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An Empirical Study on the Relation Between Types of Innovations: Pardis Technology Park as a Case Study

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ABSTRACT

Nowadays, Innovation is known as an essential component of competitiveness, classified in different types in literature. For instance, on one hand it is classified based on OECD as product, process, marketing and organizational innovations and on the other hand as incremental, competence developing, market developing and radical ones based on the degree of internal and external newness. Also, innovation models have changed from "simple linear" to "networking interactions" and concepts such as 'open innovation' and 'innovation network' have become important to both academic and market society due to intensive global competition. Therefore, this paper tried to empirically study and analyze the types of innovation based on OECD regarding to other classification based on the degree of internal and external newness in a networking interaction. Thus, in order to empirically explore the relations between these two classifications, we used the data of last three years (2008-2011) of 50 companies from the network Pardis Technology Park (PTP) in Iran as a case study. The results showed that most of the innovations as product, marketing and organizational were new to the market. Also marketing and process innovations were more related to radical and incremental innovation respectively and less organizational innovations were incremental.

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1. INTRODUCTION

Nowadays, innovations help organizations with applying more productive manufacturing processes, performing better in the market, seeking positive reputation in customers' perception and as a result gaining sustainable competitive advantage. In addition, organizations have moved forward from "hiding idea(Closed Innovation)" to "opening them(Open Innovation. Thus, the innovation model has changed from "simple linear model(Technology Push or Market Pull)" to "networking interactions(Innovation Network)" [1]. Recently, concepts such as 'open innovation' and innovation network' have become important and beneficial to both academic and market society due to intensive global competition. Actually, the logic of open innovation is that organizations need to open up their innovation processes and use external entities which are involved in innovation networks[2]. An 'innovation network' can be consisting of a number of positions or nodes, occupied by individuals, firms, business units, universities, governments, customers or other actors, and links or interactions between these nodes [2] to achieve shared innovation goals[3]. In fact, there are four major advantages for networking in innovation such as: collective efficiency, collective learning, collective risk taking and intersection of different knowledge sets[2].

In fact, there are many different classifications which define types of innovation. For example, from a point of view, there are different types of innovation as new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business[4]. Also, another studies examined other classifications of innovation as product, process and managerial one [5], [6]. Again another classifications for innovation types was proposed as service, process, technological process and administrative process in the innovation literature[7]. In addition, Based on OECD Oslo Manual (2005), four different innovation types are introduced as product innovation, process innovation, marketing innovation and organizational innovation[8]. Product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. Process innovation is the implementation of a new or significantly improved production or delivery method. Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Also, Recent evidence suggests that different types of innovation may depend on the conflation of 'novelty' and 'complexity'. This separation of the complexity of innovation activities and the novelty of innovation outputs is led to another aspects as internal and external newness which result in four other different innovations as incremental, competence developing, market developing and radical. Incremental innovations are those which are neither new in the Market nor require the development of new competences. In contrast, radical innovations are regarded here as both new in the market and require the development of new skills[9].

As a matter of fact, innovation has been considered as an interesting area of studies to be defined, categorized and investigated. A research examined the determinants of innovativeness in manufacturing firms of Turkey by considering the innovations as defined in OECD. They proposed as model to explore the probable effects and the amount of contribution of the innovativeness to innovativeness level[10]. In addition, in another study the effects of the organizational, process, product, and marketing innovations were explored on the different aspects of firm performance, including innovative, production, market, and financial performances in some firms in Turkey[11]. The findings supported the claim that innovations performed in manufacturing firms have positive and significant impacts on innovative performance. Moreover, a paper studied and analyzed the connection between different types of innovation as incremental, competence developing, market developing and radical innovation and forms of networking proposed that these types correlate with various innovation network dimensions, including the volume of networks, the strength and content of ties, and the specificity of ties[9]. it was proved that the requirement to access new competences for innovation correlates positively with the number of network partners involved. They also noted more subtle connections between types of innovation and networking, including that novel innovation outputs correlate with using network partners as a source of inspiration, whilst new competences associate with networking for knowledge capital.

