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The Effects of Technological Innovation Capabilities on Performance Outcomes in Iran Khodro

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ABSTRACT

Purpose –The purpose of this paper is to examines the effects of different dimensions of TIC on innovation performance by providing a framework to describe these dimensions.
Design/methodology/approach – This paper is based on focused and dedicated study of the literature present on technological innovation capabilities. Data for this study were collected from managers at Iran Khodro Company. Pearson correlation and regression analysis were used to examine the correlation between TIC and innovation performance.
Findings – The paper finds that Learning capability, R&D capability, marketing capability, and strategic planning capability can significantly improve innovation sale and largely enhance learning capability as well as capability of producing performance for those products that are manufactured or improved through innovation.
Research limitations/implications – This study is based on only a single case study. In addition, a great deal of time was spent to reach managers and collect required information. Another limitation was reluctance of some senior managers of companies, for different reasons, to participate in the study.
KEYWORDS: Technological innovation, Technological Innovation Capabilities (TIC), Technological Innovation Performance.

1- INTRODUCTION

Organizations, customers, employees and shareholders are always expected to try to improve performance. Furthermore, past competitive advantage can guarantee survival in future. Therefore, to survive in today's ever-changing competitive markets, companies are required to modify their procedures and strategies. In fact, today innovation is considered a competitive advantage for firms and organizations. Today's world is experiencing increasing complexity, constant and fast changes, growing technology, and close competitions between organizations and industries. To adapt to these changing complexities and to guarantee their survival, organizations need to make changes in structure and technology and offer new products and services provided through innovation and entrepreneurship. Undoubtedly, innovation is among the strategic means available to a company. To a large extent, innovation is related to a firm's capabilities and abilities in acquiring novel knowledge through learning. Innovation has always played a critical role in long-term prediction of organization survival, successful decision making in an organization, and keeping the pace with global competition. Innovation has always played a critical role in predicting the long-term survival of organizations, in determining an organization's success and sustaining its global competitiveness. Extensive researches in innovation management had descriptive linked innovation with competitive and economic outcomes at national level (Lau et al., 2010).

Today, automotive industry has been considered as one of important factors of industrial development in many countries. The increasing taste change of customers, automotive safety, fuel consumption, and other subjects cause to most famous auto makers utilize technological innovation as golden key to preserve it and survive in competitive market and they select this process as its main procedure to release the market challenge. Since decade 1980 , more open automotive market in Iran and cancellation some import bans and entering some kinds of more qualitative and modern cars into the country leads the automotive market in competitive path. The only solution for surviving in regional, global and even national markets is to use technological innovation in accompanies with customers and market needs. Then it can be concluded that the success of auto makers in century 21 is related to using innovations and accurate anticipation in automotive market. In order to use the maximum of technological innovation in organization, the process of technological innovation must be managed carefully. In this aspect, it is important to know different technological innovations and the effect of these dimensions on outputs and innovation outcomes in corporation.

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The present study describes various aspects of technological innovation and explores their effects on two dimensions of innovation performance on of Iran Khodro Company ('product performance' and 'sales growth').

2- LITERATURE REVIEW

2-1- A study framework for innovation audit

According to Grant (1996), Innovation is far more important than land, physical capital, or labor in a knowledge-based economy, and is the dominating factor affecting different economic growth and development in nations(Tseng , 2009).

Various researchers have adopted different ways of classifying innovation. Robbins (1996) noted that organization innovation can be applied to the improvement of products, services, and processes; organizational innovation thus encompasses product innovation, the development of new production process technology and the adoption of new management systems. Oldham and Cummings (1996) also held that successful execution in the form of products, processes, and services can be considered to constitute organizational innovation. Carter and Jennings (2002) defined innovation as technology-based inventions, driven by the emergence of new markets or new service opportunities. Naver and Slater (1990) pointed out the connection between successful innovation and market-oriented behavior. Atuahene-Gima (1996) confirmed that new product innovation was correlated with market-oriented behavior. Researchers have divided innovation into a wide range of different dimensions, including product innovation, process innovation, technological innovation, organizational innovation, market innovation, and service innovation (Ko and Lu, 2010).

