.000						

Note: Extraction Method: Principal Component Analysis.

Table 5: Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
V1	–0.279	0.234	–0.322	–0.185	0.205	–7.270E–02	0.533
V2	–1.957E–02	7.403E–02	0.730	–0.171	.283	2.136E–02	–2.264E–03
V3	–3.159E–02	2.301E–02	0.668	0.214	2.264E–02	0.111	–0.139
V4	0.154	0.345	0.713	0.120	2.365E–02	0.127	0.114
V5	0.187	0.714	0.353	1.663E–02	4.541E–02	–5.835E–02	5.375E–02
V6	–1.242E–02	0.817	–5.790E–02	0.189	0.138	–1.080E–02	2.789E–02
V7	–9.225E–02	0.215	5.222E–02	0.681	6.924E–03	–8.119E–03	7.237E–02
V8	0.198	0.685	0.195	0.326	–0.106	0.152	–0.148
V9	0.215	3.067E–02	0.110	0.600	3.139E–03	–5.081E–02	7.902E–02
V10	0.161	.362	0.349	0.480	–3.625E–02	0.324	7.261E–02
V11	6.253E–02	0.146	–0.160	0.641	0.273	0.427	4.645E–02
V12	0.181	7.713E–02	0.113	–6.691E–02	–1.370E–02	0.861	–9.253E–02
V13	7.858E–02	–0.365	–2.211E–02	0.202	–0.594	–0.166	–0.110
V14	–1.316E–03	–8.883E–02	0.192	0.232	0.399	0.702	9.278E–02
V15	0.216	–1.661E–02	0.211	9.877E–02	0.765	0.226	0.106
V16	0.333	–9.061E–02	0.107	0.325	0.648	–0.195	–0.259
V17	0.109	–0.101	5.748E–02	0.327	–3.039E–02	7.856E–03	0.809
V18	0.745	2.158E–02	0.345	0.117	5.802E–02	–4.280E–03	0.331
V19	0.853	0.118	–7.700E–02	0.120	0.121	5.179E–02	–3.722E–02
V20	0.812	0.137	–2.454E–02	–1.261E–02	9.922E–02	0.187	–0.139

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. A Rotation converged in 13 iterations. (V1 = aggressive targets, V2= inflexible targets V3 = superimposed targets, V4 = achievable targets,V5= merit based evaluation, V6 = continuous performance tracking, V7= public comparison of performance, V8 =review conversations, V9 = career counselling, V10 = unfair promotion practice, V11= timely promotion, V12= non monetary compensation, V13= letters of appreciation, V14 = pay, V15= time for leisure, V16 = efficiency and effectiveness in leisure, V17 = avail paid and unpaid leaves, V18 = level of stress, V19 = self efficacy, V20 = managing crises.)

value is significant at 0.000 and therefore there exists significant relationship between the 20 variables. It therefore indicates that extra-organizational life as indicated by emotional life and leisure are related to management practices. Exploratory factor analysis was then done to analyze the structure of interrelationships among the variables. Factor analysis would also identify groups of variables that can be conceptually useful in describing work practices and life outside work (Table 3).

The communalities table indicates that variables 3 (superimposed targets), 7 (public comparison of performance), 9 (career counseling) and13 (letters of appreciation) have not been extracted properly. Putting the cutoff for variables at 0.6 we can ignore the aforesaid variables which do not fit in well with the factor solution as less than 60% of their variance in variables 3, 7, 9 and 13 is accounted for by the factor in the factor solution (Table 4).

The method of principal component analysis extracts 7 factors with an Eigenvalue of greater than 1. These 7 factors cumulatively explain 68.2% of the variances in the variable. Factor 1 (Emotional Life) explains 23.3% of the variances in the model. Three factors account for maximum variance. Factors 1 (Emotional Life), 2 (Participative Performance Management) and 3 (Realistic Targets) account for nearly 45% of the variances (Table 5).

The results of the rotation that was converged in 13 iterations reveals that variable 1 has a factor loading of 0.533 on factor 7, variable 2 has 0.73 factor loading on factor 3, variable 3 has 0.668 on factor 3, variable 4 has 0.713 loading on factor 3, variable 5 has 0.714 loading on factor 2, variable 6 has 0.817 loading on factor 2, variable 7 has 0.681 factor loading on factor 4, variable 8 has 0.685 loading on factor 2, variable 9 has 0.60 loading on factor 4, variable 10 has 0.48 loading on factor 4, variable 11 has 0.641 loading on factor 4, variable 12 has 0.861 loading on factor 6, variable 13 has 0.594 loading on factor 5, variable 14 has 0.702 loading on factor 6, variable 15 has 0.765 loading on factor 5, variable 16 has 0.648 loading on factor 5, variable 17 has 0.809 loading on factor 7, variable 18 has 0.745 loading on factor 1 and variable 19 has 0.853 loading on factor 1 and variable 20 has 0.812 loading on factor 1.

The factor equations are as follows:

Factor 1: (Emotional Life) = 0.812 (Managing Crises) + 0.853 (Perceived Self-efficacy) + 0.745 (Level of Stress).

Factor 2: (Participative Performance Management) = 0.714 (Merit based Evaluations) + 0.685 (Continuous Performance Tracking) + 0.684 (Review Conversations).

Factor 3: (Realistic Targets) = 0.73 Inflexible Targets + 0.713 Achievable Targets.

Factor 4: (Perceived Fairness in Promotion) = 0.48 (Unfair Promotion) + 0.6415 (Timely Promotions).

Factor 5: (Time for Leisure) = 0.765 Time for Leisure + 0.648 Efficiency and Effectiveness at Leisure.

Factor 6 (Compensation and Non-Monetary Incentives) = 0.861 Non-Monetary + 0.702 pay.

Factor 7 (Work Pressure) = 0.533 avail paid and unpaid leaves + 0.809 aggressive targets.

DISCUSSION

The study was done with the generated parameters that the cues of extra-organizational life affected by management practices consisted of emotional life and leisure time available. Emotional life was measured through ability to handle stress, ability to handle crises situations, and perceived self-efficacy in extra-organizational life. Time available for leisure was measured through available leisure time for activities such as sports, efficiency and effectiveness in leisure time and being able to avail paid and unpaid leaves. The empirical validity of these assumptions was established in the second phase of the study. Although factor analysis validated the grouping of the variables constituting the factor emotional life, the grouping of variables constituting factor leisure had to be redone as the ability to avail paid and unpaid leave got grouped in an emergent factor. The management practice predictors effecting extra-organizational life were assumed from literature review and are measured in terms of realistic targets (aggressive targets, superimposed targets, achievable targets and inflexible targets), participative performance management (review conversations, continuous performance tracking, merit based evaluations), perceived fairness in promotion practices (merit based promotions) and compensation and non-monetary incentives (pay, team lunches, letters of appreciation). These measures were derived from a study based in US and Europe, and therefore had to be tested for their validity in an Indian context. The validity of these assumptions were upheld by the study.

The emergent factor of work pressure was formed with the combination of variables aggressive targets and being able to avail paid and unpaid leaves. It can be clearly understood that aggressive targets impacts the ability to avail paid and unpaid leave. In spite of having leave, an employee might not be able to avail it. In trying to achieve aggressive targets, an employee may have to put in extra hours and this makes time a scarce resource. The emergence of work pressure as a factor in combination with items from emotional life and management practices reaffirms the spillover relationship between work and extra-organizational life. It suggests that practices at work affect the emotional life of an employee at not just work but in other domains also. The emergence of work pressure as a factor is also characteristic of the service sector where performance determining targets and unconventional work hours combine to create work pressure. This work pressure creates stress which is likely to spillover and impact extra-organizational life in a large way.

The stress literature further suggests that lack of personal control over situations produces strain. Targets as determinants of performance when perceived to be unachievable can create a sense of lack of control over ones performance and its consequent results. It is therefore not surprising that realistic targets have emerged as one of the critical predictors of extra-organizational life.

Similarly when promotion processes are perceived to be unfair, an employee perceives promotion to be controlled not by performance but by external factors. This lack of control triggers negative emotional responses which affect the extra-organizational life as well. It explains why perceived fairness in promotion practices is a critical predictor.

CONCLUSIONS

MANAGERIAL IMPLICATIONS

An understanding of the critical factors would help organizations in framing policies and programs for better extra-organizational life of employees. A better extra-organizational life would not only increase the organizational commitment, engagement of employees and translate into higher productivity for the employers. It would also ensure a harmonious relationship between the different roles in the life of an employee. It would ensure better emotional life and emotional well-being of the employee. This would provide benefits to both the employees and employers. This is vital in increasing people's ability to participate in labor force and be productive while taking care of their family and personal needs as well creates an 'employer of choice' image for the employer.

FUTURE RESEARCH DIRECTIONS

The study identified seven critical predictors of extra-organizational life namely targets, performance management, promotions, incentives, time for leisure, emotional life, work pressure. Work pressure as a new factor was identified. The identification of these would help in orienting and furthering my doctoral research in work life linkages. The study may be extended to examine the degree of influence of each factor on the role performance and quality in extra-organizational life.

Further research is needed to test the findings in other business settings and in other sectors before any generalization can be done. Moreover a larger sample including more women can add to the validity of the findings. The gendered nature of workplaces indicates the possibility of variation in the work and family experiences of men and women. The findings can be checked against gender in future to see if there are gender differences. The sample had a predominant bias in the age groups of 20-30 years. As work and life characteristics and demands vary over the employees' life course, a wider sampling across all age groups would reveal differences if any, in the predictors. This could lead to a more conclusive study.

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A Three-Dimensional Analysis of Turnover Intention Among Employees of ITES/BPO Sector

Sree Rekha K R and T J Kamalanabhan***

This paper aims at testing a conceptual model connecting variables of the demographical characteristics of the employees, internal and external work environment to ITES/BPO employee turnover. Based on the gaps identified from the literature, the study seeks to examine the influence of intervening variables such as alternative job availability and organizational commitment on turnover intention. The findings suggest that organizations need to focus on how to foster organizational commitment, to enhance job satisfaction, reduce job stress and provide support to facilitate employee retention. The findings of this study would provide information that will be useful to management practitioners and academicians.

INTRODUCTION

Outsourcing is the buzzword of the modern management system wherein an external service provider is contracted by the management to perform functions of a non-core activity (like pay roll in Human Resource stream), which is critical in nature. The advancement in the field of information technology and telecommunication has been the fundamental reason for the evolution of such new techniques that in turn aid the successful running of business houses. Another reason for such a monumental change in the nature of functioning of today's management system can be attributed to globalization. Specifically companies need to compete on a global basis if they are to achieve economies of scale and keep up with the latest technologies and advancements (Porter, 1980). The offshore outsourcing markets were initially developed as software development services and later developed as Information Technology-Enabled Services (ITES). ITES has developed into a major part of IT industry. On the same lines, the BPO sector also forms a major part of ITES industry.

