INNOVATION MODELS AND IMPLEMENTATIONS AT FIRM LEVEL IN MANUFACTURING INDUSTRY

by

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INNOVATION MODELS AND IMPLEMENTATIONS AT FIRM LEVEL IN MANUFACTURING INDUSTRY

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Abstract

Innovation is broadly seen as the starting point of a competitive economy in recent decade since added value of existing product and services of companies are diminished by quickly changing technologies and harsh global competition. Therefore, innovativeness becomes an important contributor to competitive success. Hence, competitiveness is firmly dependent upon an organization's management of the innovation process. Particularly in the last two decades, this subject has become the focal point of many academic and industrial researches in order to overcome problems encountered by the companies while struggling for achieving sustainable competitive advantage in the global competition.

The main objective of this thesis is to develop methods and strategies for modelling and analysis of innovation at the firm level, including its effect to the competition power and firm performance, based on an empirical study covering 169 manufacturing firms. Also, it is aimed to suggest an integrated model of innovativeness at the firm level and to analyse the effects of innovations determinants which have significant role on innovation development success. In this thesis, innovation -one of the important component of today's business life which shapes the current and future economic structure - will be discussed; and the analyses about how innovativeness competency of firms influences their competitiveness and performance will be presented.

İMALAT SANAYİİNDE FİRMA DÜZEYİNDE
İNOVASYON MODELLERİ VE UYGULAMALARI

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Özet

Geçtiğimiz on yıllık dilimde, inovasyon geniş anlamda rekabetçi ekonominin başlangıç noktası olarak görülmektedir, zira firmaların ürettiği mevcut ürün ve hizmetlerin katma değeri, hızla değişen teknolojiler ve şiddetli küresel rekabet yüzünden hızla tükenmektedir. Bu sebeple, yenilikçilik firmaların idari anlamda yenilik yönetimine sıkı sıkıya bağlı olan rekabetçi başarısının temeli haline dönüşmüştür. Özellikle son yirmi yıllık dönemde, yenilik konusu firmaların rekabet avantajı kazanmak adına gösterdikleri çabalar sırasında karşılaştıkları sorunları bertaraf etmek için birçok akademik ve endüstriyel araştırmanın odak noktası olmuştur.

Bu çalışmanın ana amacı, firma düzeyinde inovasyonu modellemek, analiz etmek ve inovasyonun firma performansına ve rekabetçiliğine etkilerini belirlemek için, 169 imalat firmasını içine alan gözlemsel bir araştırma çerçevesinde metotlar ve stratejiler geliştirmektir. Ayrıca, firma düzeyinde bir yenilikçilik modeli ortaya koymak, inovasyon geliştirme sürecinde anlamlı bir öneme haiz olan yenilik belirleyicilerinin etkilerinin analizini yapmak diğer amaçlar arasındadır. Bu tez kapsamında bugünün ve geleceğin ekonomik yapısının önemli bir bileşeni olan yenilik tartışılacak ve şirketlerin yenilikçilik becerisinin rekabetçiliklerini ve performanslarını nasıl etkilediğini gösteren analizler sunulacaktır.

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CHAPTER 1

INTRODUCTION AND PURPOSES

1.1 Introduction and Scope

Innovations are the lifeblood of organizations, since swiftly changing technologies and severe global competition rapidly wear away the value added of existing products and services. Therefore, innovativeness is a latent source of competitive advantage for many firms and it is one of risky, but of utmost important attainments of the contemporary companies. Innovation as a term is not only related to products and processes, but is also related to marketing and organization. Akova et al. (1998) stated that the greater risk in innovation process does not arise from developing new products or services, but from failing to innovate at a pace that matches changing needs of customers.

Innovation is not a new phenomenon since improvements and inventions are in the nature of mankind. In spite of this, innovativeness has turned into a hot spot for academic research particularly over the last two decades, since it provides a strategic orientation to organizations with the intention of surmounting their environmental problems met in the exploration for sustainable competitive advantage in the worldwide competition (Drucker, 1985; Hitt et al., 2001; Kuratko et al., 2005). At the nationwide level, innovation is a fundamental element of current economies, which not only supports the development and growth of countries, but also increases their life standards.

The European Councils signaled the important role of R&D and innovation in the EU by indicating research and innovation should be put at the heart of EU policies, funding and business. EU has determined its strategy at the meeting on March 23-24th 2000 in Lisbon as "to form new policies for R&D and for the information society", "to gain acceleration to the structural reforms for the innovation and competitiveness" and "to define the internal market, in order to be the most competitive and dynamic information-based economy in the world".

The fundamentals of information based economy, which will provide sources of comfort for the information society at the near future, can be defined as :

i. Innovation policies, institutions and aids for maturing and commercializing the domestic and foreign innovations.
ii. Developing the human capital, especially being technology reader-writer.
iii. Data processing technologies.
iv. Open work conditions to develop information based economy.

Thus, innovativeness is one of the key elements of the Lisbon declaration that aims to establish such an information based society, which is the basis of current and foreseeable future economies.

It is possible to analyze innovation under three branches: (1) National innovation system, (2) Innovation at regional level, and (3) Innovation at firm level. Carlson (2006) declared that innovation has a great importance and reputation for national comfort; and it has a positive influence for sharing of tacit knowledge on nationwide level. Although innovation systems are more internationalized recently, the importance of national conditions, government policies and the national innovation support process has not diminished.

In this thesis, the focus is on the innovation at firm level. It has both empirical and theoretical aspects. Turkish manufacturing firms are selected to collect data for testing the hypotheses and the suggested innovation model. Six manufacturing sectors are selected for the survey application and the subsequent analysis:

Textile products manufacturing, chemical material and products manufacturing, metal goods industries, machine manufacturing, electrical home tools and equipments (domestic appliances) and automotive industries.

Further details of the selection method of firms for the survey application are presented in chapter 4. The survey is performed in the North Marmara region of Turkey, mainly in cities Kocaeli and Istanbul (Sakarya, Tekirdağ and Kırklareli had also been invited to participate in the survey). These regions compose the major parts of Turkish manufacturing industry. The survey is designed to assess information on innovation activities within enterprises, as well as various aspects of the process such as the effects of innovation, sources of information used, costs etc. With the collected data, innovation profile of the Turkish enterprises is depicted; but more importantly, while comparing regional and sectoral dimensions, innovativeness competency of firms and its impact on their competitiveness power are investigated.

In summary, this thesis contains two modules:

i. *Field study about innovation at firm level*: This field study is conceived as an innovation survey and interviews applied to firms in selected manufacturing sectors.
ii. *Modeling the innovation at the firm level*: The analysis includes both modeling of innovation process, and the effect of innovation on firm performance. The goal is to make concrete the features of innovative capability in innovative manufacturing firms, which might lead to strategies, policies, and procedures for improving the innovativeness and hence the competitiveness of the manufacturing sectors involved.

The modeling of how innovativeness affects competitiveness of a firm is an open research problem in the literature. The complexity raises from the definition of the competition power. On the contrary, modeling of the new product design and development processes and capabilities are very popular subjects analyzed in many articles of the innovation literature. Recently, original design and marketing innovation have also increased their popularities. However, in Turkey, similar researches, particularly supported by field studies are rare.

According to the OECD researches, in the years 1970-1995, more than half of the development and expansion in the economies of developed countries have resulted from innovations and innovativeness. Therefore, Turkey has to become more innovative in order to accelerate its economic development (Özçelik and Taymaz, 2004). But the data related to innovation in Turkey is rather scarce. Therefore, the innovation model, the survey database and the findings of this thesis can constitute valuable source for future researchers. With finalization of this study with all of its dimensions, it is possible to obtain important results about; (1) how innovativeness appears in manufacturing sector of Turkey, and what are main innovation determinants, and (2) why do firms need to be innovative and what are the importance of innovations in terms of firm performance.

A further output of this thesis would be the determination of the differences between the companies as well as between the sectors in terms of innovative capability. These differences may be caused by innovation determinants, which directly influence innovation competencies of the manufacturing sector.

1.2 Definitions of Innovation

In this thesis, innovation term will be considered similar to the definition provided in related European Commission reports (European Commission, 1996) that expressed innovativeness as:

i. Extending and renewing the spectrum of products and services and related markets,
ii. Developing new techniques for production, acquisition and distribution,
iii. Applying new and efficient modifications for manpower capabilities, work organization, work condition and finally for management.

Formally, innovation is considered to be the successful development and application of new knowledge (OECD, 1997). The purpose of innovation is to launch newness into the economic area. Metcalfe (1998) explains that when the flow of newness and innovations desiccate, firms' economic structure settles down in an inactive state with little growth. Hence, innovation is critical for long-run economic development. It is a dominant clarifying motive behind differences of performance and competition between firms, regions and countries. For instance, the study by Fagerberg et al. (2004) reveals that innovative countries have higher productivity and income than the less-innovative ones.

Innovation is defined as a continuous change of business processes, services and products of the company that is under the pressure of strong competition in order to gain competitive advantage and to upgrade the efficiency of work; especially in the highly dynamic market conditions of today (Elçi, 2006).

In the Oslo Manual (2005) (the sub-heading of the Oslo Manual is stated as "the measurement of scientific and technological activities, proposed guidelines for collecting and interpreting technological innovation data"), an innovation is defined as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. European Union and the OECD reports explain that innovation process indicates modifications in which an idea transforms to a marketable product or service, or else an upgraded production or distribution management, or else a new social service management. More specifically, innovation is (European Commission, 1996):

- Renewal and expansion of the range of products, services and markets,
- Establishment of new methods of production, supply and distribution,
- Introduction of changes in management, work organization, working conditions and skills of workforce.

Drucker (1985) commonly defined the innovation such as the process of equipping in new, improved capabilities or increased utility. It is worth saying that innovation is not a science or technology but a value that can be measured with environmental impact. From the managerial point of view, innovation could be defined as the development and creation of new or improved products or services. The suitable conditions for creating innovation come from the changes such as new consumer needs or new solutions for existing needs (Doyle, 1998).

Innovation can also be conceived as the transformation of knowledge to economic profit. It has great commercial importance since it creates an opportunity for firms to enter new markets and to provide enhanced competitive advantage in existing markets. It also increases the efficiency and the profitability of companies. Actually, Romer (2005) stressed that innovation is a process that encloses several diverse activities, ranging from preliminary research through to the development of prototypes and the registration of inventions and concluding commercial applications.

According to the Competitiveness Council of European Commission, the basic properties of innovation can be summarized as follows (2004):

- *Innovation diffuses at an increasing pace.* The various causes for this diffusion pace are the very developed information and communication network, and the increased economic, cultural and political connections.
- *Innovation is becoming more and more global*. The same innovation is adopted in different parts of the world. For instance, the manufacturing model of Toyota beginning at 70's (Womack et al., 1993) adopted by the USA automotive industry and then by all other related manufacturing firms all over the world, in relatively short time.
- *Innovation is complex technologically*. The innovation is formed with the synergy of different dimensions of various disciplines.
- *Innovation is demanding more and more creativity*. The growth of innovations in the same areas, the reduction of launching time between these innovations and the globalism are the key reasons why innovativeness demands more creativity day-by-day. These findings stress the importance of collaboration and communication between users and producers in order to be more innovative.

Briefly, innovation is the product, process, marketing or organizational method that is new (or significantly improved) to the firm. This includes products, processes, and methods that firms have developed mainly by themselves and also those adopted from other firms or

organizations. Besides, it is a frequent characteristic that innovation must have been implemented, meaning that it must have been introduced to the market.

1.3 Research Questions and Purposes

The main objective of this thesis is to develop methods and strategies for modeling and analysis of innovation, including its effect on the competitiveness and performance of firms. Also, it is aimed to suggest an integrated model of innovativeness at firm level and to analyse the effects of innovations determinants which have significant importance on innovation development success.

After an extensive literature review a innovativeness model is hypothesized in order to answer mainly three fundamental research questions stated below:

i. What are the determinants of innovation at firm level?
ii. How can innovation be measured?
iii. What are the benefits of the innovation to the firms, especially in terms of competitiveness and performance?

A deliverable of this study is expected to be a database, which can be employed as a pathfinder for proposing appropriate policies and strategies to the firms about innovation. The results are also useful to describe innovation capabilities of the firms in selected regions, in order to perform a comparison at sector level. Thus, the purpose is making evident the strategy and action plans that are necessary to encourage innovativeness in firms.

In order to achieve and implement these aims, this study is outlined as follows:

i. To evaluate the innovative capability and potential of the manufacturing industry;
ii. To generate an opportunity of pursuing both technical, organizational and managerial evaluation of the manufacturing industry; and to uncover new organizational, managerial and technical capabilities related to innovativeness in manufacturing industry;
iii. To propose policies about the evolution of innovativeness in the manufacturing industry.

In summary, this thesis aims to reach conclusions on the conceptual and theoretical aspects of innovation in manufacturing firms in Turkey by applying empirical research methodology. Finally, modeling of innovation process and the study of searching the

influence of innovativeness upon the competitiveness of manufacturing firms are also expected to result in valuable contributions to the innovation literature.

1.4 Research Methodology

In order to collect the required data, we utilized an empirical survey. A questionnaire form has been developed to be filled in by the upper managers working in various enterprises of selected industries in order to assess the determinants of innovations and their structural associations to firm competitiveness and performance.

The data used in this study is provided from an ongoing project (TUBITAK-105K105/SOBAG) called "Innovation Models and Implementations in Manufacturing Industry" funded by the Scientific and Technological Research Council of Turkey (TUBITAK). In that project, detailed data has been collected through the application of a questionnaire (survey application) and through interviews.

The suggested methodology of Meredith et al. (1989) for academic research is taken into account while selecting the survey application procedure. The survey is very beneficial especially for analyzing the collected data by statistical methods and also for generalizing the results through quantitative means. Thanks to the factors like being less expensive and less troublesome, survey method increases its popularity. But, on the other hand, a weak point of this method is that the respondent does not have much assistance for questions s/he does not understand while answering the questionnaire and thus s/he responds it according to his/her own perception.

The questionnaire form is prepared by considering both the recent questionnaire forms utilized in prior studies, and both the determinants and the measures met in the up-to-date academic literature. The survey is used particularly for collecting data in order to evaluate the determinants of the innovation at firm level, to find out the influence of innovativeness on the firms and to determine the relation between innovativeness, competitiveness and performance. After the data is collected, it is analyzed using statistical methods, tools, and softwares (especially SPSS and AMOS) in order to reach conclusions.

The main aspects of the methodology applied in this thesis can be explained as follows:

- *Modeling Issues.* The modeling of innovativeness begins with literature search, which is useful to obtain a hypothetical model. The validation of this hypothetical model is investigated using the results of the survey applied.

- *Survey Application.* Survey application is primarily made with mail assistance. After selecting the sub-industries, the questionnaire is posted to firms with a pre-paid return envelope and a cover letter. When the firms filled the questionnaire, they directly sent it back to the return address. But to make up for the insufficient number of survey participation, face-to-face interviews for survey application are also realized.
- *Data Analysis.* After data has been collected by the survey, the analysis is performed mainly using SPSS v13 and AMOS v4. The hypotheses are tested by appropriate statistical methods employing these softwares. Finally, results of the analysis are gathered and conclusions are drawn.

1.5 Organization of the Thesis

The thesis has eight chapters. Introduction, covering the thesis scope, innovation definitions, the research questions, the purposes, and the research methodology is presented in this chapter. In the second chapter, the importance of innovation and its basic terms, innovation types and innovation at firm level, innovativeness and competitiveness relations are discussed along with the review of innovation literature. The third chapter consists of the definition of the problem, the suggestions concerning innovation model, the hypotheses of the study and the review of the measures for innovativeness proposed in the literature. The fourth chapter is about survey design and explanation of the questionnaire form. This chapter also explains the methodology of data collection process and how the sample represents the population. The fifth and sixth chapters exhibit the analyses and the results of drivers model of innovativeness and performance model respectively. The seventh chapter acts as a summary of findings and it also includes some notions about sectoral differences. Finally, the thesis is concluded with the conclusions and suggestions for future research, all presented in the eighth chapter.

CHAPTER 2

BASIC TERMINOLOGY AND LITERATURE REVIEW

2.1 Importance of Innovation and Basic Terminology

Innovativeness is one of the fundamental elements of firms' business strategies to enter new markets, to expand the existing market share and to provide the company a competitive advantage. Nowadays, the objective of innovations is not only the necessity of reducing costs; but a wide spectrum of reasons such as improving product and service quality, designing better products, enduring the shortened product life cycle, responding to customer needs and demands, and thus developing new services and products, new organization models and new marketing techniques. Many researches are more or less based on the idea that firms overcome their competitive problems only through innovations (Evangelista et al. 1998). Hence, the modern companies need to be innovative in order to compete better in their market.

First of all, it can be useful to make a distinction between innovation and invention. As a definition, invention is the first occurrence of an idea for a new product or process, while innovation is the attempt to convert it into economic return. Similarly, Salavou (2004) draws attention to the difference between innovativeness and innovation: Innovation seems to incorporate the adoption or/and implementation of "new" defined rather in subjective ways, whereas innovativeness appears to embody some kind of measurement contingent on an organization's proclivity towards innovation. Akova et al. (1998) defines innovativeness as a critical means by which members of companies diversify, adapt, and even reinvent their firms to contest evolving market and technical conditions.

It is also useful to announce the difference between innovation and imitation. Actually, there is a clear difference between commercializing something for the first time and copying it and introducing it in a different context. The latter possibly includes a larger dose of

imitative behavior or what is sometimes called technology transfer (Fagerberg et al., 2004). Briefly, an innovation is the introduction of a product, process or application which is new both to the firm and to the market. Imitation denotes the introduction of product, process or applications, which are new only to the firm, not to the market.

On the other hand, some sources and disciplines separate innovativeness under two different categories. *Behavioral innovativeness* is a characteristic of a firm's intellectual capital that is formed by sum of innovative capabilities of firm's employees, teams and management. Internal openness to new ideas and innovations is basic unit of behavioral innovativeness, which can be seen as a crucial factor that underlies innovative outcomes. The main focus of *strategic innovativeness*, in contrast, is to evaluate an organization's capability in order to deal with specific organizational objectives (Wang and Ahmed, 2004).

Despite its apparent importance, innovation has not always attracted the academic attention it merits. Nevertheless, this situation is now changing; academic researches and studies about innovation in economic and social change have propagated in recent years, principally with a bent towards cross-disciplinary. The wisdom towards cross-disciplinary necessitates much academic work in this area and it reveals that no particular discipline can deal with all aspects of innovation (Fagerberg et al., 2004).

According to one theoretical approach based on Schumpeter's studies, it is a common fact to categorize innovations along with how radical they are, compared to existing technology (Freeman and Soete, 1997). In academic and scientific literature, innovations are generally defined under two categories: Radical innovations and incremental innovations.

Radical innovations have generally great risks and they are hard to be translated into the commercial domain. Yet, they provide important benefits to firms in long-term in terms of market success, competitive advantage, and better performance results. Sometimes, radical innovations contain new technology improvements and applications, which can even modify the market structure. In contrast, *incremental innovations* include small modifications so as the customers use the resulting products/processes more easily, with more satisfaction, and with less assistance (Darroch & McNaughton, 2002; Hermann et al., 2006).

In most cases, receiving economic benefits from radical innovations needs beforehand a series of incremental improvements. When an innovation is more radical, the risk of probable need of wide investments and/or organizational change to succeed in the market is greater. Briefly, innovation is vital for economic change; and while incremental innovations fill in the process of change continuously, radical innovations shape big changes in the market (Schumpeter, 1934).

Before further explanations, it is useful to define the key words employed in the definition of innovation types. These key words are *technologically new or improved*. According to Oslo Manual (2005), an innovation is technologically *new*, if its technological characteristics differ considerably from those of previous products or processes. Such innovations may entail radically new technologies, may be based on combining existing technologies in new uses, or may be derived from the use of new knowledge. On the other hand, *technologically improved* means that existing performance has been significantly enhanced or upgraded. A simple product or process may be improved in terms of cost and/or performance while using higher-performance materials, components, or different processes.

2.2 Innovation Types and Innovation at Firm Level

2.2.1 Innovation Types

Schumpeter (1934) differentiated between five different types of innovation: new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business. Yet, in economics, most of the focus has been on the new products and new production methods. The terms product innovation and process innovation have been used to typify the incidence of new or improved goods and services, and improvements in the processes to produce these goods and services, respectively.

In the Oslo Manual (2005), four different innovation types are introduced. These are product innovation, process innovation, marketing innovation and organizational innovation. Product innovation and process innovation are closely related to the concept of technological developments. The definitions of these innovation types are:

A product innovation is the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses; including significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (Oslo Manual, 2005). Product innovations can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies. The term product is used to cover both goods and services.

Product innovation is a difficult process driven by technology advances, changing customer needs, shortening product life cycles, and increased world competition. For success, it must involve strong interaction within the firm and further between the firm and its

customers and suppliers (Akova et al., 1998). Although design is an essential ingredient of the development and the accomplishment of product innovations, the design modifications do not involve a major change for practical distinctiveness of a product. That is why the design activities are not acknowledged as product innovations.

A 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 (Oslo Manual, 2005). Fagerberg et al. (2004) stressed that while the introduction of new products is commonly assumed to have a clear, positive effect on the growth of income and employment; process innovation, due to its cost-cutting nature, can have a more hazy effect.

A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing (Oslo Manual, 2005). Marketing innovations target at addressing customer needs better, opening up new markets, or newly positioning a firm's product on the market with the intention of increasing firm's sales. Marketing innovations are strongly related to pricing strategies, product package design proprieties, product placement and promotion activities.

Finally, *an organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Organizational innovations have a tendency to increase firm performance by reducing administrative and transaction costs, improving workplace satisfaction (and thus labour productivity), gaining access to nontradable assets (such as non-codified external knowledge) or reducing costs of supplies* (Oslo Manual, 2005). Thus, organizational innovations are strongly related with the business practices.

Alternatively, in the U.S. literature, two different types of innovation can be distinguished. According to the National Institute of Standards and Technology (2003) of the U.S., these types are technological and commercial innovations. Technological innovation is the successful implementation in commerce or management of a new technical idea. A commercial innovation is the result of the application of technical, market, or business-model ingenuity to create a new or improved product, process, or service that is successfully introduced into the market.

2.2.2 Innovation at Firm Level

Firms are basic units where innovations occur. Innovation takes place through a wide variety of business practices. Thanks to the ability of transforming system and process dynamics into innovation and market success, firms are in the heart of the innovation process. In the Oslo Manual (2005), it is predicted that the source of innovation at firm level may be described as a system of factors that shapes innovations and is referred to as the innovation dynamo. That dynamo figures out, in fact, the determinants of innovation.

Owing to the collaborations between organizations, firms are easily able to set the competitiveness strategies and establish innovation structures. In fact, innovation has a tendency to cluster firms, where it matures more hastily and involves structural alterations in the production process, as well as in the organizational and institutional behaviors.

Innovations can be created by several ways in firms: Since the research is the main factor of innovativeness that generates ideas and technical skills, innovation can be in the form of invention. Also, adapting and imitating can also be very useful firm strategies; a company can be innovative by taking an idea from other firms or sectors and adjusting it for its own purposes. Actually, inventions can be performed anywhere; however, innovations arise typically in firms. To be capable of transforming an invention into innovation, a firm usually needs to merge a number of different types of skills, capabilities, knowledge and resources. The innovator in an organization is responsible for combining these required features (Fagerberg et al., 2004).

Innovation depends on a strong relation between the different functions of companies. Particularly, R&D, marketing and production departments play a major role. The coordination between these functions and their other in-firm relations are vital in order to merge the necessary skills, capabilities, knowledge and resources for innovativeness. *Figure 2.1* sketches in-firm relations, particularly those among the important in-firm functions in the innovation making process.

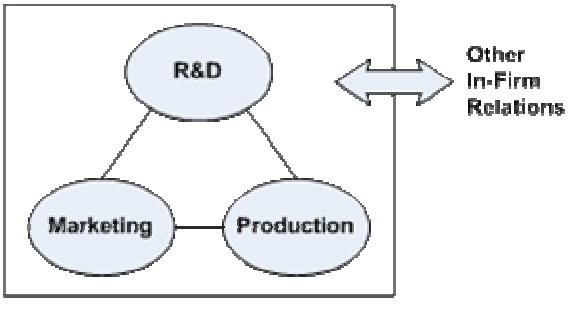


Figure 2.1 : In-Firm relations in the innovation process

Olson et al. (2001) examined the relationship of the in-firm departments in terms of their contribution to innovativeness. They found that significant in-firm cooperation must exist to be innovative, and they demonstrated that the strength of this collaboration and communication varies depending on the nature of innovation (new to market, new to firms vs.) associated with the new product, process or services being developed.

Becheikh et al. (2006) provided a systematic review of empirical articles about technological innovations in the manufacturing sector at firm level, published between years 1993 and 2003. Their main purpose is to integrate the findings of innovation studies in order to identify how innovations occur in firms and where the conclusions about innovativeness converge and diverge. They predicted that their research would help to advance the cumulative knowledge about innovativeness in companies.

OECD reports point out that companies that develop innovations in a more decisive way and rapidly, have also more qualified workers, pay higher salaries and provide more conclusive future plans for their employees. The effects of innovations on firm performance differ in a wide spectrum from sales, market share and profitability to productivity and efficiency (Oslo Manual, 2005).

2.3 Innovativeness and Competitiveness

The competition between companies is the basic factor that shapes market conditions and determines firms' competitive priorities such as optimum price and quality for products and services in the market. Since firms want to lead the competition race, they struggle to be different, to be preferred by customers and to be the first launcher in the market. Companies try not only to discover appropriate methods for extending continuously their profitability and productivity, but also to find out the customer needs not yet met and then to develop new products and services to satisfy these needs. For this purpose, the competitiveness policies and their implementation in a country have to support these activities of firms and not to obstruct the competition structure of the market (Elçi, 2006).

Innovativeness and technological developments are critical and powerful approaches for all industrialized companies to grow continuously and to gain competitive advantage in local and global markets. Currently, technology appears to be the main trigger of economical growth for organizations. Global competition is not based anymore on natural resources and cheap labor, but on technology development and innovations. Technological progress and

innovations are essential means for obtaining better performance outputs at firm level and also for achieving developed country level, providing continuous economic growth for countries.

In fact, competition is a widely used term that has no common definition and possess different meanings at different point of views, namely at firm, region, nation and global base. In this thesis, competition is considered at firm level. Accordingly, competition power of firms can be defined as the ability to keep on providing preferred goods and services to customers against the other alternative goods and services in the marketplace. From the companies' perspective, competition evolves around customers. Recently customer relations become the limelight of firms' activities; therefore, firms need to be structured as customer-oriented organizations in order to gain competitive advantage in their market.

Competitiveness is a firm's share of its markets for its product. It has been typically measured in financial and economical terms. The fundamental pressure of competition for firms is decreasing manufacturing costs and improving technological ability. These aims push companies to new organizational and work structures such as focusing on and improving firm's core competencies, developing new structures for responding and reacting better to new market conditions and customer demands, targeting different markets, increasing collaborations with other companies, and investing in innovations (Ulusoy et al., 1999).

Different approaches to competition have been discussed in the literature. Ulusoy (2000) defined the engineering approach as the ability of being competitive while searching for, determining, adopting and improving the best practices related to customer focus, quality, flexibility, cost, innovation, and responsiveness that yield superior performance. This approach suggests a best practice paradigm for competitiveness which the firms' top management points out and sets targets for.

