Innovation Capability Constructs and Firm Performance: A Study on Indian Software Firms

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Abstract

Due to rapid change in technologies and globalization, companies are adopting innovative strategies, as it is considered to play an essential role in the growth and sustainability of organizations. Now a day's, companies seek to develop their technological capability and strategies in order to attain innovative outputs, increase their profits and achieve higher performance. Software sector is technological driven sector and it lies at the heart of the modern economy which serve as a driver, of innovation across all sectors and industries. Indian software sector is evolving rapidly and its innovations are impacting various industries across the country. The study aims to investigate the relationship between innovation capability constructs namely technological orientation, innovative strategies and firms' overall performance, with reference to Indian software firms. The study was done on primary data collected through self structured questionnaire. The data was collected using non probability purposive sampling. The target respondents were software industry practitioners i.e. software engineers, analysts, CEO, CTO, project managers, R&D managers etc. Regression analysis was performed to explore the relation between technological orientation, innovative strategies and firm performance. The findings reveal that technological orientation and innovation strategies have significant positive effect on firm performance. Results of this study can benefit the firms' managers in effective management of innovation and thereby improving firm performance.

Keywords: Technological Orientation, Innovation Capability, Innovative Strategies.

Introduction

In the present day environment, there is an added pressure on organizations to be more socially and environmentally responsible and there are risks which need to be alleviated and handled the company can be succeeded and remain market leader in their operations. The survival of any organization depends on its ability to manage and build in the concept of innovations. Companies that have established themselves as technical and market leaders had shown ability to develop successful new product and properly manage changes (Oloyede B., 2002). Neely et al.(2001) defined Innovation capability as the capacity of an organization to innovate more; in other words, it is the organization's potential to accomplish innovative outcomes. Innovation capability is an important aspect of an organization's growth and success. It refers to the organization's ability to improve

existing products or technologies or to create new ones. According to the OECD's Oslo Manual (OECD, 2005), innovation means the development of technologically new products and processes and significant technological improvements in products and processes. In order to achieve innovative outputs, increase profits and achieve higher performance, many companies are trying to develop their innovation capability.

Innovation capabilities of firms may be exploited to increase operational efficiency and to explore new opportunities for revenue generation. Firms try to implement a variety of strategies to leverage their capabilities, such as portfolio Strategies like divestment, acquisition, alliance, new product development, growth strategy like consolidation, withdrawal, launching new products, entering new markets, Business strategies like cost focus, differentiation or hybrid, technological strategies like adoption of new technology, and financing strategies like debt rescheduling, raising equity. New strategies are implemented to improve the revenue generation and efficiency. Technological orientation is an important component in the progress of human societies. Technological innovation is a comprehensive set of characteristics of organization facilities and supports its technological adoption strategies (Burgelman et al., 2004). Researchers and institutions have developed different approaches to audit a firm's technological innovation capability. Chidamber and kon (1994), Gatingonand Xuereb (1997) and Berm and Voigt (2009) in their researches has found that maximizing innovation is an important strategy for success in the marketplace. An increasing number of studies have discovered the impact of strategic orientations and technology orientation on innovation and business performance.

Virtually, in every industry, from aerospace to pharmaceutical and from banking to computer, the dominant companies had demonstrated an ability to innovate. The software sector is evolving rapidly and its innovations are impacting various industries across the world. Software sector is not only a highly innovative and economically important sector in its own right, but, it is also an important element of innovation in other sectors. Many process and structural innovations depend heavily on organizational changes that are facilitated by software innovations. This ubiquity of software further demanded continuous innovation in software more than ever before. The study is undertaken to establish a better understanding of the innovative performance of Indian software companies. The software industry is at the combination of both service and product industries (Hoch et al.,1999). It has an important position within sector hierarchy and it has impact on other manufacturing industries also. Therefore, researches and studies should be intensive. But, there are insufficient researches and studies related to software industry in the literature, and lack of such studies constitutes the attention towards the importance of software industry and guide to firms in developing countries, like India. Software companies are important engines for innovation and technological advancement. From a core-competence view, it is interesting to investigate the links between the technology orientation of companies, their strategies and firm performance. Firm Performance outcomes in this study include sales, profit and market share achieved. The study explore whether such links exist in an emerging market context. Firms need to have new product and service development structures that are balanced with a appropriate combination of internal technologies and external needs (Shepherd and Ahmed, 2000). So, successful innovation requires the firm to connect technological and market opportunities for better firm performance (Nemet,2009).

