

## Investigate the relationships between Antecedent factors and product innovation

<sup>1</sup>Hashem Nikoomaram, <sup>2</sup>Farhad Ghaffari, <sup>3\*</sup>Davood Gharakhani

<sup>1</sup> Professor, Department of Accounting, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup> Assistant Professor of Economics and Faculty Member School of Management and Economics Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>3\*</sup>Department of Industrial Management, Qazvin branch, Islamic Azad University (IAU), Qazvin, Iran

E-mail: [nikomaram@sr.iau.ac.ir](mailto:nikomaram@sr.iau.ac.ir); [Ghaffari@srbiau.ac.ir](mailto:Ghaffari@srbiau.ac.ir); [Davoodgharakhany@yahoo.com](mailto:Davoodgharakhany@yahoo.com)

Davood Gharakhani (Corresponding author)

**Abstract:** The purpose of this paper is to examine the role of Antecedent factors on product innovation. In this study, Data were collected from 30 companies in Iran. The paper formulates four hypotheses from the literature review. The present study employs a questionnaire survey approach to collect data for testing the research hypotheses. In this study, relevant statistical analytical techniques including linear regression and correlation for analysis was used. The results indicate that all four factors of Antecedent (R&D strategy, Top management support, Customer focus and Organizational learning capability) have positive and significant effects on product innovation. The results of this study could be used by any managers of companies in Iran to improve successful innovation projects. Also the findings of the study are important for both practitioners and academics.

[Hashem Nikoomaram, Farhad Ghaffari, Davood Gharakhani. **Investigate the relationships between Antecedent factors and product innovation.** *J Am Sci* 2013;9(1s):55-64]. (ISSN: 1545-1003).

<http://www.jofamericanscience.org>.8

**Keywords:** R&D strategy, Top management support, Customer focus, Organizational learning capability, product innovation

### 1. Introduction

Innovation is a process where knowledgeable and creative people and organizations frame problems and select, integrate, and augment information to create understandings and answers (Teece, 2001). Innovative performance, which captures the critical domains of firms' competitive advantage, is defined here as the contribution of product and process innovations to firm performance. Given this definition, a firm's innovative performance is determined by its innovation activities, such as R&D expenditure, patents, and new products (Gharakhani, 2012). A principal source of difficulty of R & D strategy is a tendency to see the activity of product innovation and process development as linear; that is, as moving straight from research to development, engineering, manufacture and finally to sales. This approach has shown its limits (Penan, 1994 and R&D activities are handled instead in a process that can be described in such terms as sub-optimization, local rationality and limited search processes involving various actors having different status and goals, i.e. scientists, laboratories, firms and institutional or financial institutions.

Although previous researchers provide several definitions of organizational learning capability, they often emphasize only part of the concept. Concerning absorptive capability, Cohen and Levinthal emphasize the external element of capability, noting that the ability to evaluate and utilize

outside knowledge is largely a function of prior related knowledge. Prior knowledge confers an ability to recognize the value of new information, assimilate it, and apply to it to commercial ends. Regarding transformative capability, Garud and Nayyar (Cohen and Levinthal, 1990) emphasize the internal element, indicating that transformative capability is the ability to choose technologies, maintain them over time, and reactivate and synthesize them with ongoing technology development efforts. Based on previous studies, this study defines organizational learning capability as an organization's ability to absorb and transform new knowledge and apply it to new product development with competitive advantage and high production speed. On the other hand, as Dr. Peter Snich, devised the idea of learning organizations Manufacturer utters: learning organization where people continually that his ability to create results that are seeking the increase. The new local and wide patterns of thinking are reared (Freeman, 1982). Promote collective ideas and people are continually learning how to learn together. Thus, innovation can be a tool for dynamics and culture of learning organizations is based on theory because Mc Klind, innovation to ambitious, seeking progress and development and has permanent or flying Bsyarbld persistence and development of knowledge and knowledge of their permanent Are (Freeman, 1982). The level of top management support is measured by the success or failure of the organization (Liebowitz,

1999). The support from senior management plays a vital role in effectiveness of knowledge based decisions (Wong and Aspinwall, 2006). The top management is required to provide timely funding for knowledge application. Moreover, they should emphasize on knowledge based culture and also enlighten the significance of knowledge management to take organization at a highest mark (Davenport and Prusak, 1998).

Support from top management facilitates many of the operational and strategic IT management activities. These activities include negotiation, IS planning, project management, and similar tasks. The direct effect of TMT diversity on innovativeness can be mixed and ambiguous because of the dual impact of the benefits and costs associated with TMT diversity (Williams and O'Reilly, 1998). In other words, the effect of TMT diversity on innovativeness can be either positive or negative depending on whether benefits or costs dominate. Management support is required to promote knowledge culture in organizations, providing funds for knowledge infrastructure and enhance the capabilities of employees in creating, sharing, storing and dissemination of knowledge. It is an emerging trend in developing countries and important for the top management to support activities, attitudes and behaviors of employees for endorsement of knowledge. Numerous studies show that cultures that promote organizational learning improve individual, team, and organizational learning, and as a result, improve organizational performance (Egan, Yang, & Bartlett, 2004). From the perspective of organizational learning, the concrete output via knowledge capacity promotes innovative performance. Consequently, innovation often stems from knowledge absorption in the research and design (R&D) and other corporate units (Mansfield, 1983).