Cooper (1980) suggested three variables which are related to the context of innovation—the nature of the product, the market environment and the existence of potential product–technology synergy. Rothwell (1992) provided a good summary of key factors that emerged in many innovation management studies, which are highlighted below.

- Good internal and external communication.
- Treating innovation as a corporate wide task.
- Implementing careful planning and project control procedures.
- Efficiency in development work and high quality production.
- Strong market orientation.
- Providing good technical service to customers.
- Presence of certain key individuals as technological gatekeepers.
- High quality management(Yam et al ,2004).

Cooper (1996), noted that there were three critical success factors for drivers of new product performance:

- High quality new product process.
- Adequate resource commitment.
- A clear and well-communicated new product strategy.

Various researchers and institutions adopted various components to audit a firm's TICs. For instance, the innovative capabilities audit framework proposed by Burgelman et al. in 1988 (2004) included five audit dimensions:

- Resource availability and allocation.
- Capacity to understand competitor's innovative strategies and industry evolution.
- Capacity to understand technological developments.
- Structural and cultural context.
- Strategic management capacity (Yam et al ,2004).

According to Christensen (1995) , TICs classified to science research, process innovation, product innovation and esthetics design assets.

2-2- Technological innovation

Afuah and Bahram (1995), regard that technological innovation involves three uncertainties, namely, technological, market and enterprise-based uncertainties. There are numerous sources of uncertainty, and ambiguities are embedded within each phase of the technological innovation process (Cheng and Lin , 2012).

Cohen and Levinthal (1989), proposed that technological innovation can be conceptualized as a learning and utilization process. Hamel and Prahalad in (1990) also proposed that Firms can reinforce their technological innovation capability by importing technologies and then diffusing, assimilating, communicating, and absorbing them into their organizations. Teece et al. (1997) also ascertained that the ability of a firm to acquire, utilize, and develop valuable resources and capabilities is largely related to its acquisition of knowledge external to the firm and its integration of such knowledge with the firm's own (Yam et al., 2011).

According to Grant (1996) , Technological innovation can circumvent entry barriers and help firms to innovate to keep pace with the latest ideas. Similarly, if a country failing to innovate, it may be left as competitors devise more advanced and more marketable products (Tseng ,2009).

2-3- Technological innovation capabilities (TIC_s)

Technological innovation Capabilities (TCs) are dynamic resources which encompass the skills, knowledge and routines involved in generating and managing technological change, whether they concern production activities, investment activities, or relation with other firms (Albu , 1997) .Technological innovation capability (TIC) is defined as a comprehensive set of characteristics of a firm that facilities and supports its technological innovation strategies. An audit to evaluate the TICs of a firm may trigger improvement in its future practices. Such an audit can be used by the firm for self assessment or third-party independent assessment to identify problems of its capability status (Lau et al ,2010) .

Burgelman et al, (2004) defined TICs as a comprehensive set of firm characteristics that facilitate and support the firm's technological innovation strategies (Yam et al., 2011). These capabilities are important for the firm's continuous improvement (Cheng and Lin , 2012).

Technical innovation is a process, which is from a new concept, and then research development, engineering design, production and marketing, etc. Therefore, the technological innovative capabilities of enterprises not only depend on the internal research and development department, but also depend on the manufacture, marketing and financial management department, etc. Especially the effective cooperation between research and development sector, manufacturing sector and marketing sector is the key to improve the technological innovative capabilities (Peng, 2011)

TICs are a kind of special assets or resources that include technology, product, process, knowledge, experience and organization. Improving TICs can be beneficial to a firm and leads to enhanced competitiveness. For instance, Lawless and Fisher (1990) argue that successful new product introductions can provide the potential for firms to gain market position and realise more longer term returns than would otherwise be possible. Evangelista et al. (1997) regard R&D activities as a central component of the technological innovation activities of firms and as the most important intangible innovation expenditure (Yam et al ,2004).

In our study, The measurement scales of TIC were adopted from Guan and (Guan, Ma , 2003) and (Lau et. al. 2010). Thus, an innovation audit framework for evaluating a firm's innovation performance and competitiveness is shown in Figure 1.