Taş (2006) hinted that the main factor contributing to the competitiveness of a firm is its R&D investments and its continuous productivity growth. The author noted that efficient competition policies are critical for firms' competitiveness as well. McAdam and Keogh (2004) investigated the relationship between firms' general performance and its familiarity with innovation and research. They found that firms' tendency to innovations in its competitive environment are vital in the sense of installing the connection between innovativeness and competitiveness.

According to Porter (1998), innovation means technological progress and is a business practice to accomplish firms' activities via better methods and processes. For that reason, companies acquire competitive advantages by being innovative, while developing newest technologies and modern production techniques.

Taş (2006) points out that in global competition environments, since companies and even countries want to improve their competitive power, they must acquire high R&D capabilities, better innovation competence and added-value based dynamic competition superiority. That dynamic competition superiority requires both specialization in resource acquisition and low-cost advantage.

The relationship between increased productivity and economic growth is strongly related to expansion pace of the technology, knowledge accumulation and also efficient innovation strategies. Nowadays, production cost and quality are not key differentiating factors for competitive advantage; gaining and sustaining competitive advantage requires taking on new challenges and creating new markets, which no doubt are based on innovativeness.

2.4 Review of Innovation Literature

2.4.1 Introduction to the Innovation Literature

Recently, firms and countries found themselves in the challenge of global competition. The influence of this global competition forces firms to determine their business strategies. New product development, increased capability in products and production strategies, new markets, and supply chain management are some of the candidate factors to shape the competitive advantage that firms try to obtain. Innovativeness is increasing its importance among firms' strategies due to its evident contribution to the competitive advantage of firms and also due to the globalization. Therefore, innovation management research becomes very important all over the world in recent years.

In former academic studies, several approaches are discussed about innovation management. These studies aim to form a structure that combines innovation strategies with competition and business strategies. Technology management, whose importance is increasing in all sectors and economies, is one of the focused points in these innovation researches. Technology management process consists of phases like determining, choosing, acquiring, using and protecting the technology (Probert and Gregory, 1995). This proposed process structure for technology management is also very appropriate for the spread of process-based organization culture (Pandya et al., 1997). Pavitt (1990) emphasized that for successful technology management, firm determination is a necessity. The integration of

technology plans with companies' master business plans makes the technology a critical element at firm level. In fact, inclination towards structured innovation processes and innovativeness is a suitable way in order to expand the efficiency of technology planning at firms (Metz, 1996).

New product development (NPD) is also a business practice of high-reputed firms to gain competitive advantage in the marketplace. Earlier innovation literature focused mostly on this subject and the modeling of NPD process in the manufacturing industry is well-studied. According to Cooper (1999), the critical new product success factors are: The pre-research before starting the process, listening to customers' voice, offering different products to customers than competitors do, defining product goals early in the process, strong market participation and close market observation, taking the "continue/terminate" decisions seriously and quickly at the control points of the process, having a multi-discipline project team and having a strong project leader.

Related to NPD, Payzın (1998) emphasized that there are some deficiencies in forming a technology strategy and transforming this technology strategy to business strategy. Thus, these deficiencies are the primary problems in NPD processes. It is important to improve the interaction interfaces between technology, R&D and the new product and process development fields in order to be more innovative. Particularly, excessive relationship of companies with suppliers, customers, research institutions and the universities can be very useful in the innovation making process.

2.4.2 History and Evolution of Innovation Theory

Conjectural studies are the pioneers of the innovation literature that has been grown and matured by the researches which tried to elucidate the innovation concepts by defining organizational policies, processes, and characteristics whereby companies test and realize their efforts for innovative and creative ideas regarding its products, processes, and markets (Pinchot, 1985; Stevenson and Jarillo, 1990; Hitt, et al., 2001).

Innovation studies are initially based on entrepreneurship in economics literature. The term entrepreneurship was first used by French economist Richard Cantillon (1755) in his essay about general economics, where the merchant takes risk while buying some products at an agreed price, and then selling it at an ambiguous price. Thus, Cantillon defined entrepreneur as a merchant who takes risk in order to make profit. In fact, the term

entrepreneur comes from the French verb “entreprendre”, which means “to undertake”. Nowadays, the term entrepreneurship is used similar to the Cantillon definition, but innovative dimension of this term is forgotten.

Actually, in the beginning of the 20th century, in addition to its properties like risk taking and uncertainty, the entrepreneurship term gained an innovative dimension, too. This fact was first introduced in the study “The Theory of Economic Development” of Joseph A. Schumpeter (1934) and then, it had gained academic focus thanks to this Austrian economist. In that essay, Schumpeter had established the basis of economical theory of entrepreneurship, and his thoughts are still very valuable sources for entrepreneurship and innovation researches (Çetindamar, 2002).

According to Schumpeter’s entrepreneurship definition, merchant is the one who presents to market a new system, product, process or an original composition of them, while taking risk due to uncertain demand in the market. The innovations presented by the entrepreneur must be quite improved from the previous system, process or products. Schumpeter (1950) announced that each innovation must have the power that breaks the use of the previous; and this loop has been named as creative destruction. Thus, innovations are the key factors for economical development.

The global competition, which became particularly tough after 80’s, forced the companies focus on its business strategies, especially on innovations (Kurotko and Hodgettes, 1998). Damanpour (1991) emphasized that according to recent empirical studies, it is understood that innovations are not performed only by individual entrepreneurs but more commonly by organizations. In fact, nowadays, innovativeness has become the primary business strategy, even the mission of some companies like 3M (Fry, 1987). Furthermore, innovation centers like Silicon Valley have been founded. Consequently, due to increased investments based on advanced technology, number of creative destructions has increased globally, and thus, the development of global economies has gained pace.

Famous management specialist Peter Drucker (1984) suggested four fundamental aspects for quick economical development at firm level. These business practices are: (1) Increased investments thanks to quick development of global communication and technology. (2) Catalysis effect of demographic changes such as women becoming more integrated into business life, increase in education and specialization of adults etc. (3) Support and aids to firms making it easier to find funds thanks to risk capital availability for entrepreneurs. (4) Start of learning and applying the practices of entrepreneurship management by American industry. At the present time, due to the tough global competition, both individuals and

companies begin to evaluate and to apply their innovation strategies and entrepreneurship abilities with the purpose of gaining competitive advantage (Drucker, 1985; Hult et al., 2003).

2.4.3 Determinants of Innovation

In recent years, the subject of innovation determinants has been frequently discussed and it has become one of the focuses in the innovation literature. Derived from this increased literature, a central research theme has recently revealed as innovativeness by major authors exploring innovation determinants in order to initiate an innovative approach at firm level (Kanter, 1985; Pinchot, 1985; Kuratko and Montagno, 1989). These researches hinted that empirical studies should be involved in diverse cultures and industries to facilitate the understanding of innovation making process with all of its dimensions (Hornsby, Kuratko and Zahra, 2002; Kemelgor, 2002).

Actually, it is possible to examine the innovation determinants in two subgroups: in-firm (indigenous) parameters and out-firm (exogenous) parameters. The indigenous parameters include general firm characteristics (such as firm's age, size, ownership status etc.), firm structure (such as intellectual capital, firm culture, firm decision taking process and openness of in-firm communication channels, delegation of works, managerial characteristics and leadership, etc.), and firm strategies (such as collaborations, knowledge management, investments strategies and cost strategies, pressure of competition elements, etc.). On the other hand, exogenous parameters are sectoral conditions and relations (such as sector and market structure, public regulations & incentives, external financial funds acquisition, and out-firm barriers to innovation).

2.4.3.1 General Firm Characteristics

General characteristics of firms definitely contribute to establish their corporate entrepreneurship, which incarnate companies' innovation and venturing activities, and is necessary in today's competitive markets. Hence, corporate entrepreneurship is important for organizational renewal, innovativeness level and creation of new business abilities, and improved financial performance.

Empirical studies find out that the ownership types of companies slightly influence their R&D functions; in particular, foreign affiliations have uncertain effects for innovativeness.

For instance, Bishop and Wiseman (1999) declared that foreign capital negatively influences firms' innovative capabilities and R&D functions. But, Love and Ashcroft (1999) claimed that plant size, foreign ownership and the presence of R&D are all positively correlated to innovations. Consequently, despite many studies in the literature that observed the companies with foreign origin are more innovative, findings regarding the direction and intensity of the relation between ownership status and innovation are indefinite.

Similar to ownership status, firm size has also ambiguous effects for firm innovativeness abilities. George et al. (2005) examined that the ownership structures of small and medium sized firms influence their tendency to take risks and swell the scope and scale of innovativeness efforts. Peters and Van Pottelsberghe (2003) examined the innovation competencies and performance of Belgian manufacturing firms. They found that although large firms are better in term of innovation competencies, small firms assign largest share of profits to innovative projects. Surprisingly, both large and small firms have more patents applications and R&D investments than medium sized firms. The authors also stressed that the share of turnover because of incremental innovation is higher within small firms, but technological breakthroughs are more vital within large firms. Finally, they also indicated that foreign firms invest significantly less in R&D than local firms.

Evangelista et al. (1998) studied the innovative firms in different manufacturing sectors in Europe and their firm size. They found that the percentage of innovativeness is higher for large firms than for smaller ones. They also expressed that innovation inputs like R&D investment are strongly correlated to firm size, and differ seriously across industries with little change across countries.

Benavente (2006) discovered that larger firms have a higher percentage of innovative sales; and also firms that have larger market share have higher R&D intensities. These results are very suitable to Schumpeterian approach of innovation, according to which innovation is an activity generally embarked by larger firms. However, Lööf and Hesmati (2002) investigated the effect of firm size to R&D expenditure by using an econometric model. The authors found that if industry is controlled (possible effect of sectoral difference is controlled), innovation intensity is not constant but falls significantly with size.

Crépon et al. (1998) affirmed that the probability of engaging in research (R&D) at the firm level increases with firm size (number of employees), market share and diversification. On the other hand, the research effort (R&D capital intensity) of a company increases with the same variables, except for size (although its research capital being strictly proportional to size). The firm innovation output, which is measured by acquired patents and sales of new

goods, increases with research effort, market demand and technology indicators, either directly or indirectly. The authors also indicated that firm productivity correlates positively with a higher innovation output. Finally, they proposed an econometric model to estimate a simple framework to extract R&D, innovativeness and productivity interrelations at the firm level.

Koberg et al. (1996) suggested that formally structured young firms are less innovative than the ones that aren't structured; and also, in the old organizations, formalization has not any negative impact on innovativeness. Zahra et al. (2000) investigated medium-size manufacturing companies and showed that commitment to innovativeness is high when the board chair and the chief executive officer are different individuals and the board is medium in size. Camison-Zornoza et al. (2004) verified the existence of a significant and positive correlation between size and innovativeness. The authors found out that the contradictory results obtained in previous research could be because of divergences in the methodology used to analyze the variables.

In fact, innovation determinants are widely dispersed from the micro-economic patterns to the macro-economic performance. In the studies of Avermaete et al (2003), some aspects of innovativeness level of companies were shown to depend on the age of the company, firm size, and regional economic performance. They concluded that the research is ambiguous on the relationship between company age and innovativeness; whereas older firms are more likely to introduce products that are also new to the market segment in which they compete, young firms tend to introduce innovations that have a larger impact on the firm's turnover. Also, the research indicates that geographical location of companies also affects their innovativeness level.

Bugelsdijk and Cornet (2002) investigated the relationship between innovation and geography. They found that knowledge spillovers are bounded by distance, as it is expected.

2.4.3.2 Firm Structure

Individual efforts of employees for innovativeness are maintained by the impact of firm structure on corporate ambience, which appears on firms' business applications and strategies, managerial tools and internal communication practices (Fry, 1987). Competitive reflection of firm structure and its innovative orientation depend on the success of conversion the challenging new ideas of employees to corporate practices and investments (Pinchot, 1985; Kuratko et al., 1990; Hornsby et al., 2002). Innovative capability of a firm thrives when this

conversion process is instilled in firms' business methods, practices, strategies and efforts (Sathe, 1988; Kanter, 1996).

In the academic literature, numerous authors investigated firm structure and tried to find out appropriate internal climate factors for innovativeness. These factors can be combined into two categories, namely firm culture and intellectual capital. Principally, firm culture is shaped by internal sub-factors. These sub-factors of firm culture are: management support for generation new ideas, allocation of resources and time availability, decentralization level or decision making autonomy, appropriate use of incentives and rewards, and tolerance for failures in creative undertakings and risky project implementations (Souder, 1981; Sathe, 1985; Drucker, 1985; Pinchot, 1985; Fry, 1987; Sykes and Block, 1989; Kuratko et al., 1990; Damanpour, 1991; Hornsby et al., 1993; Kanter, 1996; Sundbo, 1999; Hornsby et al., 2002).

Entrepreneurship is a firm characteristic where all in-firm business practices support internal tendency to innovations while motivating and supporting employees' new ideas. Clearly, this is not possible without top management support. Management must take workers' opinions seriously and should create an in-firm atmosphere for supporting innovativeness (Hornsby et al., 2002). Sundbo (1999) stated that organizational environment and measures supported by top management are critical in order to encourage the employees to create new ideas and to be innovative.

Montalyo (2004) stressed that the roles of managers and their willingness to make innovations have all positive effect upon corporate innovativeness level. Management support for generating, developing, and implementing new ideas is directly linked to creativity and to the development of new business practices and outcomes (Kanter, 1985; Pinchot, 1985; Damanpour, 1991). Top management has to prove its support to innovation activities, to remove the barriers ahead of the innovation process, to establish open communication channels, and to produce new ideas and projects. Therefore, executive support for producing new ideas and projects is vital for arousing innovative spirit inside the company with the aim of utilizing powerfully employees' knowledge and creativeness to control environmental ambiguity (Drucker, 1985; Sathe, 1988; Sykes and Block, 1989; Kuratko and Montagno, 1989).

The support of managers is also necessary for generating new projects and for increasing the number of workers that contribute to them. The employees, who feel the top management support, have a higher willingness to take risk in order to be more creative and innovative. Hence, the endeavor toward innovations gains pace (Tatikonda and Rosenthal,

2000). Supporting new ideas, providing necessary sources and rewrd and establishing an innovative in-firm character are examples of the top management support for innovativeness.

Resource creation is another significant factor for success in innovation activities (Fry, 1987). All innovative attempts demand allocation of resources such as information, manpower, materials, equipment and time (Barney, 1991). In fact, in the innovation process, managers request from their employees to be innovative and this is possible only if employees take risk to develop innovations. Therefore, managers must provide necessary resources directed to that aim and employees must be aware that management will tolerate the loss of these resources in case the innovation activity should fail (Sykes and Block, 1989; Hisrich and Peters, 1986; Stopford and Baden-Fuller, 1994).

In addition to financial resources, physical space creation and free time creation in working hours for generating new ideas, projects and research are also very important. Time creation implies the allocation of enough free time to employees for continuous progress and implementation and achievement of new projects (Fry, 1987; Pinchot, 1985; Kuratko et al, 1990). Being flexible in working hours is another method to provide an opportunity to be more innovative for employees (Sathe, 1985; Sykes and Block, 1989; Hornsby et al., 2002). Consequently, accessibility of free time is imperative for innovative assignments of the firm's employees.

Wan et al. (2003) considered the innovativeness as a process that involves generation, adoption, implementation and incorporation of new ideas and practices within an organization. They found that frequent internal communication, greater decentralization of decision-making authority and a greater amount of organizational resources set aside for innovations are positively related to firm innovative capability.

Moenaert et al. (1994) investigated the effects of project formalization, centralization and role flexibility for innovation success. They stated that communication flows between R&D and marketing departments develop with these factors. Walker et al. (1987) investigated the roles of business strategies in term of firm performance; they particularly drew attention to the importance of formalization in order to make successful marketing implementations. Jaworski and Kohli (1993) and Menon et al. (1999) studies showed innovative culture is fundamental antecedent of effective marketing strategies of the companies. The authors found out that the components of firm structure such as communication quality, formalization and centralization have differents effects on the outcomes measured and market performance.

In the literature, various authors stressed that organizational structure for an efficient innovativeness climate ought to entail autonomy and flexibility in strategy making processes.

The authors also explored that work discretion, which is about the level of employees' autonomy to make decisions concerning their work, is positively related to innovativeness (Slevin and Covin, 1990; Honig, 2001; Hornsby et al., 2002). A similar result was reported earlier by Kemelgor (2002) stating that employee participation to the strategic decisions is more important than the financial reward. Thus, it is very useful that management gives value to the employees' ideas and motivates them by asking their opinion. Providing more authority to employees would change their perception and push them to be more innovative, to take risk and to participate in the innovative process (Pinchot, 1985).

Moreover, since employees want to be rewarded in their work, management has to respond to it by providing some incentive to motivate and to satisfy them in their innovative activities (Antoncic and Hisrich, 2001). The reward system has a significant effect upon the creativity and innovativeness of firms. Therefore, managers have to predict how they will prize employees' performance. In fact, the rewards can be financial like money or non-financial like commendation. Rewards must encourage workers to continue and to be successful in their job. The reward system is important to prevent the absence of employees from their work as well, and motivates them to reach periodic business targets (Lawler and Porter, 1967).

Hence, suitable use of rewards in return for success motivates employees to be more innovative (Souder, 1981; Kanter, 1985; Fry, 1987; Hornsby et al., 2002). Kerr (1975) defined the reward as the gain that employees obtain after they succeed a mission, completed a service or a responsibility. Employees wonder and ask, before reacting and beginning an activity, what their reward will be and what they will earn if they develop important achievements in their assignments. Eisenberger and Armeli (1997) affirmed that prizes definitely increase the creativity in the companies. But the critical factor is what attitudes will be prized and how these prizes will be shared. The authors found that prizes could be a means of to conveying management's messages to the firm's staff. These messages can be important in terms of creativity and innovativeness. Reward system of companies becomes effective only if rewards are perceived as fair, are based on individual performance and are satisfactory (Lawler and Porter, 1967; Cissell, 1987). Thus, managerial encouragements should be enriched with an effective reward system.

Also, managers' risk lenience tolerates and heartens their employees to be more innovative; tolerance for risk taking and failure increases the opportunity to keep on risky and innovative projects even in cases of failure (Miller and Friesen, 1982; Zahra et al., 2000). Risk adverse approaches of managers cause the lack of confidence for workers' innovativeness

tendency, and their displeasure reduces innovative activities of the company (Zahra, 1996). On the other hand, Wan et al. (2003) stated that a greater willingness to take risks and to exchange ideas is positively related only slightly to firm's innovativeness capability.

Tushman and O'Reilly stated that firms' strategies and culture must adapt to environmental changes. The long-term success of a firm is only possible with concordance to its surroundings and with the integration of its interior dynamics to its environment (Yılmaz et al., 2005). Similarly, Baldwin and Johnson (1996) stressed that firm' administration structures, quality procedures and continuous development strategies define their innovativeness level. Innovative firms are said to be more successful than non-innovative firms in their general performance. Veugelers and Cassiman (1999) emphasized that high perceived risks and costs of innovations do not discourage innovativeness, but rather they determine how the innovation will be supported and financed. Also, the authors said that openness of employees to change determines the innovativeness success of the company.

Subramaniam and Youndth (2005) examined the importance of intellectual capital of a company in term of its effect on innovative capabilities. In the literature, the intellectual capital is investigated under three subgroups; namely, human, social and organizational capital. The authors found that intellectual capital selectively influenced incremental and radical innovative capabilities. They stated that organizational capital positively affects incremental innovative capability, whereas human capital interrelated with social capital positively affects radical innovative capability. Human capital is negatively associated with radical innovative capability. Intriguingly, social capital played a noteworthy role in both types of innovation, as it positively affects both incremental and radical innovations.

Cohen and Levinthal (1989) stressed that human capital of a firm has a vital role for innovativeness, as it provides the ability to obtain and make use of the outcomes of other firms' R&D activities. Also, Hall and Mairesse (2006) indicated that a great deal of the knowledge created by firm activities is embedded in the human capital to some extent. Vinding (2006) announced that firms that greatly have educated their employees are more probable to launch radical innovative products or processes (radical means new to the world).

Gupta and Wilemon (1990) asserted that for successful innovation process, it is a necessity to create an innovative atmosphere with better internal organization, increased customer and supplier involvement, detectable top management support, more resources and better teamwork. Kluge et al. (1996) discovered that successful firms' strong points are based on highest integration and flexibility by creating a particularly innovation-friendly atmosphere.

2.4.3.3 Firm Strategies

The innovative capability of a company depends on many factors including understanding of the customers' needs, attention to the market, efficient development of production technologies and senior leadership. Understanding the market is an important business practice since the acquisition of marketing information is highly correlated to innovation success. Besides, Loch et al. (1996) expressed that internal and external growth strategies of firms play major roles in their innovative performance. Furthermore, increased productivity is clearly a very important driver of business success.

Belderbos (2001) investigated the statistical effects of business strategies in terms of innovative performance. The research have indicated that the number of innovations of a company is positively and significantly correlated to R&D intensity, export intensity, manufacturing intensity, and operating experience in manufacturing; whereas, a nonlinear relationship has been observed between the firm size and the innovativeness. The results have supported technology exploitation and sourcing motive for R&D investments. François et al. (2002) showed that firms' financial and control strategies are also critical business practices that must be administered carefully for market success and innovative performance.

Roper and Love (2002) analyzed the relation between innovativeness and the export performance at firm level. They noted that innovative firms are exporting more and the product innovation has a strong effect on the probability and propensity to export. Similarly, Geroski (1995) expressed that export oriented firms are more innovative than their more domestically oriented competitors, but this does not appear to cause a noticeable performance gap neither in terms of profitability nor growth. In addition to significant differences identified between innovative and non-innovative plants, there are also differences in absorption of spill-over effects. Roper and Love (2002) explored that innovative plants are more effective in their ability to exploit spill-overs from the innovation activities of companies in the same sector. The returns of innovation in terms of increased ability to enter export markets and increase export sales is obvious. Thus, the authors stressed that innovativeness and success in product innovation both have positive effects on exports.

Darroch and Mcnaughton (2002) exposed that incremental and radical innovations do not generally take place in firms which respond to market knowledge or have an effective marketing function but in firms which are sensitive to information about changes in the marketplace and respond to technology knowledge. Moreover, radical innovations are expected to come from firms with a technological orientation. The authors added that

technological orientation provides firms to develop innovations that change consumers' behavior without destroying their business competencies.

Diversification, differentiation and cost reduction strategies are also relevant innovation determinants discussed in the literature. (Montwani et al., 1999; Ahuja and Katila, 2001). Galende and De la Fuente (2003) observed the differentiation technique has definitely a positive impact upon the innovative capability of a company. Hitt et al., (1997) indicated that internationalization is also a useful business strategy for better performance; but this strategy provides competitive advantage only if the firm applies differentiation strategies in the domestic market as well. At this point, internationalization implies considering global markets as primary target and selecting the employees from diverse countries.

Although there is a general consensus on the statement that competitive advantage and market share are slightly lost for just a limited time after radical innovations appear in the market, top managers and employees of companies should resist this fact while developing new skills and putting aside their older knowledge and methods in order to keep up with innovative capabilities. Therefore, the efforts of companies to develop radical innovations are related to top managers' and employees' abilities of developing new skills rather than on their past skill and knowledge base (Hermann et al., 2006).

Soutaris (2002) examined firms' innovative capabilities while categorizing them based on their business strategies. He emphasized that firms those have specialized supplier and investigate more in R&D are found to have higher rate of innovation than supplier dominated firms. Most importantly, different variables proved to be significantly associated with innovations. For instance, innovative capability for supplier dominated firms is related to the competitive environment, acquisition of information, technology strategy, risk attitude and internal coordination. Conversely, for scale intensive firms, innovation success is related to the ability of raising funds and improving the education and experience level of employees. For firms which have specialized suppliers, innovation is associated with high growth rate and exporting as well as training and incentives offered to the employees to contribute towards innovation. Science-based firms are more related to technology-related variables, education and experience of personnel, growth in profitability and panel discussions with lead customers in their innovativeness abilities.

Effective knowledge management has been presented in the literature as one method for improving innovativeness and performance. The term knowledge management is used to denote the practices used by a firm to attain new knowledge, and to reorganize and disperse existing knowledge within the firm. Despite the fact that knowledge management is not alike

to innovation, these terms are somehow connected, since innovation can be viewed as the production of new knowledge (Hall and Mairesse, 2006). In particular, knowledge dissemination and responsiveness to knowledge have been mooted as the two components that would have the highest impact on the creation of a sustainable competitive advantage, such as innovations. Heshmati's (2001) empirical studies inspected how knowledge capital had influenced the firms' performance heterogeneity. He points out that there is no two-sided relationship between them. Besides, Liao and Chuang (2006) expressed the positive effect of knowledge management over the innovation speed and magnitude, and also the positive relation of innovations over the firms' performance. Briefly, knowledge management and knowledge sharing are essential practices that support and lead innovation activities. Thus, knowledge management becomes a guiding business application that influences the strategies undertaken by managers within firms.

Moreover, Love et al. (1996) studied that entering to import market, technological opportunities and R&D collaboration, the existence of the R&D department in the company all have positive effects over innovativeness of companies. In fact, collaborations and coordinations play significant roles in forming companies' innovative capabilities. Sáez et al. (2002) declared innovation as an occasional consequence of collaboration between diverse organizations, such as competitors, customers, suppliers, research centers and universities, all with complementary resources. Tether's (2002) findings indicated that many firms develop new processes, products or services without collaborating for innovation with other organizations. Still, firms, which get involved in R&D and attempt to initiate innovations new to the market rather than new to the firm, are more likely to commit collaborations and cooperative arrangements for innovation.

Regular consultation with customers, use of market research and monitoring of competitors' products and processes are practices also associated with high innovation rates. Contact with raw material suppliers is also useful, since they are a significant source of technical know-how. Moreover, Soutaris (2001) proposed that companies should be geared towards developing international contacts, cooperate with other firms in joint ventures and acquire licenses to be more innovative. Kappel et al. (1999) recommended that alliances are very useful means in unsteady environments to reduce innovation risks and to ascertain enduring market positions.

2.4.3.4 Sectoral Conditions and Relations

Successful firms' structure and strategies ought to be correlated auspiciously to its surroundings. Companies should observe their external environment in order to develop a well-built innovation culture. Barringer and Bluedorn (1999) stated that beneath strong competition pressure, companies attempt to be more innovative and practical. In fact, general environmental aspects such as market dynamism and competitive intensity affect firms' structure and performance (Miller and Friesen, 1982; Covin and Slevin, 1989; Pelham, 1999). Market dynamism can be described as the rate of changes in competitive conditions associated mostly to customers' demand (Simon et al., 2002). And, competitive intensity is defined as the impact of competition on business environment.

Keizer et al. (2002) suggested that innovativeness is the outcome of a purposely chosen and followed policy. If governmental and/or sectoral institutions want to motivate companies to become and continue to be innovative, they ought to hearten these firms to execute an innovation directed policy. Devoid of such a policy, firms might not be capable to grasp successfully kindled measures.

Terwiesch et al. (1996) explored the impact of market conditions on company success and how market characteristics affect the innovation development performance. They stressed that innovation development performance is more significant in technologically stable and mature industries. Additionally, large firms can notably increase their financial performance through innovations, while the profitability of small companies is driven mostly by the industry conditions. Firms in a competitive environment also seem more likely to engage in innovative activities than other firms (Geroski, 1995).

The importance of the external communication, the acquisition and use of the right and specific information, the barriers to innovation, public regulations & incentives and finally market conditions and competition power are also investigated as determinants of innovation in the literature. It is found that in order to innovate, companies have to look for specific information concerning their products and production processes in their sectors.