The remainder of this paper is organized in the following manner: Section 2 introduces the Literature review and suggests a series of hypotheses. Section 3 describes the data and the research method used to achieve an empirical analysis of the hypotheses. Section 4 reports the results of the statistical analysis. Section 5 discusses the findings and evaluates the research hypotheses and also points out some limitations of the study and directions for future research.

## 2. Literature review

### 2.1. R&D strategy (RDS)

R&D strategy has been one of the most controversial areas of management because it involves quite literally the most basic question of exactly which targets or goals the R&D should aim at and exactly how progress towards achievement of those goals

should be measured. R&D strategy aims to defend support, and expand existing R&D, to broaden and deepen a company's scientific and technological capabilities, and to drive new business (Roussel et al., 1991). In the techno-economic network approach, the fundamental role of R & D strategy is to plan, organize and control scientific and technical resources that are held inhouse and assemble resources controlled by outside parties. Businesses are increasingly using research and development (R&D) to gain a competitive advantage (Hume, 2000). R&D is widely recognised as central to the success of most businesses (Dwyer and Mellor, 1993) and therefore it forms the core of business strategy (Ito and Pucik, 1993). The R&D activities need to be linked to the needs of industry and the market (Tardif, 1997). We focus on R&D strategies for several reasons. It is widely maintained that start-ups are stimulated by the stock of accumulated knowledge of incumbent firms (Acs et al., 2009).

When employees leave to start a new firm, they walk out with tacit knowledge and know-how of e.g. routines, resources and customers connected to an incumbent firm. In this way, employee start-ups inherit knowledge from their parents. Such knowledge inheritance is expected to have a positive influence on both the quantity and quality of entrepreneurial spawns (Klepper, 2001; Klepper and Sleeper, 2005). Firms with different types of R&D strategies may be assumed to develop different levels of experience, skills and knowledge. Accordingly, they may be associated with distinct potential to generate high quality employee start-ups, and firms with persistent R&D could be regarded as 'hotbeds' for entrepreneurial spawns. The motivations of R&D outsourcing can be examined from three perspectives. First, from the perspective of core competence viewpoint, firms repeatedly performing a specific type of function can nurture associated competency (Prahalad and Hamel, 1990). That is, firms with high levels of in-house R&D are likely to enhance their technological competency. Similarly, firms adopting decentralizing and outsourcing R&D portfolios would subsequently be likely to undermine or weaken their core technological competencies (Coombs, 1996). For example, Kessler et al. (2000) have found that external sourcing is positively related to lower competitive success and slower innovation speed. However, other researchers disagree with this viewpoint and claim that R&D outsourcing is a better and quicker option than building the required skills internally where suitable in-house capabilities are lacking. They suggest that R&D outsourcing enables firms to maximize the value of their resources through pooling and utilizing complementary resources from their partners (Yasuda, 2005).

## 2.2. Top management support (TMS)

Top management support is one of the most important factors in ensuring the success of IT initiatives and the efficient use of an IT investment (Jarvenpaa & Ives, 1990). It has also been claimed that top management support is the most important critical success factor for successful IS projects (Young and Jordan, 2008). Several empirical studies (Byrd & Davidson, 2003; Ragu-Nathan et al., 2004) have confirmed the impact of top management's support on the success of IT implementation. The results have shown a direct and indirect impact of top management support, mainly through the proper positioning of IT/IS personnel in the organizational hierarchy. It has also been demonstrated that (Parolia, Goodman, Li, & Jiang, 2007) top management's commitment contributes to an improvement in IS project performance. Prescriptions for TMS are not well developed (Bassellier and Pinsonneault, 1998). Some impose very demanding requirements for top management resources simply to improve technical quality or user satisfaction (Doll, 1985) goals of little direct interest to top managers. Other prescriptions for communication, enthusiasm, involvement and participation appear to be little more than exhortation. TMS is generally promoted as being inherently good (Ma'hring, 2002) but there is clear evidence that too much TMS can be dysfunctional and lead to failure. Projects can succeed without following the general prescriptions for TMS and others can fail while following all the common prescriptions. Top management's support to IT/IS is identified as understanding the importance of IT/IS, supporting initiatives of IT/IS personnel and participating in projects of IS activities (Ragu-Nathan, Apigian, Ragu-Nathan, & Tu, 2004). Top management support is typically presented as one of the key success factors of IS effectiveness (Thong, Yap, & Raman, 1996).