The ITES/BPO industry is a young and nascent sector in India and has been in existence for a little more than a decade. Despite its recent arrival on the Indian scene, the industry has grown

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phenomenally and has now become a very important part of the export-oriented IT software and services environment. It initially began as an activity confined to multinational companies, but today it has developed into a broad based business platform backed by leading Indian IT software and services organizations and other third party service providers. The ITES/BPO market expanded its base with the entry of Indian IT companies and the ITES market of the present day is characterized by the existence of the IT giants who are able to leverage their broad skill-sets and global clientele to offer a wide spectrum of services. ITES include services that can be outsourced using the powers of IT the extent to which this is possible depends on the industry, location, time, costs and managerial perception of the risks involved. The Internet has facilitated execution of several activities, previously done within geographical proximity to the firm, from remote low-labor cost locations, drawing both transaction cost and production cost efficiencies.

WHY STUDY TURNOVER IN ITES/BPO SECTOR?

Voluntary turnover has become a problem for many organizations, regardless of the nature of job, in today's society. The costs of this turnover not only have an impact on organizations, but also affect the morale of the rest of the staff. Prior research has examined the costs of an employee's decision to voluntarily leave an organization. For example, a recent figure explained that it costs a company $78,000 to replace an employee (Ramsey-Smith, 2004). These costs include the cost of recruitment and training of employees (Alexander *et al.*, 1994), loss of firm-level social capital (Dess and Shaw, 2001), decrease in temporary productivity (Osterman, 1987) and loss of important tacit knowledge (Droege and Hoobler, 2003). For this reason, there have been a plethora of research studies conducted over the past 40 years by both academicians and practitioners on the causes and consequences of voluntary turnover.

In the ITES/BPO sector, however voluntary turnover is reaching alarming proportions. It becomes very important to study this questionable nature of large-scale attrition, as India houses a large number of ITES/BPOs. Since this sector is predominantly service oriented, it becomes very important for the Human Resource practitioners to take appropriate steps to understand the turnover drivers, to at least retain the good performers. If proper care to check employee turnover in this sector is not taken, then the quality of service rendered would be affected due to lack of trained personnel replacing the employees who have left. This would give rise to a lot of dissatisfaction amongst the customers. Turnover can also leave a severe blow to the morale of the remaining staff as they would have to take up additional burden of workload until the replaced employee is trained. This can also be up to their stress levels. Therefore, if employee turnover is not managed properly it would affect ITES/BPO sector adversely in terms of personnel costs and in the end it is likely that they would loose out on their liquidity position. Thus, it is

imperative for the Human Resource practitioners to consider changes to be brought to ensure the sustainability of this sector and its role in global economic development. An attempt has been made in this research to investigate on the employee turnover antecedents of ITES/ BPO sector in India.

DEFINITION OF TURNOVER

Turnover is defined by (Campion, 1991) "as an individual motivated choice behavior" and has been a widely studied outcome variable in industrial and work psychology literature for over a long period of time. In literature, turnover intention has been identified as the immediate precursor for turnover behavior (Mobley *et al.*, 1978; and Tett and Meyer, 1993). It has been recognized that the identification of variables associated with turnover intentions is considered an effective strategy in reducing actual turnover levels (Maertz and Campion, 1998). This was the main cause of motivation for the authors to study the antecedents of turnover intention. The following research questions were developed to guide the study.

- What is the impact of turnover antecedents on the ITES/BPO employees' decision to stay with the organization?
- Does alternative job availability moderate the effect of organizational commitment on the turnover intention?
- Do demographic characteristics of the respondents have any relation to turnover intention?

THEORETICAL FRAMEWORK

DETERMINANTS OF INTENTION TO LEAVE AND TURNOVER

The antecedents of turnover intention were gathered from the past research findings reviewed with respect to three components which could cause an impact on the employee's decision to quit his/her place of work. The three components are: (1) Organizational factors (intra organizational and extra organizational factors); (2) Justice in procedures, support, job stress, job satisfaction and commitment (individual affective outcomes); and (3) Demographic diversity characteristics; Including visible diversity such as age and invisible diversity (such as education, tenure, and marital status). The conceptual model framed was tested to examine the connection between these components and turnover intention.

INTRA-ORGANIZATIONAL FACTORS AND TURNOVER INTENTION

Perceived Organizational Support (POS) and Turnover Intention

POS refers to employees' 'global beliefs concerning the extent to which the organization values their contributions and cares about their well-being' (Eisenberger *et al.*, 1986). POS would be valued by employees for meeting socio-emotional needs, providing an indication of the organization's readiness to reward increased work effort, and indicating the organization's inclination to provide aid when needed to carry out one's job effectively (Eisenberger *et al.*, 1986). POS is fostered by two important beliefs of employees: (1) The personification of

organization, and (2) Rewards based on the organization's discretion. Through personification of organization, employees assign human characteristics to the organization and view actions by agents in the organization (e.g., managers) as actions of the organization as a whole (Eisenberger *et al.*, 1986). Favorable or unfavorable treatment received by employees determines the organization's attitude towards its employees well-being. However, there has been limited investigation of the relationship between POS and intention to leave (e.g., Wayne *et al.*, 1997; and Allen *et al.*, 2003) and work that is more empirical has been called for (Griffeth *et al.*, 2000). In sum, an employee who would rate his organization less supportive would develop a high feeling of quitting his place of work. Hence, "*Hypothesis 1* predicts that perceptions of perceived organizational support will have negative relationship with turnover intention."

Perceived Organizational Justice and Turnover Intention

Adams (1965) conceptualized fairness by stating that employees determine whether they have been treated fairly at work by comparing their own payoff ratio of outcomes (such as pay or status) to inputs (such as effort or time) to the ratio of their co-workers. This is called distributive justice, and it presents employees' perceptions about the fairness of managerial decisions from the perspective of the distribution of outcomes such as pay, promotions, etc. (Folger and Konovsky, 1989). In contrast, procedural justice focuses on the fairness of the manner in which the decision-making process is conducted (Folger and Konovsky, 1989). In other words, the focus shifts from what was decided to how the decision was made (Cropanzano and Folger, 1991b). Justice perceptions also have been linked to important outcome variables (Folger and Konovsky, 1989; Dailey and Kirk, 1992; McFarlin and Sweeney, 1992; and Martin and Bennett, 1996). For instance, perceptions of procedural justice are negatively related to intentions to quit (Dailey and Kirk, 1992), significantly correlate with organizational commitment (Folger and Konovsky, 1989; and Martin and Bennett, 1996), and produce high subordinates' evaluation of supervisors (McFarlin and Sweeney, 1992). Thus, organizational commitment is used as mediating variable in the current study. In other words, if employees perceive that the decision-making process is fair, they are less likely to form an intention to quit. Hence, "*Hypothesis 2* predicts that there is a negative relationship between organizational justice and turnover intention."

Felt Stress on the Job and Turnover Intention

Job stress is the extent to which job duties are difficult to fulfill for the employee concerned. Stress at work is a relatively new phenomenon in modern organizational set ups. The nature of work has gone through enormous changes over the last century and is still changing at a rapid speed. They have found to affect employees working in all sectors. With change comes stress, inevitably. Professional stress or job stress poses a threat to physical health and mental

health. Work related stress in the life of employees, consequently would affect the well-being of the organizations as well. According to the Survey Research Center (University of Michigan), four types of job stress are categorized and they are resource inadequacy (lack of means to perform a job), role ambiguity (unclear role obligations), role conflict (inconsistent role obligations) and workload (amount of effort required by a job) (Price, 1977). Work overload is also termed role overload. The experience of job related stress (job stress), the range factors that lead to job related stress (stressors), lack of commitment in the organization, and job dissatisfaction make employees to quit, Firth *et al.* (2004). Hence, it can be inferred that there is a direct relationship between felt stress and turnover intention. Therefore, "*Hypothesis 3* predicts that there is positive relationship between felt stress and turnover intention."

INDIVIDUAL AFFECTIVE OUTCOMES

Organizational Commitment and Turnover Intention

Mobley *et al.* (1979) have identified commitment to the organization as a potentially important variable in the turnover process. Researchers have established that there are three types of organizational commitment and they are affective commitment, continuance commitment and normative commitment. Allen and Meyer (1990) investigated the nature of the link between turnover and the three components of attitudinal commitment: affective commitment refers to employees' emotional attachment to, identification with and involvement in the organization; continuance commitment refers to commitment base on costs that employees associate with leaving the organization; and normative commitment refers to employees' feelings of obligation to remain with the organization.

Theory suggests that OC mediates the influence of job attitudes like satisfaction, affective beliefs, and job nature on turnover intention and actual turnover. This is the rationale behind employing commitment as a mediating variable between job satisfaction and turnover intention in the current study. As discussed earlier, perceptions of POS and turnover intention are expected to be associated with organizational commitment. On the same lines, perceptions of organizational justice is found to have a strong association with organizational commitment and turnover intentions. In addition to this, organizational commitment is also found to be associated with felt stress at job and in turn turnover intention. Hence, it is hypothesized that:

H_{4a}: *Organizational commitment will mediate the relationship between perceptions of job satisfaction and turnover intentions.*

H_{4b}: *Organizational commitment will mediate the relationship between perceptions of organizational support and turnover intentions.*

H_{4c}: *Organizational commitment will mediate the relationship between perceptions of organizational justice and turnover intentions.*

H_{4d}: *Organizational commitment will mediate the relationship between perceptions of felt stress and turnover intentions.*

Job Satisfaction and Turnover Intention

The relationship between satisfaction and turnover has been consistently found in many turnover studies (Lum *et al*., 1998). *Mobley et al*., 1979 indicated that overall job satisfaction is negatively linked to turnover but explained little of the variability in turnover. Mobley in (1977) developed a model that explains the process of dissatisfaction that an employee feels and how s/he arrives at a decision to leave the organization. Mobley identified several intervening variables that could serve as mediators to the effect of job satisfaction. The model first explains the employee evaluation of the existing job, and then obviously it is for the employee to gauge his/her satisfaction in performing the particular job s/he is engaged in. The result of which would be either satisfaction or dissatisfaction. Mobley favored no particular satisfaction model, but contributed to the development of several such models in which he explains how dissatisfaction arises. Thus from the research findings it is inferred that dissatisfaction, breeds the stimulation of the thoughts of quitting, which, results in evaluating the pros and cons of looking out for a job alternative that is to check for what the utilities of being in the current job are and what the alternative job would be like. If a dissatisfied employee happens to get an alternative job where s/he does not have to compromise on job satisfaction, the employee concerned would definitely choose the alternative job, resigning the current job. Thus in summary it can be said that the more satisfied an employee is in his/her job, less likely is the employee's probability of quitting his/her job in spite of alternative jobs being available in plenty. Hence, "*Hypothesis 5* predicts that job satisfaction is negatively related to turnover intention."