In this regard, this paper tries to empirically study and analyze the types of innovation based on OECD regarding to other classification based on the degree of internal and external newness in a networking interaction. Thus, in order to empirically explore the relations between these two classifications, we use the data of 50 companies from the network Pardis Technology Park (PTP) in Iran as a case study.

1.1. Innovation network

Lately, due to intensive global competition, both academic and market society have paid more attention to the concepts such as 'Open Innovation' and 'innovation network'. Actually, the logic of open innovation is that organizations need to open up their innovation processes and use external entities which are involved in innovation networks[2]. An 'innovation network' can be thought of "consisting of a number of positions or nodes, occupied by individuals, firms, business units, universities, governments, customers or other actors, and links or interactions between these nodes" [2] to achieve shared innovation goals[3]. There are four major arguments pushing for greater levels of networking in innovation as collective efficiency, collective learning, collective risk taking and intersection of different knowledge sets [2].

1.2. Types of innovation

Here, we study two classifications of innovation types as based on types of internal and external newness and the OECD definition.

1.2.1. Based on the type and degree of newness

It was suggested that different types of innovation may rely on different kinds of knowledge inputs. For example empirically, networking is positively related, not only to the introduction of innovations but, to the novelty of innovations, where novel innovations are frequently defined as ''new to the market''. Moreover, a parallel argument posits a positive relationship between networking and the complexity of

innovation processes. In fact, more complex processes increase the probability of problems in the innovation process. The direction of these dual arguments has often led to the conflation of 'novelty' and 'complexity' in empirical studies. This separation of the complexity of innovation activities and the novelty of innovation outputs, which is led to various patterns of Internal and external newness results in four types of innovation as incremental, competence developing, market developing and radical. Those are illustrated in figure 1. Here, the view of externally referenced novelty is consistent with standard practice—innovations are more or less novel relative to existing market offerings. In contrast, complexity is a function of the extent to which generation of the innovation requires the acquisition of new skills or competences. Incremental innovations are those which are neither new in the market nor require the development of new competences. In contrast, radical innovations are regarded here as both new in the market and require the development of new skills[9].

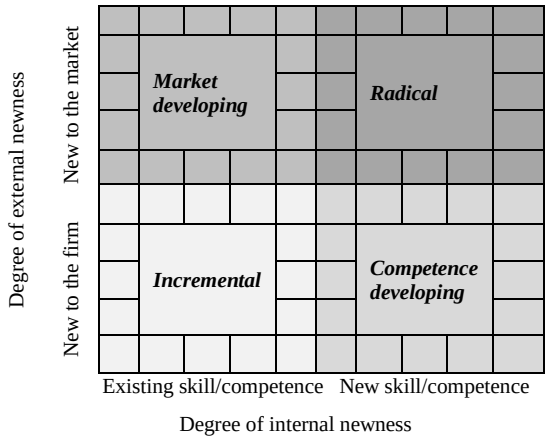

Figure 1. Types of innovation based on internal and external newness

1.2.2. Based on OECD Oslo Manual

OECD Oslo Manual (2005) is the primary international basis of guidelines for defining and assessing innovation activities as well as for compilation, use of related data and the fundamental reference source to describe, identify and classify innovations at firm level. In the OECD Oslo Manual (2005), four different innovation types are introduced. These are product innovation, process innovation, marketing innovation and organizational[8]. Product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products. Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales. Organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies. Table 1 shows these innovations with their types.

2. RESEARCH METHOD

The main purpose of this paper is to empirically study and analyzing the relation between different innovation classifications as based on OECD Oslo and internal and external newness through the methodology including some steps as follows:

- Studying Literature Review and Theoretical Aspects: firstly, this paper studied the literature review and theoretical aspects related to different innovations classifications.