## 2.3. Customer focus (CS)

Customer focus practices involve the establishment of links between customer needs and satisfaction and internal processes. Customer focused strategies enhances communications capability of the organizations with its customers and the corporation become well informed about what customers wants from them (Akao, 1990 and Anderson et al.1994) . Therefore the organization can create such value chain management which is according to the customer preference and has the chance to fulfill customer expectations (Verma et al., 1999 and Waller et al., 1999). Customer focus strategies make the most efficient value chain as it ensures cost effectiveness and less wastage (Inger et al., 1995). It reduced the inventory costs and also organization require to take

less research and development activities because customers focus strategies ensure free flow of information within customers and the company (James, 1994). Through the practices of customer focused strategies organizations value chain management also get maximum chances of highly innovative and most importantly innovative from the customer's point of view (Zokaei and Simons, 2006). This process ensures innovativeness more appropriate. The main goal is always to satisfy customers and in that process customers are also taking part to give it more viability (O'Brien and Jones, 1995). Crepon et al. (1998) also stated that many innovation outputs rose with the demand pull indicators such as customer familiarity. Calantone et al. (2006) empirical results showed that product innovativeness can be detrimental to new product success if customers are not sufficiently familiar with the nature of new product. Bulut et al. (2009) investigated the interaction between customer orientation as a dimension of market orientation and firm innovative performance. They explored the positive effect of customer orientation on firm innovative performance.

## 2.4. Organizational learning capability (OLC)

Organizational learning is a basis for gaining a sustainable competitive advantage and a key variable in the enhancement of organizational performance (Brockmand and Morgan, 2003; Nevis et al., 1995). Firms that are able to learn stand a better chance of sensing events and trends in the marketplace (Day, 1994; Sinkula, 1994). As a consequence, learning organizations are usually more flexible and faster to respond to new challenges than competitors (Day, 1994), which enables firms to maintain long-term competitive advantages (Dickson, 1996). Organizational learning is the process by which organizations learn. Learning is any change in the organization's models that maintains or improves performance (Dibella et al., 1996). Based on previous definitions of capability (Teece et al., 1997), we understand organizational learning capability (OLC) as a bundle of tangible and intangible resources or skills the firm uses to achieve new forms of competitive advantage. These skills enable the process of organizational learning. OLC is usually related to the prescriptive literature on organizational learning (Tsang, 1997) which analyses the contextual variables that facilitate learning (Hult and Ferrell, 1997). The OLC concept (Dibella et al., 1996; Goh and Richards, 1997) stresses the importance that facilitators have for organizational learning. These facilitators have traditionally been outlined by both the learning organization and the organizational learning literature. The learning organization or prescriptive literature mainly focuses on the development of normative

models for the creation of a learning organization. This literature (Goh and Richards, 1997) describes a set of actions that ensures learning capability: effective generation of ideas by implementing a set of practices such as experimentation, continuous improvement, teamwork and group problem-solving, observing what others do, or participative decision making.

The concept of organizational learning culture is derived from organizational learning and learning organization concept, and refers to when an organization recognized learning as absolutely critical for its business success (Wang, Yang, & McLean, 2007). Senge (1990) observed that learning and innovation are crucial for firms in sustaining competitive advantage. Argyris and Schon (1978) also posited that compared to morale, satisfaction and loyalty, learning and competence provide the foundation for organizations to improve their core competencies and further sustain competitive advantage. Although the terms 'organizational learning' and 'learning organization' are used somewhat interchangeably in the literature, they are different concepts. Preskill and Torres (1999) noted that the term 'learning organization' focuses on the systems, principles, and characteristics of an organization that learns as a collective entity, while 'organizational learning' focuses on the actual process of how an organizational learning occurs.

## 2.5. Product innovation

Product innovation is a continuous and cross-functional process involving and integrating a growing number of different competencies inside and outside the organisational boundaries. Simply put, it is the process of transforming business opportunities into tangible products and services. It is widely recognised that effective product innovation management is critical to the success of most manufacturing enterprises (March-Chorda` et al., 2002; Shepherd and Ahmed, 2000). With such a close link between product innovation performance and the organisation's overall success, managers and decision makers must ensure that this process is well managed and successful. However, product innovation is a risky and expensive endeavour, which results in low success rates and many projects being terminated midway in the development cycle. Research also indicates that a very high proportion of new product ideas fail

commercially in the market place (Cooper, 1999; Clancy and Schulman, 1991). Numerous studies attempt to classify innovations into appropriate typologies along dimensions including technology, market, and newness to the firm's product line or the familiarity to the firm (Garcia & Calantone, 2002; Kaminski, de Oliveira, & Lopes, 2008) in order to identify the innovative characteristics or degree of innovativeness of the newproduct (Garcia & Calantone, 2002). The newness of product innovation is also regarded as a critical factor to promote the product innovation's performance (Taylor, 2010; Turner, Mitchell, & Bettis, 2010). One important strategic dimension of innovation management (along with fast speed, high quality, etc.) involves the containment of development costs. Intensifying competition and increasingly turbulent environments are forcing firms to improve the efficiency of their new product development activities (Rothwell, 1994). New product innovation is one of the most important competitive challenges facing firms today (Jelenik and Schoonhoven, 1993; Leonard-Barton, 1995). Because of the rising significance of this topic, there has been a subsequent increase in the number of scholarly and professional publications dedicated to innovation management (Drazin and Schoonhoven, 1996). Innovation can occur in three broad domains; products, processes, and organizations, and is "an idea, product or process, system or device that is perceived to be new to an individual, a group of people or firms, an industrial sector, or a society as a whole" (Rogers, 1995). According to Damanpour (1991), organizational innovation combines the development and implementation of new ideas, systems, products, or technologies. A brief explanation of the constructs is in Table 1.