EXTRA ORGANIZATIONAL FACTOR

Alternative Job Opportunity and Turnover Intention

When alternative jobs are available in plenty there is a general feeling of ease amongst the jobs as March and Simon stated that: "Under nearly all conditions, the most accurate single predictor of labor turnover is the state of the economy. When jobs are plentiful, voluntary movement is high; when jobs are scarce, voluntary turnover is small" (1958). From the opportunity models reviewed it is understood that intention to quit the work has a direct bearing on the actual turnover of the employees. For example, Steers and Mowday (1981) and Michaels and Spector (1982) have argued that an intention to quit is more likely to result in voluntary turnover when labor market conditions are such that alternative jobs are more generally available. Michaels and Spector made a suggestion in their study that if a person intends to quit a job, he or she most likely would quit when another job became available. In an empirical examination of IT workers, Igbaria *et al*. (1991) had reported a direct effect between awareness of extra-organizational career opportunities and turnover intention. Thus, "*Hypothesis 6* predicts that alternative job availability will moderate the relationship between perceptions of organizational commitment

and turnover intentions."

Demographic Diversity and Turnover Intention

A common distinction in the diversity literature divides diversity into two categories: (1) Visible diversity (e.g., gender, ethnicity and age); and (2) Invisible diversity (e.g., education, tenure and position) (Cummings *et al.*, 1993; and Jackson and Ruderman, 1995). The findings of (Knapp *et al.*, 1982; Schwartz, 1989; and Powell and York, 1992) related to gender and turnover and came out with the analysis that women are more likely to leave their place of work than their men counterparts.

Age is also a relevant variable in predicting turnover. According to (Kiyak *et al.*, 1997; Manlove and Guzell, 1997; and Ito *et al.*, 2001), older workers are less likely to leave their jobs than their younger co-workers, often this is often attributed to the condition of lack of alternative job opportunities and vested benefits (McNeely, 1992; Clark *et al.*, 1997; and Spector, 1997).

Organizational tenure is also negatively related to employees' intention to leave the organization. The more time an employee invests in an organization, the more committed s/he would be, and is more likely to continue employment with the organization (Miller and Wheeler, 1992; Krecker, 1994; and Lane, 1998).

With respect to qualification and intention to leave, findings suggest that better educated employees have more alternative employment opportunities available to them. Thus they think of giving up their current employment (Cordes and Dougherty, 1993; Todd and Deery-Schmitt, 1996; and Blankertz and Robinson, 1997). Thus it is hypothesized that:

H_{7a}: *There is a significant difference in turnover intent from the organization between the married and unmarried employees.*

H_{7b}: *There is a significant difference in turnover intent among the four categories of age.*

H_{7c}: *There is a significant difference in turnover intent among the 3 categories of qualification.*

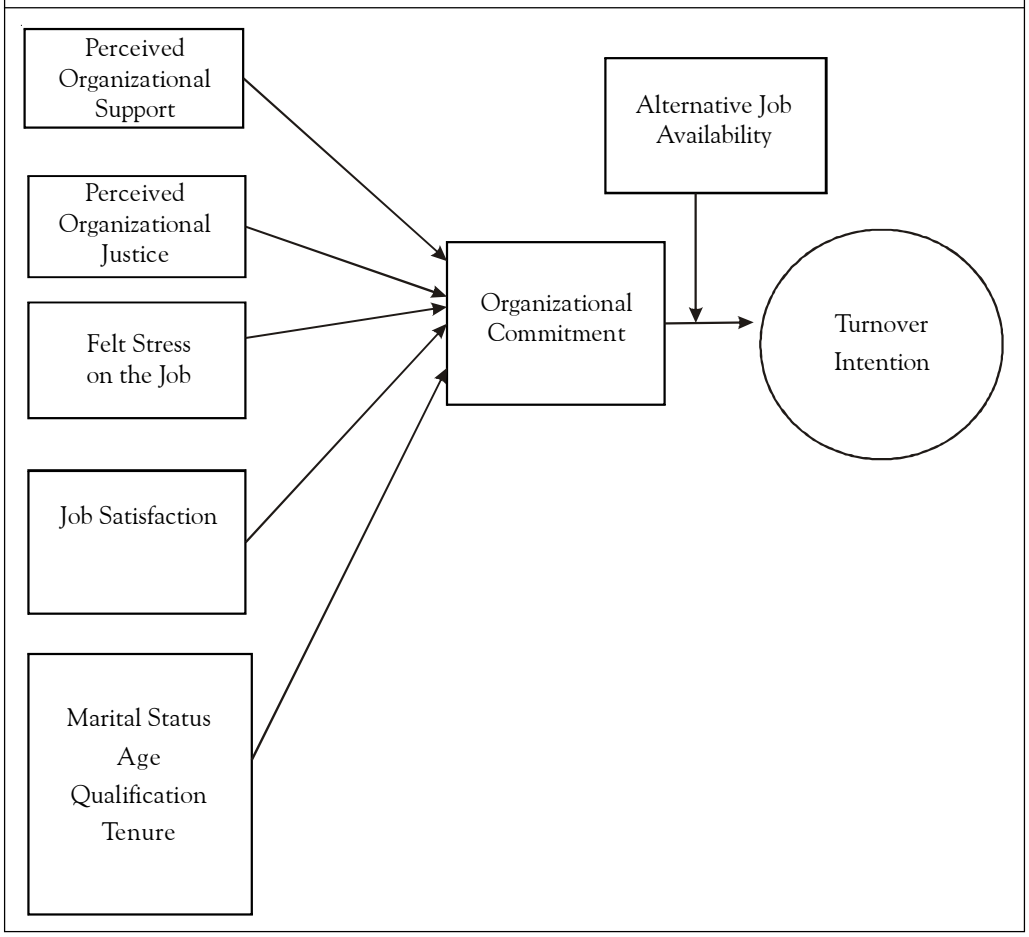
H_{7d}: *There is a significant difference in turnover intent among the 3 categories of tenure.*

MODEL

PROPOSED CONCEPTUAL FRAMEWORK

Figure 1 presents the model of turnover intentions examined in this study. The proposed conceptual model incorporates antecedents of turnover intention and the mediating role played by organizational commitment between the turnover antecedents and turnover intention. In most of the previous studies on turnover literature, organizational commitment is found to be used as an important antecedent of turnover. Consequently, the following model was conceptualized to be tested. Here the role of moderation is played by alternative job availability, whose moderation effect is likely to increase or

Figure 1: Conceptual Model of Turnover Intention



decrease the intention to quit amongst the employees in an ITES/BPO set up.

METHODOLOGY

SAMPLE

Data for this study was collected from the employees working in five ITES/BPO organizations located in Chennai, India. The data was collected via a questionnaire made up of multiple questions. The questionnaire contained quantitative measures of turnover intentions, job satisfaction, organizational commitment, organizational justice (distributive and procedural justice), and felt stress at job, alternative job availability, job satisfaction and demographic particulars. Within the background section of the questionnaire, respondents were asked to provide information on their occupation title, gender, age, job tenure and organizational tenure. Questionnaires were handed over to HR Managers of these organizations, who in turn distributed them to the employees. Out of 245 questionnaires distributed, only 208 respondents returned the questionnaires. Among them the usable ones were only 181, i.e., 87% response rate. Out of 181 respondents

61% were women and 39% were men. The sample included abstractors, legal specialists, validators, team leaders, quality controllers and training heads. It was found 56% of the employees belonged to an age group below 25 yr, and less than 1% of employees belonged to an age group between 41 and 50 yr. Another 40% of the respondents had served their organizations between 1 and 3 years and less than 1% of the respondents served their organizations above 11 years. Data was collected on a structured questionnaire consisting of the scales on support, justice, felt stress, job satisfaction, commitment, alternative job availability and turnover intent, besides some demographic details like age and tenure with the organization. Respondents were asked not to indicate any form of identification to ensure the anonymity of their response.

MEASURES

Organizational Support

Was assessed using twelve-item scale by Eisenberger *et al.* (1986). The respondents were asked to rate the statements on a five-point scale (1 = Strongly Agree, 2 = Agree, 3 = Neither Agree or Disagree, 4 = Disagree, 5 = Strongly Disagree) as to indicate their agreement to the statements to their feel of support from their organizations. Internal consistency (Cronbach's alpha) for the measure was 0.70.

Organizational Justice

'Distributive justice' in our study is defined in terms of reward and pay and it was measured using five items from the scale used by Price and Mueller (1986). The respondents were asked to rate the rewards on a five-point scale (1 = Strongly Agree, 2 = Agree, 3 = Neither Agree or Disagree, 4 = Disagree, 5 = Strongly Disagree) based on the effort that they put on their job. '*Procedural justice*' was measured through a six-item scale used by Niehoff and Moorman (1993). This scale assessed the gathering of accurate information of the issues relating to employee empowerment, and an appeal process. Internal consistency (Cronbach's alpha) for organizational justice was 0.94.

Felt Stress at Job

Stress at job was measured keeping in mind stress factors like ambiguity, conflict, workload, inadequate resources. Job stress was measured by a 16 item scale used by Kim *et al.* (1996). The respondents were asked to rate the statements on a five-point scale (1 = Strongly Agree 2 = Agree, 3 = Neither Agree or Disagree, 4 =Disagree, 5 = Strongly Disagree) as to indicate their agreement to the statements to their feel of stress they undergo while they perform their jobs. Internal consistency (Cronbach's alpha) for the measure was 0.76.

Job Satisfaction

Was measured adapting seven items from the scale used by Hackman and Oldham (1975). Respondents rated their agreement with each statement by use of a five-step scale where 1 indicated strong agreement and 5 indicated strong disagreement. Internal consistency (Cronbach's alpha) was 0.72.

Organizational Commitment

Was measured using seven items of the scale used by Mowday *et al.* (1979). The

respondents were asked to rate the statements on a five-point scale (1 = Strongly Agree, 2 = Agree, 3 = Neither Agree or Disagree, 4 = Disagree, and 5 = Strongly Disagree) as to indicate their agreement to the statements to their feel of commitment to their organizations. Internal consistency (Cronbach's alpha) for the measure was 0.74.

Alternative Job Availability

Was measured using three items of the scale developed by Kim (1996). Respondents rated their agreement with each statement rated on a five-step scale ranging from strong agreement (1) to strong disagreement (5). Coefficient alpha for the measure was 0.91.

Intention to Leave

Four items were adapted from two scales: Lyons' and Camman, Fichman, Jenkins and Klesh (cf. Cook, Hepworth, Wall and Warr, 1971). Respondents rated their agreement with each statement rated on a five-step scale ranging from strong agreement (1) to strong disagreement (5). Krausz *et al.* (1989) previously used the items. Coefficient alpha for the measure was 0.85.