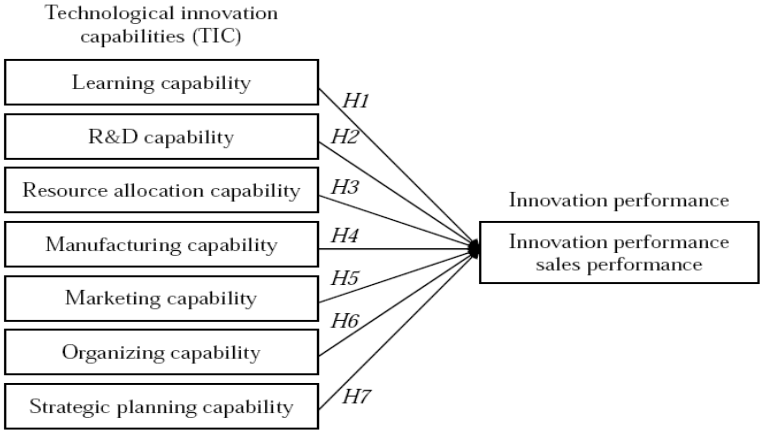

Figure 1. The framework measured TIC in seven dimensions

The functional approach used by these two studies has the advantage of easy to understand. The seven capability dimensions are described as follows.

● Learning capability is a firm's ability to identify, assimilate, and exploit knowledge from the environment.

●R&D capability refers to a firm's ability to integrate R&D strategy, project implementation, project portfolio management, and R&D expenditure.

●Resources allocation capability is a firm's ability to acquire and to allocate appropriately capital, expertise and technology in the innovation process.

● Manufacturing capability refers to a firm's ability to transform R&D results into products, which meet market needs, accord with design request and can be manufactured.

● Marketing capability is a firm's ability to publicize and sell products on the basis of understanding consumer needs, the competitive environment, costs and benefits, and the acceptance of the innovation.

● Organizing capability refers to a firm's ability in securing organizational mechanism and harmony, cultivating organization culture, and adopting good management practices.

● Strategic planning capability is a firm's ability to identify internal strengths and weaknesses and external opportunities and threats, formulate plans in accordance with corporate vision and missions, and adjusts the plans for implementation (Yam et al ,2004).

The indicators of these seven innovation capability dimensions are shown in Appendix A.

2-4- Technological innovation performance

After reviewing the literatures about TIP for performance indicators were found to be appropriate: sales performance, innovation performance, product performance and sales growth. Except product performance, the other three measurement scales were also used in different innovation studies . Sales performance, innovation performance and sales growth were each measured by a single item while product performance was measured by multi-items.

We follow existing literature (Yam et al., 2004;OECD, 1997) to use two innovation performance indicators in this study are Product performance and sales performance.

●Sales performance is measured in terms of the average annual sales growth rate over the last 3 years. Sales growth rate represents one dimension of a firm's market advantage. It shows whether the innovation has had market impact or been financially successful (Lau et al., 2010).

●Product performance is another dimension of a firm's market advantage. Product competitiveness is a portfolio concept encompassing various aspects, such as average concept-to-launch time, programming product series, quality level, cost, analysing market competitive intensity, market need and growth potential, technology characteristics, product manufacturing process, and price/function advantage. It is believed that most TICs could be associated with product competitiveness (Yam et al., 2004). Product performance relates to the competitiveness of a firm's new products.

3- RESEARCH HYPOTHESES

Following Lau et al, (2010) approach, this paper proposes seven hypotheses between each TIC and innovation performance. The findings of the study thus test the relationship between TIC and innovation performance with better theoretical background.

Learning capability and innovation performance: Learning capability was defined as the capacity to generate ideas with impact, across multiple boundaries, and through specific management initiatives (Yeung et al., 1999); the ability of an organization to learn the lesson of its experience and to pass those across boundaries and time (Ashkenas et al., 1995). Learning is one of the most valuable assets that provides sustainable competitive advantage and a key element for access, acquisition, and development of new knowledge from external boundaries (Caloghirou et al., 2004). Many literatures have reflected that firm-level technological advancement is conceptualized as a learning process. Learning results in generation of knowledge and skills needed for firms to choose, install, operate, maintain, adapt, improve, and develop technologies (Lall, 1992). Freeman (2002) argues that the innovative performance is closely related with active learning. Leonard-Barton (1992) The capacity to sustain innovation has found to be associated with organization learning (Lau et al., 2010) . Thus, the following hypothesis is proposed:

H_1. Learning capability is positively related to technological innovation performance.