Based on the literature review and research objectives, the following hypothesis was derived:

**H1.** The extent of R&D focus in a firm's overall strategy has a direct positive effect on product innovation.

**H2.** The extent of TMS has a direct positive effect on product innovation.

**H3.** The extent of CF has a direct positive effect on product innovation.

**H4.** The extent of OLC has a direct positive effect on product innovation.

Table1. Constructs of the survey

Constructs	Description	Representative references
Product innovation	It deals with the production of new products/services to create new markets/customers or satisfy current markets/customers	Wan et al. (2005), Wang and Ahmed (2004)
R&D strategy	It consists of many dimensions related to R&D expenditure, R&D personnel, R&D project choice, and R&D capacity	Prajogo et al. (2007), Prajogo and Ahmed (2006), Prajogo and Sohal (2006), Yam et al. (2004)
Top management	It refers to issues associated with internal applications	Santos-Vijande and Alvarez-Gonzalez (2007), Herrmann et



support	organized by top management. Applications such as incentives, rewards, necessity funds, and materials	al. (2007), Prajogo and Ahmed (2006), Bastic and Leskovar-Spacapan (2006), Wan et al. (2005), Yap et al. (2005), Wang and Ahmed (2004), Swink (2000)
Customer focus	It includes issues such as listening to the voice of customers by marketing research, exploring their current and future needs, and reflecting on customer feedback to firm process or products	Santos-Vijande and Alvarez-Gonzalez (2007), Singh and Smith (2004), Prajogo et al. (2004)
Organizational learning capability	It encompasses a broad-range program for employee training and education to raise their skill levels. It can be both individual and organizational. Also, it strives for continuous improvement	Herrmann et al. (2007), Akgu'n et al. (2007), Prajogo and Ahmed (2006), Jerez-Gomez et al. (2005), Yam et al. (2004)
<i>Source : Murat Ar and Baki,2011</i>		

### 3. Research Methodology

This study examined a sample of 30 companies in Iran (Qazvin City). The authors request the questionnaires to be completed by presidents. The present study employs a questionnaire survey approach to collect data for testing the research hypotheses. All independent and dependent variables require five-point Likert style responses ranging from "strongly disagree"(1) to "strongly agree" (5). Appendix contains the construct measures not listed here. In order to do regression analysis, SPSS 15.0 for Windows software packages were used in this study.

### 4. Analysis and results

This study attempts to understand the relationships among Antecedent factors and product innovation. Table 2 displays the means, standard deviations, and correlations of all variables. Table 3 presents the results of regression analysis regarding the effects of Antecedent factors on product innovation. Coefficients of R&D strategy are positive and significant for product innovation ( $p < 0.05$ ). These findings indicate that Iranian companies would achieve a higher level of product innovation if they have well-developed R&D strategy. Accordingly, the results support H1, which states that the extent of R&D focus

in a firm's overall strategy has a direct positive effect on product innovation. Coefficients of Top management support are positive and significant for product innovation ( $p < 0.05$ ). These findings indicate that Iranian companies would achieve a higher level of product innovation if they have well-developed Top management support. Accordingly, the results support H2, which states that the extent of Top management support has a direct positive effect on product innovation. Coefficients of Customer focus are positive and significant for product innovation ( $p < 0.05$ ). These findings indicate that Iranian companies would achieve a higher level of product innovation if they have well-developed Customer focus. Accordingly, the results support H3, which states that the extent of Customer focus has a direct positive effect on product innovation. Coefficients of Organizational learning capability are positive and significant for product innovation ( $p < 0.05$ ). These findings indicate that Iranian companies would achieve a higher level of product innovation if they have well-developed Organizational learning capability. Accordingly, the results support H4, which states that the extent of Organizational learning capability has a direct positive effect on product innovation.

Table 2. Means, standard deviations, and correlations

The variables	Mean	SD	1	2	3	4	5
1. R&D strategy	3.28	0.58	1.00				
2. Top management support	3.39	0.69	0.073	1.00			
3. Customer focus	3.30	0.69	-0.133	0.10	1.00		
4. Organizational learning capability	3.22	0.50	0.297	0.146	0.220	1.00	
5. product innovation	3.34	0.39	0.424*	0.421*	0.451*	0.541**	1.00

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

Table 3. Results of regression analyses of product innovation

Variables	product innovation
R&D strategy	0.36*
Top management support	0.31*
Customer focus	0.40*
Organizational learning capability	0.29*
R <sup>2</sup>	0.62
F	10.609
Durbin-Watson	2.09

Note: n=30 (two-tailed test). Standardized coefficients are reported. \* $p < 0.05$