ANALYSIS AND RESULTS

This section presents the outcomes of the statistical analyses, which are separated into five main sections: (a) Summary statistics, (b) Correlations, (c) Mediated regression analysis, (d) Moderated regression analysis, and (e) Differences in turnover intention (variable) across demographic categories.

Descriptive Statistics: Includes all variables, including means, standard deviations and skew. Respondents indicated low levels of organizational support (2.41) received. On average, the participants indicated they had low levels (2.57) of intent to leave their place of work. The participants also indicated low levels of justice shown by their organization (2.33). In relation to the extra organizational variable, respondents indicated relatively high level of interest in taking up alternative jobs. Three variables had statistically significant levels of skew, an indication of asymmetry of distribution. Firstly, most respondents indicated that they experienced moderate to high levels of job satisfaction (skew = –3.45). Secondly, most respondents indicated that they experienced high levels of job stress (–0.109) relatively. Thirdly, the number of married respondents was high compared to the unmarried individuals. Correlations, showing the strength and direction of the linear relationships between the predictor variables and the outcome variable are presented in Table 1.

Hypothesis 1 (organizational support), *Hypothesis 2* (justice) and *Hypothesis 5* (job satisfaction) were stated that they would be negatively related to turnover intention. The three *R*'s were not significant, and therefore the hypotheses were not supported. While *Hypothesis 3* was supported as, significant association was found between felt stress and turnover intention.

Mediation Regression: The next hypothesis was related to mediation. The recommendations of Baron and Kenny (1986) were followed to test for mediation. According to them, three conditions must hold to establish a significant mediation effect:

Table 1: Relationships Between the Variables in the Model

Correlations

	AGE	*MARITAL*	*SERVICE*	*EDU*	*MOS*	*MOC*	*MAJA*	*MJ*	*MJS*	*MTI*	*MS*
AGE	1	–0.459**	0.286**	0.221**	0.057	0.021	0.201**	0.005	0.120	0.221**	0.153*
MARITAL		1	–0.228**	–0.291**	0.102	0.046	0.142*	0.147*	0.069	–0.006	0.017
SERVICE			1	0.312**	0.175*	0.097	0.268**	0.061	0.10	0.146*	0.198**
EDU				1	0.065**	0.047	0.174*	0.055	0.005	0.039	0.10
MOS					1	0.588**	0.245**	0.591**	0.511**	0.612**	0.517**
MOC						1	0.151*	0.463**	0.371**	0.569**	0.473**
MAJA							1	0.127	0.313**	0.349**	0.316**
MJ								1	0.405**	0.442**	0.450**
MJS									1	0.502**	0.553**
MTI										1	0.518**
MS											1

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

1. The predictor (independent variable) must significantly impact the mediator.
2. The predictor must impact the criterion (dependent variable).
3. The mediator must impact the criterion variable and predictor variable.
4. (Independent variable) on criterion must either become insignificant (total mediation) or must become less significant (partial mediation) in the third equation when the criterion is regressed on both independent and mediator variable in the third condition.

Consequently, to test for mediation effects, three regression equations were tested.

RESULTS OF MEDIATION ANALYSIS

Baron and Kenny's mediation rules were

applied for mediation analysis in this study. According to H_{4a}, organizational commitment will mediate the relationship between perceptions of job satisfaction and turnover intentions. The results showed a partial mediation. Likewise the relationship between turnover intention and organizational support was found significant and was less than in equation two, satisfying Baron and Kenny's (1986) conditions. Thus, the results indicate a partially mediated relationship. A Sobel test was performed indicating a significant mediation effect. Hence, hypothesis H_{4a} was supported.

Likewise, organizational justice, felt job stress and job satisfaction were subjected to mediation analysis. It was found that the relationships between all the antecedent variables and turnover intention were partially mediated by organizational commitment. The Sobel test for all the mediation tests produced a significant mediation effect as well. Hence, H_{4b}, H_{4c} and H_{4d} were supported.

MODERATION REGRESSION ANALYSIS

To explore the moderator effect of alternative job availability on the relationship between organizational commitment and intent to turnover, the turnover intentions variable was regressed on organizational commitment and alternative job availability and then on the interaction of these two predictors. The product of the two predictors carries the interaction effect after these two predictors have been first entered into the regression equation. Evidence for a moderator effect is found when there is a significant increase in the multiple R^2 after entering the interaction term. Nevertheless, the findings showed no significant moderation effect. Hence, *Hypothesis* 6 was not supported.

DEMOGRAPHIC CHARACTERISTICS AND ITS RELEVANCE IN STUDYING TURNOVER BEHAVIOR

The final objective was to study the effect of demographic characteristics of the respondents on their turnover intention. Differences in the independent and dependent variables across the various demographic categories were tested using t-tests and tests of ANOVA.

The following are the hypotheses tested to study the effect of demographic characteristics on turnover intention.

RESULTS OF *t*-TESTS AND TESTS OF ANOVA

According to *Hypothesis* 7_a, there is a significant difference in turnover intent from the organization between the married and unmarried employees. However, the finding is that there is no significant difference in the turnover intention between the married and the unmarried employees in this sample as ($p = 0.507$ and $t = 0.084$). Hence $Hypothesis_{7a}$ is not supported.

According to *Hypothesis* 7_b, there is a significant difference in turnover intent among the four categories of age. Using ANOVA test, turnover intent across various categories of age was found to be significant. This is in line with the study of Kiyak *et al.* (1997), Manlove and Guzell (1997), and Ito *et al.* (2001), older workers

are less likely to leave their jobs than their younger coworkers are. This is often attributed to the condition of lack of alternative job opportunities and vested benefits (McNeely, 1992; Clark *et al.*, 1997; and Spector, 1997).

Hypothesis 7_c (there is a significant difference in turnover intent among the three categories of qualification) is not supported in this study. No significance is seen in the result of the ANOVA test for turnover intention and qualification level of the employees as (f = 0.656 and p= 0.58). This is contrary to the findings that better educated employees have more alternative employment opportunities available to them. Hence, they think of giving up their current employment (Cordes and Dougherty, 1993; and Todd and Deery-Schmitt, 1996; and Blankertz and Robinson, 1997).

No significance is seen in the result of the ANOVA test for turnover intention and tenure of the employees as (f = 1.518 and p = 0.198). Thus, *Hypothesis* H_{7d} (there is a significant difference in turnover intent among the three categories of tenure) is not supported. This is contrary to the study that organizational tenure is negatively related to employees' intention to leave the organization. The more time an employee invests in an organization, the more committed he/she would be, and is more likely to continue employment with the organization (Miller and Wheeler, 1992; Krecker, 1994; and Lane, 1998).

It can be inferred from the above findings that employees in a call center set up are generally job stressed and are found to be unaffected by the important measures of turnover from the demographic perspective as in the literature review. Age variable is showing significance in this study as it could be inferred that the older workers are less likely to leave their jobs than their younger coworkers are. This is often attributed to the older workers' obligations to familial responsibilities than their younger counterparts.

FINDINGS AND CONCLUSION

PRACTICAL CONSIDERATIONS

From a practical perspective, the study helps practitioners to adopt the behavior, which can help employees to enhance their commitment towards their organization and in turn, improves the job satisfaction and performance of the employees in spite of the availability of alternative job opportunities for them. This will help the employees feel accountable for their growth as well as the organization's growth. When commitment towards the organization improves, employees are found to be less vulnerable to quit their workplace.

For example, the findings of this study shows that the respondents were least committed to their jobs. This could be attributed to their non-satisfactory response concerning distributive justice (reward system in the organization) than the procedural justice (employee empowerment) in their place of work. This shows that the respondents were not getting enough support from their management to help them stay fully committed to their organizations. This finding reveals that the management

needs to concentrate more on improving favorable job attitudes like commitment and satisfaction amongst the employees towards their jobs by paying more attention to improve the intra-organizational factors (Perceived organizational support, organizational justice and felt stress) within the organization to reduce unfavorable job attitudes. The benefit of such a change can bring forth more employees internalizing the vision and mission of the company and they will strive to improve their performance in their organizations.

Similarly, the findings of the study shows that the respondents in this sample are more stressed out concerning workload (amount of effort required by a job) and role conflicts (inconsistent role obligations) which are different types of job related stress. It is also found that the turnover intention amongst the respondents was found to be on the higher side due to job stress, which is detrimental to the organization as poor manpower management, can stunt the growth of the organization. Hence, the management has to realize that since ITES/BPO sector is primarily a service-oriented sector, it cannot afford to loose existing employees and replace them with experienced and trained work force in a short span of time. They will have to work towards building a stress free environment to help employees excel in their jobs and reduce the vulnerability to quit. Turnover in ITES/BPO sector can ruin the quality of service provided which could cause a slow death to this sector. Thus, it becomes very important for the management to foster positive work behavior amongst its employees by looking into ways of reducing job stress among them.

Demographic characteristics of the employees can also be considered to help the management to retain their staff. This is well substantiated by the use of variables such as age, tenure and educational qualifications, which defines demographic nature of the respondents and was found to have contributed significantly to the turnover models as in the literature reviewed.

However, it is inferred from the findings of the current study that the employees in a call center are found to be unaffected by the important determinants of turnover from the demographic perspective. Around 55% of the respondents were found to belong to a specific age group, below 25 yr and less than 1% of employees belonged to age group between 41 to 50 yr. From this, it can be inferred that majority of employees in ITES/BPO sector are youngsters who are most likely to quit their place of work and this is very much supported by the turnover literature. The older workers are less likely to leave their jobs than their younger coworkers are. This is often attributed to the older workers' obligations to family responsibilities than their younger counterparts. The results of this study show that marital status, tenure and educational levels of the respondents did not have any impact on their intention to quit. Hence, the management could think of ways to help young employees to seek a meaningful career path to help them grow in their job ladder. This can largely reduce their intention to quit.

LIMITATIONS OF THE STUDY

All measures reported were self reports and social desirability desired by the respondents. Due to time constraints and difficulty in the availability of respondents, a sample of 208, has been used. However, the study could be replicated with a larger sample to study if the results differ. The research design in this study was cross sectional and it was hence not possible to infer a causal relationship. Undertaking research at one period in time can only reflect that period in time. A greater focus on longitudinal research designs may give a better understanding of turnover intentions and may highlight stronger associations. Another limitation was concerned with the use of turnover intention measures rather than actual behavior in the analyses. Dalton *et al.* (1999) have voiced concerns regarding conducting research using 'intention' variables as the relationship between the tendency and actual variable is found to below.

The set of independent variables, although derived from extensive literature review may not have been comprehensive.