Literature Review

Innovation capability plays a vital role in enhancing a firm's innovation skills. According to Lawson and Samson (2001) innovation capability is the ability to continuously transform knowledge and ideas into new products, processes and systems for the advantage of the organizations and its stakeholders. Innovation capability varies according to the type of innovation (such as product innovation or process innovation), and also differs from firm to firm; it can be specified through multiple factors (Saunila et al.,2014).Authors such as Lawrence and Lorsch (1967), Prahalad and Hamel (1990),Kogut and Zander (1992) considered innovative capability as a key for competition.

According to Adler and Shenbar (1990), innovative capability is defined as the capacity of developing new products satisfying market needs; applying appropriate process technologies to produce these new products; developing and adopting new product and processing technologies to satisfy the future needs; and responding to accidental technology activities and unexpected opportunities created by the competitors. Kogut and Zander (1992) defined a firm's innovative capability as its ability to mobilize the knowledge included its employees and combine it to create new knowledge resulting in product or process innovation. Un (2002) stated that this capability is dynamic capability and it involves interaction between firm's internal knowledge and the demands of the external market. Innovative capability of a firm is highly contingent upon the level and the types of resources and other competencies of the firm (Neely et al., 2001), as well as on the extent to which the firm's management successfully integrate and manage such resources (Lawson and Samson, 2001).

Schumpeter (1934) suggests a range of possible innovative capability alternatives, namely developing new products or services, developing new methods of production, identifying new markets, discovering new sources of supply, and developing new organizational forms. Capon et al. (1992) adopted three dimensions of organizational

innovativeness: market innovativeness, strategic tendency to pioneer, and technological sophistication. Environmental volatility, organizational munificence, size, slack, structure, culture, and leadership factors have been found to influence a firm's propensity to innovate (Damanpour 1991; Subramanian and Nilakanta 1996). The software industry is characterized by a high rate of product and process innovations, high knowledge intensity, rapidly shrinking product and technology life cycles, global market (Nambisan, 2002).Software firms have significant experience in adopting innovative practices for designing and developing products (Nambisan, 2002). Our study mainly focuses on innovation capability constructs namely technological orientation, innovative strategies and firm performance in context to Indian software firms.

Technology orientation in this study is concerned with the utilization of technology to facilitate innovation and innovative behavior within and between organizations. Technologies such as virtual reality (Watts et al., 1998) and group work software (Klein and Dologite, 2000; Pissarra and Jesuino, 2005) all have a place in the innovation process. In most studies, process innovativeness is considered as a sub-element of technological innovativeness. According to Kitchell (1997) technological innovativeness is best examined in light of the nature and process of innovation adoption. Avlonitis et al. (1994) consider technological innovation challenges in relation to machinery and production methods as measures for technological innovativeness. In various studies, technology is discussed as an output of innovation (Erdener and Dunn, 1995).This study is concerned with its role as an influencing factor on firm performance.

Strategies in this study refer to aspects of the corporate strategies for future benefits of the organization (Damanpour and Evan, 1984; Read, 2000; Martins and Terblanche, 2003) and their impact on the management of innovation. It also refers to the dissemination of the strategic vision throughout the organization. According to Markides, (1998), strategic innovation is about "a fundamental re-conceptualization of what the business is all about that, in turn, leads to a dramatically different way of playing the game in an existing business". Strategic innovation takes place when a company identifies gaps in industry positioning, rectify them, and become the new mass market. Besanko et al. (1996) define strategic innovation as the development of new competitive strategies that create value for the firm.

To evaluate relative overall performance, the improvement in sales, market share, profits, quality of products, costumer relationship, skill of employees and turnover of company within a three years time period has been considered as benchmark for innovations. Many quantitative measures have been considered in previous studies related to innovation management. The literature indicated factors such as size (Mansfield, 1963), age (Nejad, 1997), growth rate (Smith, 1974), profitability (Mansfield et. al.,1971), earnings from exports (Calvert et al., 1996) and foreign capital involvement as determinants of innovation. The number of new products developed in the last few years as a percent of current sales (Lawrence and Lorch,1967), the number of significant innovations during a period of time(Mansfield,1968) and measures of manpower, raw materials, supplies, and machines, can also be used to compare the marketable outputs. Market share is also used to evaluate the relative strength of marketable outputs (Rochwell and Particelli,1982).