Public regulations and incentives encourage firms toward innovative activities, either through government/private institution funding or via tax incentives for R&D expenditures. Jaumotte and Pain (2005) indicated that according to findings of European Community Innovation Survey, public funding has a significant positive correlation to innovativeness level of companies and also positively related to the share of turnover accounted for new products.

2.4.4 Data Collection and Barriers

The discussion of how to measure and to evaluate company applications in term of its strategic targets is a long-term debate for both researchers and firms' managers. In the management literature, there are two assessment methods for the performance measures in order to quantify the effectiveness of firm activities. The first one is related to how the data is collected and the second is related to data type, namely, quantitative or qualitative data.

It is possible to collect data from primary and secondary sources. Primary sources depend on perceptions of respondents since the data is obtained from firms' managers and employees using questionnaires and interviews. As for the secondary sources, the data is obtained from firms' own records and from open sources elsewhere. In some studies both primary and secondary sources are used together for performance analysis and a strong correlation is found between these two data sources (Dess and Robinson, 1984; Pearce et al., 1987). Nevertheless, both methods have relative advantages and disadvantages. For instance, the difficulty of collecting secondary source data and the validity of primary source data are important discussion subjects (Venkatraman and Ramanujam, 1986).

There are some concerns on the collection of primary data. Firstly, it depends on the individual perceptions and secondly there are some confidentiality concerns, if these data are kept secret by managers. The collection of firm performance data by secondary sources has also an important drawback: It is quite possible to obtain false data due to the tax and financial secrecy issues. Furthermore, particularly for SMEs, which are not traded in stock exchange, calculating exactly these secondary data is very intricate and sometimes it is declared to be far away from reality. Even worse, for SMEs generally these data are not possible to obtain.

Narver and Slater's (1990) studies about the primary and secondary firms' performance measures showed there is a strong statistical correlation between them. The confidentiality depends on consistency of collected data by the multiple managers and/or employees within the same time interval, or it depends on the validity of variance of performance measure (Motowidlo, 2003). Still, the survey and interview methods are also advantageous in terms of time and cost.

According to the objective and the duration of the studies, the collection method of data may change. Some researchers give attention to quantitative measures like increase in sales, sales profitability, rate of return of investments, product delivery period, etc., but some others use qualitative data like employee satisfaction, the degree of loyalty to firm, perception of

equity, loyalty of customers to firm etc. However, more quantitative data such as increase in financial criteria and market share growth are commonly used for performance measures. In this thesis both qualitative and quantitative data are considered. The focus is on firms' profitability and effectiveness as well as firms' business strategies.

In order to measure the effectiveness of firm strategies, performance of companies can be analyzed as a dependent variable. In many recent studies, different criteria of performance are used. Financial, marketing, production and sometimes innovation performance can be the components that constitute quantitative firm performance. On the other hand, qualitative performance arises from in-firm processes such as employees' commitment to firm, customer satisfaction and employees' satisfaction from their work.

In this thesis, a questionnaire is used for data collection. For the content and scale of the survey, a broad up-to-date literature search is accomplished.

CHAPTER 3

INNOVATION MODEL AND HYPOTHESES

3.1 Innovation Model

The foremost objective of companies is to survive in the business while making profit. Principal means of making profit are provided nowadays by firm innovation capabilities, since innovations are among the most essential resources through which firms contribute to increased employment, economic growth, economic dynamics and competitive strengths. A large number of studies in innovation literature have been carried out in order to find out which factors enhance innovative efforts of companies. In chapter 2, these literature is extensively presented. In this chapter, an integrated model of innovation with its determinants and its outputs is presented in order to describe the innovation making framework at firm level.

3.1.1 Model Elements

The developed integrated innovation model represents the relationships between innovation elements discussed. Most of the innovation literature exposes the managerial tools needed to support an innovation oriented entrepreneurial climate within large organizations or SMEs.

Based on these determinants an integrated model is developed. The basic elements of the developed innovation model are summarized in ***Figure 3.1***. In the model, in-firm and out-firm innovation determinants settle the innovative capability at that firm, which ultimately influences and affects the competitiveness of the firm in its marketplace, and hence, the general, financial, market, and production performance success of the company.

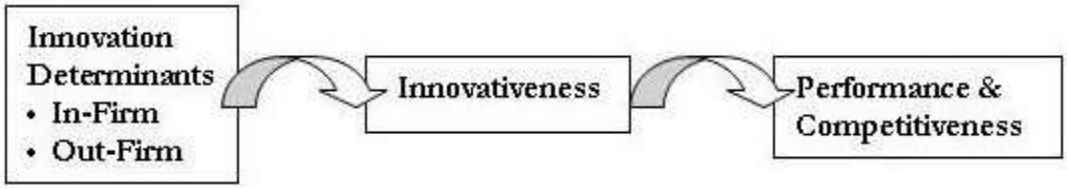


Figure 3.1 : Basic elements of the innovation model

Innovation determinants play a major role in order to schematize the model. These determinants can be classified under four broad categories:

- General Firm Characteristics
  - Firm Size
  - Firm Age
  - Ownership Status
  - Foreign Capital
- Firm Structure
  - Organization Culture
    - Communication, Formalization, Centralization, Management Support, Work Discretion, Time Availability, Reward System
  - Intellectual Capital
    - Human Capital, Social Capital, Organizational Capital, Specialization
- Firm Strategies
  - Collaborations
  - Innovation Outlay
  - Business Strategies
    - Market Strategies and Monitoring Innovations
    - Manufacturing Strategies (Cost, Quality, Flexibility, On-time Delivery)
- Sectoral Conditions and Relations
  - Market Dynamism & Competition Intensity
  - Public Incentives
  - Barriers to Innovation (In-Firm Barriers, Out-Firm Barriers)

Since innovation process is a system, if a critical and/or complementary component is lacking or fails, this can slow down or even block the entire innovation process. Thus, all of the innovation determinants have important roles and effects in the making of innovation in

order to obtain successful outcomes at the company. The success level of an innovation depends on how these determinants interact in the innovation process. One of the most significant research problems in innovation processes is, of course, to explain how innovations occur.

The innovativeness is definitely a mixed result of general firm characteristics, organizational structure, its strategies and external conditions. Provided that a suitable organization climate exists, companies can benefit from the changing business conditions employing their entrepreneurial capabilities. If top managers support the innovation process and create an appropriate in-firm climate, it will result in a sustainable competitive advantage through innovations such as new products, services, and processes (Schumpeter, 1934; Hornsby et al., 2002).

Drucker (1985) expressed that innovations are in the heart of entrepreneurial companies. The leadership and vision at firm must be associated with entrepreneurship in order to create an environment conducive of innovation. The organizational structure, the leadership style of entrepreneurs, lean organization, the effect of ownership structure and analyzing the current lines of applications in order to find the best practices are the subjects that must be analyzed among the innovation determinants together with firm culture components such as reward system policies, managerial support of idea generation and project formulation, time availability, risk taking for innovativeness and work discretion.

Fagerberg et al. (2004) claimed that it is necessary to prevent internal resistance in the organization to create new practices and work processes. Actually, innovation is the outcome of incessant struggle in the firm, which provides new solutions to particular problems. Since every innovation consists of a new combination of existing ideas, capabilities, skills, resources, etc., openness to new ideas and solutions is considered indispensable for innovation in early phases in the companies. Subsequently, it is possible to generalize that innovations increasingly engage teamwork and take place within well structured organizations.

Intellectual capital constitutes a valuable asset for firms in their innovation activities. Without ideas, talents, projects and their employees' and managers' knowledge, it is meaningless to talk about innovativeness. Intellectual capital is discussed in the literature under three sub-dimensions (Edvinson, 1977). These dimensions are human capital, social capital and organizational capital.

Human capital is related to talents, specializations, capability of developing new and creative ideas of individuals in an organization. Social capital consists of the relationships among the members of organizations, the sharing of ideas and information, ability to learn

together or to teach to each other, and the ability of finding, analyzing and solving common problems. Besides, the specialization of the employees in companies is also an important dimension of the firm's intellectual capital (Walker et al., 1987).

Organizational capital is the sum of written and registered organization policies and production processes, organization practices and social intellectual capital such as handbooks and databases, and finally the intangibles such as patents and licenses obtained or purchased by companies through their past innovations. How much the intellectual property protection and associated laws are encouraging firms to be more innovative is a critical problem still open for discussion.

Nonetheless, legal protection for the intellectual property rights of innovators is broadly accepted as an essential means of arousing innovativeness. IP instruments, for instance patents and copyright, permit inventors to have special use of their innovations for a fixed time, after which it becomes accessible for every probable user (Jaumotte and Pain, 2005). In their research, CIS surveys point out that although patenting is the most significant means of IP protection in some sub-industries. Substitute protection approaches such as secrecy and lead-time, are used by a majority of firms in many sectors. The authors concluded that stronger IP protection has a considerable positive impact on patenting, but just a restricted impact on R&D.

Innovation activities in firms also depend on external sources and collaborative applications which have a positive influence on the innovation process. The more firms manage to become capable of interacting with external sources, the greater becomes the demand of other firms to imitate them. This really enhances innovative capabilities of both individual companies and the entire network of that firm.

Similarly, public regulations & incentives and governmental circumstances are important for innovation making phase in terms of fundings, encouragement for R&D activities, and investments of firms toward innovativeness. In a few words, the public regulations & incentives contain tax regulations, financial supports at the market, intellectual property regulations and the labor market regulations. On the other hand, market intensity and dynamism, customers' expectations, their demands and suggestions, competition in the market, competitors and their investment in R&D, other innovations made by competitor firms all have undeniable impacts for increasing the tendency of companies to innovate.

How firms control and supervise the technology management, how they integrate it to their business practices and processes are other important research questions for

innovativeness. Thus, process analysis and make/buy strategies are also other means to push firms to innovations.

These factors, combined with all of other innovation determinants, compose the business strategies that firms select and apply for their future innovation activities. Actually, business strategies depend on many features and external factors like the public regulations or internal factors like the recent financial performance. Cainelli et al. (2005) showed that innovations are positively influenced by past financial performance of firms. Also, innovation activities have a positive impact on firms' growth and productivity. The authors also explored that productivity and innovativeness perform as a self-reinforcing system which further enhances economic performance. Competitive priorities and competitors' strategies are also critical factors in order to determine firm's business strategies.

Briefly, the key reason of innovativeness is the desire of firms to obtain increased business performance and increased competitive advantage. Companies gain additional competitive advantage and market share in their market according to the level of importance that they give to manufacturing strategies prevailing in the market such as price, quality, flexibility, and on-time delivery. These are vital factors for companies to build a reputation in the market and therefore to increase their market share.

As a result, innovations bring together new mixtures of accessible assets and new knowledge possibilities for future innovations, and so, a continuous innovativeness period settles. The success level of an innovation is determined by how the firm's performance is affected. Innovations can actually add many benefits to an enterprise in terms of general performance, or more specifically, in terms of market performance like gaining more market share and reputation, financial performance like increasing the general profit and/or production performance like increasing the efficiency and productivity of the firm. These criteria compose the performance indicators to evaluate and monitor firm performance.

3.1.2 Model Scheme and Relations

So far, in the academic literature, a complete model of innovativeness was hardly ever tested by researchers; thus, very few noteworthy results were found. This might be due to the difficulty of finding and acquiring detailed information from firms about their innovative strategies and performance and/or due to using an incomplete innovation model.

The innovation determinants described in the previous section are summarized and visually expressed by an integrated innovation model in ***Figure 3.2.***

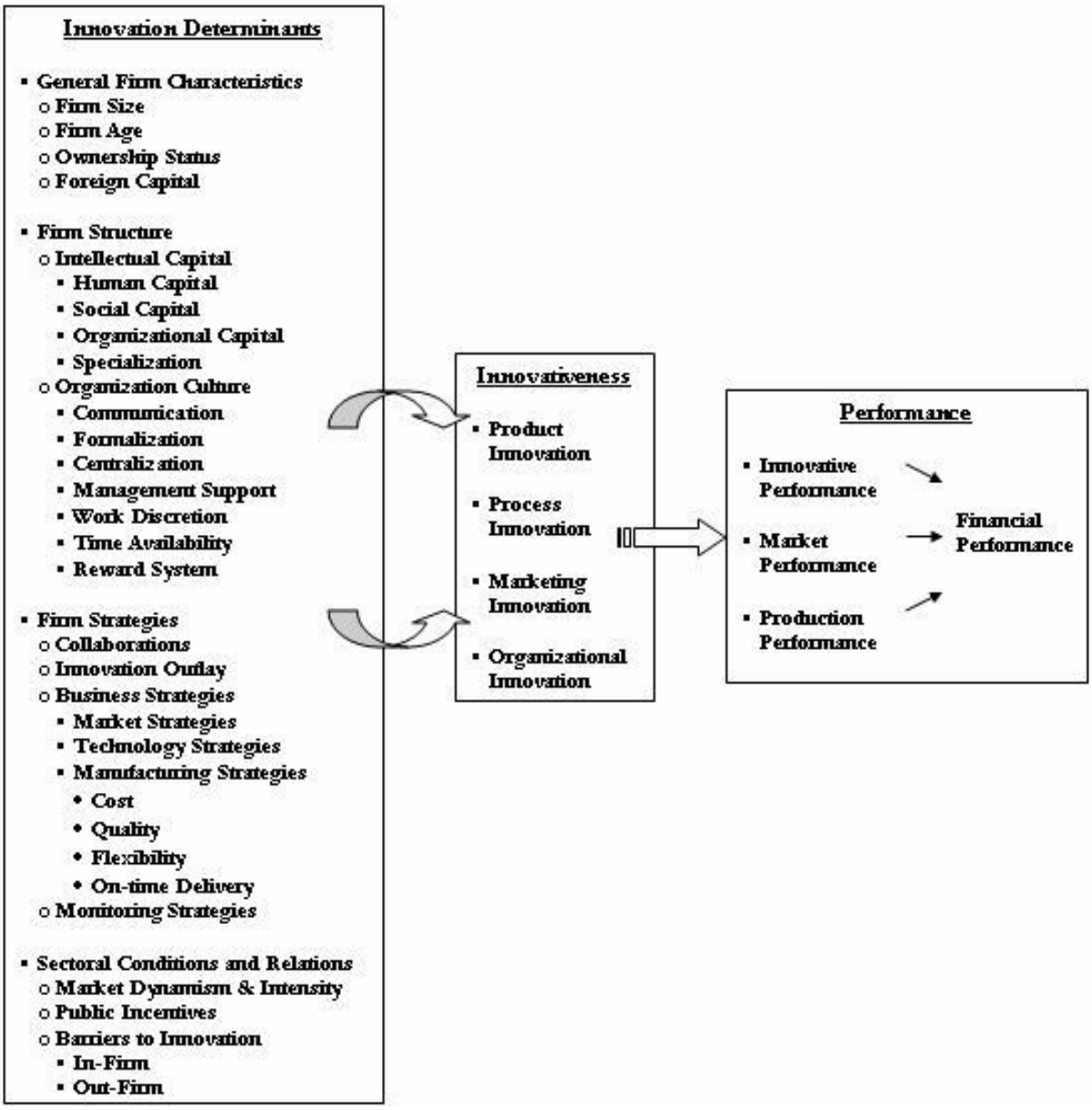


Figure 3.2: The integrated innovation model

Clearly, the proposed model reflects two stages. The first one is regarding to the innovation process where innovation determinants constitute and determine the innovative capabilities of companies. The first stage will be referred to as the drivers of innovativeness model.

The drivers of innovativeness model is presented in ***Figure 3.3***. According to this model,

- general firm characteristics: firm size, firm age, share of foreign capital and ownership status,

- firm structure: intellectual capital and organization culture,
- firm strategies: business strategies, innovation outlay and collaborations,
- sectoral conditions and relations: market dynamism & competitive intensity, public regulations & incentives and barriers to innovation,

have direct impacts on innovativeness level of firms.

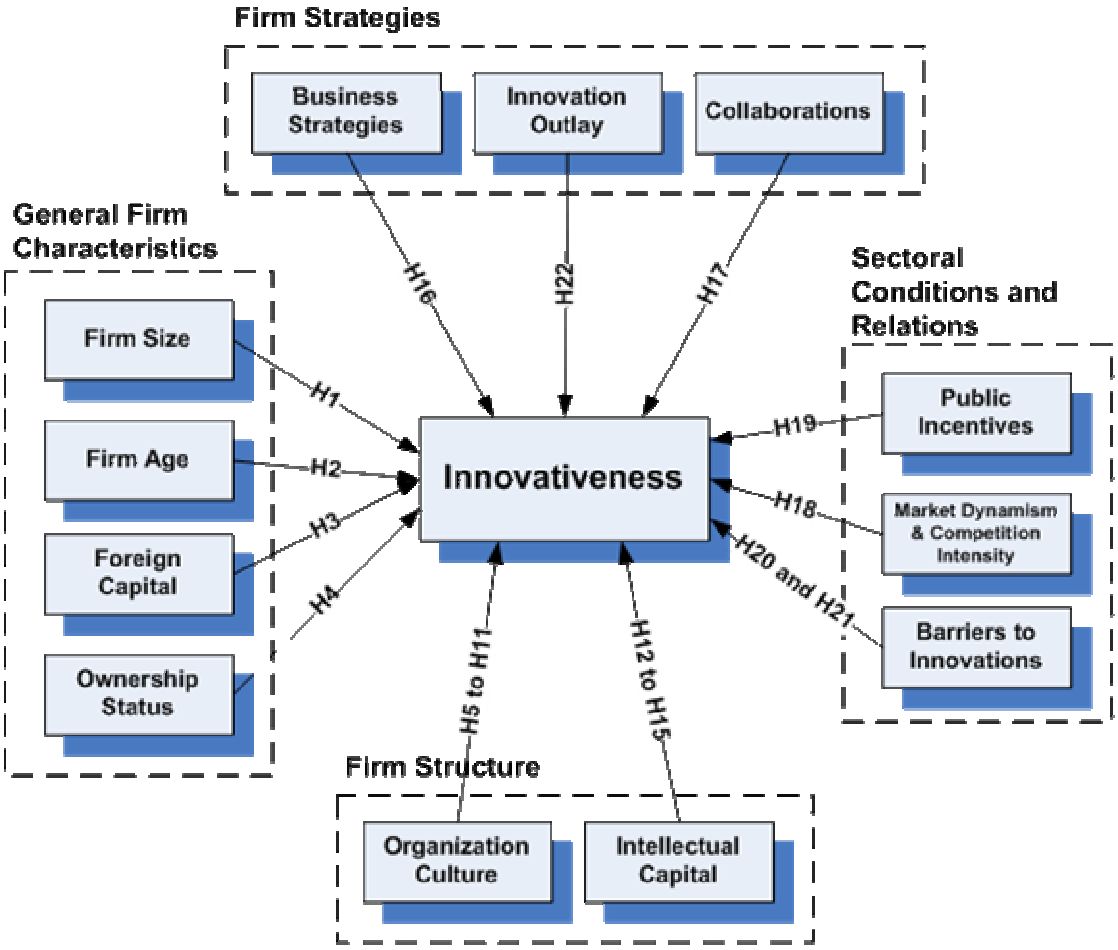


Figure 3.3: The drivers of innovativeness model

The second stage of the integrated innovation model is referred to as the performance model of innovation (***Figure 3.4***). According to this model, innovations or innovativeness success (product, process, marketing or organizational) directly affect the firm performance that can be measured by the performance indicators presented in detail in the following section. These performance indicators are divided into four sub-groups; namely general performance, market performance, financial performance and production performance. Financial performance is, in fact, an output of the other firm performance indicators. It is an accepted fact that there is a lag between innovations and the resulting financial contribution to the company.

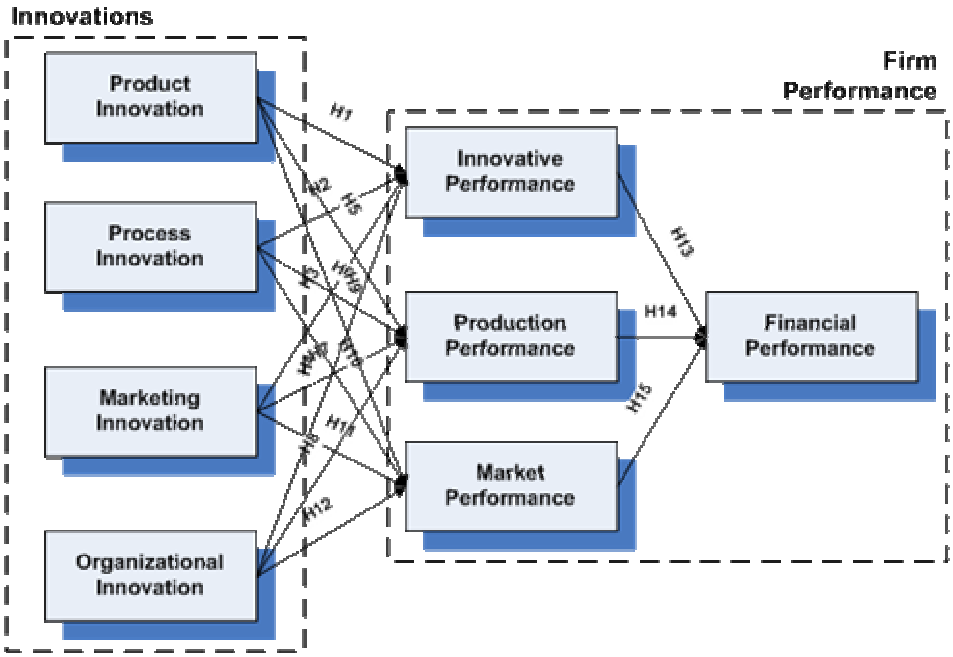


Figure 3.4: The performance model of innovation

Confirmation of these models is performed in two phases. The first phase is about testing the success level of innovations (innovativeness level of the firm), which are the expected outcome of innovation determinants. In the second phase, the effects of innovation to firm performance and competitiveness are also explored. The hypotheses presented in the following part clearly have critical importance for the analysis and findings. Finally, suitable suggestions have been developed for successful innovations at firm level.

The innovation timeframe can be defined as a period during which innovation takes place or is projected to occur. The aim of the innovation clarifies the reasons and expectations of the company when it invests in innovation. In fact, firms generally focus on developing new products, new processes or new strategies in order to create financial and competitive advantages in the market.

The innovation processes and implementations may be identified as a series of modifications, functions and proceedings performed, that terminate with an output. Incidentally, owner of the innovation process is the recipient of the innovation for whom that innovation process steps are completed. At firm level, the owner could be companies or markets. The impact of innovation becomes observable once the outputs of the innovation process are obtained. These outputs are commonly innovations that companies acquire. For instance this can be an end product or a process that provides a competitive advantage to the firm. ***Figure 3.5*** summarizes this innovation frame and its relations:

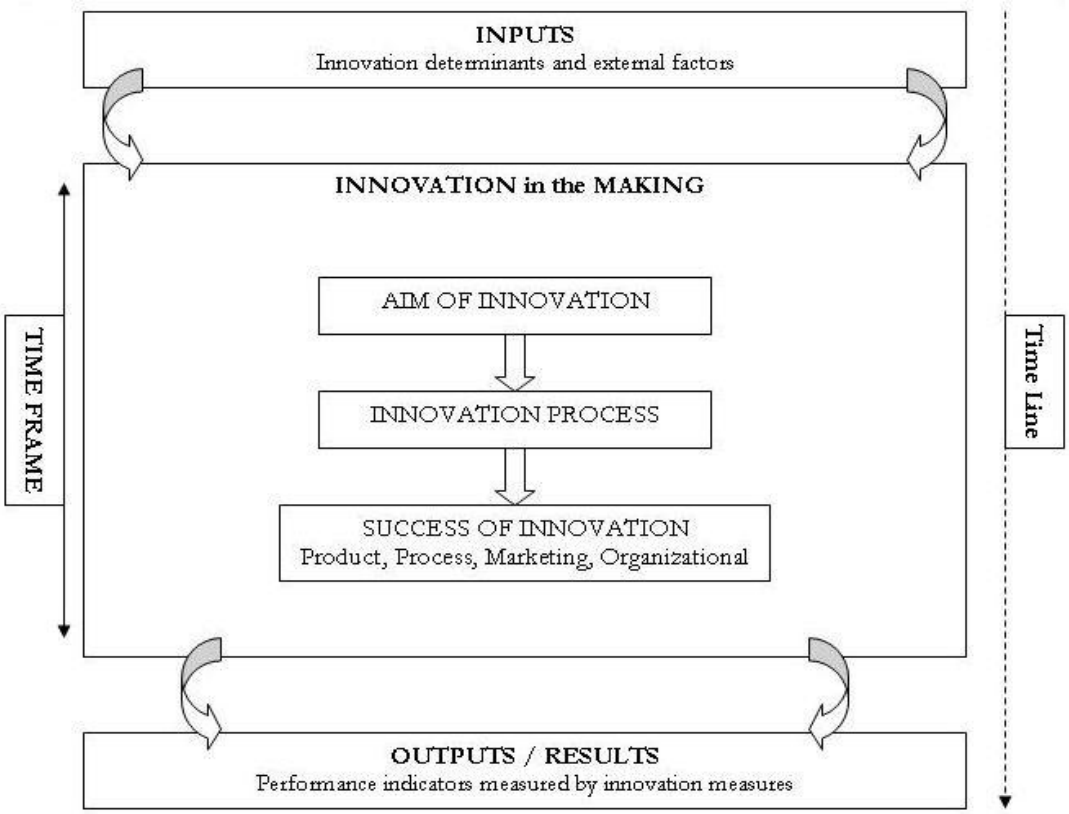


Figure 3.5: Innovation frame

3.2 Hypotheses

The basic research question in innovation studies should be about the triggering mechanism of innovativeness at firm level. Namely, does the financial comfort and market success trigger innovation activities or on the contrary, does the financial trouble and loss trigger innovations? In fact, good financial performance clearly can be a reason of companies to invest more in R&D; but also bad financial, market and production performance can also be reasons for innovation investments in a firm in order to overcome these problems.

Firstly, in the light of the drivers of innovativeness model, the hypotheses at ***Table 3.1*** have been put forward, where the dependent variable is taken as innovativeness. Secondly, by using the performance model of innovation, the hypotheses at ***Table 3.2*** have been proposed, where the dependent variable is considered as firm performance.

To analyse the collected data and to test these hypotheses, the measures of innovation described in the following part are used. The data analysis and results are presented in Chapters 5 and 6, respectively.