### 5. Discussion and Conclusion

The current paper investigated the impact of many antecedent factors on product innovation. The results indicate that all four factors of Antecedent (R&D strategy, Top management support, Customer focus and Organizational learning capability) have positive and significant effects on product innovation. Akgu'n et al. (2007) advocated that a firm should develop or launch new products to perform better

than competitors in respect to firm performance measured as sales, market share, and financial. In spite of the empirical support that product and process innovation are crucial for the FP, these capabilities are also affected by many antecedents. Thus, the antecedents of innovation also vary by innovation type. So, the effects of antecedents on product innovation must be explained particularly. Sohn et al. (2007) determined that strategic planning includes R&D strategy, R&D objective, and R&D plan has the statistically significant relationship with business performance includes the item of new product development. Determining a R&D strategy which is appropriate to firm resources and is supported by employees can be evaluated in internal connect. The characteristics of the top managers did not discriminate between non-innovators and innovators firms according to Avermaete et al. (2004). In this study, TMS is statistically related with product innovation. The significant hypothesis related to CF suggests that CF it had a significant impact on product innovation as Baker and Sinkula (2005) also found. They detected that the effect of market orientation on new product success was highly significant. However, Singh and Smith's (2004) statistical results indicated that the relationship between TQM consists of CF and innovation includes product and process innovation had not been supported by data from Australian manufacturers. The results showed that OLC has a significant effect on product innovation. Although there are a few studies, for example Shipton et al. (2005) and Garcia-Morales et al. (2007), which have parallel results with our study, it is different from Herrmann et al.'s (2007) survey.

This research study, like a lot of the empirical researches, has many limitations that should be noted. Furthermore, it is important to discuss potential limitations before discussing the implications of our research further. One of these limitations is the sample size. In this study, validation and hypothesis testing were concluded using the same sample. Although this situation is not ideal, it is commonly faced given the sample size needed for both steps and the difficulty in obtaining such large samples. In our study, we solicited and obtained responses from firm manager. Future studies can also examine the proposed relationships in other countries. New researches can be conducted with different perspectives of our theoretical model. First, to better understand how a firm can maximize its innovation level, one can be more focused on concepts such as strategy, creativity, and supportive approach – how they can be used to have an impact on product and process innovation. Further, the other innovation types, such as organizational and technological can be studied in the context of the model in future studies.

The results of this study could be used by any managers of companies in Iran to improve successful innovation projects. Also the findings of the study are important for both practitioners and academics. The results of this study will also provide companies operating in Iran with useful information on how their policies and actions might affect firm innovation. We believe that this study can be a useful support tool for planning a system for evaluating the performance of Iranian companies.

## References

1. Acs, Z.J., Audretsch, D.B., Braunerhjelm, P., Carlsson, B., (2009). The knowledge spillover theory of entrepreneurship. *Small Business Economics* 32, 15–30.
2. Akao, Y. (1990). *Quality Function Deployment: Integrating Customer Requirements into Production Design*. Productivity Press, Cambridge, MA.
3. Akgu'n, A.E., Keskin, H., Byrne, J.C. and Aren, S. (2007), "Emotional and learning capability and their impact on product innovativeness and firm performance", *Technovation*, Vol. 27 No. 9, pp. 501-13.
4. Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer satisfaction, market share, and profitability: Findings from Sweden. *Journal of Marketing*, 58, 53–66. <http://dx.doi.org/10.2307/1252310>
5. Argyris, C., & Schon, D. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
6. Avermaete, T., Viaene, J., Morgan, E.J., Pitts, E., Crawford, N. and Mohon, D. (2004), "Determinants of product and process innovation in small food manufacturing firms", *Trends in Food Science and Technology*, Vol. 15, pp. 474-83.
7. Baker, W.E. and Sinkula, J.M. (2005), "Market orientation and the new product paradox", *Journal of Product Innovation Management*, Vol. 22, pp. 483-502.
8. Bassellier G, Pinsonneault A. (1998). Assessing top management support for information technologies: an new conceptualisation and measure. In: *European conference on information systems*.
9. Bastic, M. and Leskovar-Spacapan, G. (2006), "What do transition organizations lack to be innovative?", *Kybernetes*, Vol. 35 Nos 7/8, pp. 972-92.
10. Brockmand B, Morgan F. (2003). The role of existing knowledge in new product innovativeness and performance. *Decis Sci*, 32(2):385–419.