R&D capability and innovation performance: R&D capability is defined as a firm's ability to integrate R&D strategy, project implementation, and R&D expenditure. In general, R&D activities are being regarded to closely relate to innovation as R&D aim at creating something new. Evangelista et al, (1997) regards R&D activities as a central component of the technological innovation activities of firms. (Jacobsson et al., 1996) In fact, many innovation studies employed R&D inputs as the indicators of technological innovation activity level, such as R&D budget , existence of formalized R&D in the company and participation in R&D projects with other organizations (Flor and Oltra, 2004). Therefore, R&D is considered to be a key part of innovation activities. Caloghirou et al. (2004) found that the higher the level of the R&D efforts and training within a firm is, the more the firm will be able to create and exploit novelty. Bougrain and Bernard (2002) found that R&D capacities would enhance the firm's ability to cooperate and carry innovation projects to success. Many researchers also argue that the intensity of R&D was strongly associated with innovation (Lau et al., 2010). Based on the above discussion, we propose that:

H_2. R&D capability is positively related to technological innovation performance.

Resource allocation capability and innovation performance. Resource allocation capability is defined as a firm's ability to mobilize and expand its technological, human, and financial resources in the innovation process. Resource is always a critical factor for all kinds of activities and processes. Evangelista et al. (1997)

proposes that technology resources are going to increase its importance as a strategic factor for firm's performance in near future. Human resources are other crucial issues for innovation performance. Jacobsson et al. (1996) put forward the use of statistics on company staff with higher education in engineering and science as a technological innovation performance indicator. In addition, technological innovation activities cannot be carried out if there is no support of finance. Italian survey found that the major obstacles for introducing technological innovation are of an economic nature (i.e. lack of appropriate sources of finance, and cost of innovation is too high). A few studies also found that resource allocation capability enables firm to sustain global competitiveness (Lau et al, 2010). Therefore, we propose the following hypothesis:

H_3. Resource allocation capability is positively correlated with technological innovation performance.

Manufacturing capability and innovation performance:

Manufacturing capability is defined as a firm's ability to transform R&D results into new products which meet market needs, and to attach importance to overall quality control and continuous improvement of manufacturing systems. Technological innovation is the transformation of an idea into a new or improved saleable product or operational process in industry or commerce (OECD, 1997). Following this definition of innovation, successful innovation involves the saleable product. An outstanding and creative R&D output alone cannot lead to good innovation performance. It must be processed by manufacturing in the innovation process. The capacity of manufacturing may not only guarantee the success of the transformation of R&D outcome into product, but also ensure its quality suits customer's needs. Evangelista et al. (1997) found that most of the manufacturing firms in Italy rely on the investment in manufacturing machinery as the most important innovation source and the improvement of product quality is a key element in Italian manufacturing firm's innovation strategies, all of which aimed at enhancing innovation performance through advancing manufacturing capability.

Besides, some researchers found that the intensity of quality control is strongly correlated with innovation (Zairi, 1996) and manufacturing capability was found to be effective in enhancing firm's competitive advantage (Lau et al., 2010). Thus, the following hypothesis is proposed:

H_4.Manufacturing capability is positively related to technological innovation performance.

Marketing capability and innovation performance:

Marketing capability indicates a firm's capacity to publicize and sell the products on the basis of understanding consumer's current and future needs, customer's access approaches, and competitors' knowledge. For a new product to hit the targeted customers, it is essential for the firm to be capable of keeping connected with the market in order to promote new products and to understand customers' needs and their feedbacks of the products. The OSLO manual has identified marketing as a key innovation activity (OECD, 1997). Various authors have found that innovation was positively associated with acquisition and scan of market information (Tidd et al., 2001), effective marketing programs (Cooper, 1984) and broad distribution systems (Maidique and Zinger, 1984). The rate of technological innovation was also associated with marketing competency (Lau et al., 2010). Hence, we propose that:

H_5. Marketing capability is positively correlated with technological innovation performance.