	Hypothesis	Sign of Relationship
1	Firm Size	+
2	Firm Age	+
3	Ownership Status	+
4	Foreign Capital	-
5	Communication	+
6	Formalization	+
7	Centralization	-
8	Management Support	+
9	Work Discretion	+
10	Time Availability	+
11	Reward System	+
12	Human Capital	+
13	Social Capital	+
14	Organizational Capital	+
15	Specialization	+
16	Business Strategies	+
17	Collaborations	+
18	Market Competition & Intensity	+
19	Public Regulations & Incentives	+
20	In-Firm Barriers to Innovations	-
21	Out-Firm Barriers to Innovations	-
22	Innovation Outlay	+

Table 3.1: Drivers of innovativeness model hypotheses

	Hypothesis	Sign of Relationship
1	Product Innovations – Innovative Performance	+
2	Process Innovations – Innovative Performance	+
3	Marketing Innovations – Innovative Performance	+
4	Organizational Innovations – Innovative Performance	+
5	Product Innovations – Market Performance	+
6	Process Innovations – Market Performance	+
7	Marketing Innovations – Market Performance	+
8	Organizational Innovations – Market Performance	+
9	Product Innovations – Production Performance	+
10	Process Innovations – Production Performance	+
11	Marketing Innovations – Production Performance	+
12	Organizational Innovations – Production Performance	+
13	Innovative Performance – Financial Performance	+
14	Production Performance – Financial Performance	+
15	Market Performance – Financial Performance	+

Table 3.2: Performance model hypotheses

3.3 Measures for Innovativeness and Performance

Innovations are required and are indispensable for companies for several reasons such as to utilize more efficient and more productive manufacturing processes, to perform better in the market, to gain reputation in customers' perception and to obtain competitive advantage. Still, in the literature, there are not much empirical verifications to reveal that innovativeness is strictly correlated to firm performance and competitiveness. Successful innovations have unavoidably positive effects on firms' performance in the long-term; however, in the short term initiated investments and firms' internal source usages might cause possible losses at first. Nevertheless, successful innovations may provide possible increase in firms' sales and market share; then, in the long run better competitive position in their marketplace can generate higher financial incomes.

The discussion of how to measure innovativeness is a lasting subject in all innovation related literature. Diverse fields of studies are using different measures for company performance analysis. Frequently, financial measures such as Return on Sales (ROS), Return on Investments (ROI) and Return on Assets (ROA) are favored for performance evaluation. Yet, certain thriving innovative managerial efforts can not be measurable with such financial performance indicators (Zahra, 1993). The innovation and economics studies consider the number of patented or patentable innovations (new process, products or technologies) as an important factor in order to compute the creativity and innovative performance (Hagedoorn and Cloodt, 2003). Jaumotte and Pain (2005) added that countries with the highest patents per capita are characteristically ones with high levels of business R&D intensity. Generally accepted innovation performance measures are R&D inputs, the numbers of patented or patentable process and products, and the new product announces to the market (Alpkan et al., 2005).

Archibiugi and Pianta (1996) explored the measurement of innovation and found out that innovations can either be embodied in capital goods, products and skilled personnel or disembodied in know-how included in patents, licenses, designs and R&D activities. Conte (2002) proposed a general analysis regarding the innovation inputs and outputs. The author indicated that innovative activities depend on investment strategies and behaviors that firms follow. Thus, innovative activities of firms can be measured by diffusion of innovations and R&D intensity.

Geroski's (2005) examined the effects of the major innovations and patents to various corporate performance measures such as accounting profitability, stock market rates of return

and corporate growth. The observed direct effects of innovations on firm performance are relatively small, and the benefits from innovations are more likely indirect. However, innovative firms seem to be less susceptible to cyclical sectoral and environmental pressures than non-innovative firms.

Jaumotte and Pain (2005) pointed out that patents confine simply a part of innovation output, since there are many not patented inventions. Sometimes, firms prefer to maintain commercially information secret. In addition, innovations can also be protected by copyrights, trademarks, and design registrations; or simply by the measure of the share of new products in turnover. These measures indicate not only information about the number of innovations per firm, but also reflect diversities in market structure, competition intensity and innovation spillovers.

In this thesis, a similar approach to Hagedoorn and Cloodt (2003) is followed in order to evaluate the in-firm innovation environment and innovative performance of companies. According to this approach, innovativeness broadens the innovative outcomes of firms' activities and applications in a given period, namely, last three year. Then, an innovativeness measure consisting of measures such as R&D expenditures, patents, patent citations and number of new products developed is utilized. Also, the number of new business ideas and projects, number of incremental improvements in production processes, better quality and low cost for existing products and services and number of patented products are other innovativeness measures that are considerred.

In this study, a variety of performance criteria for evaluating the consequences of innovativeness is used at firm level. Particularly, four different performance measures are employed to expose the effects of realized innovations to firm performance. An innovative performance scale consisting of seven criteria have been adapted from Antoncic and Hisrich (2001), and Hagedoorn and Cloodt (2003).

Production performance, market performance and financial performance scales have been adapted from existing academic literature with four, three and four criteria respectively. The base of items asked regarding these performance criteria are adapted mainly by researches of Barringer and Bluedorn (1999), Hornsby et al. (2002), Narver and Slater (1990) and Yılmaz et al. (2005).

The questions about firm performance are presented using a "five-point Likert Scale". The questions considered the latest three year performance compared to the previous years' performance based on the managers' perception. In the scale, numbers from 1 to 5 referred to "very unsuccessful", "unsuccessful", "similar", "successful" and "very successful",

respectively. Such subjective measures possibly bring in manager bias, but are widespread practice in the literature (Khazanchi et al., 2007). The reason of using such a subjective scale is that firms are reluctant to disclose exact performance records and managers are less willing to give objective performance data (Boyer et al., 1997; Ward and Duray, 2000). Conversely, top managers who are well-acquainted with performance data could present a precise subjective evaluation (Choi and Eboch, 1998). Moreover, objective measures could limit the comparability and accuracy of responses (Dess and Robinson, 1984; Porter, 1979).

To sum up, the criteria used in the thesis for measuring the innovative performance are:

1. Ability to offer the new product before competitors,
2. Percentage of new products in the existing product diversity,
3. Number of new products and projects,
4. Innovations developed about work processes and methods,
5. Quality of new products and services,
6. Number of patented or patentable innovations,
7. Renewal of managerial structures and mentality due to the environment conditions.

The criteria used in the thesis for measuring the production performance are:

1. Production quality,
2. Production cost,
3. Production flexibility,
4. Production and delivery speed.

The criteria used in the thesis for measuring the market performance are:

1. Customer satisfaction,
2. Total sales,
3. Total market share.

The criteria used in the thesis for measuring the financial performance are:

1. Return on sales (profit/total sales),
2. Return on assets (profit/total assets),
3. General profitability of the firm,
4. Cash flow except investments.

These items are quantified on a five point Likert scale as explained earlier. Mean and Mean and standard deviation scores are computed and necessary reliability estimations and statistical analysis are performed for all of these measures using SPSS v.13 and AMOS 4.0 softwares.

CHAPTER 4

THE SURVEY

4.1 Survey Design

Surveys are proven to be fairly valuable tools and thus utilized commonly in field studies. This study is mainly based on the application of a questionnaire and evaluation of its results. The innovation model introduced in the previous chapter is the basis of the questionnaire form that is prepared for survey application. Each question in the questionnaire aims to collect necessary data to measure the influence of the related element in the model.

The drivers of innovativeness model deals with the effects of innovation determinants upon the innovative capabilities of a firm. On the other hand, the performance model discusses how the realized innovations in the company influence firms' competitiveness power and performance in the market. The survey application is established according to this frame. The questionnaire form needs several questions not only about the firms' identity, structure, strategies and sectoral relations, but also about the quantity and quality of firms' realized innovations, and its performance and competitiveness power. The questionnaire contains eleven headings described in the next section.

In Appendix A, the transformation of the model elements into the questionnaire form is displayed showing how these elements match with questionnaire headings.

4.2 Questionnaire Form

The questionnaire form is provided in Appendix B. To protect its originality and to prevent any misunderstandings resulting from translation of the questions from English, the questionnaire form attached is kept in its original Turkish version

The questionnaire form is constructed with strong relation to the innovation literature review presented in the second chapter. Before the real survey application had begun, ten pilot applications have been performed. Afterwards, the questionnaire is updated based on the results of the pilot survey,.

The questions are chosen in order to collect correct and useful data for analysis and testing the hypotheses. Basically the objective of the survey structure is to get rid of characteristic misapprehensions of the respondent and to provide consistent data for better judgments in later analysis. The 1-5 Likert scale questions in the survey aim to easily assemble qualitative information concerning firm structure and strategies, as well as innovative capabilities of companies. There are also a few numerical questions in order to collect directly financial performance data.

The questions are chosen in order to collect correct and useful data for analysis and testing the hypotheses. Basically the objective of the survey structure is to get rid of characteristic misapprehensions of the respondent and to provide consistent data for better judgments in later analysis. The 1-5 Likert scale questions in the survey aim to easily assemble qualitative information concerning firm structure and strategies, as well as innovative capabilities of companies. There are also a few numerical questions in order to collect directly financial performance data.

A key notion that should be considered before conducting a survey research is to cautiously performing questionnaire construction stage. For example, in order to obtain independent replies, questions ought to be listed in such a way that a previous question does not manipulate the present one. Furthermore, the questionnaire form should be standardized and same form should be applied for every new application. Consequently, each respondent should be asked identical questions and in the same order as other respondents.

The questionnaire form can be summarized under eleven modules, which are: General Firm Information, Market Properties and Competition Structure, Firms' Strategies, Application Level of Innovation Types, Intellectual Property, Public Incentives, Organizational Culture, Barriers to Innovation, Collaboration, Performance, and Quantitative Data.

For every questionnaire title, the purpose is to ascertain the current state of innovation related activities and environment in the firm. Despite the fact that more quantitative answers are better, quantitative questions are minimized, since it is very difficult to collect numerical data from companies in Turkey due to the confidentiality issues. For the question types, which are generally close-ended (that means standardized selections resembling multiple-choice that

encourage respondents to complete the questions), using 5 equal-distance items Likert scale is preferred, where 1= strongly disagree/extremely worse and 5= strongly agree/extremely better. But, there are also a few open-ended questions in order to gather specific innovations examples from firms' managers. Finally, how to investigate necessary data in minimum number of questions is also discussed. Extreme care is taken for questionnaire clarity, comprehensiveness and acceptability.

In the *General Firm Information* module, data such as firm establishment date, primary product group, ownership status and foreign capital existence are collected. These questions are important in order to classify participant firms, and to explore the relationship between innovativeness and firms' general characteristics such as size, age, ownership status, etc.

Market Properties and Competition Structure module tries to secure useful information about the competition in the market and the competitive power of the competitors in the sector. Therefore, these questions serve to analyze whether the market competition pushes firms to innovate in order to improve their position in the market.

Firms' strategies module has a wide spectrum. In this part, the objective is to clarify the relationship between business strategies and innovativeness. There are questions not only about foreign investments, market focus, product price and quality strategies, products gamme, make and buy strategies, technology management etc., but also questions about manufacturing conditions and flexibility, on-time delivery, production cost and quality and the willingness to improve them in order to examine the roles of competition elements in term of innovative capabilities of a company. This part is clearly useful to evaluate the effects of firm strategies to be more innovative.

The module on *Application Level of Innovation Types* employs four categories according to four innovation types: product, process, marketing and organizational. The questions aim to collect data about the innovations in the company, and the application level of technology and manufacturing methods for each of those innovation types. Also, there are open-ended questions to gather innovation examples.

Intellectual Capital module is about the protection of firm's intellectual property by means of patents, useful models, registrations, secrecy procedures etc. Therefore, it is possible to understand not only if companies have a tendency to acquire these intellectual properties, but also if there is a gap in laws and regulations which might harm innovation eagerness of firms. On the other hand, in this section, there are also questions about human capital, social capital and organizational capital in order to find out, if there is really a positive correlation between having strong intellectual capital and innovative capability.

Public Regulation & Incentives module aims to understand if the R&D activities and innovation projects are supported with the public institutions and governmental rules. This data is useful to investigate if innovativeness is really supported through public regulations.

Organization Culture module includes questions to identify the innovative climate in the organizations. The encouragement of employees towards innovations, communication between managers and workers, leadership styles, support to idea generation, project support, work discretion, time availability and reward system are the main subjects under investigation to find out how the organization climate affects the innovativeness in a firm.

Barriers to innovation module consist of two parts. The first one tries to discover the internal barriers to innovation and the second part explores external barriers to innovation. Thus, this part helps to determine which factors are critical for innovation making process.

Collaboration module includes questions about the cooperation and partnership of firms with their customers, competitors, universities, suppliers and other related institutions while developing new process and technologies.

In the *Performance* module, questions aim to discover useful insights about general innovative performance and production, market and financial performance. These questions are designed to be suitable to Likert scale for easiness to respondent. This data is very vital to measure the effects of innovations to firm performance.

Finally, *Quantitative Data* module contains questions requesting numerical answers about firm financial performance and sales, market share, exports, R&D investments, number of employees and their education level, etc. This part is crucial in order to gather necessary quantitative information both for descriptive and statistical analysis.

4.3 Data Collection Procedure

After the questionnaire form was created, the target sample number of participant firms for the thesis is defined and characteristics of firms (i.e. geographic location) and sectors are set. Note that, in order to achieve a consistent sample for the analysis, target sample number and distribution of firms into business sectors and cities must be homogeneous enough to obtain an appropriate representation (Nardi, 2003). Thus, conditional on planned analysis types, the sample sizes for each of these sectors and cities are determined.

In this thesis, manufacturing firms from six Turkish sectors in the north Marmara region of Turkey is selected. Based on the pilot interviews, it is understood that mail method can be

untruthful and insufficient due to survey difficulty and lengthiness for the overall survey. Therefore, in addition to mail method, face-to-face interviews with companies' top managers are arranged. For these interviews, firms are primary selected in Kocaeli, close to Gebze Organized Industrial Zone (GOSB) and TAYSAD Organized Industrial Zone (TOSB) areas since they are located close to Sabancı University campus.

Companies for the face-to-face interviews are determined after a full list of member firms with phone number and detailed addresses is acquired from the headquarter offices of GOSB and TOSB. Then, appointments are requested by phone from the top managers, especially from the CEOs, the Production or R&D directors of the firms. The dispersion of the firms to the sectors is considered in order to obtain a true randomized and representative sample. Thus, necessary adjustments are made in the sample according to the number of returns of the mail application while face-to-face applications have been applied. Top managers are more suitable for this survey interviews since the questions force the respondents to answer a wide spectrum of disciplines regarding every area of the company processes. The respondents must have deep knowledge and experience in the firms' activities and they should also possess the authority to reply the specific questions. Top managers are critical actors that shape the organization climate and strategies through their decisions, implementations and knowledge. Besides, they have vital roles for setting off innovative behaviors through the organization and assisting to innovativeness policies. Therefore, the real innovative climate of organizations can be observed from the behaviors, supports and attitudes of top managers.

On the other hand, the mail application of the survey started with gathering mailing addresses and phone numbers of companies. For that purpose, the databases of TOBB (Union of Chambers and Commodity Exchange), Istanbul, Kocaeli, Tekirdağ Çerkezköy and Sakarya Industry Chambers and member lists of various Organized Industry Regions are used. Then, the questionnaire forms are printed, cover letter is written, and lastly 1857 copies of survey packages are prepared. The mail packages contain questionnaire forms, pre-paid envelopes to return of questionnaire forms and cover letter for CEOs. Finally, these packages are posted to selected firms. To motivate completion, respondent are promised an outline of findings.

The firms are reminded by phone and by e-mails to complete the surveys after the packages were sent. Once the returns began, if there were some questions not answered in the questionnaire form, it is tried to collect these missing data by phone. The returned mail numbers per week are recorded regularly. Further details of survey sample and related descriptive graphs are presented in Chapter 5, in Descriptive Analysis section.

4.4 Sample

This part represents the sample including descriptive analyses such as demographic charts, distribution of the companies according to sectors and cities, frequency tables etc.

Although return percentage of mail application was initially predicted to be no more than 5%, a total of 83 survey were returned; and 138 surveys sent back due to refusal, address change etc. That means that the percentage of returns becomes 83 / (1857-138), namely 4.83%. Figure 4.1 illustrates the number of returned questionnaire forms per week; beginning on 31st October 2006, when the mails were sent for the first time. The questionnaire forms were resent to the unreplied firms for the second time on 27th February 2007.

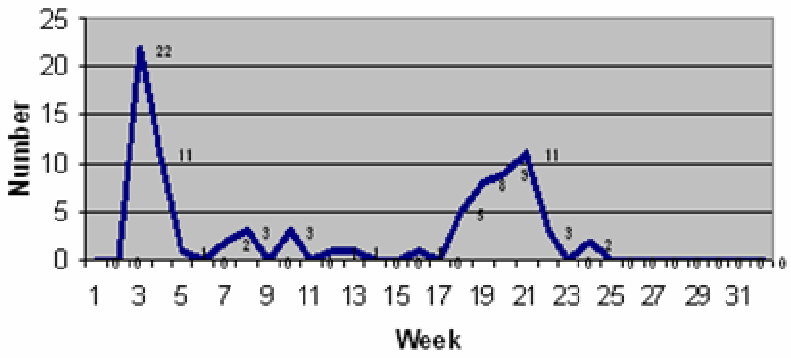


Figure 4.1 : Number of returns per week

In summary, the questionnaire form was sent to 1857 manufacturing companies, but the number of responding companies was only 83. All of these returned questionnaires are usable since the majority of questions are answered. ***Figure 4.2*** displays the proportion of face-to-face interviews and returned mails in total 169 respondents.

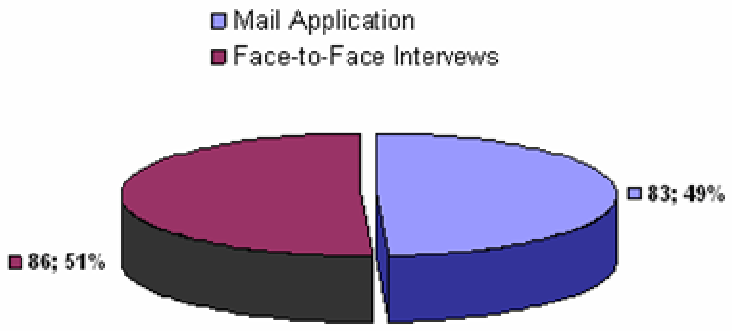


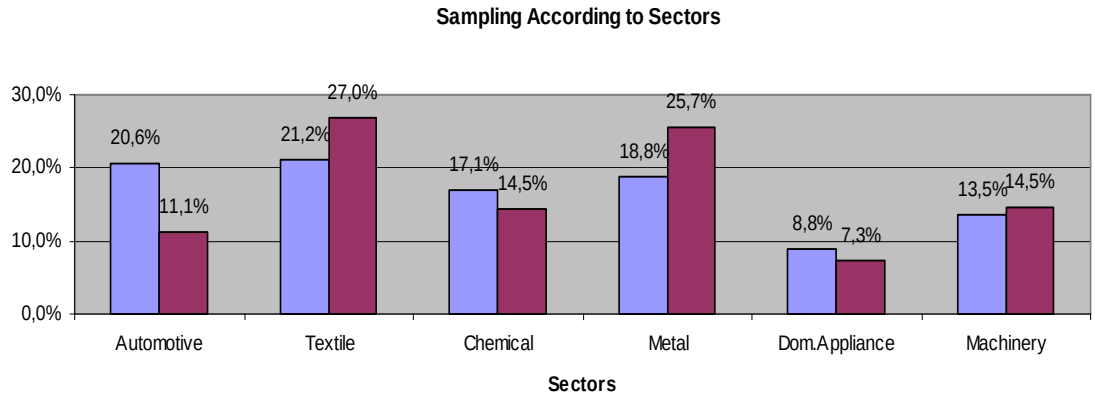
Figure 4.2 : Data collection

:

	Istanbul	*Kocaeli*	*Tekirdag*	*Sakarya*	*Kirklareli*	*Total*
Automotive	3	29	0	3	0	*35*
Textile	25	5	5	0	1	*36*
Chemical	6	21	2	0	0	*29*
Metal	7	20	4	1	0	*32*
Elektrical	5	6	2	1	0	*14*
Machine	8	13	0	2	0	*23*
Total	*54*	*94*	*13*	*7*	*1*	**169**

Table 4.1: Distribution of participant firms

The degree to which the sample is representative of the population is addressed by carrying out a series of comparative tests regarding firm distributions according to sectors and cities. The sample number per sector and its randomization are determined by number of total firms in these six sectores on selecting five cities according to TOBB (Union of Chambers and Commodity Exchange) firm lists, where the weights of sectors are: textile 27.0%, chemical 14.4%, fabricated metal 25.6%, machinery 14.5%, domestic appliances 7.3% and automotive 11.1%. Table 4.1 presents the number of the companies participated to the research with respect to the sectors and the cities. ***Figure 4.3*** and ***Figure 4.4*** depicts the comparison of the actual number of participant companies vs. the estimated number of companies according to sectors and cities, respectively.



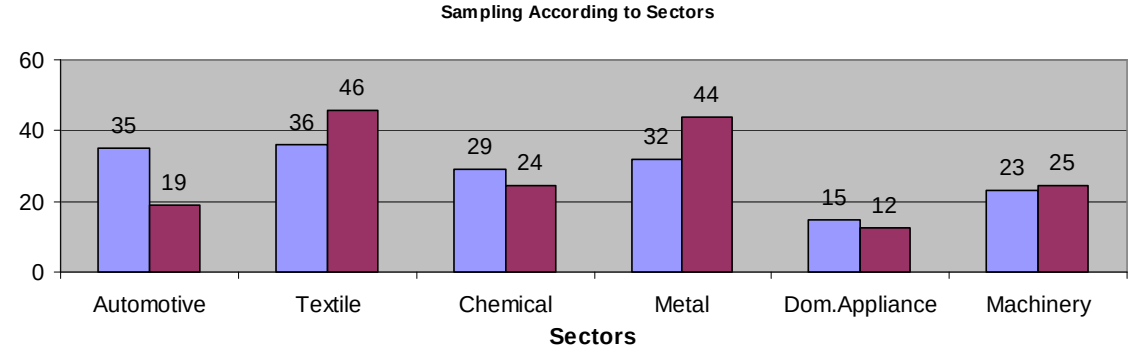


Figure 4.3: Distribution of firms according to sectors

In Figure 4.3, the blue bars represent the number of firms in the sample, while the violet bars represent the number of firms that must be present according to sector weights of TOBB list in five selected provinces. For each sector, sample number is acceptable, since there is no significant difference between population and sample percentages.

Nonetheless, there is a little more than needed data for automotive and chemical sectors, while there is a little less than needed data for textile and fabricated metal sectors; but this bias is at an acceptable range. Therefore, the sample is sufficient and suitable for the following analyses and it is representative for the population.

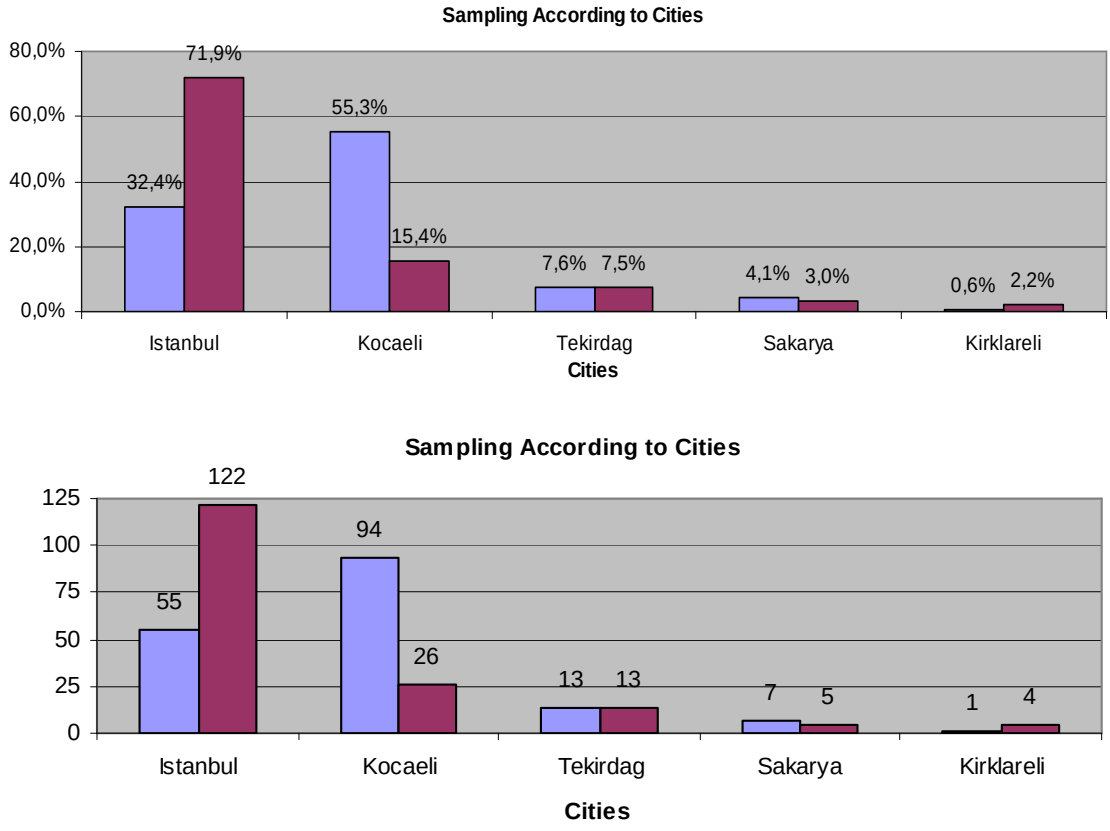


Figure 4.4: Distribution of firms according to cities

In Figure 4.4, the blue bars represent percentage of firm in the sample, while the violet bars signify percentage of firms that must be present according to sector weights of TOBB list in five selected provinces.

Figure 4.4 indicates that there is more than needed data from Kocaeli, while there is less than needed data from Istanbul. However, this bias can be acceptable since the sample response profile is not significantly different from the population profile in terms of sectors.Furthermore, considering the proximity to Istanbul of some of the firms that are

officially listed in Kocaeli,we can conclude that the sample is broadly representative the key variable. Note that, the bias of distribution according to provinces is not important criterion for innovativeness since location is not even one of innovation determinant in this study. Therefore, the sample is sufficient and suitable for the following analyses in term of randomization procedure

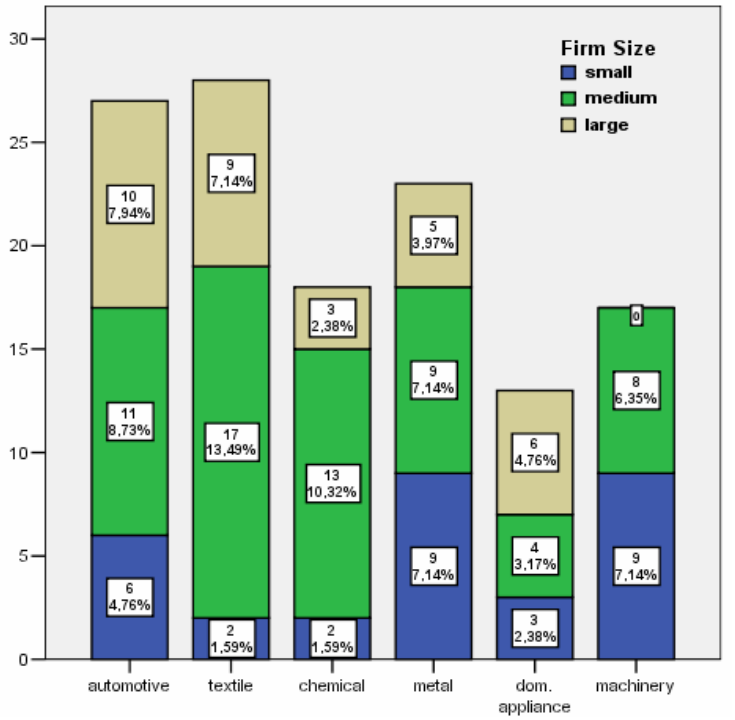


Figure 4.5: Distribution of firms according to firm size

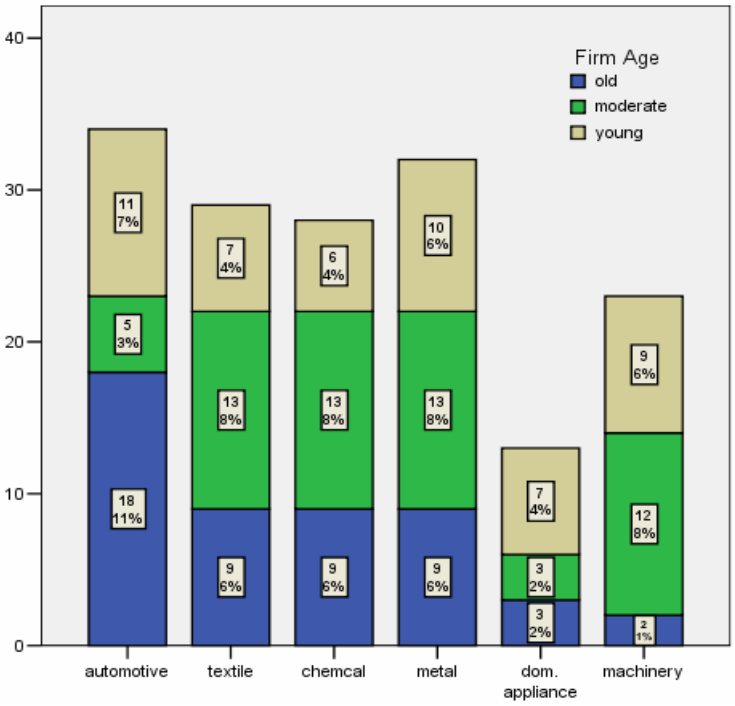


Figure 4.6: Distribution of firms according to firm age

Figure 4.5 and ***Figure 4.6*** offer a profile of the resulting sample, illustrating its diversity in terms of firm size and firm age. Firm size is determined by the number of full-time employees (up to 50: small, 50≤medium<250, ≥250: large) and firm age is determined by year of production started (up to 1975: old, 1975≤moderate<1992, ≥1992: young). More details about firms' general characteristics in the sample including distribution of firm according to firm size, firm age, ownership status and direct foreign capital will be presented in the next section at the firms' characteristics sub-part.