11. Bulut, C., Yilmaz, C. and Alpkın, L. (2009), "The effects of market orientation dimensions on firm performance", *Ege Akademik Bakış*, Vol. 9 No. 2, pp. 513-38.
12. Byrd, T. A., & Davidson, N. W. (2003). Examining possible antecedents of IT impact on the supply chain and its effect on firm performance. *Information & Management*, 41(2), 243–255.
13. Calantone, R.J., Chan, K. and Cui, A.S. (2006), "Decomposing product innovativeness and its effect on new product success", *Journal of Product Innovation Management*, Vol. 23 No. 5, pp. 408-21.
14. Clancy, K., Schulman, R., 1991. *The Marketing Revolution: A Radical Manifesto for Dominating the Marketplace*. Harper Business, New York.
15. Cohen, W.M. Levinthal, D.A. (1990), Absorptive capacity: a new perspective on learning and innovation, *Administrative Science Quarterly*. 35 (1) 128–152.
16. Coombs, R., (1996). Core competencies and the strategic management of R&D. *R&D Management* 26(4),345–355.
17. Cooper, R.G., 1999. From experience: the invisible success factors in product innovation. *Journal of Product Innovation Management* 16, 115–133.
18. Crepon, B., Duguet, E. and Mairesse, J. (1998), "Research innovation and productivity: an econometric analysis of the firm level", *Economics of Innovation and New Technology*, Vol. 7, pp. 115-58.
19. Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), 555–590.
20. Davenport, T. H., & Prusak, L. (1998). *Working Knowledge: Managing what Your Organization Knows*. Harvard Business School Press, Boston, MA.
21. Day GS. (1994). The capabilities of the market-driven organizations. *J Mark*; 58(4):37–52.
22. Dibella, A.J., Nevis, E.C., Gould, J.M., (1996). Understanding organizational learning capability. *Journal of Management Studies* 33 (3), 361–379.
23. Dickson Peter R. (1996). the static and dynamic mechanics of competition: a comment on Hunt and Morgan's comparative advantage theory. *J Mark*; 60(4):102–6.
24. Doll WJ. (1985). Avenues for top management involvement in successful MIS development. *MIS Quart*; 9(1):17–35.
25. Drazin, R., Schoonhoven, C.B., (1996). Community, population, and organization effects on innovation: a multilevel perspective. *Academy of Management Journal* 39, 1065–1083.
26. Dwyer, L., Mellor, R., (1993). Product innovation strategies and performance of Australian firms. *Australian Journal of Management* 18 (2), 159–180.
27. Egan, T. M., Yang, B., & Bartlett, K. (2004). The effects of learning culture and job satisfaction on motivation to transfer learning and intention to turnover. *Human Resource Development Quarterly*, 15(3), 279–301.
28. Freeman, S.C. (1982). *the economics of industrial innovation*, (2nd end), London, Frances Printer.
29. Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: A literature review. *Journal of Product Innovation Management*, 19(2), 110–132.
30. Garcia-Morales, V.J., Llorens-Montes, F.J. and Verdu-Jover, A.J. (2007), "Influence of personal mastery on organizational performance through organizational learning and innovation in large firms and SMEs", *Technovation*, Vol. 27 No. 9, pp. 547-68.
31. Gharakhani, D., (2012), Knowledge management capabilities and innovation performance, *Archives Des Sciences*, Vol 65, No. 5. PP 148-155.
32. Goh, S., Richards, G., (1997). Benchmarking the learning capability of organisations. *European Management Journal* 15 (5), 575–583.
33. Herrmann, A., Gassmann, O. and Eisert, U. (2007), "An empirical study of the antecedents for radical product innovations and capabilities for transformation", *Journal of Engineering and Technology Management*, Vol. 24 Nos 1-2, pp. 92-120.
34. Hult, G.T.M., Ferrell, O.C., (1997). Global organizational learning capability in purchasing: construct and measurement. *Journal of Business Research* 40 (97), 111–121.
35. Hume, C., (2000). Tough competition keeps innovations flowing. *Chemical Week* 162 (16), 40–41.
36. Inger, R., Braithwaite, A., & Christopher, M. (1995). Creating a manufacturing environment that is in harmony with the market: the 'how' of supply chain management. *Production Planning and Control*, 6(3), 246-58.
37. Ito, K., Pucik, V., (1993). R&D spending, domestic competition, and export performance

