Investigate the relationships between Antecedent factors and product innovation

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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.

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 Klinoid, innovation to ambitious, seeking progress and development and has permanent or flying Bsyarbblind 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,
The support from senior management plays a vital role in the 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 signification 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 what 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 in-house 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 recognized 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 the 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 Sleep, 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 specific type of function can nurture associated competency (Prabahad 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 (Verna 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 (Brockman 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 new product (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 (Damanpour 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.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Description</th>
<th>Representative references</th>
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<tr>
<td>Product innovation</td>
<td>It deals with the production of new products/services to create new markets/customers or satisfy current markets/customers</td>
<td>Wan et al. (2005), Wang and Ahmed (2004)</td>
</tr>
<tr>
<td>Top management</td>
<td>It refers to issues associated with internal applications</td>
<td>Santos-Vijande and Alvarez-Gonzalez (2007), Herrmann et</td>
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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), Akgün et al. (2007), Prajogo and Ahmed (2006), Jerez-Gomez et al. (2005), Yam et al. (2004)

Source: Murat Ar and Baki, 2011

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>
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<th>The variables</th>
<th>product innovation</th>
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<tbody>
<tr>
<td>R&amp;D strategy</td>
<td>0.36*</td>
</tr>
<tr>
<td>Top management support</td>
<td>0.31*</td>
</tr>
<tr>
<td>Customer focus</td>
<td>0.40*</td>
</tr>
<tr>
<td>R²</td>
<td>0.62</td>
</tr>
<tr>
<td>F</td>
<td>10.609</td>
</tr>
<tr>
<td>Durbin-Watson</td>
<td>2.09</td>
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</table>
| 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. Akgün 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


Appendix

R&D strategy
RDS1 We have more R&D expenditure when compared 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

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

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