The survey is applied to top level managers, especially to general, plant, production or R&D managers. Only 19 of 169 respondents are females (11%). ***Figure 4.7*** displays the dispersion of the respondents' functions in details.

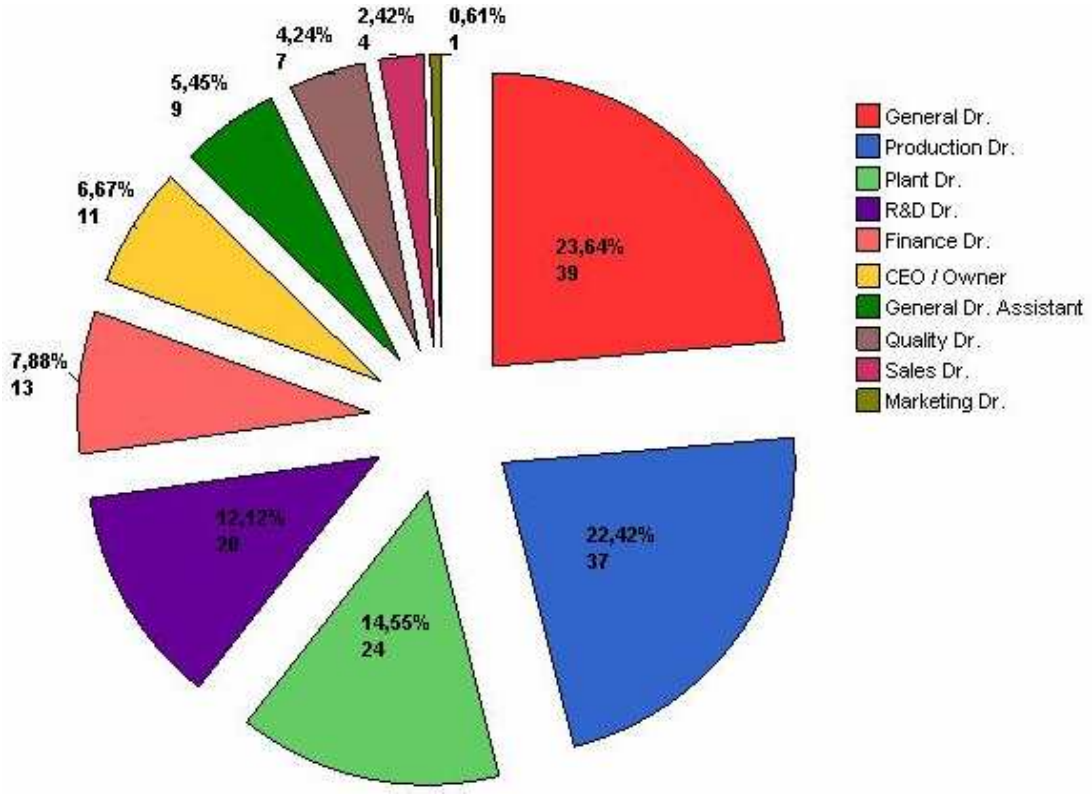


Figure 4.7: Dispersion of survey respondents in company

CHAPTER 5

PERFORMANCE MODEL ANALYSIS

Once the survey has been completed and retrieved, collected firm responses are organized and converted into computer stage for data analysis involving statistical softwares SPSS (Statistical Package for Social Sciences) v.13 and AMOS v4.0.

In the following two chapters the results of the statistical analyses that are utilized, such as factor analysis, reliability analysis, means and variances of the factors, correlation analysis to test the one-to-one relationship of factors, and also regression analysis, structural equation model and path analysis in order to depict final relationship between factors, will be presented. Note that, in order to extract the effects of control variables, mean comparisons such as ANOVA analysis and student t-tests are also performed with the assumption that the variances are equal for each hypothesis test. In chapter five, the analysis of the performance model will be presented. The analysis regarding to the innovativeness model will be presented in chapter six.

5.1 Statistical Analyses

In order to identify the statistically relationships between innovation determinants, innovativeness and firm performance, it is necessary to begin with explanatory factor analysis (EFA) to determine the factor structures. Next, confirmatory factor analysis (CFA) (using AMOS software) can be utilized in order to validate the results of the EFA. Note that the, factors represent the underlying dimensions that summarize the original set of observed variables.

Factor analysis is a generic name given to a class of multivariate statistical methods whose main purpose is data reduction and summarization. It addresses the problem of

analyzing the interrelationships among a large number of variables and then explaining these variables in term of their common factors. It is a technique particularly suitable for analyzing the complex, multidimensional problems encountered by researchers. It can be useful to observe the underlying patterns or relationships for a large number of variables and determine, if the information can be condensed or summarized in a smaller set of factors or components. The general purpose of factor analytic techniques is to find a way of condensing the information contained in a number of original variables into a smaller set of new composite dimensions (factors) with a minimum loss of information.

Explanatory factor analysis is performed with SPSS v13.0.using principal component analysis with varimax rotation. Mostly, *eigenvalue over 1* criterion is taken into consideration to set the number of extracted factors. Eigenvalue represents the amount of variance accounted for by a factor. Confirmatory factor analysis is performed with AMOS v4.0 while using maximum likelihood estimation. Once the factors are obtained, reliability analysis with Cronbach α is also implemented.

The performance model of innovation is about how innovativeness influences a firm's performance. It aims to extract the effects of innovations to firm performance and its competitiveness. According to this model, realized innovations (product, process, marketing or organizational) directly affect the firm performance that can be measurable by performance indicators. These performance indicators are divided into four sub-groups and discussed with four dimensions which are innovative, production, market and financial performances.

It is useful to note that financial performance is, in fact, a consequence of other performance indicators. It is accepted fact that there is time a lag between innovations and their financial contributions to companies. Once an innovation is born, its impact on innovative, production and market performance could be seen in a recognized time frame. But the financial impact will come after these innovative, production and market performance ameliorations (or opposite) have occurred.

After explanatory factor analysis procedure is applied with SPSS, the extracted factor structure of firm performance can be seen in ***Table 5.1*** where the numbers represent the factor loadings. For this analysis, all of the performance questions in the survey are placed together into principal component analysis. Expectedly, four performance dimensions are extracted.

One of the innovative performance questions, namely "ability to offer new products before competitors" is left outside the analysis as it spoils the factor structure. It is not categorized under an appropriate factor and failed in internal structure validity check. But since this is considered to be an important criterion for measuring the innovative performance,

the question is analyzed separately with the student t-test. The results of this analysis will be presented later in this section. All other questions are settled as expected. As a result, firm performance is separated into four factors.

Questions		Factors 1	2	3	4
Financial Performance	Return on assets (profit/total assets)	,912			
	General profitability of the firm	,907			
	Return on sales (profit/total sales)	,890			
	Cash flow except investments	,780			
Innovative Performance	The innovations developed about the worl processes and methods		,780		
	The renewals of managerial structures an mentality due to the environment conditio		,759		
	The quality of new products and services		,745		
	The number of new products and projects		,705		
	The percentage of the new products in the existing product diversity		,685		
	The number of patented or patentable innovations		,536		
Production Performance	Production flexibility			,696	
	Production cost			,692	
	Production quality			,684	
	Production and delivery speed			,661	
Market Performance	Total sales				,712
	Total market share				,697
	Customer satisfaction				,584

Total Variance Explained: % 67,348

Table 5.1: Factor structure of performance indicators

On the other hand, explanatory factor analysis extracted five factors from innovation items. These factors are presented in ***Table 5.2.*** There isn't any item that spoils the factor structure. Moreover, product innovation is grouped under two significant factors, namely radical and incremental product innovations. For some of the upcoming analyses, these two factors are combined to a single factor, i.e., product innovations.

The result of explanatory factor analysis demonstrated that all of the variables in the survey placed under their expected factors. However, confirmatory factor analysis is conducted in order to test the factors structure. That method is performed according to the results of the explanatory factor analysis. Note that, for the analysis the observed variables (a.k.a questions) are attached to the latent factors with fixed error terms.

Therefore, a single-step confirmatory factor analysis is conducted for the performance and innovativeness factors. ***Table 5.3*** and ***Table 5.4*** depict the results of these two confirmatory factor analyses with their factor loadings, respectively.

Questions		Factors 1	2	3	4	5
Organizational Innovations	y21	,786				
	y22	,757				
	y23	,731				
	y16	,716				
	y18	,680				
	y19	,665				
	y17	,645				
	y24	,528				
	y20	,481				
Market Innovations	y14		,741			
	y15		,694			
	y12		,662			
	y13		,647			
	y11		,604			
Process Innovations	y9			,754		
	y10			,753		
	y8			,576	,540	
	y7			,569		
	y6			,559		
Incremental Product Innovations	y2				,742	
	y3				,617	
	y1				,611	
Radical Product Innovations	y4					,833
	y5					,737

Total Variance Explained: % 63,959

Table 5.2: Factor structure of innovations

Performance Questions	**Factor Loadings**
Financial Performance	
Return on assets (profit/total assets)	0.947*
General profitability of the firm	0.938*
Return on sales (profit/total sales)	0.902*
Cash flow except investments	0.716*
Innovative Performance	
Ability to offer the new product before the competitors**	---
The innovations developed about the work processes and methods	0.670*
The renewals of managerial structures and mentality due to the environment	0.633*
The quality of new products and services	0.664*
The number of new products and projects	0.840*
The percentage of the new products in the existing product diversity	0.772*
The number of patented or patentable innovations	0.502*
Production Performance	
Production flexibility	0.602*
Production cost	0.583*
Production quality	0.602*
Production and delivery speed	0.657*
Market Performance	
Total sales	0.842*
Total market share	0.912*
Customer satisfaction	0.425*
**Out of analysis due to factor structure spoiling	*p<.05

Table 5.3: Factor loadings of CFA for performance factors.

Innovativeness Questions	Factor Loadings
Incremental Product Innovation	
Y1, Y2, Y3	0.585*, 0.552*, 0.552*
Radical Product Innovation	
Y4, Y5	0.644*, 0.552*
Process Innovation	
Y6, Y7, Y8, Y9, Y10	0.634*, 0.777*, 0.868*, 0.664*, 0.544
Marketing Innovation	
Y11, Y12, Y13, Y14, Y15	0.607*, 0.702*, 0.702*, 0.716*, 0.779*
Organizational Innovation	
Y16, Y17, Y18, Y19	0.766*, 0.721*, 0.787*, 0.732*
Y20. Y21, Y22, Y23, Y24	0.601*, 0.768*, 0.796*, 0.658*, 0.540*
	*p<.05

Table 5.4: Factor loadings of CFA for innovativeness factors

The results of both of these confirmatory factor analyses are evaluated by the goodness of fit indices. These indices are presented in ***Table 5.5***.

Goodness of fit indices	Findings		Reference Value
	Performance	Innovativeness	
χ^2 / degree of freedom	2.414	2.100	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.984	0.968	0.9<CFI<1
NFI (Normed Fit Index)	0.972	0.941	0.9<NFI<1
RFI (Relative Fit Index)	0.963	0.928	0.9<RFI<1
IFI (Incremental Fit Index)	0.984	0.968	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.978	0.961	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.092	0.081	RMSEA<0.08

Table 5.5: Goodness of fit indices of CFA

χ2 / degree of freedom is the minimum discrepancy divided by its degrees of freedom. Wheaton et al. (1977) suggest that this relative chi-square begins to be reasonable when it is approximately 5 or less. This ratio shows the appropriateness of the model to the data. The comparative fit index (*CFI*; Bentler, 1990) is testing the suitability of the model. It indicates a very good fit when values are close to 1. The Bentler-Bonett (1980) normed fit index (*NFI*), Bollen's (1986) relative fit index (*RFI*) and Bollen's (1989) incremental fit index (*IFI*) indicate a very good fit when values are close to 1 also. The Tucker-Lewis coefficient (*TLI*) was discussed by Bentler and Bonett (1980) in the context of analysis of moment structures, and is also known as the Bentler-Bonett non-normed fit index (NNFI). The typical range for

TLI lies between 0 and 1, but it is not limited to that range. TLI value close to 1 indicates a very good fit. Browne and Cudeck (1993) implied that a value of about 0.08 or less for the *RMSEA* would indicate a reasonable error of approximation.

The overall fit statistics for the performance and innovativeness factors demonstrate an acceptance level of overall fit (Bollen, 1989). Therefore, the factor structures are concluded to be valid. Recall that, the confirmatory factor analysis evaluates the measurement properties of the explanatory factor analysis. All the factor loadings but one (i.e. pe12: customer satisfaction) have high (>0.50) and significant (p<0.05) loadings (Chin, 1998). Still, pe12 is retained since its factor loading is also reasonably high (0.425) and significant (p<0.05). Additionally, reliability analysis with Cronbach α will show later that it is a reliable item.

Structural equation modeling approach reveals the upper factor structure of both performance and innovativeness factors (Figure 5.1). The lower factors are merged and transformed to upper factors with secondary level confirmatory factor analysis.Thus, general performance and innovativeness factors are obtained. This method was used in various studies in literature (Oczlowski and Farrel, 1998).

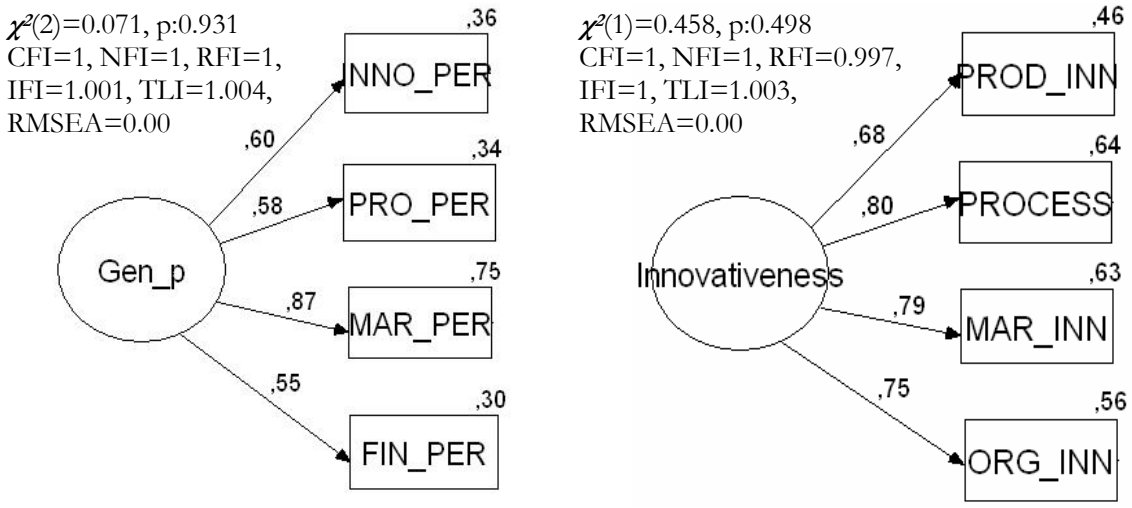


Figure 5.1: Secondary Level CFA for firm performance and innovativeness

As a result of explanatory and confirmatory factor analyses, general firm performance factor has taken form from 4 lower factors namely innovative, production, market and financial performance. Similarly, innovativeness factor is formed by 4 lower factors namely product, process, marketing and organizational innovations.

Factor analysis provides insights about the factor structures when the variables are loaded into a single factor. EFA tests unidimensionality and CFA tests convergent and discriminant validity. Convergent validity of the factors is supported with high factor loadings

already presented. Considering the means of the variables that are loaded into a single factor, relations between dual combinations of the factors give information about the reliability of internal consistency (Hair et al., 2003). For the reliability analysis of the factors, Cronbach α is used (Cronbach and Shavelson, 2004).

Usually, when α value is greater than 0.70, the scale is accepted as reliable. However, in the literature there are discussions about whether this value can be even smaller (Streiner, 2003). In this thesis, a factor with α >0.60 is accepted as reliable. ***Table 5.6*** shows α value of performance and innovation factors obtained. Reliability analysis shows that all the factors are internally consistent and reliable since all α values are greater than 0.70.

Factors	**Number of Question**	**α Value**
Innovative Performance	6	0.829
Production Performance	4	0.702
Market Performance	3	0.759
Financial Performance	4	0.929
Incremental Product Innovations	3	0.702
Radical Product Innovations	2	0.799
Product Innovations	5	0.759
Process Innovations	5	0.824
Marketing Innovations	5	0.827
Organizational Innovations	9	0.900

Table 5.6: Results of reliability analysis

Therefore performance and innovativeness scales' reliabilities are tested and approved, and it is followed by correlation analysis. The correlation coefficient is a measure of the linear association between two variables. It ranges in value from -1 to +1, whose absolute value predicts the strength of the relationship (Norusis, 2003). If the sign is positive, it means the values of the two variables increase together; if the sign is negative, it means while one value is increasing, the other is decreasing.

Correlation analysis is conducted in order to inspect the one-to-one relationship between factors. The results are shown in ***Table 5.7*** with means of the factors. Findings of the correlation analysis give information similar to linear regression between two factors. Thus, this analysis is valuable to test the performance model hypotheses. All of the factors that are directly related to initial hypotheses (marked with red in the Table 5.7) are significantly correlated as already expected. The positive correlation between innovativeness and general performance ($p<0.01$; r:0.313) supports the primal hypothesis and aim of the performance model.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1- Incremental product innovation	3,14	1,05	1	,427(**)	,858(**)	,525(**)	,420(**)	,486(**)	,270(**)	,219(**)	,133	,112	**,231(**)**	,709(**)
2- Radical product innovation	2,56	1,43	(**)	1	,830(**)	,355(**)	,512(**)	,361(**)	,302(**)	,172(*)	,109	,083	**,206(**)**	,641(**)
3- Product innovation	2,91	1,02	(**)	(**)	1	,526(**)	,548(**)	,504(**)	,341(**)	,236(**)	,144	,116	**,262(**)**	,800(**)
4- Process innovation	2,90	1,04	(**)	(**)	(**)	1	,410(**)	,610(**)	,331(**)	,222(**)	,162(*)	,165(*)	**,284(**)**	,788(**)
5- Marketing innovation	2,56	1,11	(**)	(**)	(**)	(**)	1	,576(**)	,239(**)	,164(*)	,071	,091	**,178(*)**	,799(**)
6- Organizational innovation	2,87	1,01	(**)	(**)	(**)	(**)	(**)	1	,444(**)	,190(*)	,145	,094	**,280(**)**	,833(**)
7- Innovative Performance	3,63	,68	(**)	(**)	(**)	(**)	(**)	(**)	1	,363(**)	,523(**)	**,317(**)**	,718(**)	**,419(**)**
8- Production Performance	3,91	,55	(**)	(*)	(**)	(**)	(*)	(*)	(**)	1	,503(**)	**,322(**)**	,674(**)	**,253(**)**
9- Market Performance	3,90	,70				(*)			(**)	(**)	1	**,479(**)**	,828(**)	**,163(*)**
10- Financial Performance	3,29	,92				(*)			(**)	(**)	(**)	1	,768(**)	,148
11- General Performance	3,69	,53	(**)	(**)	(**)	(**)	(*)	(**)	(**)	(**)	(**)	(**)	1	**,313(**)**
12- Innovativeness	2,81	,84	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(*)		(**)	1

** p < ,01
* p < ,05

Table 5.7: Correlation analysis of performance model

The amount of variance between variables is convenient for further statistical analyses since factors' standard deviations are between 0.53 and 1.43. Firstly, according to the means, it is understood that the firms in our sample perform incremental product innovations rather than radical ones. Process and organizational innovations are also made at a mediocre level, but marketing innovations are relatively low. Moreover, innovations are generally at imitation level; the realized innovations are mostly new to the firm but not for the market, so firms are using the spillover effects. The realization level of innovations at firms are summarized in Figure 5.2, where the scale is 1=no such innovation is performed, 2=imitation from national market, 3=imitation from international market, 4=imitated first, but significantly improved later, 5= original innovation realized is new for all of the markets.

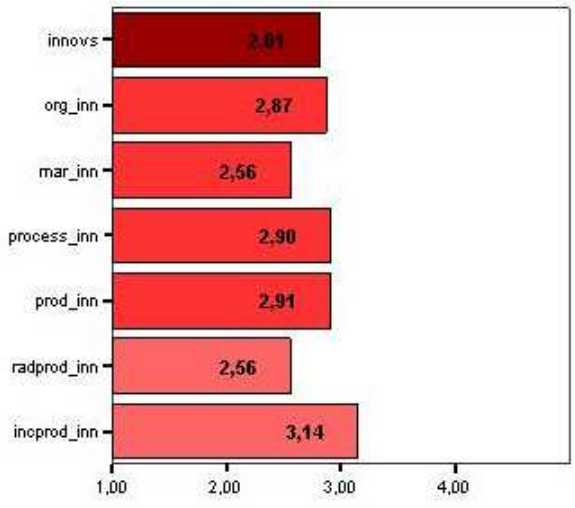


Figure 5.2: Realization level of innovations at firms

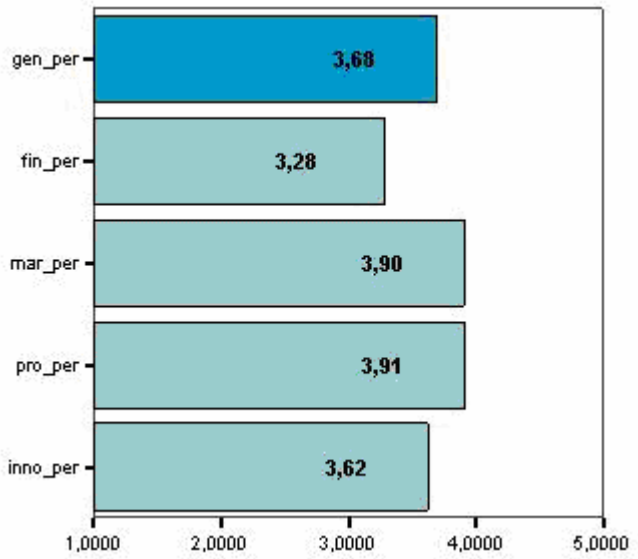


Figure 5.3: Firms' relative performances in the last three years

Besides, looking to performance factors' means, firms indicate that, their performance in the last three years is a little bit better regarding to previous years (innovative per:3.63; production per:30.91; market per:30.90). However, this performance increase is minor especially for financial performance (3.29). Firms' last three years' relative performances are summarized in ***Figure 5.3***, where 1=very unsuccessful, 2=unsuccessful, 3= similar, 4=successful and 5=very successful.

The findings of the correlation analysis extracted significant one-to-one positive relationship of the aggregated factors. All of the innovation types are correlated significantly to general performance scale with $p<0.01$ except market innovations whose correlation is at $\alpha=95\%$ level. While process innovation has higher correlation coefficient (r:0.284), marketing innovation has lower correlation coefficient (r:0.178) with general performance.

Similarly, all of the innovation types are significantly correlated with innovative performance at $\alpha=99\%$ level (product innovationwith r:0.341 ; process innovation with r:0.331 ; marketing innovation with r:0.239 and organizational innovation with r:0.444). For production performance, product (r:0.236) and process innovations (r:0.222) are correlated at $\alpha=99\%$ level, while marketing (r:0.164) and organizational (r:0.190) innovations are correlated at $\alpha=95\%$ level. However, only process innovation is significantly correlated with market performance ($p<0.05$, r:0.162).

Also, innovativeness scale is significantly correlated to performance measures (innovative per: $p<0.01$, r: 0.419; production per: $p<0.01$, r: 0.253, market per: $p<05$, r:0.163). On the other hand, financial performance is positively correlated at $\alpha=99\%$ level to innovative (r: 0.317), production (r: 0.322) and market (r: 0.479) performances. These are all important findings which support our performance model.

Briefly, correlation analysis brought up the positive relation between the innovativeness and the firm's performance. The findings indicated that all performance model hypotheses are supported except the relationship between market performance and product, marketing, and organizational innovations (**H5**, **H7** and **H8**).

On the other hand, correlation analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analysis might be more useful.

Before passing to regression analysis, it is time to analyze the innovative performance question (pe1) which was previously kept outside the analysis because it spoiled the factor structure. This item is "ability to offer the new product before competitors" which is clearly an important item to measure time-to-market. Student t-test is applied in order to analyze the effect of this innovative performance measurement (***Table 5.8***).

The independent-samples t-test procedure compares means of two groups of cases. Ideally, for this test, the subjects should be randomly assigned to two groups, so that any difference in response is tested with respect to this ability and not to other factors.

Ability to offer the new product before the rivals

	pe1	N	Mean	Sig.
innovs	= 5,00	23	3,2729	**,004**
	< 5,00	142	2,7395	
inno_per	= 5,00	23	4,2333	**,000**
	< 5,00	143	3,5184	
pro_per	= 5,00	23	4,3370	**,000**
	< 5,00	143	3,8427	
mar_per	= 5,00	23	4,4058	**,000**
	< 5,00	143	3,8182	
fin_per	= 5,00	23	3,5543	,137
	< 5,00	139	3,2464	
gen_per	= 5,00	23	4,1326	**,000**
	< 5,00	143	3,6107	
incprod_inn	= 5,00	23	3,4348	,161
	< 5,00	142	3,1056	
radprod_inn	= 5,00	23	3,2826	**,009**
	< 5,00	142	2,4507	
prod_inn	= 5,00	23	3,3739	**,019**
	< 5,00	142	2,8415	
process_inn	= 5,00	23	3,3304	**,030**
	< 5,00	141	2,8241	
mar_inn	= 5,00	23	2,9913	**,046**
	< 5,00	141	2,4933	
org_inn	= 5,00	23	3,3961	**,006**
	< 5,00	141	2,7778	

Table 5.8: t-test analysis for ability to offer the new product before competitors

For this question, the firms which indicated they were very successful in the last 3 years compared to the previous years (=5 in the scale), compared with the other firms (<5 in the scale). The outcomes of the statistical analyses reveal that Ho ($\mu_{verysuccessful} = \mu_{others}$) should be rejected, and that the firms which indicated they were very successful are performing better than others in achieving high outcomes nearly for all of the performance and innovation scales except incremental product innovation and financial performance. Thus, findings of the analysis show that ability to offer the new product before competitors makes a significant difference, and firms that are competent at this ability are more innovative and have better performance.