- of Japanese manufacturing firms. *Strategic Management Journal* 14, 61–75.
38. James, H. D. (1994). Linking Customer Satisfaction to Service Operations and Outcomes. In Roland T. Rust & Richard L. Oliver (Eds.), *Service Quality: New Directions in Theory and Practice*. Newbury Park, CA: Sage Publications, Inc., 173-200.
  39. Jarvenpaa, S. L., & Ives, B. (1990). Information technology and corporate strategy: A view from the top. *Information Systems Research*, 1(4), 351–376.
  40. Jelenik, M., Schoonhoven, C., (1993). *The Innovation Marathon: Lessons from High Technology Firms*. Basil Blackwell, Oxford.
  41. Jerez-Gomez, P., Jose, J.C.-L. and Ramon, V.-C. (2005), “Organizational learning and compensation strategies: evidence from the Spanish chemical industry”, *Human Resource Management*, Vol. 44 No. 3, pp. 279-99.
  42. Kaminski, P. C., de Oliveira, A. C., & Lopes, T. M. (2008). Knowledge transfer in product development processes: A case study in small and medium enterprises (SMEs) of the metal-mechanic sector from São Paulo, Brazil. *Technovation*, 28(1), 29–36.
  43. Kessler, E. H., Bierly, P. E., Gopalakrishnan, S., (2000). Internal vs. External learning in new product development: effects on speed, cost and competitive advantage. *R&D Management* 30(3), 213–223.
  44. Klepper, S., (2001). Employee startups in high-tech industries. *Industrial and Corporate Change* 10, 639–674.
  45. Klepper, S., Sleeper, S., (2005). Entry by spinoffs. *Management Science* 51, 1291–1306.
  46. Leonard-Barton, D., (1995). *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*. Harvard Business School Press, Boston, MA.
  47. Liebowitz, J. (1999). Key Ingredients to the Success of an Organization's Knowledge Management Strategy. *Knowledge and Process Management*, 6(1), 37-40.
  49. Ma'hring M (2002). *IT project governance: a process-oriented study of organizational control and executive involvement*. Stockholm: Stockholm School of Economics.
  50. Mansfield, E. (1983). Technological change and market structure: An empirical study. *The American Economic Review*, 73(2), 205–211.
  51. March-Chorda, I., Gunasekaran, A., Lloria-Aramburo, B., 2002. Product development process in Spanish SMEs: an empirical research. *Technovation* 22 (5), 301–312.
  52. Murat Ar.I and Baki.B, (2011) , Antecedents and performance impacts of product versus process innovation Empirical evidence from SMEs located in Turkish science and technology parks *European Journal of Innovation Management* ,Vol. 14 No. 2, 2011 pp. 172-206
  53. Nevis E, Dibella A, Gould J. (1995). Understanding organizations as learning systems. *Sloan Manage Rev*; 36(2):73–85.
  54. O'Brien, L., & C. Jones (1995). Do rewards really create loyalty? *Harvard Business Review*, 73(3), 75–82.
  55. Parolia, N., Goodman, S., Li, Y., & Jiang, J. J. (2007). Mediators between coordination and IS project performance. *Information & Management*, 44(7), 635–645.
  56. Penan, H., (1994) , Analyse strat6gique du portefeuille technologique, *Revue Fran~aise de Gestion* 97.
  57. Prahalad, C.K., Hamel, G., (1990).The corecompetence of the corporation. *Harvard Business Review* 68(3), 79–93.
  58. Prajogo, D.I. and Ahmed, P.K. (2006), “Relationships between innovation stimulus, innovation capacity, and innovation performance”, *R&D Management*, Vol. 36 No. 5, pp. 499-515.
  59. Prajogo, D.I. and Sohal, A.S. (2006), “The integration of TQM and technology/R&D management in determining quality and innovation performance”, *Omega*, Vol. 34 No. 3, pp. 296-312.
  60. Prajogo, D.I., Laosirihongthong, T., Sohal, A. and Boon-itt, S. (2007), “Manufacturing strategies and innovation performance in newly industrialised countries”, *Industrial Management & Data Systems*, Vol. 107 No. 1, pp. 52-68.
  61. Preskill, H., & Torres, R. T. (1999). The role of evaluative enquiry in creating learning organizations. In M. Easterby-Smith, J. Burgoyne, & L. Araujo (Eds.), *Organizational learning and the learning organization: Developments in theory and practice* (pp. 92–114). Thousand Oaks, CA: Sage.
  62. Ragu-Nathan, B. S., Apigian, C. H., Ragu-Nathan, T. S., & Tu, Q. (2004). A path analytic study of the effect of top management support for information systems performance. *Omega*, 32(6), 459–471.
  63. Rogers, E. M. (1995). *Diffusion of innovations* (4th edition). New York: The Free Press.
  64. Rothwell, R., (1994). Towards the fifth-generation innovation process. *International Marketing Review* 11,31-37.