Research Objective

The objective of the study is to explore the relationship between the innovation capability constructs namely technological orientation, innovative strategies and firm performance, in context to Indian software companies.

Development Of Hypothesis

Technological orientation of the firm is an important factor in developing new processes, products and services (Henard and Szymanski, 2001; Zhou et.al., 2005). Attitudes to technology and innovation can determine the firm's achievement of competitive advantage (Hitt, Hoskisson and Ireland, 1990). Firms that proactively acquire new and advanced technologies might be more innovative owing to their emphasis on applying these technologies to developing new processes, products and services to meet customer needs (Cooper, 1994). The level of technology orientation of a firm has a significant influence on its ability to innovate and is viewed as being a source of competitive advantage (Humphreys et.al., 2005), which can lead to better business performance (Voss and Voss, 2000). Technological adoption and/or development in India vary for different companies, due to a dynamic and a highly competitive marketplace and rapid technological changes. These factors may influence long-term investment in technological resources and capabilities and in turn financial performance of the company (Grant et.al.,2007, Hamel and Prahalad,1994). The studies guide to propose the following hypothesis:

H1 : Technology orientation exhibits significant positive effect on a firm's performance.

The importance of innovative strategies as complements to innovation is well recognized. The importance of maintaining a competitive position in the production arena is emphasized by Teece (1986), who notes that "innovating firms without the requisite strategies may die, even though they are the best at innovation." The studies by Desai (2000), Kraus et.al, (2006) indicates that several performance benefits are attributed to strategic planning . They hypothesize that strategic planning is a management tool which cushions businesses from unstable and

competitive markets. Schraeder (2002) also found that strategic planning provides an operational framework which allows an organization to enjoy competitive advantages and improved performance. Thus, this leads to develop the hypothesis given below

H2: Innovative Strategies exhibits significant positive effect on a firm's performance.

Research Methodology

An exploratory study was carried out on Indian Software companies registered with National Association of software and Service Companies (NASSCOM). The study was limited to IT services and Software product companies. The target respondents were software industry practitioners i.e. software engineers, analysts, project managers, R&D managers, CTO, CEO, etc. Non-probability purposive sampling was used for data collection. The data was collected through a questionnaire developed from the depth interviews with software professionals and by exploring existing scales of innovation in literature, including The Innovation Audit tool by Chiesa(1996),Inventory of Organizational Innovativeness by Tang (1998) Oslo Manual: Guidance for Collecting Innovation Data (OECD), CENTRIM innovation tool (McAdam et al., 2004) and the Business Excellence Model for small businesses (EFQM,2005). Wide range of items based on five point Likert scale were extracted. The content validity of the survey was established by grounding it in the existing literature. The initial scales were then tested and refined via a pilot study. A multi-disciplinary consultant team, involving the four academics and eight software professionals were consulted to investigate the comprehensiveness, appropriateness, and possible overlap of the items. Finally, total 24 items based on five point likert scale anchored from strongly disagree to strongly agree were considered in the study. Technology orientation consists of seven items in responses to survey questions relating to advanced technological position, adoption, training to employees and R&D budget. Innovative strategies consist of seven items relating to strategic planning about marketing techniques, competitors and future benefits. Firms' financial performance within a three-year time period was measured using an ten -item scale in responses to survey questions about performance measures including sales, profits, turnover and market share(refer questionnaire in annexure). Data was collected online through a link to questionnaire which was mailed to software companies registered with NASSCOM in India. The mail clearly mentions the purpose and objectives of the study. After several follow-up through e-mails and phone calls, a total of 254 responses were received. The reliability of the questionnaire was assessed by cronbach alpha test and was found to be 0.939. The alpha value of construct technological orientation construct was 0.943, innovative strategies construct was 0.937 and that of firms performance construct was 0.845. All the values were found to be greater than the threshold value of 0.7.The data was then subjected to correlation and multiple regression analysis.

Statistical Analysis And Results

Correlation Matrix

The Karl Pearsons correlation coefficient between technological orientation and firm performance was found to be 0.621 which is significant at 0.01 level. The correlation coefficient between innovative strategies was 0.444 significant at 0.01 level. The correlation matrix provides initial support for the hypothesis that firms performance is positively related to innovation capability constructs technological orientation and innovative strategies.