- Collecting the data from a network as a case study: at this step, in order to empirically explore the relation between different innovations classifications, the data are collected from about 50 companies of the network Pardis Technology Park in Iran as a case study.
- Analyzing the data and presenting the findings: at the last step, the data will be analyzed and accordingly results and findings will be presented.

Table 1. Types of innovation based on OECD

Types of innovation	
Product innovation	Introduction of new product
	Development of new use for product with a minor change to technical specifications
	Significant improvement to existing product
	Minor changes or improvement to existing product
Process innovation	Production method
	Delivery method
Marketing innovation	Product design or packaging
	Product placement (sales channels)
	Product pricing
	Product promotion
Organizational innovation	Business practice
	Workplace organization
	External relation

3. DATA AND CASE STUDY

In order to explore empirically the relation between different innovations classifications based on OECD definition as product, process, marketing and organizational and based on internal and external newness as incremental, competence developing and radical ones, it was decided to examine and analyze this by studying the data of last three years (2008-2011) of the network Pardis Technology Park (PTP). PTP is a technology park located in Tehran metropolitan area, in the Islamic Republic of Iran. PTP is as the region's technology paradise, under supervision of Presidency and a fourteen-entity Board of Trustees from ministries, science centers and academies. So far, PTP has had100 Hi-Tech companies. The sample consists of 60 companies drawn from 3 main sectors as Mechanics and Automation, Information and Communication Technologies and Chemistry, Biotechnology and Advanced Materials. Companies to be contacted were selected randomly from the database of PTP site [12] .Table 2 depicts a profile of the resulting sample, illustrating its diversity in terms firm size (in terms of number of employees as up to 50: small; between 50 and 250: medium; 250 and above: large) and firm age(before 1975: old; between 1975 and 1992: moderate; 1992 and later: young). Afterwards, the data was collected by a questionnaire including about 80 questions in the year 2012 within a period of 5 months. Finally, the questionnaire was applied simultaneously through face-to-face interviews to the sample and only about 50 acceptable ones were received

The general structure of questionnarie is shown in table 3 that the innovation classifications based on OECD and internal and external newness with their types are located in the first column and row respectively. Actually, as shown in table 3, the seconed classification is scored from 1 to 10 for the degree of internal and external newness. Next, innovations as product, process, marketing and organizational with each its types are measured based on the scores. In this way it can be understood that how each innovation based on OECD is related to the degree of internal and external newness.

Table 2. Sample profile

Sectors			Firm Size			Firm Age		
			<50	50<<250	>250	<75	75<<92	>92
Mechanics and Automation	10%	100%	25%	70%	5%	5%	55%	40%
Information and Communication Technologies	80%			100%			100%	
Chemistry, Biotechnology and Advanced Materials	10%							

4. ANALYSIS AND FINDINGS

As mentioned before, this study recieved the data of last three years (2008-2011) of about 50 companies in the network Pardis Technology Park to explore empirically the relation between different innovations classifications based on OECD definition as product, process, marketing and organizational and

based on internal and external newness as incremental, competence developing and radical ones. The results and findings are shown in figures 2, 3, 4 and 5 for innovations as product, process, marketing and organizational respectively.

Table 3. General structure of questionnarie for the relation between types of innovations based on OECD and internal and external newness

Types of innovation		Degree of internal newness										Degree of external newness									
		Incremental Inno.					Competence Dev.					Market Dev.					Radical Inno.				
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Product innovation	Introduction of new product																				
	Development of new use for product with a minor change to technical specifications																				
	Significant improvement to existing product																				
	Minor changes or improvement to existing product																				
Process innovation	Production method																				
	Delivery method																				
Marketing innovation	Product design or packaging																				
	Product placement (sales channels)																				
	Product pricing																				
	Product promotion																				
Organizational innovation	Business practice																				
	Workplace organization																				
	External relation																				

Figure 2 shows the scatter chart of the innovation schema for product innovation of OECD. As you see, most of the companies in PTP are located in the middle area of the chart from the point of product innovation. Actually, although it shows that their product innovations are related to all four types of innovations as incremental, competence developing, market developing and radical, but more than half of their product innovations are located on the half top area which means new to the market and makes them be more related to market developing and radical innovation.