65. Roussel, P.A., K.N. Saad and T.J. Erickson, (1991), *Third Generation R&D, Managing the Link to Corporate Strategy* (Arthur D. Little Inc., Harvard Business School Press, Boston).
66. Santos-Vijande, M.L. and Alvarez-Gonzalez, L.I. (2007), "Innovativeness and organizational innovation in total quality oriented firms: the moderating role of market turbulence", *Technovation*, Vol. 27 No. 9, pp. 514-32.
67. Senge, P. (1990). *The leaders' new work: Building learning organizations*. *Sloan Management Review*, 32(1): 7-23.
68. Shepherd, C., Ahmed, P.K., 2000. From product innovation to solutions innovation: a new paradigm for competitive advantage. *European Journal of Innovation Management* 3, 100-106.
69. Shipton, H., Fay, D., West, M., Patterson, M. and Birdi, K. (2005), "Managing people to promote innovation", *Creativity and Innovation Management*, Vol. 14 No. 2, pp. 118-28.
70. Singh, P.J. and Smith, A.J.R. (2004), "Relationship between TQM and innovation: an empirical study", *Journal of Manufacturing Technology Management*, Vol. 15 No. 5, pp. 394-401.
71. Sinkula JM. (1994). Market information processing and organizational learning. *J Mark*; 58 (1):35-45.
72. Sohn, S.Y., Joo, Y.G. and Han, H.K. (2007), "Structural equation model for the evaluation of national funding on R&D project of SMEs in consideration with MBNQA criteria", *Evaluation and Program Planning*, Vol. 30, pp. 10-20.
73. Swink, M. (2000), "Technological innovativeness as a moderator of new product design integration and top management support", *The Journal of Product Innovation Management*, Vol. 17 No. 3, pp. 208-20.
74. Tardif, C., (1997). Europe revamps aerospace R&D strategy. *Interavia* 52 (614/Nov), 28.
75. Taylor, A. (2010). The next generation: Technology adoption and integration through internal competition in new product development. *Organization Science*, 21(1), 23-41.
76. Teece, D.J., (2001). Strategies for managing knowledge assets: the role of firm structure and industrial context, in: Nonaka, I., Teece, D. (Eds) *Managing Industrial Knowledge: Creation, Transfer and Utilization*. Sage Publications, London, UK, pp. 125-144.
77. Thong, J. Y. L., Yap, C.-S., & Raman, K. S. (1996). Top management support, external expertise and information systems implementation in small businesses. *Information Systems Research*, 7(2), 248-267.
78. Tsang, E., (1997). Organizational learning and the learning organization: a dichotomy between descriptive and prescriptive research. *Human Relations* 50 (1), 57-70.
79. Turner, S. F., Mitchell, W., & Bettis, R. A. (2010). Responding to rivals and complements: How market concentration shapes generational product innovation strategy. *Organization Science*, 21(4), 854-872.
80. Verma, R., Thompson, G., & Louviere, J. (1999). Configuring Service Operations in Accordance with Customer Needs and Preferences. *Journal of Services Research*, 1(3), 262-74.
81. Waller, M. A., Dabholkar, P. A., & Gentry, J. J. (2000). Postponement, product customization, and marketoriented supply chain management. *Journal of Business Logistics*, 21 (2), 133-61.
82. Wan, D., Ong, C.H. and Lee, F. (2005), "Determinants of firm innovation in Singapore", *Technovation*, Vol. 25 No. 3, pp. 261-8.
83. Wan, D., Ong, C.H. and Lee, F. (2005), "Determinants of firm innovation in Singapore", *Technovation*, Vol. 25 No. 3, pp. 261-8.
84. Wang, X., Yang, B., & McLean, G. N. (2007). Influence of demographic factors and ownership type upon organizational learning culture in Chinese enterprises. *International Journal of Training and Development*, 11(3): 154-165.
85. Wang, C.L. and Ahmed, P.K. (2004), "The development and validation of the organizational innovativeness construct using confirmatory factor analysis", *European Journal of Innovation Management*, Vol. 7 No. 4, pp. 303-13.
86. Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. In B. M. Staw, & L. L. Cummings (Eds.), *Research in Organizational behavior*, vol. 20. (pp. 77- 140) Greenwich, CT7 JAI Press.
87. Wong, K. Y., & Aspinwall, E. (2006). Development of a Knowledge Management Initiative and System: A Case Study. *Expert Systems with Applications*, 30(4), 633-641.
88. Yam, R.C.M., Guan, J.C., Pun, K.F. and Tang, E.P.Y. (2004), "An audit of technological innovation capabilities in Chinese firms: some empirical findings in Beijing, China", *Research Policy*, Vol. 33 No. 8, pp. 1123-40.

89. Yap, C.-M., Chai, K.-H. and Lemaire, P. (2005), "An empirical study on functional diversity and innovation in SMEs", *Creativity and Innovation Management*, Vol. 14 No. 2, pp. 176-90.
90. Yasuda, H., (2005). Formation of strategic alliances in high-technology industries: comparative study of the resource-based theory and the transaction-cost theory. *Technovation* 25(7), 763-770.
91. Young, R., & Jordan, E. (2008). Top management support: Mantra or necessity? *International Journal of Project Management*, 26(7), 713-725.
92. Zokaei, K., & Simons, D. W. (2006). Value chain analysis in improvement of customer focus: a case study of UK red meat industry. *International Journal of Logistics Management*, 17(2), 22-35.

### Appendix

#### R&D strategy

- RDS1 We have more R&D expenditure when compare with sector average
- RDS2 R&D plays a major part in our business strategy
- RDS3 We have a R&D strategy/plan
- RDS4 We develop our R&D plan by connecting with firm plan
- RDS5 Our R&D resources/facilities are appropriate for new product development

#### Top management support

- TMS1 Top management researches the new technologies, processes and product ideas
- TMS2 Top management actively seeks innovative ideas
- TMS3 Top management encourages innovation activities
- TMS4 Top management promotes the advantages of new solutions and ideas enthusiastically

1/8/2013

TMS5 Mistakes regarding creative and innovative efforts of individuals are tolerated by top management

#### Customer focus

- CF1 We actively and regularly seek customer input to identify their needs and expectations
- CF2 We involve customers in our product design processes
- CF3 We always maintain a close relationship with our customers and provide them with an easy channel for communicating with us
- CF4 We research that the needs of customers are now and in the future
- CF5 The number of new products which are developed by knowledge from customers is higher in last three years

#### Organizational learning capability

- OLC1 We have a comprehensive program for employee learning
- OLC2 We have an organization-wide training and development process, including career path planning, for all our employees
- OLC3 Employee learning is a topic that is discussed intensively by top management
- OLC4 The attitude prevails here is that employee learning is an investment, not an expense
- OLC5 We always upgrade employees' knowledge and skills profiles

#### Product innovation

- PRD1 The rate of product innovation into the firm among innovation activities is the highest over last three years
- PRD2 We describe ourselves as a firm focusing on product/service innovation
- PRD3 Our new products and services are often perceived as very novel by customers
- PRD4 We are able to produce products with novelty features