Organizing capability and innovation performance:

Organizing capability is defined as a firm's ability in securing organizational culture and adopting good management practices. Ability to manage internal cooperation among departments and external communication with suppliers and customers are also included. Wan et al. (2003) indicated that innovation is positively correlated with organizational structure and culture. Interactions with customers and suppliers are thought to be beneficial to innovation (von Hippel, 1988; Lundvall, 1988). Some researchers, such as Rothwell (1992), Rogers and Shoemaker (1971), and Burns and Stalker (1961), have identified a positive association between internal communication and technological innovation. The researchers found that, the more the firm uses formal mechanisms to scan external information and cooperate with external organization, the more is its openness to external sources of knowledge with successful innovative performance (Caloghirou et al., 2004). Souitaris (2002) argued that a firm's ability to communicate with the stakeholders, develop external networks, formulate interdepartmental teams working on innovation projects, and work on internal communication system is associated with technological innovation performance(Lau et al., 2010). Hence, the following hypothesis is proposed:

H_6. Organizing capability is positively associated with technological innovation performance.

Strategic planning capability and innovation performance:

Strategic planning capability is defined as a firm's ability to identify internal strengths and weaknesses and external opportunities and threats, and to formulate plans in accordance with corporate vision and missions. Strategic management literature views strategy as a network of choices to position the firm according to its

environment. Porter (1990) made a major contribution to the analysis of innovation on corporate strategy. His approach implies that managers have to analyze the internal and external environment and, based on this analysis, to determine a definite course of action. Cooper (1984) identifies an association between corporate strategy and innovation performance. Well-defined business strategies as well as plans for new technology were found to be positively correlated with innovation rate (Swan and Newell, 1995; Rothwell, 1992). Owing to its significant effect, Souitaris (2002) includes this strategic planning capability in his model of innovation(Lau et al., 2010) . Therefore, we propose that:

H_7. Strategic planning capability is positively correlated with technological innovation performance.

4- METHODOLOGY

4-1- Research Goal

In this survey, which is the result of a study in an industrial firm, attempts to analyze the effects of different dimensions of TIC on innovation performance by providing a framework to describe these dimensions. The study is a survey based on data collected through questionnaires. Statistical techniques were used to test the hypotheses.

4-2- Sample and Data Collection

To completely understand the concepts and identify dimensions and components of the hypotheses, we reviewed the literature and interviewed experts, professors, and managers at different levels (free directive interviews). The questionnaires were designed based on the previous studies, OECD (1997), literature review, and operational system at the company studied here. Several measures were used for each dimension of TIC; for example, 8 items were assigned to learning and 11 items were used for R&D (see the table in Appendix A). The respondents were asked to score 61 TIC variables based on the following chart:

	Totally agree	Agree	Some how agree	No comment	Some how disagree	Disagree	Totally disagree
Score	7	6	5	4	3	2	1

We used Cronbach's alpha to determine reliability of the questionnaire. The value of 90% confirmed reliability of the questionnaire (See Appendix I). The statistical population was consisted of 36,000 managers in Iran Khodro. Since gaining access to all of these managers was costly in terms of time and expenses, we selected a sample consisting of 120 managers through simple random sampling. In addition, the respondents were asked to give their opinions on sales performance and product performance created by innovation in existing products or manufacturing innovative products (See Appendix B).

5- ANALYSES AND RESULTS

To test the hypotheses, we first employed descriptive statistics (*e.g.* mean value, standard deviation, min and max) for each dimension of TIC and assessed two dimensions, namely sales performance and product performance). Table I shows the results obtained through descriptive statistics.

Table I . result of descriptive statistics

dimension of TIC & innovation performance	Mean	SD	Min	Max
Learning capability	4.554	0.733	2.38	6.38
R&D capability	4.3	0.699	2.09	6.09
Resource allocation capability	4.319	0.764	2	6.57
Manufacturing capability	4.438	0.769	2.14	6.57
Marketing capability	4.258	0.702	2.64	6.45
Organizing capability	4.297	0.684	2.3	6
Strategy planning capability	4.11	0.785	2.29	6.86
sales performance	3.89	1.644	1	7
product performance	4.78	1.486	1	7

Next, to determine the dependence of each dimension of TIC on product performance and sales growth, we obtained Pearson correlation coefficients shown in Table II. As seen in the table, sales growth is correlated to R&D capability, resource allocation capability, and marketing capability at 0.01, and to organizational capability at 0.05. Correlations are shown in the table; for example, coefficient for correlation between D&R and sales growth is 0.39 at 0.01. The table also indicates that product performance is correlated to learning capability, R&D, and production capability at 0.01 and to resource allocation capability, marketing capability, organizational capability, and strategic planning capability at 0.05.