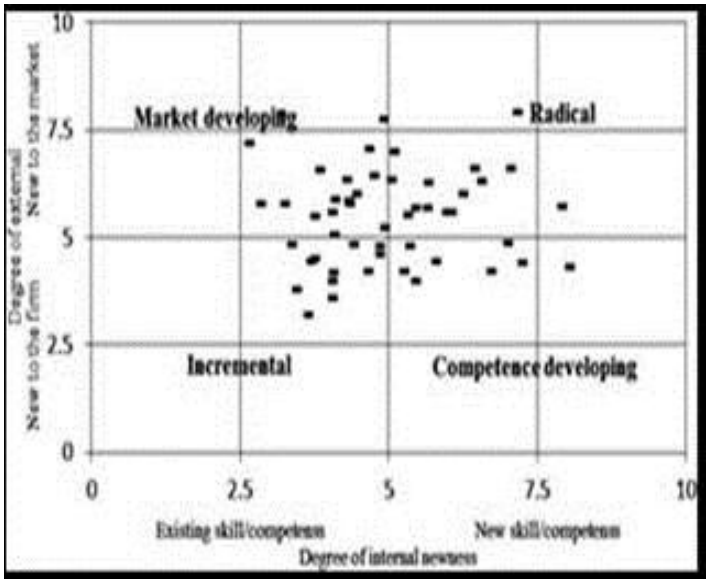

Figure 2. An innovation schema for product innovation

As figure 3 shows the scatter chart of the innovation schema for process innovation of OECD, it can be said that most of companies' process innovations are located in the bottom side of the chart, which indicates they are more new to the firm only, not to the market. Therefore, it is concluded that their process innovations are kind of incremental or competence developing. Although more precisely, the findings show there is a tendencey to incremental innovation.

You can see the innovation schema for marketing innovations of the companies in PTP in figure 4. Again it is clear that like the innovation schema for product innovations, marketing innovations of companies are located about in the middle area of the chart. But if we see this chart more precisely, it can be said that not only most of the company are active in the half top area of the chart from the point of marketing innovation, but also their marketing innovations are more related to the radical innovation as they were new to the market and needed new skills/competences.

Figure 5 shows an innovation schema for organizational innovation based on the degree of internal and external newness. Although this innovation is located in the middle area of the chart as product and marketing innovations, but most of them are related to innovations as competence developing, market developing and radical. Therefore, it is concluded that less organizational innovations are incremental. More precisely, most of organizational innovations of the companies in PTP are new to the market than only to the firm or need new skills/competences.