SCOPE FOR FUTURE RESEARCH

There is further scope to use the study in different environments and different geographical locations. A suggestion for future research would be to the use of actual turnover as the criterion variable rather than using intention in the turnover model as there is a concern raised by Dalton *et al*. (1999), explaining the inappropriateness of using 'intention' variable, as the relationship between the tendency and actual variable is found to be very low. The next suggestion would be a longitudinal study with same variables to infer causality as true causal relationships from a cross-sectional study would be ideally impossible. This study is among the few in India that have researched into the domain of ITES/BPO sector, particularly from the employee turnover perspective. Given the present worldwide belief that India is key player in the ITES/BPO industry, research studies of this nature provide useful insights for strengthening or improving practices in the industry and thus consolidating India's position within global competition.

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Case Study

Knowledge Management as a Process to Develop Sustainable Competitive Advantage

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Knowledge Management Systems are dedicated to retaining and leveraging knowledge. Knowledge Management (KM) can play a critical role in the strategic management of human capital in a government organization. This paper presents findings from a survey on Knowledge Management System (KMS) in Indian public sector. Information technology has been accorded an important role in much of the contemporary knowledge management literature. When these assumptions are challenged, the role of information technology in knowledge management processes also comes into question. This paper outlines this perspective of knowledge management and examines the way it characterizes knowledge sharing processes. It analyses the extent, strategy and imperatives of knowledge management and role of information technology in creating a virtual organization for knowledge sharing purposes. The results indicate that more government organizations need to consider the strengths of KM and implement a formal KM strategy. Presently only a few publicly funded organizations have a KM program in place, and most of them have invested in simple information and communication technologies. The survey introduces role of information technology by projecting the overall approach to knowledge management followed by Indian public sector. The survey indicates that the benefits of KM programs are quite positive and the role of information technology systems in the sharing of knowledge is likely to be somewhat limited. Accordingly, the research findings indicate that KM could improve organizational and managerial as well as financial aspects of an organization for sustainable competitive advantage.

INTRODUCTION

Over the last decade businesses have recognized the importance of managing their intangible assets. The development of brands, stakeholder relationships, reputation and the culture of organizations

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are viewed as providing sustainable sources of business advantage. The ability to build and leverage the value of these intangible assets constitutes a core competency for organizations, especially those providing financial and professional services. In these knowledge-intensive organizations, processing knowledge is central to business success (Prahalad and Hamel, 1990; Crawford, 1991; and Drucker, 1998).

Knowledge Management (KM) is the ability to recognize and manage the system of core competencies required for knowledge-intensive businesses. It requires a well-defined framework that relates investment in expertise or internal competencies to corporate performance. This includes making explicit the relationships and interactions between all business enablers so that people can perform their jobs effectively. Knowledge—such as expertise, creative ideas and skills is treated as a resource that can be captured, codified and shared (Boisot, 1983; and Nonaka and Takeuchi, 1995). A key element is creating, sharing and reusing internal capabilities to maximize business opportunities and to minimize the risk of missed opportunities or not meeting key business objectives such as stakeholder expectations.

KM is a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that will improve organizational performance (APQC, 2000).

KM is a complex process that must be supported by a strong foundation of enablers. The enablers for KM are strategy and leadership, culture, measurement and technology. Each of these must be designed and managed in alignment with the other in support of the process. The process usually involves several of the following stages or sub processes in the use of knowledge: create, identify, collect, organize, share, adapt, and use. One of the fundamental questions in KM is that of the appropriate role of information technology in KM in organizations. There are various possible positions on this. Is an organization's KMS just an information technology one? Is information technology a part only a part, of a KMS? Or is information technology really not a key issue in managing an organization's knowledge, compared to others, such as people or process issues?

KM technology can contribute significantly to the evolution and application of knowledge for implementing strategies and practices that are more environmentally and socially sustainable. The development of sustainable competitive advantage is a vital management function and an important requirement is the nurturing of a knowledge creating environment to enable the organization to exploit and develop resources better than competitors and create sufficient knowledge to address the industry's future success factors. These issues can be studied through this case study of NTPC. Embracing sustainability as a critical strategic driver has stimulated new knowledge and contributed to strategy innovations. Sustainability requires special content and processes for KM.

NTPC has more than 30 years of accumulated knowledge KM can play a critical role in the strategic management of its human capital and to leverage its knowledgebase for business performance improvement and competitive advantage. KM should probably be a key pillar of the human capital strategy, along with competency management, performance management and change management as emerged from the recommendations of Disha Project conducted in 2004 for NTPC transformation in consultation with AT Kearney (a MNC consulting company). Even though the need is great for KM in government organizations, many of these agencies do not have a clear vision or strategy as to how to implement KM in their organization. To help these organizations in implementing KM, this paper will discuss components of the KM implementation plan at NTPC a leading Navratan Government Organization (PSU) following the KM imperatives to achieve its strategic business objectives. Before proceeding, we must first define what knowledge is.

Knowledge is best defined in terms of three related but not interchangeable concepts. Data are set of discrete, objective facts about events. Information is an organized data presented in context. Data become information when its creator adds meaning or value. Similarly, knowledge is derived from information as information is derived from data. Knowledge can be viewed as information in context, together with an understanding of how to use it (Davenport and Prusak, 1998; and Brooking, 1999). Since knowledge can be found in many forms, the interlocking of data and information sources when combined with human assets, produce an evolving learning environment. This is evident in the building block approach of data to information to knowledge. The infinite number of sources (i.e., databases, policies, and procedure, etc.), when organized, can enable an organization to better manage the learning process. Knowledge is a very important resource for preserving valuable heritage, learning new things, solving problems, creating core competencies, and initiating new situations for both individual and organizations now and in the future.

KNOWLEDGE MANAGEMENT

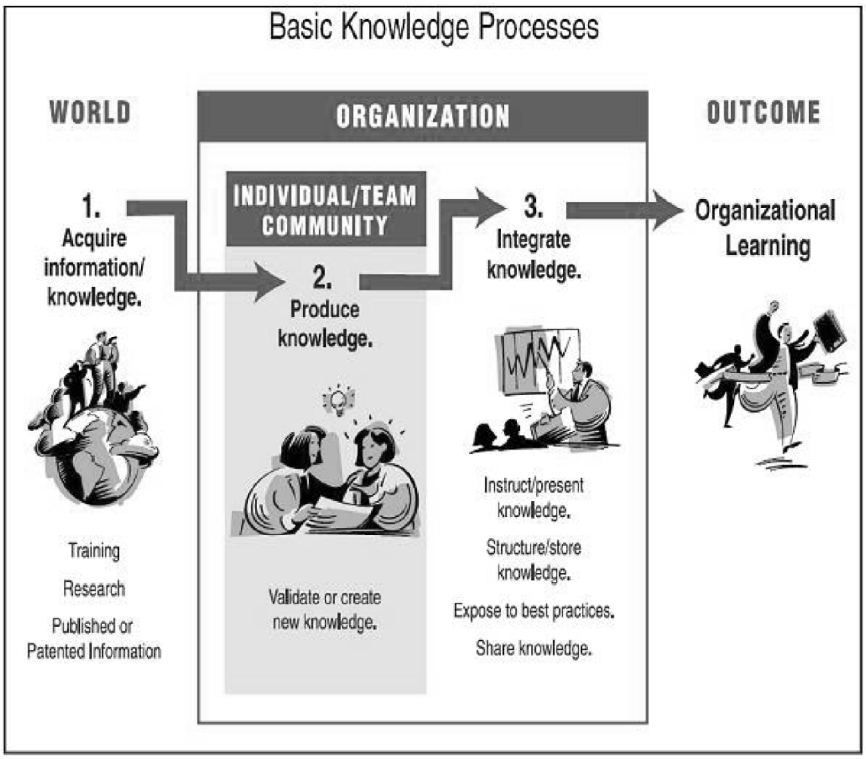
The popularity of KM has increased rapidly, particularly since 1995, and it has become a central topic of management philosophy as well as a management tool. There is no one simple definition of KM. One reason for this lack of agreement stems from the fact that people working in the KM field come from a wide range of disciplines, such as psychology, management science, organizational science, sociology, strategy, computer sciences, production engineering and so on. Most definitions are, however, similar on one point; they take a very practical approach to knowledge, that is, how knowledge can contribute to organizational effectiveness (Hlupic *et al*., 2002). In most cases, the term is used loosely to refer to a broad collection of organizational practices and approaches related to generating, capturing and disseminating knowledge relevant to the organization's business (World Bank, 1998).

Knowledge can be either explicit (knowledge for which a person is able to make available for inspection) or tacit (knowledge for which a person is unable to make available for inspection) (Davenport and Prussak, 1998). 'Only explicit knowledge is the province of information technology, including the communication systems by which people informally share their observations and the more formal repositories in which structured knowledge is stored for later reuse' (Markus, 2001). In contrast, tacit knowledge is stored only in the mind of the expert and is not available for inspection, so it cannot be captured, documented, verified, codified, and disseminated by a team of domain experts and knowledge intermediaries.

Continuous reinvention of the organization through learning is a key feature of KM. An organization's distinctive competence is based on the specialized resources, assets and skills it possesses. To harness the business value of tacit or explicit knowledge, an organization must create an environment that enables the management of the knowledge (Figure 1).

KM is an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing and preserving knowledge, relevant to achieving specified objectives.

Figure 1: Basic Knowledge Processes



The knowledge sources may include databases, documents, policies and procedures, as well as the uncaptured tacit expertise and experience stored in individual workers 'heads' (Smith and Liu, 1999).

One of the difficulties in KMSs is that knowledge sources are widely distributed and exist in many forms. As diverse sources of knowledge accumulate in the company, it becomes more difficult for the knowledge seeker to locate and access the desired knowledge. The knowledge seeker may be unaware of knowledge sources and may not have the software necessary to access the knowledge. Since knowledge is widespread and varied (in type) in an organization, a means of keeping track of the knowledge stored by the organization and accessing is paramount.

COMPETITIVE ADVANTAGE

Competitive advantage is normally defined as the ability to earn returns on investment persistently above the average for the industry (Porter, 1985). Competitive advantage can be created in numerous ways, for instance, by size, location, access to resources (Ghemawat, 1986), or even by plain luck (Barney, 1996). Lasting advantage comes from using KMS to support what we do better and to add value to resources we possess that are not readily available to competitors. For organizational knowledge to offer sustainable competitive advantage, it should have the following four properties: it should be valuable, rare, imperfectly imitable and non-substitutable or imperfectly substitutable.

A prerequisite of implementation of KM is to understand and develop the infrastructure elements required to support the acquisition, management, and transfer of tacit and explicit organizational knowledge. Three areas of emphasis form the literature on organizational knowledge infrastructure these are emphasis on people, process and technology. Innovations that exploit a firm's assets are likely to add value to those resources and the competitive advantage that results is likely to be sustainable.