In order to test the probable effects of innovations to firm performance, multiple linear regression method is used. While simple linear regression gives information on the direction

and the power of one-to-one relationship, multiple linear regression analysis serves to investigate the effects of two or more variables over another dependent variable (Hair et al., 2003). Regression analysis is conducted by SPSS v.13, and then path analyses are performed by AMOS v4.0 for causality. The p values in the tables show whether the models are significant or not at α=99% (p<0.01) or α=95% (p<0.05) level. R^2 values are for how much of the dependent variables can be expressed by independent variables.

The regression model that investigates the effects of innovation types on innovative performance is presented in ***Table 5.9*** and ***Figure 5.4*** in schematized form.

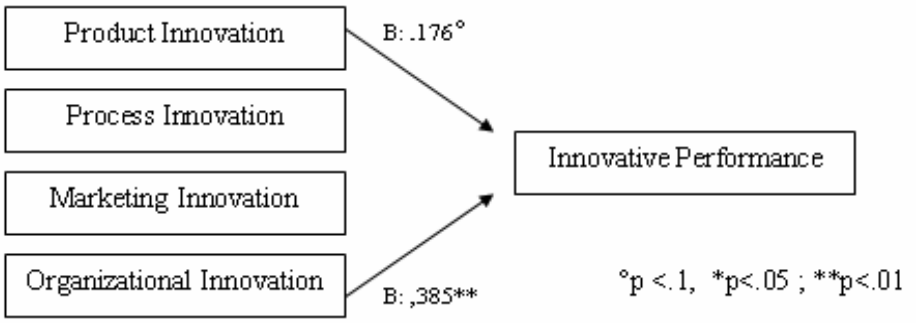


Figure 5.4: Effects of innovation types on innovative performance

Independent Variables	**Standard Beta**	**p Value**
Product Innovation	0.176	0.054
Process Innovation	0.037	0.692
Marketing Innovation	-0.082	0.371
Organizational Innovation	0.385	0.000
R^2 = 0.223 ; p=0.000		

Table 5.9: Effects of innovation types on innovative performance

The regression model of effects of innovation types on innovative performance is statistically very significant (p<0.01) and according to this model, the independent variables express 22.3% (R^2=0.223) of innovative performance. However, when the innovation types are included jointly in the multiple linear regression analysis, only product (β=0.176; p=0.054) and organizational innovations (β=0.385; p<0.01) turns out have significant positive effects on innovative performance. But when entered separately, all of the innovation types are significantly and positively correlated to innovative performance.

Therefore, despite the fact that the regression model is significant, multiple linear regression analysis reveals that only some innovation types have statistically significant effects over innovative performance. This situation arises when one innovation type which has dominant effect on the dependent variable reduce or sometimes even eliminate the effects of other independent variables. Here, product and organizational innovations have dominant direct effects on innovative performance; therefore, there are mediating effects between innovation types.

Mediating effects are discussed in the literature by Barron and Kenny (1986). Mediating effect is present when a relation between the variables is reduced or eliminated after a mediator variable has entered to the model. In such a case, it is necessary to carry on the multiple linear regression analysis of innovative performance by structural equation modeling and path analysis in order to expose the direction of mediation effects.

Post hoc analysis indicates that organizational and product innovations mediated marketing and process innovations' effects on innovative performance. In Figure 5.4, the direct effects of marketing and process innovations on innovative performance have been shadowed in multiple linear regression analysis. Therefore, in the light of this knowledge, a path analysis model for innovative performance is formed by AMOS v4.0 and analyzed according to structural equation modeling criteria. ***Figure 5.5*** presents this model with its significantly consistent findings.

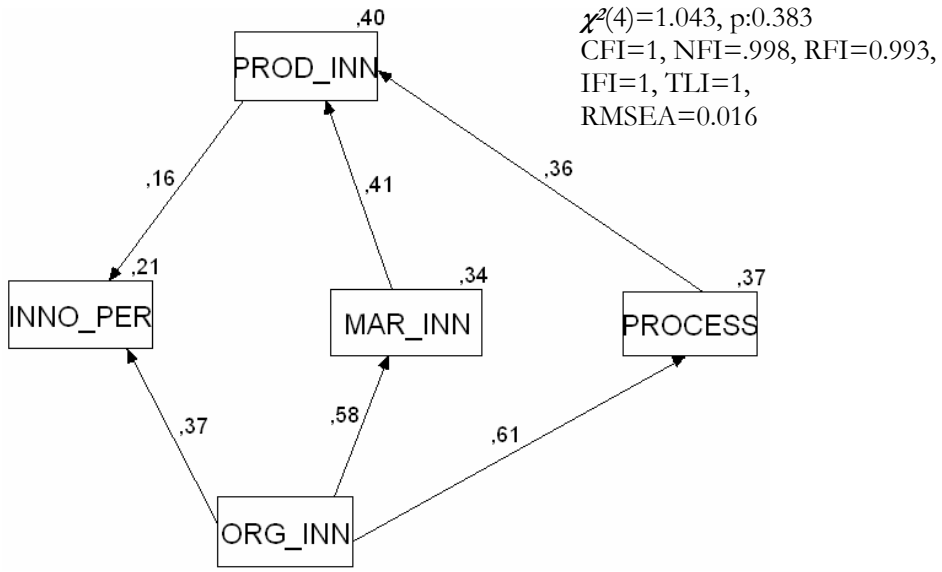


Figure 5.5: Path analysis of innovative performance

Here, while the estimates (numbers) on the single headed arrows are regression weights, the estimates on the box corners are the squared multiple correlations which can be

interpreted as follows: For example, 40% of the variance of product innovation is accounted for by the variance in innovative performance. In other words, 40% of product innovation contributes to innovative performance. Also, the estimate on the innovative performance box means that 21% of the innovative performance can be explained in that model.

As a result, the findings expose the positive relationship between innovation types and innovative performance; hence, our initial hypotheses **H1**, **H2**, **H3** and **H4** are supported. Innovative performance is directly affected by organizational (which acts as a base) and product innovations. Marketing and process innovations influence firstly products and so, their effects come by passing over product innovations.

Table 5.10 shows the regression model that investigates the effects of innovation types on production performance. This regression model is statistically significant ($p<0.05$) but according to this model, the independent variables express 6.8% ($R^2=0.068$) of production performance.

Independent Variables	**Standard Beta**	**p Value**
Product Innovation	0.151	0.130
Process Innovation	0.113	0.268
Marketing Innovation	-,004	0.966
Organizational Innovation	,050	0.646
$R^2 = 0.068$; p=0.024		

Table 5.10: Effects of innovation types on production performance

When the innovation types have entered together to the multiple linear regression analysis, significance of their effects drastically reduced despite the fact that correlation analysis already indicated all of the innovation types had significant one-to-one relation with production performance. This finding implies that there are mediating effects among the innovation types

Therefore, a path analysis model for production performance is formed by AMOS v4.0 and analyzed according to structural equation modeling method. ***Figure 5.6*** presents this model with its significantly consistent findings. 6% of the production performance can be explained by that model.

The findings expose a slight positive relationship between innovation types and production performance despite the mediating effects between variables. Hence, our initial

hypotheses **H9**, **H10, H11** and **H12** are all supported. Product innovations have direct, others innovations have indirect effects on production performance according to path analysis.

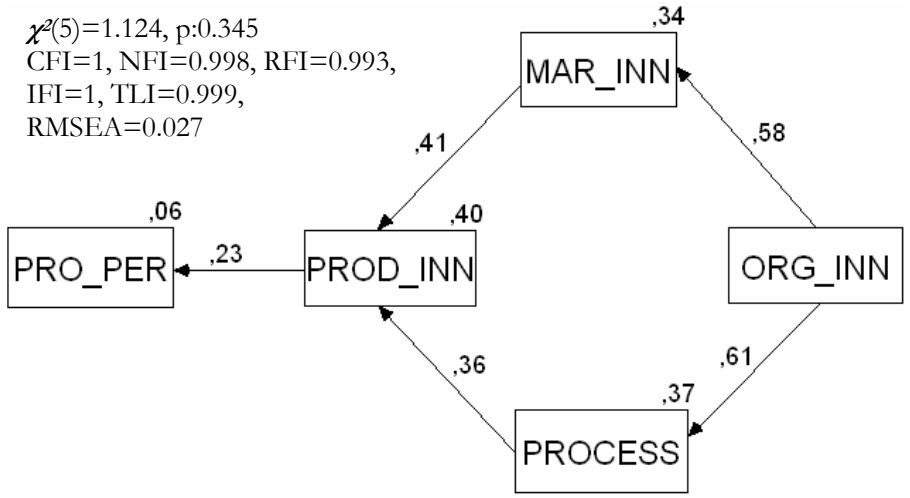


Figure 5.6: Path analysis of production performance

The regression model that investigates the effects of innovation types on market performance can be seen in ***Table 5.11***. Unfortunately, this regression model is not statistically significant (p=0.265). Thus, there is no evidence that market performance can be expressed by innovations. However, the correlation analysis showed that process (β=0.162; p<0.05), product (β=0.144; p<0.1) and organizational (β=0.145; p<0.1) innovations were significantly and positively correlated to market performance.

Independent Variables	**Standart Beta**	**p Value**
Product Innovation	0.080	0.429
Process Innovation	0.087	0.399
Marketing Innovation	-0.053	0.607
Organizational Innovation	0.081	0.463
R^2 = 0.032 ; p=0.265		

Table 5.11 : Effects of innovation types on market performance

Although multiple linear regression analysis does not expose a significant relationship between innovation types and market performance, correlation (simple linear regression) analysis reveals that process innovations and market performance is positively correlated. As a result, initial hypothesis **H6** is partially supported while there is not enough evidence to claim **H5, H7** and **H8** are supported.

Table 5.12 inspects the regression model of the effects of innovation types on general firm performance. This regression model is statistically significant ($p<0.01$) at α= 99% level and according to this model, the independent variables express 10.6% (R^2=0.106) of general performance.

Independent Variables	**Standart Beta**	**p Value**
Product Innovation	0.126	0.197
Process Innovation	0.135	0.176
Marketing Innovation	-0.032	0.745
Organizational Innovation	0.152	0.152
R^2 = 0.106 ; p=0.001		

Table 5.12: Effects of innovation types on general performance

Nevertheless, in the multiple linear regression analysis of the innovation types, it is observed that their effects are reduced drastically despite the results of the correlation analysis. Therefore, to investigate the mediating effects between innovation types, a path analysis model for general performance is formed and analyzed according to structural equation modeling method. Significantly consistent findings are displayed in ***Figure 5.7***. The model explains 10% of the variance of the general performance. Organizational and product innovations have direct, marketing and process innovations have indirect effects on general performance.

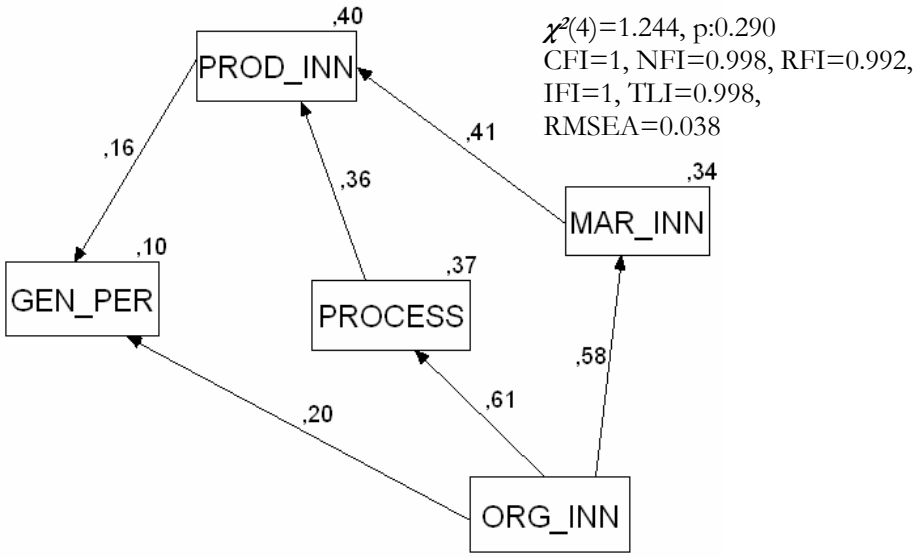


Figure 5.7: Path analysis of general performance

Finally, the regression model that investigates the effects of innovative, market and production performances on financial performance is presented at ***Table 5.13*** and ***Figure 5.8***.

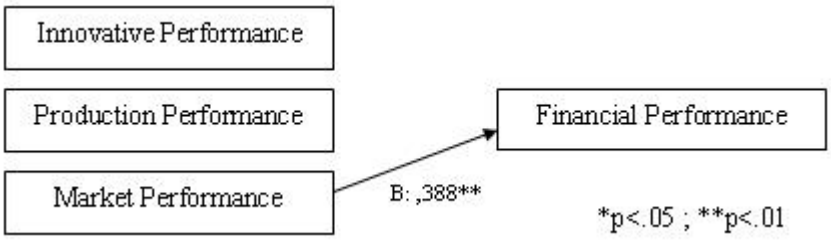


Figure 5.8: Effects on financial performance

Independent Variables	**Standard Beta**	**p Value**
Innovative Performance	0.078	0.339
Production Performance	0.099	0.218
Market Performance	0.388	0.000
R^2 = 0.243 ; p=0.000		

Table 5.13: Effects on financial performance

The regression model about the effects on financial performance is statistically very significant ($p<0.01$) and according to this model, the independent variables express 24.3% (R^2=0.243) of financial performance.

Despite the fact that the model is significant, when innovative, market and production performances are considered jointly in the multiple linear regression, only market performance (β=0.388; $p<0.01$) is observed to have significant positive effects on financial performance. But when entered separately, innovative, production and market performance are significantly and positively correlated to financial performance. Again, this finding implies there are mediating effects between performance factors.

Post hoc analysis reveals innovative and production performance mediated by market performance. Therefore, a path analysis model for financial performance is formed by AMOS v4.0 and analyzed according to structural equation modeling method. ***Figure 5.9*** presents this model with its significantly consistent findings. The model explains 24% of the variance of the financial performance. Innovative performance seems as the base of the model which positively influences production and marketing performance which is directly-connected to financial performance.

The findings reveal the positive relationship between other performance criteria and financial performance despite mediating effects between them. Hence, our initial hypotheses **H13, H14,** and **H15** are all supported.

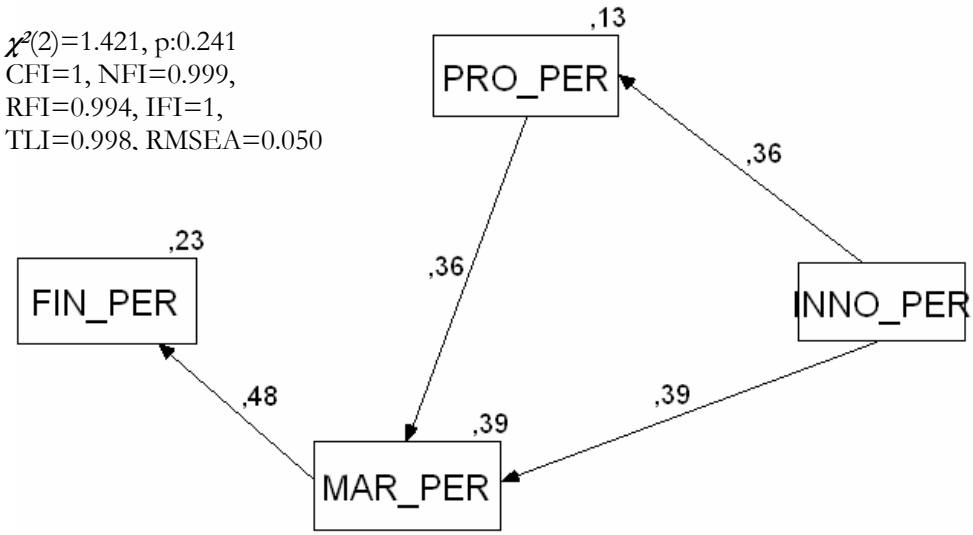


Figure 5.9: Path analysis of financial performance

5.2 Complementary Analyses

The correlation and regression analyses at the previous section are based on factors which are formed by subjective questions with 5-Likert scale. Here, some objective measures will be used as complementary analyses for performance model of innovation in order to extract the relationship between innovativeness and firm performance. Objective data is difficult to acquire since managers are unwilling to indicate their numerical performance results such as total sales and market share. Descriptive statistics of obtained objective data are summarized in ***Table 5.14***.

		Market Share Increase (%)	Market Share	Capacity Usage Increase (%)	Capacity Usage (%)	Total Sales Increase (%)	Total Sales (M€)	Export Increase (%)	Export (M€)
N	Valid	78	79	117	121	99	104	78	103
	Missing	91	90	52	48	70	65	91	66
Mean		,10	,31	,11	,72	,50	50,60	,52	16,80
Median		,00	,28	,08	,77	,34	7,17	,45	1,20
Std. Deviation		,28	,25	,30	,18	,61	212,92	,72	78,21
Minimum		-,20	,00	-,40	,05	-,50	,23	-,87	,00
Maximum		2,00	1,00	1,67	1,00	2,68	2000,00	3,00	752,25

Table 5.14: Descriptive statistics of objective firm performance data

There are 79 firms which shared their market share data (47% of sample), the average market share is 31% and its median is 28%; average market share increase in our sample from 2003 to 2005 is 10%, but its median 0%. Firms utilized 72% of their capacity on average (77% median) and average capacity usage increase from 2003 to 2005 is 11% (8% median).

On the other hand, the average total sales is 50.6 M€, but the median is 7.2 M€; therefore there are a few firms which have large total sales in our sample. Similarly, average export is 16.8M€ and its median is 1.2M€ (only 104 and 103 firms gave their total sales and exports respectively.)

The companies in the sample are classified with respect to their annual total sales. In the overall sample, 59% of the companies have total sales less than 10 million USD and 8% have total sales more than 100 million USD. ***Figure 5.10*** offers a profile of the sample, illustrating the diversity in terms of firm total sales by sectors. The companies are separated to five categories based on their total sales such as: <1M€, [1M€, 5M€[, [5M€, 20M€[, [20M€, 50M€[and >50M€.

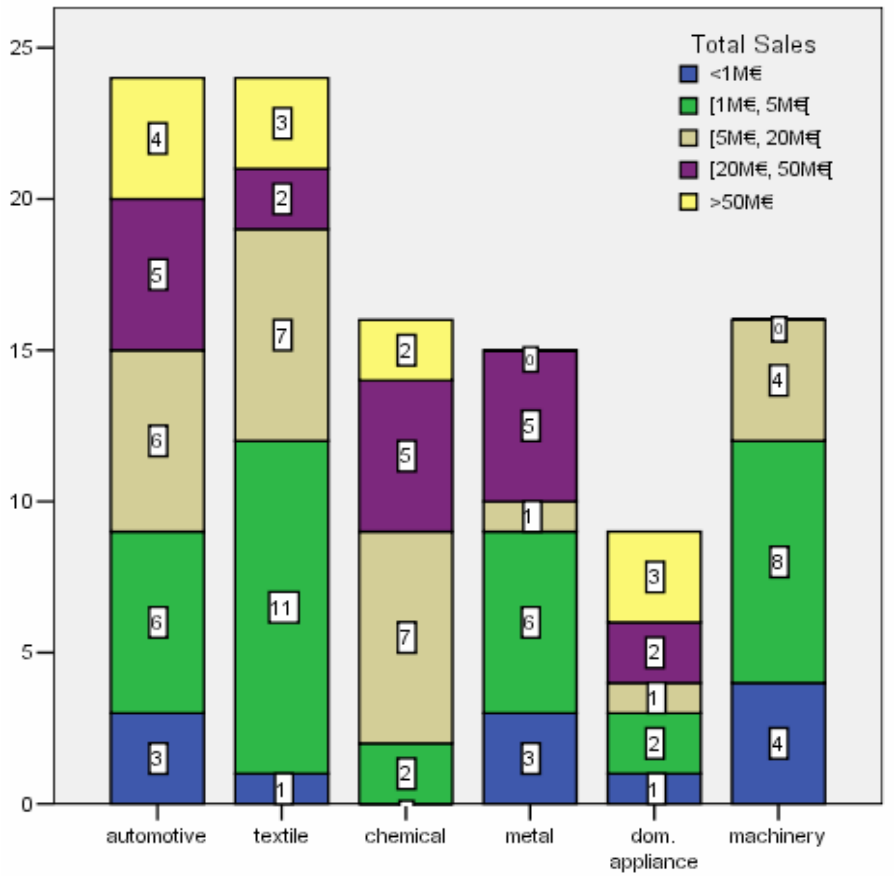


Figure 5.10: Distribution of firms according to total sales

Correlation analysis is performed in order to inspect one-to-one relationship between firms' objective performance data and their innovativeness level. The results are shown in

Table 5.15. Findings of the correlation analysis result similar to simple linear regression between two factors. Thus, these analyses are valuable to substantiate the performance model hypotheses.

Between the correlations coefficients of factors only total sales (p<0.01; r:0.274) and exports (p<0.01; r:0.238) are significantly correlated to innovativeness (marked with red in Table 5.16). The positive correlation between innovativeness and these two variables indicate that innovativeness level of firms which have higher total sales and exports is also higher. Or simply, innovative firms have higher total sales and exports.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1- Innovativeness	1	-,041	,136	-,020	,095	,151	,274(**)	-,115	,238(*)
2- Market Share Increase		1	-,201	,004	-,010	,254(*)	-,117	,396(**)	-,121
3- Market Share			1	,127	,262(*)	,156	,206	-,088	,227
4- Capacity Usage Increase				1	-,218(*)	,195	-,085	,262(*)	-,090
5- Capacity Usage			(*)	(*)	1	,075	,102	,022	,115
6- Total Sales Increase		(*)				1	,239(*)	,381(**)	,224(*)
7- Total Sales	(**)					(*)	1	-,114	,978(**)
8- Exports Increase		(**)		(*)		(**)		1	-,130
9- Exports	(*)					(*)	(**)		1

** p < ,01
* p < ,05

Table 5.15: Correlation analysis of objective data

To investigate statistically the effect of innovativenss on total sales, a hypothesis test is conducted using the analysis of variance technique for the five intervals. Innovativeness level of firms is compared and the initial hypothesis of means equality is tested (***Figure 5.11***).

innovativeness

	N	Mean	Sig.
<1M€	11	2,75	,013
[1M€, 5M€[	35	2,75	
[5M€, 20M€[	26	2,80	
[20M€, 50M€[	19	2,73	
>50M€	12	3,65	
Total	103	2,86	

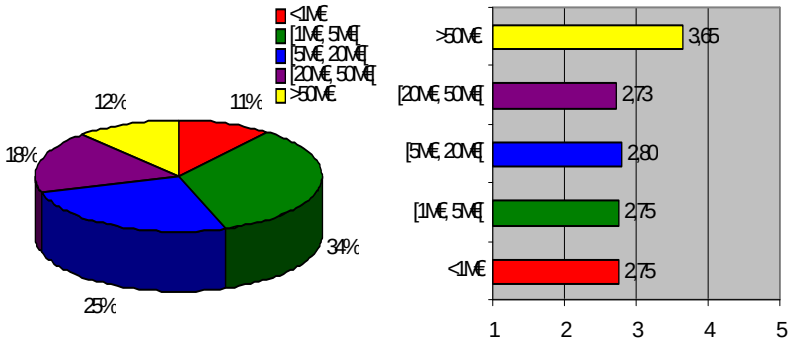


Figure 5.11: Descriptive statistics for total sales

There is almost a balanced distribution in the sample according to total sales: 11% <5M€, 34% [1M€, 5M€[and 25% [5M€, 20M€[, 18% [20M€, 50M€[and 12% >50M€. Findings of the one-way ANOVA analysis show that there is a significant difference of innovativeness level between these five groups. In order to find which mean differs, post-hoc Duncan test procedure can be used (***Table 5.16***)

total sales	N	Subset for alpha = .05	
		1	2
[20M€, 50M€[	19	2,7284	
<1M€	11	2,7505	
[1M€, 5M€[	35	2,7509	
[5M€, 20M€[	26	2,8023	
>50M€	12		3,6531

Table 5.16: Post-hoc Duncan test for total sales

Firms whit total sales are over 50M€ per year are more innovative than other ones. The same fact can also be interpreted as more innovative firms have higher total sales. ***Table 5.17*** investigates statistically the effects of total sales for various innovativeness activities with independent student t-tests. Findings of the analysis show that higher total sales makes significantly positive difference for innovativeness ($p<0.01$) and for each innovation type. Therefore, firms that have higher total sales are more innovative.

	total sales	N	Mean	Sig.
innovs	>= 50 M€	12	3,65	**,000**
	< 50 M€	91	2,76	
incprod_inn	>= 50 M€	12	3,97	**,005**
	< 50 M€	91	3,12	
radprod_inn	>= 50 M€	12	3,50	**,026**
	< 50 M€	91	2,55	
prod_inn	>= 50 M€	12	3,78	**,002**
	< 50 M€	91	2,89	
process_inn	>= 50 M€	12	3,63	**,024**
	< 50 M€	91	2,93	
mar_inn	>= 50 M€	11	3,47	**,006**
	< 50 M€	91	2,48	
org_inn	>= 50 M€	12	3,65	**,002**
	< 50 M€	91	2,74	

Table 5.17: Effects of higher total sales

Similarly, to analyze the effect of exports, innovativeness level of firms are compared, and the initial hypothesis of their means are equal is tested using one-way ANOVA (***Figure 5.12***). There is almost a balanced distribution in the sample according to exports: 34% <0.5M€, 26% [0.5M€, 3M€[and 18% [3M€, 10M€[, 11% [10M€, 20M€[and 11% >20M€. Findings show that there is a significant difference of innovativeness level between firms in these five exports intervals. Post-hoc Duncan test procedure for exports shows which mean differs (***Table 5.18***)

innovativeness

	N	Mean	Sig.
<0,5M€	35	2,66	,030
[0,5M€, 3M€[	27	2,93	
[3M€, 10M€[	18	2,66	
[10M€, 20M€[	11	2,69	
>20M€	11	3,55	
Total	102	2,83	

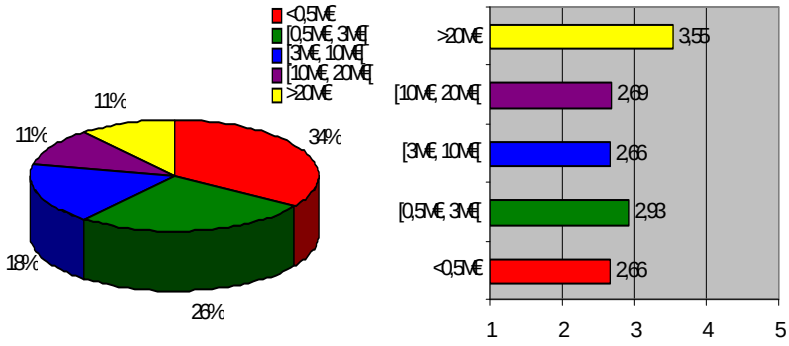


Figure 5.12: Descriptive statistics for exports

Exports	N	Subset for alpha = .05	
		1	2
[3M€, 10M€[	18	2,6605	
<0,5M€	35	2,6629	
[10M€, 20M€[	11	2,6894	
[0,5M€, 3M€[	27	2,9287	
>20M€	11		3,5458

Table 5.18: Post-hoc Duncan test for exports

Firms with export levels over 20M€ per year are more innovative than others. The same fact can also be interpreted as more innovative firms have higher exports. Table 5.19 explores statistically the effects of exports. According to findings of the student t-test analysis, higher exports makes significantly positive difference for innovativeness ($p<0.01$) and also for each innovation types except radical product innovation. Therefore, firms that have higher total exports are more innovative. But, exports are not based on radical product innovations.