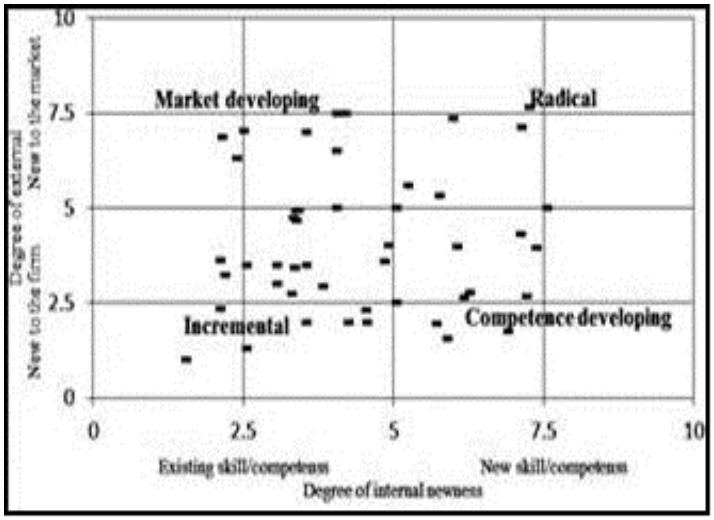

Figure 3. An innovation schema for process innovation

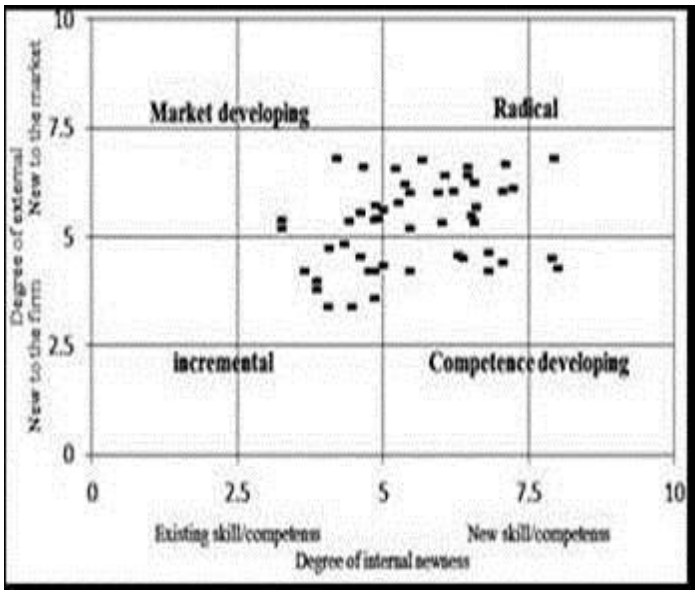

Figure 4. An innovation schema for Marketing innovation

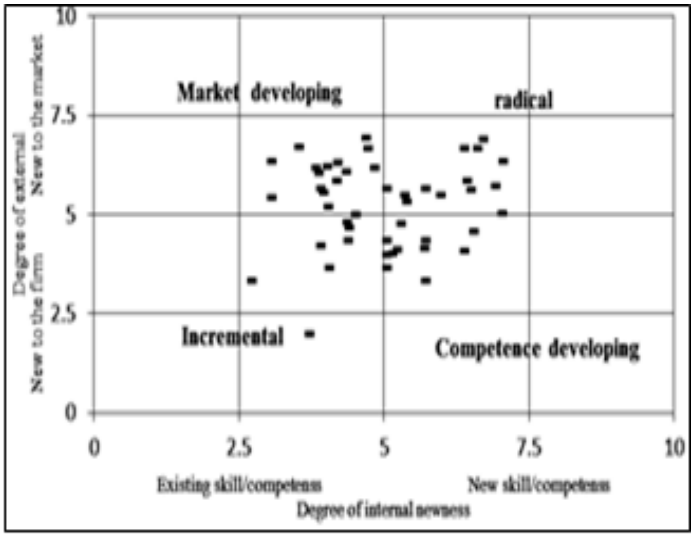

Figure 5. An innovation schema for Organizational innovation

5. CONCLUSION

The main purpose of this paper was to empirically study and analyze the types of innovation based on OECD as product, process, marketing and organizational one regarding to other classification based on the degree of internal and external newness as incremental, competence developing, market developing and radical one in a networking interaction. Thus, in order to empirically explore the relations between these two classifications, this paper used the data of last three years (2008-2011) of about 50 companies of the network Pardis Technology Park (PTP) in Iran as a case study. the results and findings show that most of their product innovations are new to the market which makes them be more related to market developing and radical innovation. But most of process innovations are kind of incremental or competence developing. It was found that marketing innovation of companies are more related to radical innovation as they were new to the market and needed new skills/competences. Finally, it was cleared that less organizational innovations are incremental most of them are new to the market or need new skills/competences. At the end, as a conclusion we can say that most of the innovations as product, marketing and organizational are new to the market and more precisely marketing and process innovations are more related to radical and incremental innovation respectively and less organizational innovations are incremental.

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