Table II . Correlation analysis on the relationship between TIC and innovation performance

Technology innovation capabilities	Innovation performance	
	product performance	sales performance
(H1) Learning capability	0.46**	0.004
(H2) R&D capability	0.24**	0.39**
(H3) Resource allocation capability	0.23*	0.28**
(H4) Manufacturing capability	0.5**	0.18
(H5) Marketing capability	0.23*	0.36**
(H6) Organizing capability	0.22*	0.23*
(H7) Strategy planning capability	0.20*	0.12

* P < 0.05
** P < 0.01

We used regression to examine the effects of dependant variables on independent ones (testing hypothes) .

Table III. Regression analysis of TIC and innovation performance

	Innovation performance	
Technology innovation capabilities		
	Regression coefficient (b)	Regression coefficient (b)
	product performance	sales performance
(H1) Learning capability	0.295**	0.237
(H2) R&D capability	ns	0.429**
(H3) Resource allocation capability	ns	ns
(H4) Manufacturing capability	0.493**	ns
(H5) Marketing capability	ns	0.391**
(H6) Organizing capability	ns	ns
(H7) Strategy planning capability	ns	0.395**
F	7.682**	6.756**
R	0.57	0.545
R^2	0.324	0.297
Adjusted R^2	0.282	0.253

** P < 0.01
ns, not significant

The results are shown in Table III. R&D capability, marketing capability, and strategic planning capability have positive effects on sales growth for those products improved or produced through innovation (R^2 = 0.324). In addition, learning capability and production capability positively influence performance for those products improved or produced through innovation (R^2 = 0.297).

Table III indicates a direct relation between the two dimensions of TIC (product performance and sales growth) and learning capability, R&D capability, marketing capability, strategic planning capability, and production capability. Therefore, H_1, H_2, H_4, H_5, and H_7 are confirmed while H_3 and H_6 are rejected. It is worth noting that among the various TIC dimensions, R&D capability (b=0.429, p<0.01) has the most significant effect on growth sales for those products improved or produced through innovation while production capability (b=0.429, p<0.01) has the most significant effect on production performance for those products improved or produced through innovation.

6- CONCLUSION

6-1- Conclusion

The findings so far reveal that R&D capability, marketing capability, and strategic planning capability at level of 0.01 had positive effects on growth sales for those products improved or produced through innovation. Based on the β coefficients, and with respect to their effects on sales growth, the capabilities can be orders as follows: R&D capability (b=0.429, p<0.01), strategic planning capability (b=0.395, p<0.01) and finally marketing capability (b=0.391, p<0.01).

However, in relation with the other dimension of TIC studied here (innovation performance), R&D capability is effective at 0.01, and based on the β values the most effective factor is production capability (b=0.493, p<0.01) followed by R&D capability (b=0.295, p<0.295).

6-2- Suggestions for future research

Since automotive industry is considered as one of important factors of industrial development in many countries and this matter has more priority in developing countries, the following recommendations are offered for future researches:

● assess the effect of different dimensions of technological innovation on other dimensions of innovation in automotive companies.

● Perform this research in different industries and industrial clusters.

●Compare the results of this research in other automotive industries in country.