	Exports	N	Mean	Sig.
innovs	>= 20M€	11	3,55	,003
	< 20M€	91	2,74	
incprod_inn	>= 20M€	11	3,76	,048
	< 20M€	91	3,11	
radprod_inn	>= 20M€	11	2,95	,400
	< 20M€	91	2,57	
prod_inn	>= 20M€	11	3,44	,085
	< 20M€	91	2,89	
process_inn	>= 20M€	11	3,56	,038
	< 20M€	91	2,89	
mar_inn	>= 20M€	10	3,42	,017
	< 20M€	91	2,49	
org_inn	>= 20M€	11	3,68	,002
	< 20M€	91	2,71	

Table 5.19 : Effects of higher exports

Lastly, using the student-t test analysis, the firms' performance measures are compared in terms of their innovativeness level. This analysis serves to observe potential positive effects of higher innovativeness on various performance measures (***Table 5.20***).

	Innovativeness	N	Mean	Sig.
Market Share Increase (%)	>= 4,00	6	,07	,767
	< 4,00	72	,11	
Market Share (%)	>= 4,00	6	,43	,248
	< 4,00	73	,30	
Capacity Usage Increase (%)	>= 4,00	10	,11	,938
	< 4,00	106	,12	
Capacity Usage (%)	>= 4,00	10	,74	,737
	< 4,00	110	,72	
Total Sales Increase (%)	>= 4,00	11	,61	,575
	< 4,00	87	,50	
Total Sales (M€)	>= 4,00	11	311,11	**,000**
	< 4,00	92	19,99	
Exports Increase (%)	>= 4,00	8	,33	,434
	< 4,00	69	,55	
Exports (M€)	>= 4,00	11	96,39	**,000**
	< 4,00	91	7,35	
Innovation Spending Increase (%)	>= 4,00	8	1,60	,233
	< 4,00	84	,83	
Innovation Spending (M€)	>= 4,00	9	6,00	**,000**
	< 4,00	90	,97	
Innovative Performance	>= 4,00	15	4,12	**,003**
	< 4,00	151	3,58	
Production Performance	>= 4,00	15	4,17	**,057**
	< 4,00	151	3,88	
Marketing Performance	>= 4,00	15	4,11	,216
	< 4,00	151	3,88	
Financial Performance	>= 4,00	14	3,84	**,019**
	< 4,00	148	3,24	
General Performance	>= 4,00	15	4,05	**,005**
	< 4,00	151	3,65	

Table 5.20: Effects of higher innovativeness level

Findings show that higher innovativeness makes significantly positive difference for total sales, exports, innovative performance, production performance, financial performance and general firm performance. Also, innovative firms have significantly more innovation spending. As a result, more innovative firms have higher total sales and exports, and they also have better performance.

Before the complementary analyses on performance model of innovation are concluded, the performance model is also constructed by single step structural equation model using AMOS 4.0 in order to test our initial hypotheses (***Figure 5.13***).

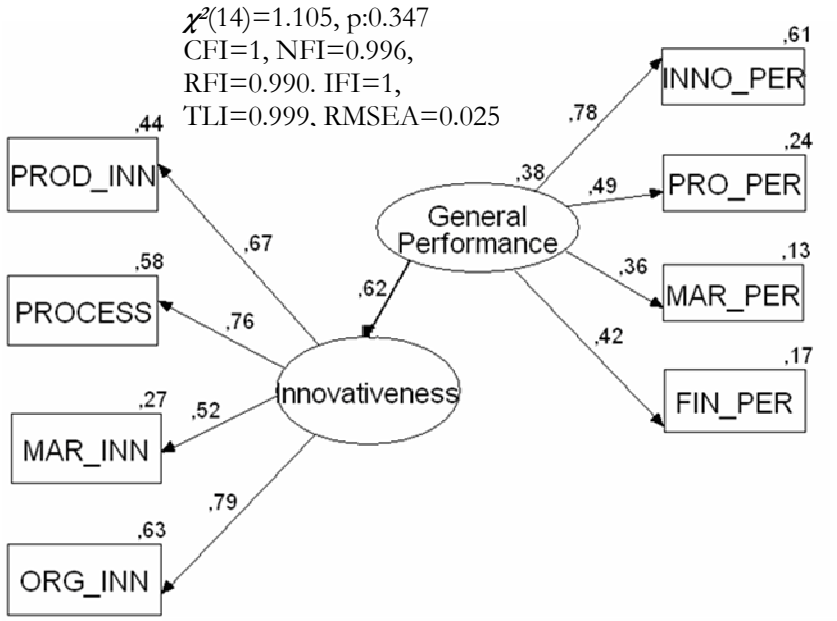


Figure 5.13: Structural equation model of performance model of innovation

The overall fit statistics for that model demonstrate an acceptable level of overall fit. ***Table 5.21*** shows the standardized path estimates (regression weights) and significance value (p) of the structural model. All factor loadings are significant ($p<0.01$), therefore the hypotheses of the path model are strongly supported. Thus, our fundamental hypothesis that predicts a significant positive relationship between innovativeness and firm performance is also supported by this structural equation model.

Hypothesis	Path	Standard Path Estimate	p Value	Result
H1	Product Innovation - Innovativeness	0.665	< 0.01	Supported
H2	Process Innovation - Innovativeness	0.763	< 0.01	Supported
H3	Marketing Innovation - Innovativeness	0.518	< 0.01	Supported
H4	Organizational Innovation - Innovativeness	0.791	< 0.01	Supported
H5	Innovative Performance - Firm Performance	0.782	< 0.01	Supported
H6	Production Performance - Firm Performance	0.493	< 0.01	Supported
H7	Marketing Performance - Firm Performance	0.358	< 0.01	Supported
H8	Financial Performance - Firm Performance	0.415	< 0.01	Supported
H9	Innovativeness - Firm Performance	0.615	< 0.01	Supported

Table 5.21: Results of structural equation model of performance model

CHAPTER 6

DRIVERS OF INNOVATIVENESS MODEL ANALYSIS

6.1 Statistical Analyses

The drivers of innovativeness model is about how the innovations are produced in companies. This model simulates the innovation process, where innovation determinants constitute and determine the innovative capabilities of firms. According to drivers model, innovation determinants (which are general firm characteristics, firm structure, firm strategies and sectoral conditions and relations) have direct impacts on innovativeness level of firms. The success level of innovations in companies (or innovativeness level of firms) is the expected outcome of innovation determinants

Briefly, it is aimed to extract the probable effects and the amount of contribution of innovation determinants to firms' innovativeness which is obtained by merging five innovation types performed in companies, namely incremental product, radical product, process, marketing and organizational innovations. This merging process is conducted with confirmatory factor analysis that is previously presented (see Figure 5.1, page 75).

For the analysis of the drivers of innovativeness model and to test its hypotheses, the same methodology of the performance model analysis is utilized. Firstly, explanatory and confirmatory factor analyses are performed in SPSS v13 and AMOS v4.0 respectively. Then, the obtained factors are tested for consistency and reliability with Cronbach α. Lastly, correlation, regression and path analyses are executed.

Nonetheless, all of the determinants are not suitable for factor analysis, since they cannot be evaluated in five-point Likert scale, and they are generally in binary format. Those items are examined as control variables. They are probably relevant factors that influence the

model, which are kept stable so as to minimize their effects on the result, while the other analyses are conducting. The effects of control variables on innovativeness are tested with one-way ANOVA or student t-tests when all other factors are constant. Firm characteristics and collaborations are control variables for drivers of innovation model.

6.1.1 Firm Strategies

The innovative capability of a company depends on customers' needs, efficient development of production technologies and firm's business practices. Among the innovation determinants, firm strategies constitute important business philosophy since internal/external growth and manufacturing strategies have major roles for their innovative performance. Furthermore, increased productivity is clearly a very important driver of business success.

6.1.1.1 Business Strategies

Table 6.1 presents the factor structure of firm production strategies after explanatory factor analysis procedure is applied with SPSS. For this analysis, all of the strategy questions in the survey are placed together into principal component analysis, and six latent factors are extracted. There is no any item that spoiled the factor structure. The obtained factors are production quality, production flexibility, on-time producton and delivery, production cost efficiency (those four items are manufacturing strategies), market focus, and resource for technology development strategies (those final two are top management business strategies).

The result of explanatory factor analysis confirmed that all the variables in the survey are placed under expected factors. However, confirmatory factor analysis is also performed to test the factors structure. That method is applied according to the findings of explanatory factor analysis. Observed variables are attached to the latent factors with fixed error terms.

A single-step confirmatory factor analysis is conducted for the strategy factors. ***Table 6.2*** depicts factor loadings of the confirmatory factor analysis.

Questions		Factors 1	2	3	4	5	6
Production Cost	s31	,711					
	s26	,687					
	s29	,670					
	s30	,645					
	s27	,620					
	s28	,578					
	s24	,486					
On-time Production and Delivery	s43		,759				
	s42		,733				
	s44		,701				
	s41		,645				
	s45		,616				
	s40		,567				
	s33		,470				
Production Flexibility	s38			,816			
	s37			,734			
	s35			,714			
	s36			,595			
	s34			,581			
	s32			,449			
Production Quality	s22				,776		
	s21				,686		
	s20				,677		
	s23	,460			,598		
	s25				,552		
Resource for Technology	s15					,750	
	s14					,719	
	s16					,690	
	s13					,608	
Market Focus	s10						,830
	s12						,663
	s9						,610
	s11						,476

Total Variance Explained: % 55,060

Table 6.1: Factor structure of business strategies

Strategies Questions	**Factor Loadings**
Production Cost	
S24, S26, S27, S28, S29, S30. S31	0.632*, 0.494*, 0.457*, 0.676*, 0.813*, 0.665*, 0.626*
On-time Production and Delivery	
S33, S40. S41, S42, S43, S44, S45	0.498*, 0.721*, 0.699*, 0.731*, 0.709*, 0.635*, 0.572*
Production Flexibility	
S32, S34, S35, S36, S37, S38	0.560*, 0.573*, 0.723*, 0.449*, 0.688*, 0.751*
Production Quality	
S20. S21, S22, S23, S25	0.557*, 0.687*, 0.637*, 0.758*, 0.634*
Resource for Technology	
S13, S14, S15, S16	0.616*, 0.722*, 0.641*, 0.495*
Market Focus	
S9, S10. S11, S12	0.478*, 0.815*, 0.306*, 0.632*
	*p<0.05

Table 6.2: Factor loadings of CFA for business strategies factors.

The results of this analysis are evaluated by the goodness of fit indices. These indices are depicted in ***Table 6.3***.

Goodness of fit indices	Findings	Reference Value
	Strategies	
χ^2 / degree of freedom	2,074	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.973	0.9<CFI<1
NFI (Normed Fit Index)	0.950	0.9<NFI<1
RFI (Relative Fit Index)	0.942	0.9<RFI<1
IFI (Incremental Fit Index)	0.974	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.969	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.080	RMSEA<0.08

Table 6.3: Goodness of fit indices of CFA for business strategies

The overall fit statistics for the model demonstrate an acceptance level for business strategies factor structure. Therefore, the factors are consistent and valid. Confirmatory factor analysis is useful to evaluate the measurement properties of the explanatory factor analysis.

All of the factor loadings but 7 (i.e., S26, S27, S33, S36, S35, S9, S11) have high (>0.50) and significant ($p<0.05$) values. Still, those 7 items are also retained since their factor loadings are also reasonably high and significant ($p<0.05$). Additionally, reliability analysis with Cronbach α will show that they are in deed reliable items.

As a result of explanatory and confirmatory factor analyses, business strategies are determined to consist of 6 factors namely production cost, on-time production and delivery, production flexibility, production quality, market focus and resource for technology.

For the reliability analysis, Cronbach α method is used. ***Table 6.4*** depicts α value of business strategies factors. Reliability analysis confirms that all of the factors are internally consistent and reliable since all α values are greater than 0.60.

Factors	Number of Question	α Value
Production Cost	7	0.808
On-time Production and Delivery	7	0.827
Production Flexibility	6	0.792
Production Quality	5	0.794
Market Focus	4	0.715
Resource for Technology	4	0.633

Table 6.4: Results of reliability analysis for firm strategies factors

Once business strategies factors are approved, correlation analysis is conducted. This analysis is utilized in order to inspect one-to-one relationship between the innovativeness and strategies factors. The results are illustrated in ***Table 6.5*** with means of factors. Correlation analysis is valuable to test the drivers of innovativeness model hypotheses since its findings yield information similar to simple linear regression between two factors.

	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1- Innovativeness	2,81	,84	1	,193(*)	,228(**)	,206(**)	,178(*)	,373(**)	,323(**)
2- Production Quality	4,68	,43	(*)	1	,551(**)	,240(**)	,415(**)	,130	,222(**)
3- Production Cost	4,40	,51	(**)	(**)	1	,346(**)	,457(**)	,154(*)	,191(*)
4- Production Flexibility	3,72	,73	(**)	(**)	(**)	1	,517(**)	,195(*)	,091
5- On-time Production and Delivery	4,36	,57	(*)	(**)	(**)	(**)	1	,203(**)	,120
6- Market Focus	3,67	,82	(**)		(*)	(*)	(**)	1	,235(**)
7- Resource for Technology	2,80	,82	(**)	(**)	(*)			(**)	1

** p < ,01
* p < ,05

Table 6.5 : Correlation analysis of firm strategies

All of the factors that are directly related to hypotheses (marked with red in Table 5.27) are significantly correlated. Thus, the positive correlation between innovativeness and business strategies supports the hypotheses of the drivers model.

The amount of variance between variables is suitable for further statistical analyses since factors' standard deviations are between 0.43 and 0.84. According to the descriptive statistics and means of business strategies, firms in our sample give importance essentially to production quality. Production cost efficiency and on-time production and delivery are also important factors for them. The least important of these competition priorities is production flexibility. The importance levels of these strategies based on their responses are summarized in ***Figure 6.1***, where the scale is 1=not important, 2=slightly important, 3=important, 4=very important, 5= extremely important.

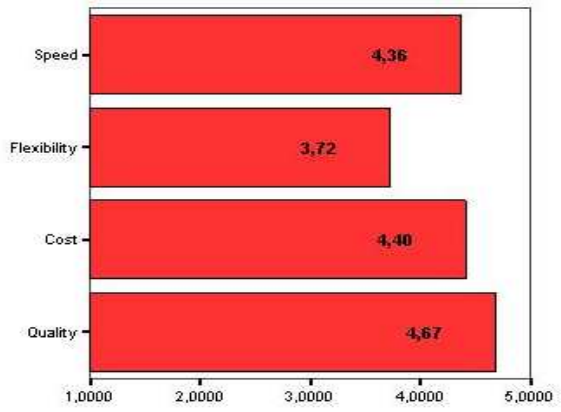


Figure 6.1: Importance levels of business strategies

The findings of the correlation analysis extracted significant one-to-one positive relationship of the aggregated factors. All of the business strategies correlate very significantly to innovativeness with $p<0.01$ except production quality and on-time production and delivery whose correlations are at $\alpha=95\%$ level. While market focus strategy has higher correlation coefficient (r: 0.373), on-time production and delivery has lower correlation coefficient (r: 0.178) with innovativeness.

Briefly, correlation analysis supports the positive relation between innovativeness and business strategies. All of the related drivers of innovativeness model hypotheses are supported. However, this analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analysis can provide more insights..

Table 6.6 and ***Figure 6.2*** indicates the regression model about the effects of business strategies on innovativeness.

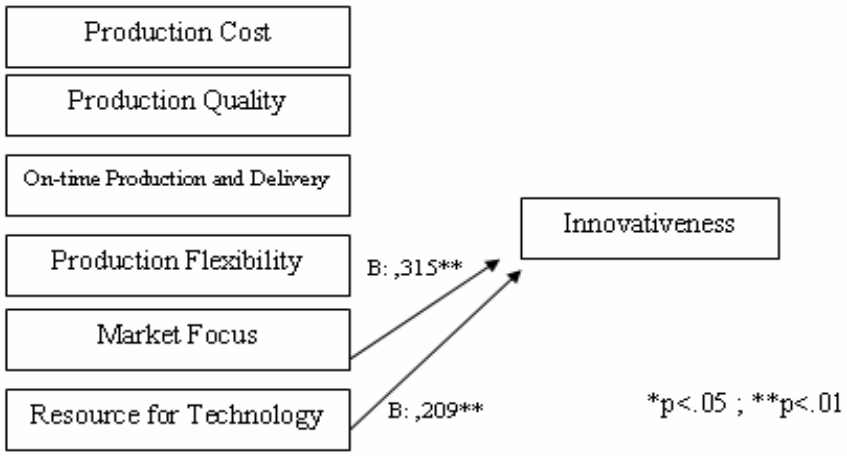


Figure 6.2: Effects of business strategies on innovativeness

Independent Variables	**Standard Beta**	**p Value**
Production Cost	0.115	0.190
Production Quality	0.051	0.547
On-time Production and Delivery	-0.058	0.511
Production Flexibility	0.108	0.189
Market Focus	0.315	0.000
Resource for Technology	0.209	0.004
R^2 = 0.246 ; p=0.000		

Table 6.6: Effects of business strategies on innovativeness

This regression model is statistically very significant ($p<0.01$) and the independent variables express 24.6% ($R^2=0.246$) of innovativeness variation. However, when firm strategies are considered together in the multiple linear regression, only market focus ($\beta=0.315$; $p<0.01$) and resource for technology ($\beta=0.209$; $p<0.01$) are observed to have significant positive effects on innovativeness.

Thus, despite the fact that the model is significant, multiple linear regression analysis reveals only some business strategies have statistically significant effects over innovativeness. Moreover, correlation analysis already indicated all of the strategy factors had significant one-to-one correlation to innovativeness. This finding implies that there are mediating effects between firm strategies.

Post hoc analysis reveals that market focus and resource for technology factors mediated the effects of production cost, quality and flexibility strategies on innovativeness. Therefore, a path analysis model for firm strategies is formed by AMOS v4.0 and analyzed according to structural equation modeling method. ***Figure 6.3*** presents this model with its significantly consistent findings. The model explains 21% of the variability associated with the innovativeness. Market focus, resource for technology and production cost have direct and other manufacturing strategies have indirect effects on innovativeness.

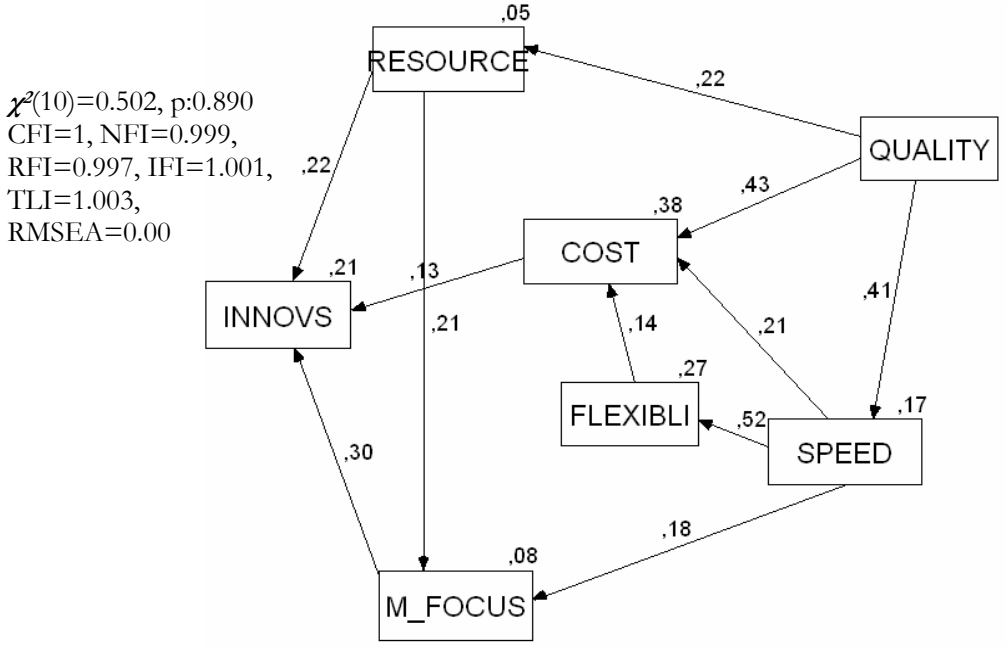


Figure 6.3: Path analysis of business strategies

This path model for business strategies is very interesting since it supports the rationale of sand cone model (Ferdows and De Meyer, 1990).

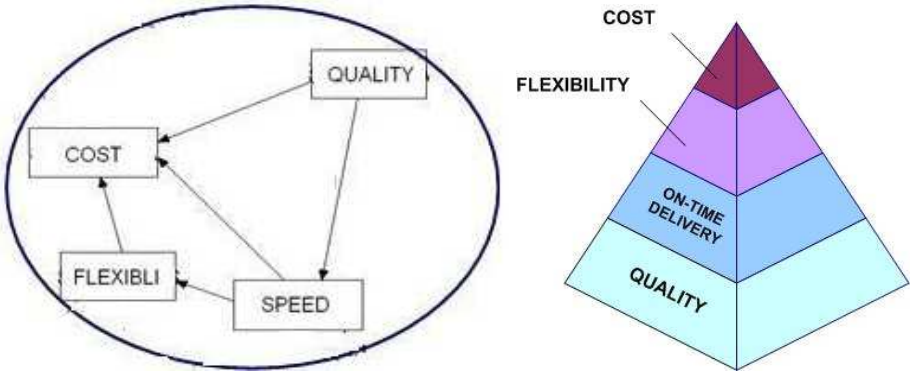


Figure 6.4: Sand cone model

Sand cone model (***Figure 6.4***) illustrates the structure of competitive strategies such that hierarchies, relative importance and relationship between them are visible. The factor at the bottom of the cone is internally crucial for the company, and it is a base for the upper elements. Sand cone model depicts four driver capabilities contributing to firms' manufacturing strategies. The researchers claimed that quality is the most deeply oriented capability and serves as a foundation for the rest of the cone. All other layers are supported by the quality. Cost efficiency is at the top of the cone, which is the ultimate aim and the most visible layer of manufacturing strategies.

The findings expose the positive relationship between business strategies and innovativeness despite mediating effects between variables; hence, initial hypothesis **H16** is supported.

6.1.1.2 Monitoring Innovations

Firms struggle to profit from the spillover effects of their network. Monitoring their supply-chain, their close and distant environment and thereby tracking innovations is another useful firm strategy for innovativeness. ***Table 6.7*** presents the factor structure of monitoring strategies regarding the explanatory factor analysis procedure applied on SPSS. For this analysis, all of the monitoring questions in the survey are placed together into principal component analysis, and three factors are extracted. There are no items that spoiled the factor structure. The resulting factors are monitoring the inner milieu (here milieu reflects the surroundings and the supply-chain elements of the company), monitoring the outer milieu and monitoring technical sources.

Questions		Factors 1	2	3
Monitoring the inner milieu	i18k	,772		
	i17k	,638		
	i14k	,626		
	i16k	,603		
	i22k	,580		
Monitoring the outer milieu	i21k		,787	
	i19k		,746	
	i20k		,652	
	i15k		,564	
Monitoring the technical sources	i12k			,793
	i11k			,714
	i13k			,648

Total Variance Explained : 59,257%

Table 6.7: Factor structure of monitoring

Confirmatory factor analysis is conducted for the monitoring factors in order to validate the factor structure. ***Table 6.8*** depicts factor loadings of the confirmatory factor analysis.

Monitoring Questions	**Factor Loadings**
Monitoring the Inner Milieu	
I18k, I17k, I14k, I16k, I22k	0.507*, 0.622*, 0.629*, 0.597*, 0.612*
Monitoring the Outer Milieu	
I15k, I19k, I20k, I21k	0.695*, 0.768*, 0.636*, 0.583*
Monitoring Technical Sources	
I11k, I12k, I13k	0.775*, 0.546*, 0.755*
	*p<0.05

Table 6.8: Factor loadings of CFA for monitoring activities

The results of this analysis are evaluated by the goodness of fit indices. These indices are represented in ***Table 6.9***.

Goodness of fit indices	**Findings**	**Reference Value**
	Monitoring	
χ^2 / degree of freedom	2,038	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.988	0.9<CFI<1
NFI (Normed Fit Index)	0.976	0.9<NFI<1
RFI (Relative Fit Index)	0.963	0.9<RFI<1
IFI (Incremental Fit Index)	0.988	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.981	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.079	RMSEA<0.08

Table 6.9: Goodness of fit indices of CFA for monitoring activities

The overall fit statistics for the model demonstrate an acceptance level for monitoring factor structure. Therefore, the factors are consistent and valid. Confirmatory factor analysis is performed in order to evaluate the measurement properties of the explanatory factor analysis. All of the factor loadings have high (>0.50) and significant (p<0.05) values. The analyses have resulted in three factors for monitoring activities, namely, monitoring the inner milieu, monitoring the outer milieu and monitoring technical sources.

Reliability analysis confirms that all of the factors are internally consistent and reliable since all Cronbach α values are greater than 0.70 (***Table 6.10***).

Factors	**Number of Question**	**α Value**
Monitoring the Inner Milieu	5	0.729
Monitoring the Outer Milieu	4	0.754
Monitoring Technical Sources	3	0.736

Table 6.10: Results of reliability analysis for monitoring activities' factors

Reliability analysis of monitoring strategies scales are followed by correlation analysis, which is conducted in order to inspect one-to-one relationship between the innovativeness and monitoring factors. The results are presented in ***Table 6.11*** with means of factors. Findings are valuable to test the drivers of innovativeness model hypotheses since correlation analysis gives information similar to simple linear regression between two factors.

	Mean	*S.D.*	*1*	*2*	*3*	*4*
1- Innovativeness	2,81	,84	1	,362(**)	,282(**)	,265(**)
2- Monitoring the Inner Milieu	3,19	,87	(**)	1	,547(**)	,441(**)
3- Monitoring the Outer Milieu	2,14	,95	(**)	(**)	1	,561(**)
4- Monitoring Technical Sources	3,20	,91	(**)	(**)	(**)	1

** p < ,01
* p < ,05

Table 6.11: Correlation analysis of monitoring activities

Monitoring activities' factors are significantly positive correlated to innovativeness (marked with red in the Table 5.24). The amount of variance between variables is suitable for further statistical analyses since factors' standard deviations are between 0.84 and 0.91. According to the means of monitoring strategies, firms in our sample monitor essentially their supply chain, namely partners, customers, suppliers, vendors, competitors; and also technical sources such as journals, e-database and internet in order to track innovations.