Multiple Regression Analysis

Assumptions Of Multiple Regression Analysis

Outliers And Normality Of Variables

Casewise examination using Mahalanobis distance and Cook's distance was done to remove the outliers. Eleven cases with a Mahalanobis score greater than 5.99 (critical chi-square value with two degree of freedom at 0.05 level) were found as an outliers and were not considered in the analysis. Regression assumes that variables should have normal distributions. Non-normally distributed variables (highly skewed or kurtotic variables, or variables with substantial outliers) can distort relationships and significance tests.). Histograms and P-¬P plots were used to examine the normality of the residuals. Figure 1shows the P-¬ P plot for our model. The dots hover fairly close to the diagonal line indicating normality in the residuals. The normal curve in histogram further confirms the normality of data (refer figure 2).

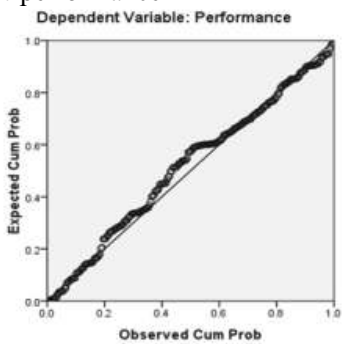

Figure 1 Normal P-P plot of Regression standardized Residuals

Linearity And Homoscedasticity

Linearity and Homoscedasticity are important assumptions of multiple regression to be examined. Standard multiple regression can accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature. If linearity is violated all the estimates of the regression including regression coefficients, standard errors, and tests of statistical significance may be biased (Keith, 2006).

Homoscedasticity means that the variance of errors is the same across all levels of the independent variables. When the variance of errors differs at different values of the independent variables, heteroscedasticity is indicated. According to Berry and Feldman (1985) and Tabachnick and Fidell (2001), slight heteroscedasticity has little effect on significance tests;

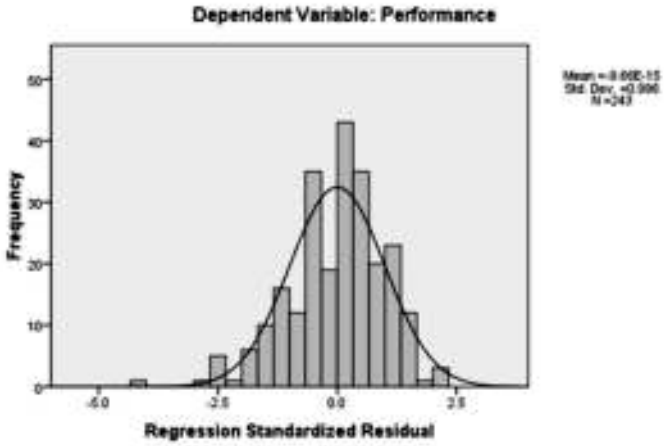

Figure 2 Histogram

however, when heteroscedasticity is marked it can lead to serious distortion of findings and seriously weaken the analysis.

Heteroscedasticity and non -linearity is examined using a plot of standardized residuals against standardized predicted values. This graph should look like a random array of dots and if the graph funnels out then that is a sign of heteroscedasticity and any curve suggests the existence of nonlinearity. The scatter diagram is represented in figure 3. It can be observed that the points are randomly and evenly dispersed throughout the plot. This pattern is indicative of a situation in which the assumptions of linearity and homoscedasticity have been met.