In reviewing the literature, it appears that many government organizations do not have a strong KM strategy and an associated KM implementation plan. KM has proven to be a strategic and value-added endeavour for improving an organization's effectiveness. For example, according to the American Productivity and Quality Center (2008), Chevron had a $2 bn reduction in annual operating costs through its communities of practice and transfer of best practices. The KM focuses on processes and knowledge flows. In addition, these processes are often supported by shared databases and document management systems. For example, Hewlett-Packard has documented a very large number of their business processes with KMSs (Gannon, 1998). Other examples include Pacific Gas and Electric Company, Texaco and British Petroleum, all have Knowledge Management Systems that focuses on storing their businesses' best practices.

Schlumberger used their technical communities of practice, Intranet, and portal to save $75 mn in their first year of these KM activities, with $100 mn projected customer savings. Hence, there is a culture in these organizations that emphasizes the sharing of knowledge between employees in the organization. NTPC considered the above case examples while developing its KMS.

NTPC developed and deployed an enterprise—wide KM portal named 'Lakshya' as a means of cataloging, tracking and accessing the knowledge in the organization. It offers one-stop knowledge sharing in a familiar, easily created environment. Lakshya makes all of the knowledge available to the company accessible from an integrated central source. Since the various types of knowledge differ in their completeness and accuracy, the design of the portal is used to influence the user to use the most accurate source.

Research Question: In this paper, the following research theme is being explored what are the impediments of KM implementations and role of virtual organization? How do organizations confront and manage these? What recommendations can be made to either prevent or solve these problems?

Our research aims to answer the following questions:

- What are the impediments of KM implementations?
- How is KM redefined by the requirements of sustainable industrial practices?
- How can KM contribute to Sustainable Competitive Advantage in the new economy?
- What practical processes and systems are companies putting in place to support sharing and creation of knowledge for more environmentally and socially responsible business practices?
- What opportunities for advancing sustainability are provided by emerging KM technology?

METHODOLOGY

This practitioner oriented paper is illustrated by a case study, which explores the knowledge management and integrates the findings with contemporary knowledge on KM and competitive advantage. The data for this study includes analysis of interviews with a range of stakeholders. This research study included interviews with KM Managers, HR executives, Line managers and employees to get a better understanding of the KM in the context of competitive advantage. These interviews were analyzed using a constant comparative process of the main themes as described by Glaser and Strauss (1967).

An exploratory, inductive approach using grounded theory, Glaser and Strauss (1967) is adopted for this study. Grounded theory is a well-established inductive process for developing theoretical models with a high level of rigour. This inductive approach is being used to gain an understanding of the concerns of stakeholders involved in establishing the process of knowledge management.

CASE SELECTION

It was decided to conduct the study in a 'knowledge intensive' organization, that is, an organization whose survival or success is highly dependent upon knowledge-based-activities, processes and people. NTPC emerged as the most suitable case. Not only was management very supporting but employees also engaged in assignments in a rapidly changing technology area where knowledge turnover is considered high.

COMPANY BACKGROUND

NTPC, the largest power Company in India, was setup in 1975 to accelerate power development in the country. It is among the world's largest and most efficient power generation companies. In *Forbes* list of World's 2000 Largest Companies for the year 2007, NTPC occupies 411th place. NTPC has installed capacity of 29,394 MW. It has 15 coal based power stations (23,645 MW), 7 gas based power stations (3,955 MW) and 4 power stations in Joint Ventures (1,794 MW). The company has power generating facilities in all major regions of the country. It plans to be a 75,000 MW company by 2017. NTPC has gone beyond the thermal power generation. It has diversified into hydro power, coal mining, power equipment manufacturing, oil and gas exploration, power trading and distribution. NTPC is now in the entire power value chain and is poised to become an Integrated Power Major. NTPC's share on March 31, 2008 in the total installed capacity of the country was 19.1% and it contributed 28.50% of the total power generation of the country during 2007-08. NTPC has set new benchmarks for the power industry both in the area of power plant construction and operations.

KM IMPERATIVES AT NTPC

In order to create a KMS in NTPC, a framework needs to be built. The basic building blocks consist of the lower tier involving KM benchmarking, KM strategy, KM awareness and KM target areas. KM benchmarking consists of seeing what others are doing in the KM area that relates to NTPC.

Once the NTPC learns what their competitors or other global utility companies like British Petroleum, Texaco, and Chevron are doing, then it can best determine the KM strategy that fits in NTPC culture. Part of the KM strategy is to educate employees on KM and create an awareness of KM throughout NTPC. The strategy then targeted specific areas where KM can best be applied in the organization for proof-of-concept and for addressing critical knowledge gaps in the organization where knowledge is 'at risk' of being lost. NTPC followed a codified approach of developing a best practices/ lessons learned repository.

NTPC's KM imperatives are derived from its strategic objectives and HR vision of becoming a 'Learning Organization' (Table 1).

The KM technologies and tools used as an enabler for knowledge sharing, through the NTPC's web-based portal Lakshya. Since technology is just a small

Table 1: Learning Organization

Strategic Objectives of NTPC	Knowledge Management Imperatives
Plan and expeditiously implement power projects	Improve engineering and project construction lead time and reduce cost through efficient reuse of past knowledge and experience
Operate power stations economically and efficiently	Reduce operations and maintenance costs and improve work practices by sharing ideas and best practices across plants
Diversify and grow into new areas	Capture external knowledge of regulatory environment, competitive environment, leverage experiential knowledge for commercial purposes

piece of developing a KM capability, the processes, culture and people components considered carefully in order to become a learning organization.

FOLLOWING ISSUES ARE CONSIDERED WHILE DESIGNING NTPC KM SYSTEMS

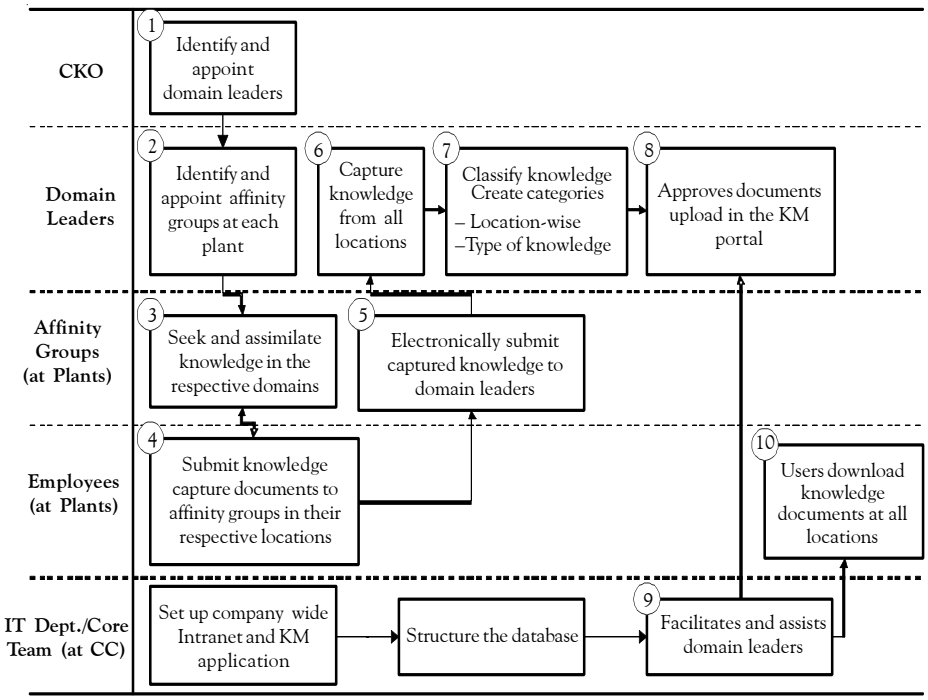
- What are the knowledge processes that are critical to creating value and competitive advantage?
- What are the characteristics of the relevant knowledge?
- What mechanisms are needed for the generation and application of relevant knowledge?
- What organizational conditions need to be in place in order for the KM mechanisms to work?

KM PILOTS AT NTPC

The next phase involved is developing and measuring KM pilots and instilling a change management program in NTPC in order to transform individual learning into organizational learning. KM processes are to be embedded into the employees' daily work activities so they are seamless and interwoven throughout the fabric of the organization. NTPC's KMS cost no extra funding as it has been customized during the ERP implementation through SAP.

Once the KM pilots have achieved success and a change management process is underway, full implementation of these pilot projects can occur, given the necessary resources. A kind of virtual organization has been setup to deploy KMS in NTPC headed by a Chief Knowledge Officer (CKO). CKO is being assisted by a full time core group. Knowledge domains are formed based on specific areas. Further, affinity groups are formed to support domain leaders in updating and archiving the knowledge base. To develop the KM organizational infrastructure, critical elements needed include: the establishment of full-time core group assigning domain leaders to projects in a part-time capacity, re-assigning existing roles of affinity group members to help achieve the KM goals and embedding KM processes into the daily working activities of the NTPC employees. KM process at NTPC consists

Figure 2: KM Process Steps Will Comprise Assimilation of Knowledge from Various Locations and Uploading on the KM Intranet for Dissemination



of following steps comprising assimilation of knowledge from various locations and uploading on the KM intranet for dissemination as shown in Figure 2.

In the first year (2007) NTPC tried to create an awareness of KM at all levels in the organization, educate people on KM, set up the technology infrastructure as an enabler for knowledge sharing, and provide some quick-wins to show the value of KM. For the second year, the goal is to create the organizational infrastructure to infuse KM throughout NTPC (KM Organization), and expand the various KM pilots and activities into full-fledge projects (KM implementation).

THE KNOWLEDGE MANAGEMENT SYSTEM PROVIDES SEVERAL BENEFITS TO THE NTPC

- Develop NTPC into a learning organization by creating a culture of knowledge sharing.
- Build an environment of trust and openness.
- Prevent 'reinventing the wheel'—reduce employee effort to seek knowledge and experience.
- Improve efficiency – employees spend more time in analyzing rather than in searching for information.

- Reduce lead time in business processes and day-to-day activities.
- Reduce cost through sharing of ideas and best practices across plants.
- Capitalize on external knowledge for identifying revenue enhancement opportunities for NTPC.