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Appendix A. List of auditing elements of TICs

Variables	Mean	SD	a, if item deleted
Learning capability			
Systematically monitoring technology development trends.	5.47	1.314	0.9
Capacity to assess technologies relevant to firm's business strategy.	4.78	1.486	0.9
Work teams encouraged to identify opportunities for improvement.	4.68	1.646	0.9
Understanding firm's core competencies and matching technological capabilities to market needs.	4.48	1.64	0.91
Learning the lessons of experiences.	4.26	1.47	0.91
Cultivating learning readiness and investing on learning.	4.31	1.555	0.9
Paying attention to tacit acknowledge	4.18	1.582	0.9
Learning from past experiences and failings	4.28	1.518	0.9
R&D capability			
Application of advanced designing methods, such as reengineering	5.24	1.495	0.9
Quality and speed of feedback from manufacturing to design and engineering.	4.37	1.539	0.91
Mechanisms for transferring technology from research to development.	4.67	1.6	0.9
Has high Level of investment in new products.	4.28	1.456	0.9
Has high Level of investment in new processes.	4.32	1.489	0.91
R&D personal as percentage of firm's total employment.	3.77	1.633	0.91
Communication between R&D department and marketing department	3.89	1.644	0.91
Choosing special personal or building organization to collect various innovation ideas	3.98	1.66	0.9
Your company has great extent of market's and customer's feedback into innovation process	4.17	1.53	0.9
Establishing project targets, phases standard and pro	4.45	1.407	0.9
Linking the R&D plan to the corporate plan and technology capability	4.17	1.422	0.9
Resources allocation capability			
Programming human resource in phases	4.98	1.366	0.9
Predicting new technology trends	4.48	1.216	0.91
Adapting self-technology level according to changes in the external environment	4.61	1.404	0.9
Making fully use of external technologies	4.28	1.443	0.9
Understanding competitors core technology competence.	4.26	1.596	0.9
Steady capital supplement in innovation activity	3.73	1.521	0.9
Attaching importance to human resource	3.9	1.344	0.9
Manufacturing capability			
Adjusting production process according to the requirement of R&D process designing.	5.13	1.577	0.9
requirement of R&D process designing.	4.41	1.492	0.91
great extent which is continuously improve manufacturing system.	4.82	1.478	0.9
effectively applied advance manufacturing methods.	4.52	1.512	0.9
Contribution of the manufacturing department during the initial phase of the innovation process.	4.18	1.512	0.9
Level of importance attached to overall quality control.	3.81	1.374	0.9
high degree of manufacturing cost advantage.	4.19	1.579	0.9

Marketing capability			
Relationship management with major customers.	4.71	1.595	0.9
Knowledge of different market segments.	4.058	1.395	0.9
Performance of after-sales services.	4.45	1.6	0.9
Effectiveness of the marketing intelligence system.	4.19	1.557	0.9
Tracking customer satisfaction level.	4.33	1.626	0.9
Maintenance of brand image and corporate image.	4.06	1.393	0.91
systems of effective marketing.	4.02	1.58	0.9
high sales-force efficiency.	4.3	1.616	0.9
introduse of brand image.	4.17	1.518	0.9
Controlling and managing distribution network.	4.38	1.41	0.9
Understanding subdivided market.	4.17	1.428	0.9
Organising capability			
Ability to handle multiple innovation projects in parallel.	5.09	1.478	0.91
Coordination and cooperation of R&D, marketing and manufacturing.	4.37	1.529	0.9
good communication with major suppliers.	4.42	1.394	0.9
Mechanisms to track progress of innovation projects.	4.44	1.448	0.9
Flexibility in adjusting the organization structure.	4.33	1.317	0.9
Encouragement/punishing system.	4.18	1.556	0.91
good communication with major customers	3.9	1.672	0.9
High-level integration and control of the major functions with the company.	4.21	1.517	0.9
Overlap between R&D, marketing and manufacturing functions	3.97	1.483	0.9
Communication with dominant customers and suppliers	4.05	1.505	0.9
Strategy planning capability			0.9
Ability to identify external opportunities and threats.	5.13	1.234	0.9
Ability to identify internal strengths and weaknesses.	4.39	1.349	0.9
Goal clarity.	4.65	1.482	0.9
The extent of contingency thinking and planning	4.43	1.424	0.9
clear plan – a road map of new product	4.18	1.517	0.9
highly adapted and responsive to external environment	4.18	1.516	0.9
Adaptability and responsiveness of the company to external environment	3.92	1.678	0.9

Appendix B . Performance indicators	
Indicators	Resources of Informantions
Sales growth	Financial manager
Product competitiveness Dimension	Financial manager
Quality level	R&D manager
Market need and growth potential	Marketing manager
Price advantage	Financial manager
function advantage	Financial manager
Cost advantage	Financial manager