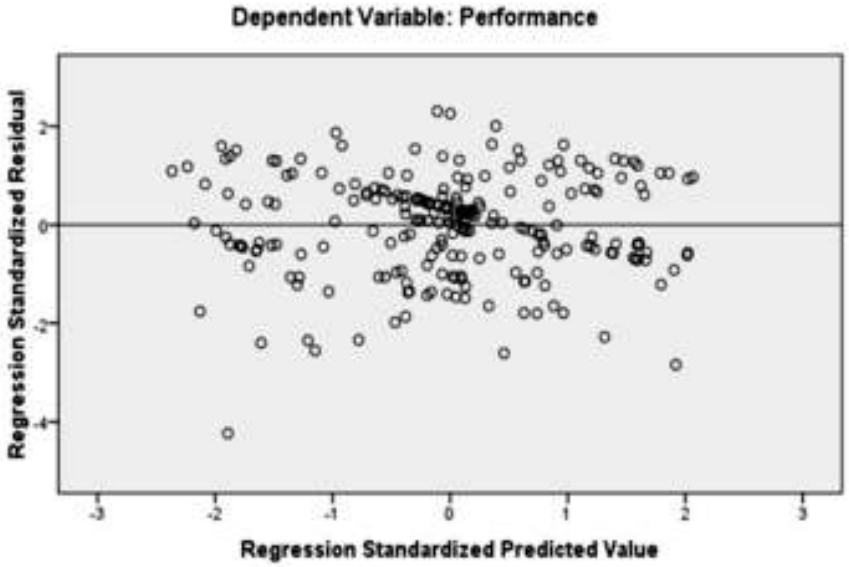

Figure 3 Scatter Plot

Independence Of Errors

The Durbin-Watson value informs about whether the assumption independence of errors is defensible i.e there is no autocorrelation of error terms. The D-W value from 0-4 is acceptable and closer to 2 is better and in this study the statistic is 2.207 (refer annexure 1-Model summary). The statistic value confirms that the assumption of independence of errors is tenable.

Multicollinearity

Another important assumption is multicollinearity which occurs when two or more independent variables in the study are highly correlated with each other. This leads to problems with understanding which independent variable contributes to the variance explained in the dependent variable, as well as technical issues in calculating a multiple regression model. Statistical software packages include collinearity diagnostics that measure the degree to which each variable is independent of other independent variables. The Tolerance Value and Variance Inflation Factor (VIF) help in detecting multicollinearity. The Tolerance Value of technological orientation and firm performance was 0.763 and the Variance Inflation Factor (VIF) was 1.1310 (refer annexure 3-coefficients). When the tolerances are close to 0, there is high multicollinearity and the standard error of the regression coefficients will be inflated. Variance Inflation Factor (VIF) greater than 3 is usually considered problematic. In the present study, the values are in acceptable region and thus, indicate no multicollinearity.

Model Summary

The stepwise multiple regression analysis was run using SPSS (Statistical Package for services and solutions) 16.0 version. The innovation capability constructs technological orientation and innovative strategies were considered as independent variables or predictors where as the firm performance is considered to be independent variable. The regression model produced R square of 0.351which was statistically significant with F value 64.877, df (2, 240) and $p<0.05$ (refer annexure 1-Model summary). The results indicate that technological orientation and innovative strategies can account for 35.5% of variance on firm performance. The results of regression analysis are shown in the annexure. Since all the assumptions of multiple regression analysis are confirmed thus our model is acceptable and can be used for future predictions.

Results And Discussion

The beta value (standardize coefficients β) of technological orientation was 0.499 ,t=2.669 and $p<0.05$ (Annexure 3). The hypothesis H_1 is accepted which confirms that technological orientation exhibits positive significant relation with firm performance. Technologically-oriented firms devote their resources to acquiring new and advanced technologies and developing new processes, products and services, although, the rate of technological changes within the software industry might affect their technological adoption and/or development Gao et.al.(2007). Gatignon and Xuereb (1997) also found positive relationships between technology orientation and business performance in their study. The importance of technology orientation to innovation has been long recognized, but the relationship between technology orientation and business performance has been given only minimal attention in the literature (Humphreys et.al, 2005; Voss and Voss, 2000). Firms that have a high technology orientation gain better business performance when technology changes rapidly because they are able to introduce new processes, products and services to satisfy customer needs (Hamel and Prahalad, 1994). Technologically-oriented firms that combine customer-value innovation with technological innovation have an increased chance of enjoying sustainable profit and performance (Gatignon and Xuereb,1997).

The standardize coefficients β for Innovative strategies was 0.159, t=8.377 and $p<0.05$ (annexure 3). The hypothesis H_2 is accepted which confirms that Innovative strategies exhibits positive significant relation with firm performance. The results are supported by studies of Forbes and Seena (2006), Mazzarol, et. al.(2009), and Kantabutra (2008) confirm that a business mission and vision statement enhances business performance as it guides in decision-making, and motivates and inspires personnel. A study by Dincer et al. (2006) on strategic planning of Turkish firms confirms the importance of time horizon of strategic planning in contributing to business performance. Kraus et al. (2006) affirms that formalised strategic plans help a business to achieve goals and to grow.

Conclusion

This study examines the impact of the technology orientation and innovative strategies on the business performance of Indian software companies. The findings of the study support both the hypotheses and reveal that technology orientation and innovative strategies has a significant positive effect on business performance. Based on the findings, a number of outcomes can be offered regarding the role of technology orientation, innovative strategies and firm performance within the software companies. It is important for a firm to evaluate their competitive strategies and incorporate innovation at the organizational level and in their activities in order to achieve better business performance (Vossen,1998). A firm can use different technologies to internally create a new and better process, product or service for the market that it is centered on the innovation outcomes (Myers and Marquis,1969).