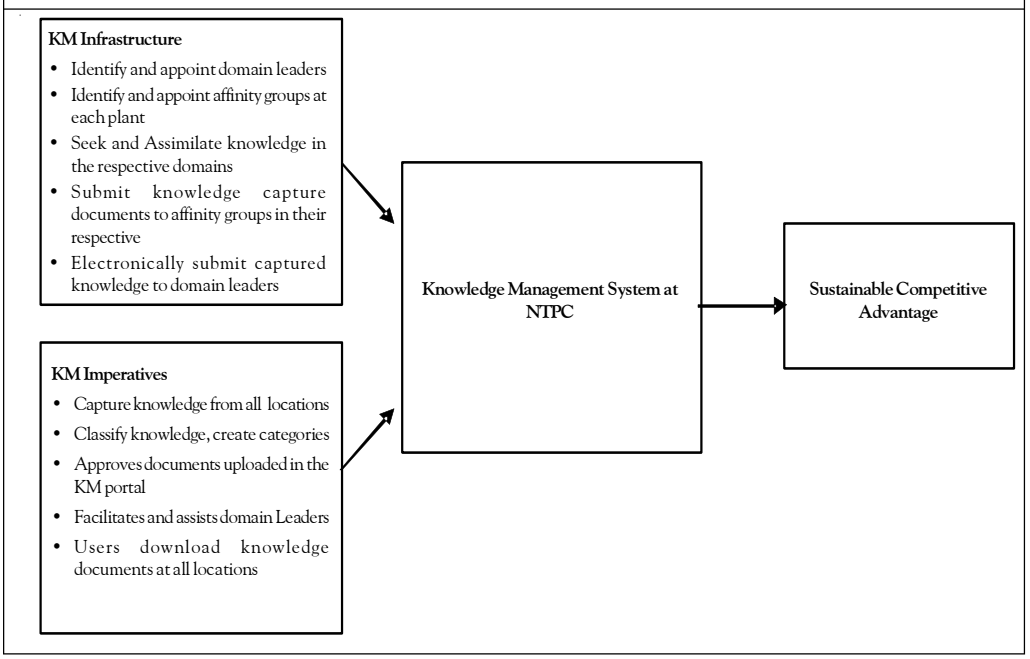
The most important use for KM portal Lakshya is to facilitate knowledge reuse by providing an integrated portal for all knowledge sources.

This portal organizes the knowledge assets by topic and type and contains the necessary software to access all of the knowledge sources. The user searches the available knowledge sources by context and is shown listings of appropriate knowledge grouped by knowledge type. The KM portal obtains the user's request, loads the appropriate data and software, and displays the knowledge to the user. The other uses of this KM portal are to evaluate the depth and breadth of KM within NTPC. This portal is an inventory of knowledge assets that users can search by context, thereby determining the availability of knowledge sources for specific domains. This KM portal may also be used as a planning tool for KM by locating knowledge and expertise for future knowledge efforts.

IMPLICATIONS

Knowledge is the most important strategic resource and the ability to acquire and develop it, share it and apply it can lead to sustainable competitive advantage because organizations with superior knowledge can combine traditional resources and assets in new and distinctive ways and thereby provide superior value to customers. This paper found that KM is inextricably linked to corporate

Figure 3: KM Cycle at NTPC



sustainability, but a methodical approach is required for successful KM implementation. This paper presents some important elements of a KM implementation plan that may be used as a role model for other project-based, technically-oriented organizations to follow (Figure 3). Without incorporating KM into the human capital strategy of the organization, there may be some major knowledge gaps resulting in the near future putting the organization at risk. This paper also developed a framework for building the KMS in the organization. NTPC is used as a case study in applying this framework. One of the most difficult parts of implementing this KM framework is the change management component—that is, how to embed knowledge sharing activities into everyone's daily work life without it being something extra one has to do. In NTPC, the new project and program management policies and guidelines required that lessons learned be captured and applied during all phases of the project life cycle. KM is used to facilitate these knowledge sharing roles and government organizations can take advantage of this study in developing a KM strategy and linking it with the organization's mission and vision.

CONCLUSION

KMS are dedicated to retaining and leveraging knowledge. It should be pointed out that this study is only a preliminary step in attempting to address a multifaceted complex subject. What emerged from the analysis is that the importance of the concept of knowledge sharing. In addition, it would be interesting to further investigate how in fact they create knowledge through organizational processes and identify what the main drivers of value creation are. In the future, more government organizations will be including KM as a key pillar of their human capital strategy. This KMS study will help other organizations as they embark on their KM journey. This paper provides a mechanism for organizations to benchmark their KM activities and to develop a KM strategy that would improve their activities.

This paper has demonstrated that corporate sustainability is strongly linked to KM. Developing a KM strategy is the core to the concept of sustainability as improvement in the way knowledge assets are managed and reported, can lead to better corporate governance, facilitate continuous improvement, enhance stakeholder value and provide sustainable competitive advantage.

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Book Reviews

Personality Plus
How to Understand Others by Understanding Yourself

By Florence Littauer

Manjul Publishing House Pvt. Ltd. Bhopal, 2005; pp. 204; Price Rs. 150

ISBN: 1-85424-509-0

Personality plus delivers an entertaining account and expert perspective on how to understand others by understanding oneself. This book is an excellent resource to students, educators, trainers and psychology enthusiasts. In reviewing this book, the principal criteria included content, organization and reference sources. The range of topics covered (17 Chapters) is indeed commendable. *Personality Plus* talks about four key personality types. A valid system has to make generalizations, trying to strike a balance between precise descriptions and applicable number of personality types. The Personality Plus concepts extend by mixing profiles or rather also provide insights on combination of personality profiles. The book exists not simply to describe an individual's personality type, which perhaps any personality test does, but rather aims to highlight those vital aspects of personality which are significant for interactions between people.

In *Personality Plus*, Florence Littauer gives the readers valuable insight for appreciating your God-given personality uniqueness. She also highlights a Personality Profile test that reveals how your unique blend of traits affects your emotions, work performance and relationships.

The personality plus is a unique blend of humorous anecdotes and straightforward counsel. Personality Plus guides you to improve upon your strengths and amend your weaknesses. This engaging book also provides tips to understand other personalities around you. After reading this book, you will learn how to recognize and like the traits that make each of us so different. Personality Plus is the tool to change the quality of your life and the lives of those you care about. The personality traits are the natural elements that are wired into a person right from his or her birth and this is carried along throughout his or her entire life. Although the personality is deeply rooted into a person and can never be changed fundamentally, the individual can however, learn about the other personality types—that unnatural personality and when learnt, it is called

learned personality. In the process, the individual puts conscious effort to obtain rather than something that one has been blessed naturally. The author explains 'When we know who we are and why we act the way we do, we can begin to understand our inner selves, improve our personality, and learn to get along with others (Chapter 1). In the first chapter, the author dwells deep into concept of there's only one you and no two alike. With a thought provoking start "How many of you have a Michelangelo Complex" (p. 12), the author travels deep into the personality types and their associated traits. The reader is taken on a journey through the world of temperaments. This work is undoubtedly the culmination of the author's 25 years of seminar speaking, personality counseling and day-to-day observation of people's temperaments. Under the same shelter, an enthusiastic reader will gain in a nutshell, the methodology to explore one's own strength and weakness. It provides guidelines on how to accentuate positives and purge the negatives. The tone of the book reflects a learned appreciation for the subject of psychology. The language of the book is simple.

Each part of the book is broken down into different chapters, which typically fit into the theme logically. All chapters are composed of several defining parts that maintain a sense of continuity throughout the book. The introduction begins with a short verse on how the world needs the personalities (Oh, how the world needs the personality). The book progresses through a journey providing significant insight on the author's observation of four personality types, such as Popular Sanguine (Fun Lovers) – People with sanguine personality type are fun loving. They are adventurous, talkative, have good sense of humor and possess high degree of expression. Sanguine type people are usually popular. They are extroverts and perceived as party freaks. People with this personality type are excellent at making initial contact with other people. They are also great motivators. They have the desire to ensure everyone is having fun. They are also perceived as creative people (Chapter 3, p. 28). Organized Perfect Melancholy (Chapter 4, p. 43) – People with this personality type are perfection focused. Melancholy people can be viewed as one who is analytical, purposeful, sensitive and being serious. They are involved in the journey of thinking most of the times. Melancholy people set high benchmarks for their accomplishments. They are better known as Plan man. They can also be seen as someone who admires their own personal space and like silence and share the traits of an introvert. They are strategist in nature. The book progresses into more personality types like the Powerful Choleric (Dynamic) – People with choleric personality. They prefer to have control of most of the things around them. Choleric people can be described as someone who is loyal and gifted with leadership traits. They are quick at making decisions. Choleric people are better risk takers and ready for challenges. They are best at uplifting the spirit of people. (Chapter 6, p. 61) and finally the Peaceful Phlegmatic (Relaxed), (Chapter 7, p. 72) – People with phlegmatic personality are peace-oriented and saintly.

They are usually calm, soft and cool-headed. They are friendly, well balanced in thoughts and usually have good social interaction. They are good listeners. They do not overreact to situations and also at times viewed as indecisive type. They are good team players. Littauer presents a broad analysis of ways to overcome personal weakness under personality plan (Part Three, p. 85). In part four, the author has dealt with Personality Principles and prescribed solutions and techniques for better interpersonal relationship (Part Four, p. 141). The author has concluded the book by highlighting the Personality Power as a source of strength to achieve individual potential where the concept of spiritual energy is quite engaging (Part Five, Find Spiritual Energy, Chapter 17, p. 188).

The appendices conclude with a listing of Personality Test word definitions adapted from Personality Patterns by Lana Bateman, well organized with strengths and weakness defined separately for clarity. Addition of bibliography and references would have enriched the book and enabled the inspired reader to obtain more information on related work. The author's enthusiasm for the topic is obvious throughout the book. In the text of the chapter, there are assortments of intriguing stories so plentiful that in certain parts of the book they distort the flow of the text. The temperament combinations are not fully described. The book would have been more effective from the research and practical perspectives if concepts like the profiling systems and justifications had been used.

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International Marketing Management: Text and Cases

By U C Mathur

Sage Publications, New Delhi, 2008, pp. 572, Price Rs. 495

ISBN: 978-0-7619-3640-4

It is well known today that international marketing is a complex task. Managers are challenged to design marketing programs and strategies that will work well across many countries with different economic, political, social, and cultural characteristics. Professor U. C. Mathur provides an analytical framework for the development and implementation of international marketing programs in his book *International Marketing Management: Text and Cases*.

International trade, economic free trade zones, restrictions on exports and tariff and non-tariff barriers that the organizations face in the international arena form a major part of the book. This book is well written and researched and provides the students with a solid foundation in the major topics of International Marketing.

This is a comprehensive college text on the subject of international marketing as it covers all relevant subject areas of International marketing in some depth. International Marketing games at the end of each chapter are very good and reinforce the content of each chapter. These can be used by academicians in having interactive sessions in the classrooms

Each chapter starts with aims and outcomes that lay out what to expect in the coming pages. Discussion questions are presented at end of each chapter which provides the opportunity to apply chapter knowledge. Moreover, the cases themselves are inherently interesting, particularly because they cover a wide range of industries in a variety of countries.

The comprehensibility of chapters is significantly enhanced through good use of visual tools such as tables, charts, diagrams, graphs, exhibits and maps. The examples of global marketing practices by companies are particularly useful in helping readers digest the text material.

CHAPTER REVIEWS

Chapter 1 ("International Marketing: An introduction") concentrates on the basic concepts of International Marketing. It provides students with an idea of the various concepts and topics covered in the book in its later parts.

Chapter 2 ("Market Potential of Countries") explores the importance of studying business environment in

international business. It analyzes the impact of environment on business potential.