Firm performance is related to the ability of the firm to gain profit and growth in order to achieve its strategic objectives. Software industry has a different structure as compared to

other industries, product design and development is an important topic for this industry. According to the result, technological orientation is more effective factor of firm performance. The support of technology in innovation activities of the firms play important role in improving their financial performance. Innovation capability is the result of the interplay between actions taken in relation to competitive forces that allow the firm to adapt to the external environment, thereby integrating the efficiency and effectiveness. Innovative strategies provide firm more flexible organizational structure that facilitate. Innovative firms focus on future customers and potential competitors. The strategies of firm must be future oriented to sustain the success. Firm's innovation performance depends on the opportunities provided by their external environment. Innovation capability can be used as a tool to achieve better business performance.

Managerial Implications

The results conclude that increased practices of innovative strategies leads to high level of firm's financial performance. Managers of software companies need to be aware of technological changes within their industry in order to be actively involved in new product, service and process developments to innovate and survive in a changing market environment. Innovation that brought changes to the local market resulted in more economic benefits for the firms. So, managers of software companies can enhance their business performance by considering technological orientation and innovative strategies.

Limitations

The research study is limited to a few facets. Illustrating these limitations will benefit future studies, when used as guidance. First, this research was based on software firms, and design of research, analysis, results and interpretation were realized by taking into account characteristics of software sector. Findings of this research could be a guide to studies, that will be made in other sectors. Taking into account other variables may affect the results. Also this study explains 35.5% of variance that belong to firm performance. This study only considered two factors namely technological orientation and innovative strategies and therefore advises that other characteristics of innovation capability should be determined and their effects on firm performance should be explored in future researches. Thirdly, the model needs to be tested on a larger dataset. With more than 500 software service companies of various specializations, sizes and turnover in India spread across the Indian sub-continent, dataset can be further increased to garner better results.

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Annexures

Annexure 1: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.592[a]	.351	.346	.41955	2.207

a. Predictors: (Constant), TechOrt, Innovstg
b. Dependent Variable: Performance

Annexure 2: ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	22.840	2	11.420	64.877	.000[a]
	Residual	42.245	240	.176		
	Total	65.085	242			

a. Predictors: (Constant), TechOrt, Innovstg
b. Dependent Variable: Performance

Annexure 3 :COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.030	.206		5.013	.000		
	Innovstg	.134	.050	.159	2.669	.008	.763	1.310
	TechOrt	.619	.074	.499	8.377	.000	.763	1.310

a. Dependent Variable: Performance

Annexure 4: Questionnaire

(Strongly Disagree(SD)=1, Disagree(D)=2 ,Neutral(N)=3, Agree (A)=4, Strongly Agree(SA)=5)

Items	Details	SD	D	NS	A	SA
	Technological Orientation	1	2	3	4	5
TO1	A formal innovation framework is adopted for development of new products/services /processes.					
TO2	Training is provided to the employees for developing new or substantially changed products / services/ improved processes/methods.					
TO3	Advanced technology is used to develop new products/services/processes.					
TO4	New technologies are integrated rapidly.					
TO5	There is a tie up with the leading technology vendors.					
TO6	A dedicated budget is spent on R&D activities.					
TO7	Effect of change in the environment due to new technology is periodically reviewed.					
	Innovative Strategies					
IS1	Strategic allian ces are formed with other organizations for future benefits.					
IS2	Potential products that will provide competitive superiority in the future are explored.					
IS3	Strategies are flexible enough to respond to changes in the environment.					
IS4	Proactive in introducing new product in the market					

IS5	Innovative marketing techniques are adopted for promotion.					
IS6	Pre-development market and feasibility studies are rigorously undertaken.					
IS7	Project propo sals are tested for alignment with organizational goals.					
	Firm Performance					
P1	In last three years market share of the firm has been increased.					
P2	In last three years profit margins have been increased.					
P3	In last three years sales have been improved.					
P4	In last three years relationships with customers and business partners have been improved.					
P5	In last three years skills and qualifications of the employees have been enhanced.					
P6	In last three years turnover of company has been increased.					
P7	In last three years range of goods or services has been increased.					
P8	In last three years the quality and flexibility of goods and services have been improved					
P9	In last three years brand value of my firm is raised.					
P10	In last three years outdated products or processes are replaced by improved ones.					