Chapter 3 ("International Organizations") discusses various international organizations like WTO, World Bank, IDA, IBRD, IFC, MIGA, IMF, etc., that can help the organizations in exploring international marketing.

Chapter 4 ("International Trading") covers international trade from exporter's perspective. It explores the evolution of international marketing and provides good insight about Export Councils of India

Chapter 5 ("International Competitive Advantage and Buyer's profile"), focuses on how the firm creates and develops competitive advantage in the international market. Porter's value chain framework is used to discuss the competitiveness issue from a macro perspective. This chapter also concentrates on the international buyers profile and helps students in enhancing the importance of understanding customers buying motivation in the International market.

Chapter 6 ("International Environment for Business, Customer, Competition and Controls"), focuses on economic differences between different countries and suggests the ways of dealing under different economic conditions in the international market. This chapter also discusses the Mackenzie's Seven S Model for improving performance.

Chapter 7 ("International Pricing"), covers issues related to international pricing strategies. After the internal and external factors that influence international pricing decisions are examined, pricing formulae and finalization of the price for international markets are discussed.

Chapter 8 ("International Business-to-Business Marketing"), concentrates on Business-to-Business Marketing in international arena. It makes use of purchase decision triangle and gives good idea to students about Business-to-Business trading.

Chapter 9 ("International Marketing of Services"), discusses importance of the service sector in the international market. It provides good insight about the marketing process and philosophy behind marketing of services in the global context.

Chapter 10 ("International Strategic Marketing"), focuses on the strategic marketing aspect for international businesses. Strategic marketing planning process in the chapter gives good ideas about customer and market analysis. Conceptual approaches such as product life cycle concept and branding strategies at the production level are also discussed. It also makes use of portfolio management analysis with the help of BCG matrix and GE matrix.

Chapter 11 ("International Stakeholders"), provides a detailed account of corporate survival and initiates the readers in the intricacies of double bottom line paramount in the context of international business that covers the interest of stakeholders.

Chapter 12 ("International Brands"), focuses on the role of brands and their effect on the profitability of the organizations. Here it also uses the concept of projective techniques. Positioning strategy and building brand loyalty are also discussed in this chapter.

Chapter 13 ("International Marketing Concepts"), concentrates on marketing from an international perspective and provides readers with some basic concepts on marketing, finance, supply chain management and organizational culture in the context of global business environment.

Chapter 14 ("Market competitive forces worldwide"), provides insights about the competitive business environment that can help organizations in achieving competitive advantage in the international market place.

Chapter 15 ("Advertisement and Promotion in International Markets"), concentrates on advertising and promotional activities for international markets. This chapter provides the good insights about advertising, selection of advertising agency, media planning, creative strategy and promotional strategies for international markets.

Chapter 16 ("International Public Relations"), focuses on the importance of public relations for an organization from the international perspective. This also provides reader with an idea about crisis management in global business.

Chapter17 ("International Marketing Research"), discusses market research methodologies from a global perspective. This chapter provides useful inputs for conducting market research activities in the international market.

Chapter 18 ("Distribution of Goods Worldwide"), focuses on the management of international distribution channels and logistics. This chapter provides insights about various methods of distribution in the global arena. International retailing is also discussed in this chapter.

Chapter 19 ("International Markets for the Twenty First Century, Imports and Exports"), discusses international markets for the twenty first century. It also covers information on import and export strategies in gaining competitive advantage in the global scenario. Turnkey operations are also discussed in this chapter.

Chapter 20 ("International Management for Marketing Personnel"), focuses on the perspective of human resources in the international business. Seven S model is also discussed in the international context. This chapter provides good insights for optimizing the human resources in the international market.

Chapter 21 ("International Marketing Audit"), concentrates on the importance of conducting marketing audit in the global environment. Concepts like Balanced Scorecard, Activity Based Costing and Experience effect are also discussed from the perspective of conducting international marketing audit. Summary checklist for conducting marketing audit is also provided at the end of the chapter.

Chapter 22 ("International Collaborations, Controls and Global Manufacturing"), concentrates on global collaborations, controls and requirements of various ISO certifications in international operations. Importance of outsourcing in the global context is also discussed in this chapter.

Last part of the book provides 12 case studies on international marketing. These case studies provide good insights about the various concepts of international marketing and can help the students to understand the concepts discussed in the book in a more pragmatic manner.

This book can equip students with knowledge and skills to enable them to make key management decisions and understand how organizations may be navigated through the increasingly dynamic and difficult global environment. It enables students to identify, evaluate, and integrate a wide range of international marketing concepts to create and execute highly effective international marketing programs. Students will be able to assess and monitor a company's effectiveness and examine the implications and applications of contemporary thinking on global marketing management.

I think we need to add more examples in the various chapters so that students can link with it in a better manner. I would also suggest author to add more about International pricing strategies in the next edition.

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Compensation: Theory Evidence and Strategic Implications

By Barry Gerhart and Sara L Rynes

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Organizations are becoming more concerned with positioning employee compensation as a strategic human resource management function in order to gain competitive advantage. The increasing competitiveness of the labor market and turnover of employees has resulted in a nightmare in compensation planning. Apart from this, the growing demand of the employees and competitive salaries offered by multinational companies has almost resulted in a compensation war in certain industries. Compensation represents the largest of all expenses in most organizations. With such high stakes on the table, there is enormous demand for innovative business practices and the need to have a closer look at the compensation management system for more effective business results. This book by Barry Gerhart and Rynes provides answers to many compensation related issues being faced by management and generates thought provoking questions that will force the managers to have a relook at their compensation system, evaluate and improve upon it and motivate the researchers to work on the research gaps highlighted in the book.

Barry Gerhart is a Professor of management and human resources and the John and Barabara Keller distinguished Chair of Business, School of Business, University of Wisconsin. His major fields of interest are human resource management and strategy, compensation and business performance. Sara. L. Rynes is the John F Murray Professor and Chair of Department of Management and organizations at the University of IOWA.

This book forms a part of the series, Foundations for Organization Science. FOS books are education aids for mastering the core theories, essential tools and emerging perspectives that constitute the field of organization science. Authors for this series are encouraged to write the books as they teach to pass on their craft knowledge to the next generation of scholars. This book does full justice to this objective by integrating theory with empirical evidence for each of the three compensation decisions covered in this book: pay level, pay structure and pay delivery systems. Theories and practices about both the outcomes and determinants of pay have been reviewed. The book incorporates theories and evidence from multiple disciplines primarily economics, psychology, management and sociology to cover the multiple facets of a complex theme like compensation. For example, economics tend to focus on average or general effects and psychology on individual differences

and variations in outcomes. As the book takes a broader outlook in areas where previous research has been misinterpreted, it seeks to understand not only what has been learnt from previous research but provides directions for further research.

The book has been divided into a total of eight chapters. Chapter one presents the enigmas of compensation and covers the major objectives and outline of the book. Chapter two and three discuss the most general pay decisions made by the organization -that of pay level. Chapter two tries to answer the question as to why do some companies pay more than the others. Here the author also provides examples of executive compensation strategies at various companies like Coca-Cola, Ford and Procter & Gamble. This chapter brings out that studying both the determinants and effects of pay level is a complex enterprise as it is difficult to apprehend that a pay level higher than average is intentional or unintentional and strategic or not. Also because pay levels are typically studied separately from pay form (benefits) and pay basis (incentives, stock options), it is not clear whether high compensations reflect higher total compensation. The chapter also provides additional notes under the heading 'resource' where it presents discoveries made by post intuitionalists that do not accord with the neo classical theories like imperfect mobility of labor, weak links between labor supply and pay rates, pay rates based on relative rather than absolute rates and others.The author points out an interesting question whether managers actually employ efficiency wage concepts or are concerns about equity and fairness more important in the decisions about pay level and the fact that this issue remains under examined gives a direction to researchers to look into this area. Chapter three moves further to discuss as to what do employers get for higher pay. While the previous chapter brought out that pay level for the same job varies across organizations and geographic areas with reasons for the same, this chapter reviews empirical evidence regarding the variance in pay levels and outcomes, in the light of motivational theories. This chapter provides a storehouse of research done in the linkages between pay and outcomes, pay satisfaction, attraction and retention, employee effort and performance and pay level and overall utility as it shares the findings of many research studies and also points the existing gap in literature.

In chapter four, the author first illustrates the difference between pay level and pay structure with the help of an example. The chapter also discusses in brief, the main administrative tool job evaluation for establishing pay rates that allows to deviate pay to some extent from those based on the external market. Theories of differences in pay structure like internal labor markets that provided the first systematic explanation as to why an employer might choose to have an internal pay structure that differs from the external market have been covered. Other sub themes that have been given due coverage by the author in this chapter includes the transaction cost economies, tournament theory and work life incentives. Each of the theories covered offer a slightly different explanation as to why pay structures may vary across employers. Some of the reasons brought to light are differences in monitoring

costs, skill specificity and the need for cooperation and team work.

Pay basis refer to decisions of organizations of how to pay. In chapter five, an attempt has been made to cover several theories that differ in their disciplinary background (psychology versus economics), their focus (incentive versus sorting effects) and their emphasis on psychological mechanisms or mediators. The intensive review in the light of existing literature brings out the strengths and weaknesses of each of the discipline psychology and economics from the perspective of understanding pay basis and its effects. Hence the author points out the need for further theorizing, blending the economic and psychological approaches to the greatest extent possible.

Pay for performance programs is the theme covered in the sixth chapter where the author gives special attention to behavior oriented performance measures and results oriented performance measures. Besides focusing on the broad policy issues in the pay programs, the authors provide discussion on the specific pay programs like merit pay, individual incentives , profit sharing, stock plans and gain sharing. The following chapter reviews models and evidence relevant to the role of compensation strategy in the formulation and execution of an organization's strategy and vice-versa. The last chapter briefly outlines some of the major conclusions and areas of controversy that emerge from the book while suggesting five substantive topics for future research and methodological recommendations that apply across substantive areas.

Overall the book does an efficient work in summarizing the current status of theory and research on compensation and its effects on individuals and organizations. As the book draws from multiple disciplines in the hope of directing researchers to relevant work in areas other than their own, the book not only reviews theory but supports it with relevant research studies and evidence from current practices of various companies on the link between pay decisions and effectiveness.

Specifically the detailed analysis regarding the integration of economic, psychological and management perspectives offer rich insight in this area. The book is an invaluable tool for those trying to understand the complexities associated with compensation and how pay strategies influence the success of organizations. In sum, the authors Barry Gerhart and Sara Rynes do full justice to the questions they try to answer relating to pay level, pay structure and the pay delivery system. As the book presents a compendium of theory, current practices and research evidence, it lives up to the title of the book "Compensation: Theory, Evidence and Strategic Implications". The book is a useful guide to not only student community but also compensation management consultants and organizational development specialists.

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