Unfortunately, firms are less willing to monitor their outer milieu, namely universities and firms from other industries. This fact also supports that academy-industry relationship is not yet mature in Turkey. The collaboration findings in next part will clearly depict the same situation.

The application level of these monitoring activities from companies is presented in ***Figure 6.5***, where the scale is 1=none/least useful, 2=few/slightly useful, 3=moderate/useful, 4=much/very useful, 5= very much/extremely useful.

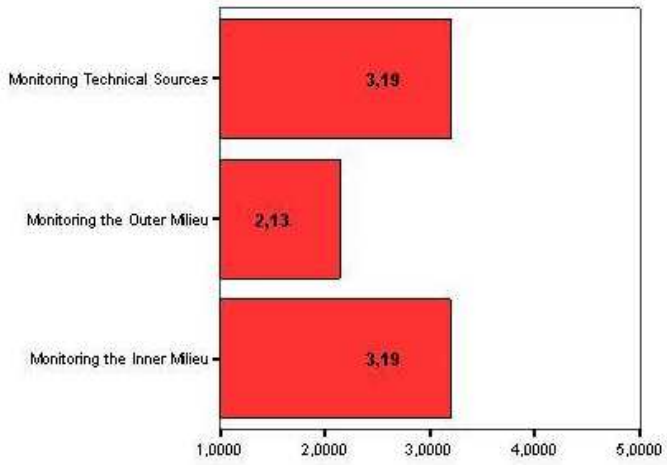


Figure 6.5: Application level of monitoring activities

The findings of the correlation analysis extracted significant one-to-one positive relationship of the aggregated factors. All of the monitoring strategies correlate significantly to innovativeness with $p<0.01$. Monitoring the inner milieu has higher correlation coefficient (r:0.362), and monitoring technical sources has lower correlation coefficient (r:0.265). Briefly, correlation analysis brings up the positive relation between innovativeness and monitoring of innovations strategies. However, multiple linear regression analysis can say much about the direction of the relationship than correlation analysis.

Figure 6.6 and ***Table 6.12*** reports the regression model that investigates the effects of monitoring activities on innovativeness.

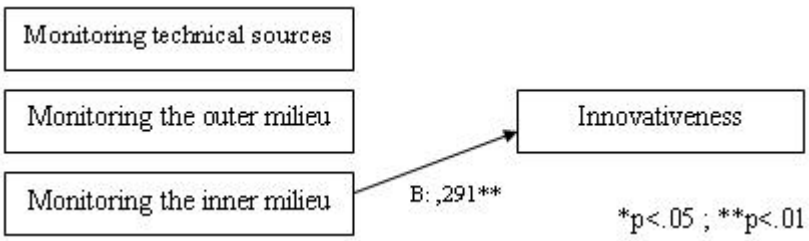


Figure 6.6: Effects of monitoring activities on innovativeness

Independent Variables	Standard Beta	p Value
Monitoring the inner milieu	0.291	0.001
Monitoring the outer milieu	0.067	0.485
Monitoring technical sources	0.099	0.266
R^2 = 0.153 ; p=0.000		

Table 6.12 : Effects of monitoring activities on innovativeness

The regression model of the effects of monitoring strategies is statistically significant ($p<0.01$) and according to this model, the independent variables express 15.3% ($R^2=0.153$) of innovativeness variation. However, when the monitoring activities are included jointly in the multiple linear regression, only monitoring the inner milieu ($\beta=0.291$; $p<0.01$) has significant positive effect on innovativeness. But when entered separately, all of the monitoring activities are significantly and positively correlated to innovativeness. Thus, despite the fact that the model is significant, multiple linear regression analysis reveals only one monitoring activity has statistically significant effect over innovativeness. This finding implies that there is mediating effect between factors.

Post hoc analysis suggests that monitoring inner milieu mediated monitoring outer milieu and technical sources. Therefore, a path analysis model for monitoring activities is formed by AMOS v4.0 and it is analyzed employing to structural equation modeling method. ***Figure 6.7*** presents that 13% of the variation of innovativeness can be explained by that model and the findings are significantly consistent.

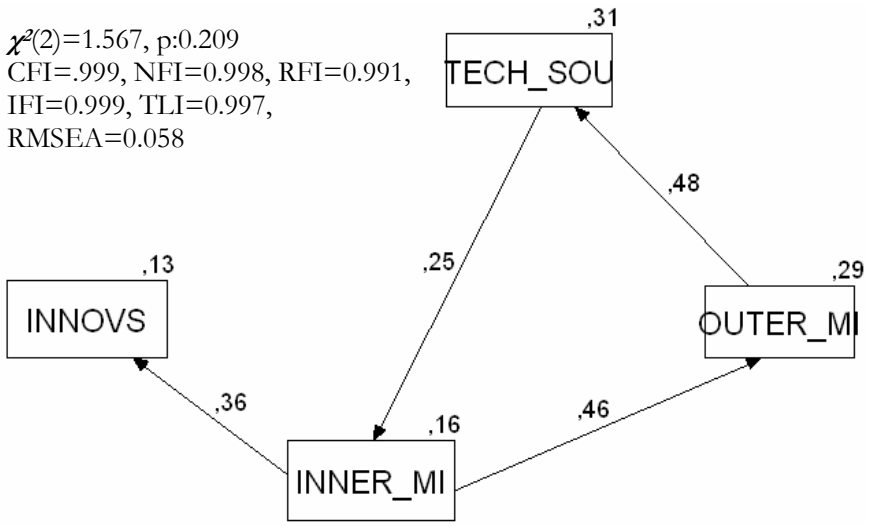


Figure 6.7: Path analysis of monitoring strategies

6.1.1.3 Collaborations

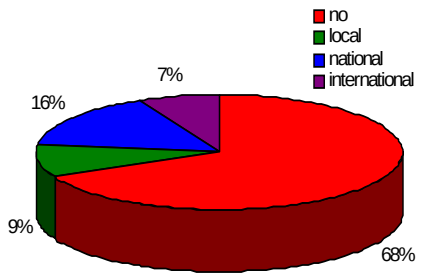
Before concluding firm strategies section, collaborations and their effects on innovativeness will also be discussed. Based on the answers of the questionnaire, firms separated under four categories for collaboration levels: 1=no, 2=local, 3=national and 4=international collaboration. Independent student t-test and one-way ANOVA procedure is used to extract possible collaborations' effects. For this analysis, the firms which indicated they were collaborating at least one level, namely, at local, national or international (≥2 in the scale), judged against non- collaborative firms (<2 in the scale), and the initial hypothesis Ho ($\mu_{collaborative} = \mu_{non\text{-}collaborative}$) is tested for each collaboration activity.

In fact, there are ten different collaboration types: R&D collaboration with universities or research centers / R&D collaboration with competitors / R&D collaboration with other firms (except customers and suppliers) / production collaboration / purchasing collaboration / service, sales, delivery collaboration / training collaboration with firms or training centers / collaboration with customers / collaboration with suppliers / complementary collaborations.

For each of these collaboration activities, innovativeness level of no collaboration, collaboration with local, national and international firms are compared visually and the hypothesis of "innovativeness level of non-collaborative and collaborative firms is similar" is tested using student t-test. For which innovation and performance scale collaborative firms are better (or worse) than no collaborative ones is also explored. ***Figure 6.8*** illustrates the findings for R&D collaboration with universities or research centers.

innovativeness

	N	Mean
no	111	2,65
local	15	3,28
national	26	3,11
international	12	3,15
Total	164	2,82



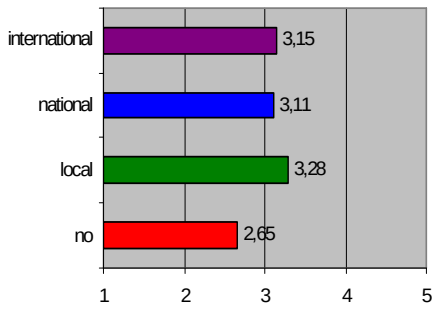


Figure 6.8: Descriptive statistics for R&D collaboration with universities / research centers

The results imply that only 32% of firms in our sample are performing R&D collaboration with universities or research centers. But, collaborative firms have higher innovativeness level. ***Table 6.13*** presents the results of the statistical analysis investigating the effects of this collaboration type.

		N	Mean	Sig.
innovs	>= 2,00	53	3,17	,000
	< 2,00	111	2,65	
gen_per	>= 2,00	53	3,86	,003
	< 2,00	111	3,60	
incprod_inn	>= 2,00	53	3,48	,004
	< 2,00	111	2,98	
radprod_inn	>= 2,00	53	2,92	,036
	< 2,00	111	2,41	
prod_inn	>= 2,00	53	3,25	,003
	< 2,00	111	2,75	
process_inn	>= 2,00	53	3,26	,003
	< 2,00	110	2,75	
mar_inn	>= 2,00	52	2,88	,008
	< 2,00	111	2,39	
org_inn	>= 2,00	52	3,24	,001
	< 2,00	111	2,70	
inno_per	>= 2,00	53	3,81	,019
	< 2,00	111	3,54	
pro_per	>= 2,00	53	4,02	,085
	< 2,00	111	3,86	
mar_per	>= 2,00	53	4,08	,024
	< 2,00	111	3,82	
fin_per	>= 2,00	53	3,54	,010
	< 2,00	107	3,14	

Table 6.13: Effects of R&D collaboration with universities / research centers

Findings of the student t-test analysis indicate that R&D collaboration with universities or research centers makes significant difference for each innovation and performance scale. As a result, firms that perform this collaboration are more innovative and have better performance.

Only 7% of firms in our sample are performing R&D collaboration with their competitors. ***Figure 6.9*** illustrates the findings of R&D collaboration with competitors. Since there are few firms in the analysis, these findings are not reliable.

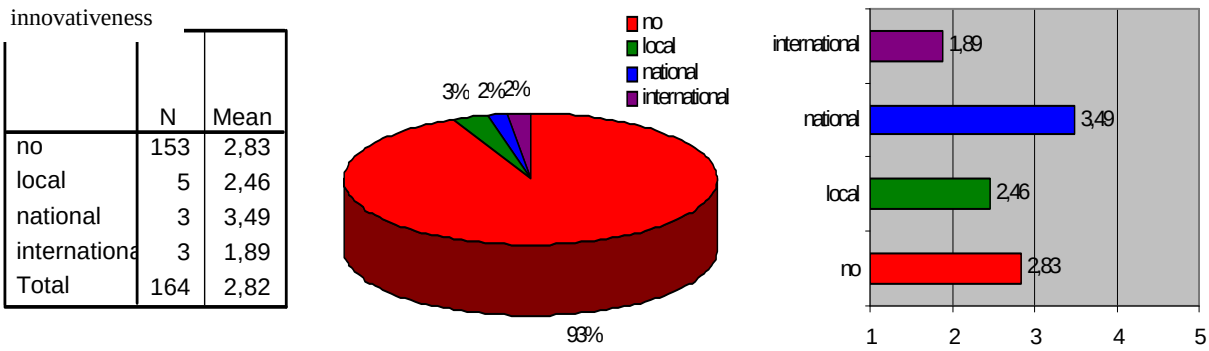


Figure 6.9: Descriptive statistics for R&D collaboration with competitors

		N	Mean	Sig.
innovs	>= 2,00	11	2,59	,347
	< 2,00	153	2,83	
gen_per	>= 2,00	11	3,78	,540
	< 2,00	153	3,68	
incprod_inn	>= 2,00	11	3,09	,867
	< 2,00	153	3,15	
radprod_inn	>= 2,00	11	2,82	,563
	< 2,00	153	2,56	
prod_inn	>= 2,00	11	2,95	,891
	< 2,00	153	2,91	
process_inn	>= 2,00	11	2,35	**,056**
	< 2,00	152	2,96	
mar_inn	>= 2,00	11	2,45	,778
	< 2,00	152	2,55	
org_inn	>= 2,00	11	2,59	,334
	< 2,00	152	2,89	
inno_per	>= 2,00	11	3,82	,332
	< 2,00	153	3,61	
pro_per	>= 2,00	11	4,05	,406
	< 2,00	153	3,90	
mar_per	>= 2,00	11	4,18	,176
	< 2,00	153	2,59	
fin_per	>= 2,00	10	2,83	,375
	< 2,00	150	3,78	

Table 6.14: Effects of R&D collaboration with competitors

Table 6.14 presents the results of the statistical analysis that investigates the effects of this collaboration type. Findings of the student t-test analysis report that R&D collaboration with competitors makes significantly a difference only at process innovations ($p<0.1$). But the results are not reliable since there are not sufficient data for this collaboration type.

Figure 6.10 depicts findings of R&D collaboration with other firms. The results imply only 20% of firms in our sample are performing R&D collaboration with other firms. And, it seems that only at national level, this collaboration types provide better innovativeness ability.

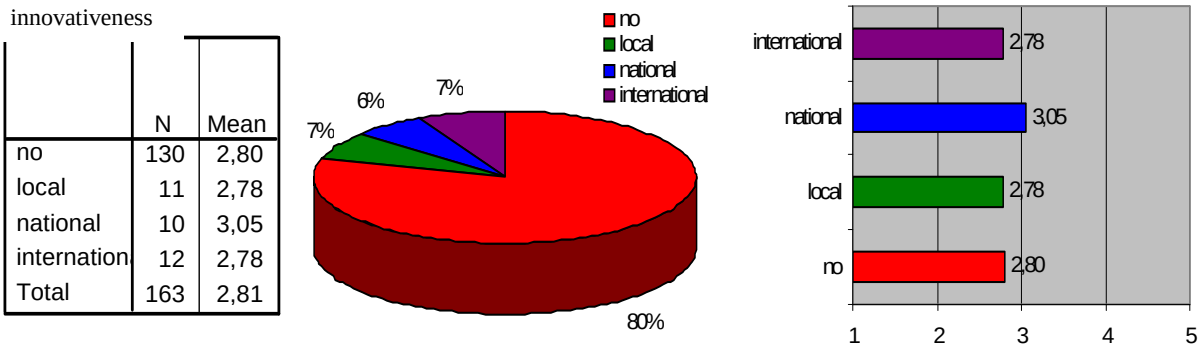


Figure 6.10: Descriptive statistics for R&D collaboration with other firms

		N	Mean	Sig.
innovs	>= 2,00	33	2,86	,698
	< 2,00	130	2,80	
gen_per	>= 2,00	33	3,90	**,007**
	< 2,00	130	3,62	
incprod_inn	>= 2,00	33	3,45	**,051**
	< 2,00	130	3,06	
radprod_inn	>= 2,00	33	2,80	,330
	< 2,00	130	2,53	
prod_inn	>= 2,00	33	3,19	**,078**
	< 2,00	130	2,84	
process_inn	>= 2,00	33	3,06	,357
	< 2,00	129	2,87	
mar_inn	>= 2,00	32	2,39	,405
	< 2,00	130	2,58	
org_inn	>= 2,00	33	2,75	,452
	< 2,00	129	2,90	
inno_per	>= 2,00	33	3,77	,173
	< 2,00	130	3,59	
pro_per	>= 2,00	33	4,00	,264
	< 2,00	130	3,88	
mar_per	>= 2,00	33	4,07	,110
	< 2,00	130	3,85	
fin_per	>= 2,00	32	3,77	**,001**
	< 2,00	127	3,15	

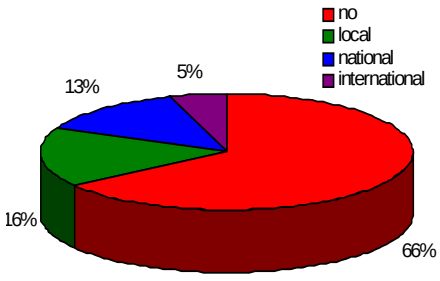
Table 6.15: Effects of R&D collaboration with other firms

Table 6.15 reports the effects of this collaboration type. Findings of the student t-test analysis indicates that R&D collaboration with other firms makes significantly a difference for general firm performance, financial performance and also for (incremental) product innovations ($p<0.1$). Therefore, firms that perform this collaboration, have better performance, and are more innovative for (incremental) products.

Figure 6.11 exposes findings of production collaboration which is performed generally to match capacity deficiencies due to sudden orders. The results imply that only 34% of firms in our sample are performing production collaboration. But, collaborative firms at national or international level in this field have better innovativeness level.

innovativeness

	N	Mean
no	107	2,77
local	27	2,54
national	22	3,17
internationa	8	3,36
Total	164	2,82



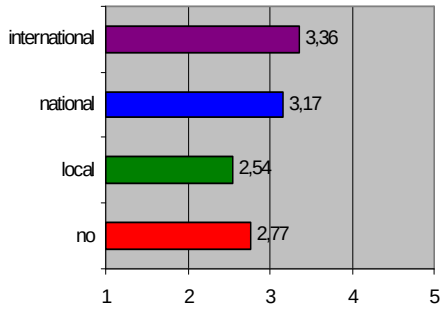


Figure 6.11: Descriptive statistics for production collaboration

		N	Mean	Sig.
innovs	>= 2,00	57	2,90	,368
	< 2,00	107	2,77	
gen_per	>= 2,00	58	3,60	,131
	< 2,00	106	3,73	
incprod_inn	>= 2,00	57	3,15	,931
	< 2,00	107	3,14	
radprod_inn	>= 2,00	57	2,84	**,082**
	< 2,00	107	2,43	
prod_inn	>= 2,00	57	3,02	,318
	< 2,00	107	2,86	
process_inn	>= 2,00	56	2,91	,966
	< 2,00	107	2,92	
mar_inn	>= 2,00	57	2,68	,271
	< 2,00	106	2,48	
org_inn	>= 2,00	57	2,97	,348
	< 2,00	106	2,82	
inno_per	>= 2,00	58	3,53	,179
	< 2,00	106	3,68	
pro_per	>= 2,00	58	3,85	,285
	< 2,00	106	3,95	
mar_per	>= 2,00	58	3,79	,144
	< 2,00	106	3,96	
fin_per	>= 2,00	58	3,22	,530
	< 2,00	102	3,31	

Table 6.16: Effects of production collaboration

The effects of this collaboration type are reported in ***Table 6.16***. Findings of the student t-test analysis demonstrate that production collaboration does not significantly make a difference for any innovativeness or performance type.

Figure 6.12 illustrates findings of purchasing collaboration which is performed generally to share high order cost. The results imply that only 27% of firms in our sample are performing purchasing collaboration. But, collaborative firms at national or international level in this field have better innovativeness level. ***Table 6.17*** examines the effects of this collaboration type.

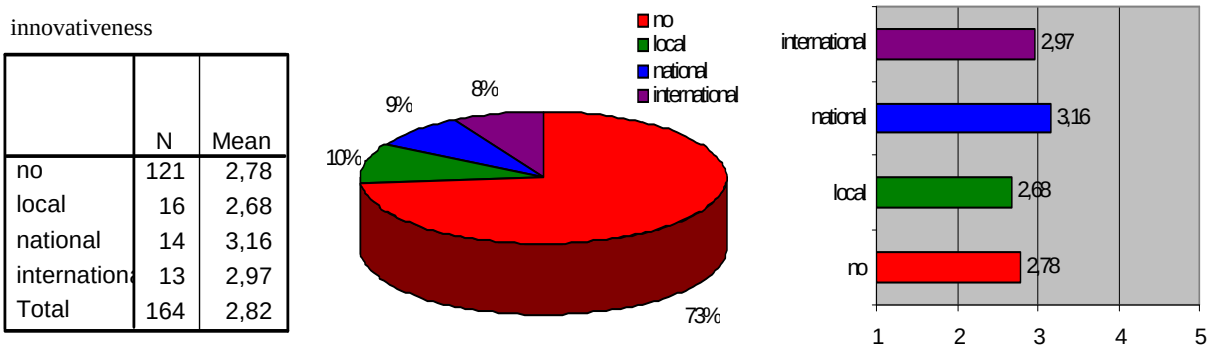


Figure 6.12: Descriptive statistics for purchasing collaboration

		N	Mean	Sig.
innovs	>= 2,00	43	2,92	,332
	< 2,00	121	2,78	
gen_per	>= 2,00	43	3,72	,591
	< 2,00	121	3,67	
incprod_inn	>= 2,00	43	3,26	,378
	< 2,00	121	3,10	
radprod_inn	>= 2,00	43	2,50	,686
	< 2,00	121	2,60	
prod_inn	>= 2,00	43	2,96	,741
	< 2,00	121	2,90	
process_inn	>= 2,00	43	3,17	**,061**
	< 2,00	120	2,83	
mar_inn	>= 2,00	43	2,62	,594
	< 2,00	120	2,52	
org_inn	>= 2,00	43	2,94	,588
	< 2,00	120	2,85	
inno_per	>= 2,00	43	3,74	,216
	< 2,00	121	3,59	
pro_per	>= 2,00	43	3,94	,677
	< 2,00	121	3,90	
mar_per	>= 2,00	43	3,92	,830
	< 2,00	121	3,90	
fin_per	>= 2,00	41	3,26	,870
	< 2,00	119	3,28	

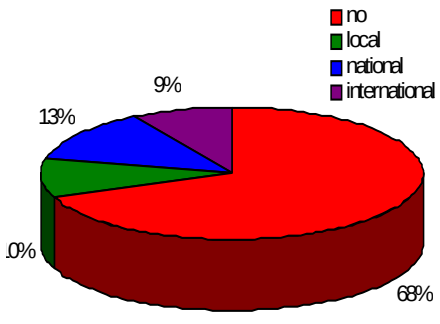
Table 6.17: Effects of purchasing collaboration

Findings of the student t-test analysis show that purchasing collaboration does not significantly make a difference for any innovativeness or performance type.

Figure 6.13 reports findings of service, sales, delivery collaboration. The results imply that only 32% of firms in our sample are performing this collaboration. But, collaborative firms at national or international level in this field have better innovativeness level. ***Table 6.18*** depicts the effects of this collaboration type.

innovativeness

	N	Mean
no	113	2,75
local	16	2,69
national	21	3,02
internationa	14	3,17
Total	164	2,82



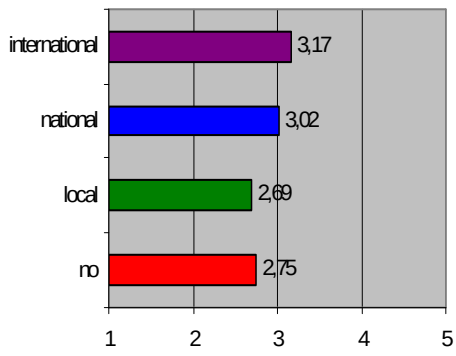


Figure 6.13: Descriptive statistics for service, sales, delivery collaboration

		N	Mean	Sig.
innovs	>= 2,00	51	2,96	,150
	< 2,00	113	2,75	
gen_per	>= 2,00	52	3,70	,809
	< 2,00	112	3,68	
incprod_inn	>= 2,00	51	3,18	,779
	< 2,00	113	3,13	
radprod_inn	>= 2,00	51	2,75	,284
	< 2,00	113	2,50	
prod_inn	>= 2,00	51	3,01	,428
	< 2,00	113	2,87	
process_inn	>= 2,00	51	3,02	,385
	< 2,00	112	2,87	
mar_inn	>= 2,00	51	2,77	**,079**
	< 2,00	112	2,44	
org_inn	>= 2,00	50	3,02	,212
	< 2,00	113	2,81	
inno_per	>= 2,00	52	3,60	,707
	< 2,00	112	3,64	
pro_per	>= 2,00	52	3,91	,976
	< 2,00	112	3,91	
mar_per	>= 2,00	52	3,90	,951
	< 2,00	112	3,90	
fin_per	>= 2,00	50	3,37	,390
	< 2,00	110	3,23	

Table 6.18: Effects of service, sales, delivery collaboration

Findings of the student t-test analysis indicate that service, sales, delivery collaboration does not significantly make a difference for any innovativeness or performance type.

Figure 6.14 presents findings of training collaboration with firms or training centers. The results imply that 56% of firms in our sample are performing this collaboration. Fortunately, collaborative firms at national or international level in this field have better innovativeness level. The effects of this collaboration type are reported in ***Table 6.19***.

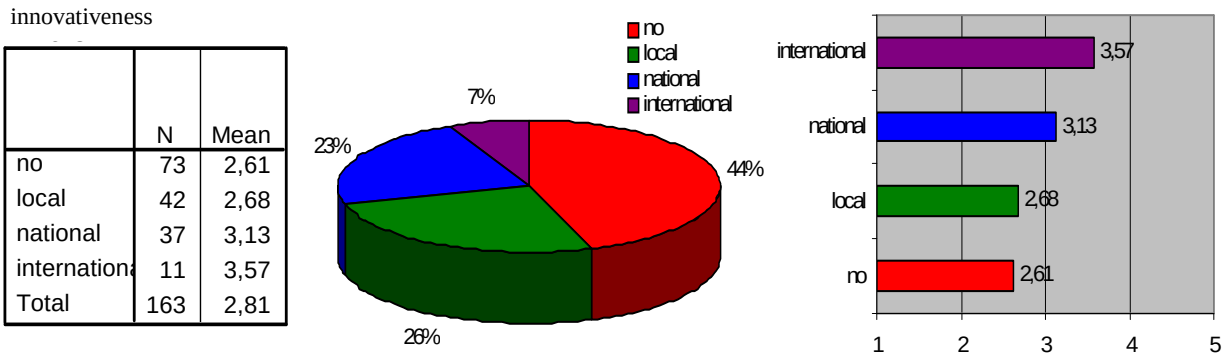


Figure 6.14: Descriptive statistics for training collaboration with firms or training centers

		N	Mean	Sig.
innovs	>= 2,00	90	2,9748	**,006**
	< 2,00	73	2,6139	
gen_per	>= 2,00	89	3,7548	**,070**
	< 2,00	74	3,6011	
incprod_inn	>= 2,00	90	3,2630	**,088**
	< 2,00	73	2,9817	
radprod_inn	>= 2,00	90	2,6444	,505
	< 2,00	73	2,4932	
prod_inn	>= 2,00	90	3,0122	,159
	< 2,00	73	2,7863	
process_inn	>= 2,00	90	3,0978	**,010**
	< 2,00	72	2,6806	
mar_inn	>= 2,00	89	2,6489	,202
	< 2,00	73	2,4247	
org_inn	>= 2,00	89	3,1174	**,000**
	< 2,00	73	2,5556	
inno_per	>= 2,00	89	3,7157	**,074**
	< 2,00	74	3,5243	
pro_per	>= 2,00	89	3,9185	,881
	< 2,00	74	3,9054	
mar_per	>= 2,00	89	3,9401	,501
	< 2,00	74	3,8649	
fin_per	>= 2,00	88	3,4460	**,011**
	< 2,00	71	3,0704	

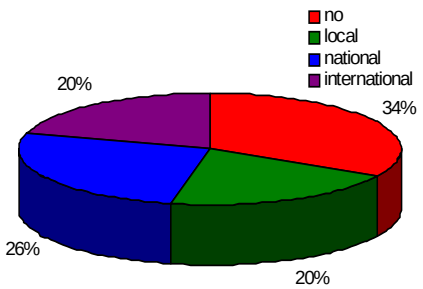
Table 6.19: Effects of training collaboration with firms or training centers

Findings of the student t-test analysis demonstrate that training collaboration with firms or training centers makes a significant difference for innovativeness, process innovations, organizational innovations and financial performance at α=95% level and innovative performance, general firm performance and incremental product innovation at α=90% level. Therefore, firms that perform this collaboration are more innovative and have better performance.

Figure 6.15 illustrates findings of collaboration with customers. The results imply that 66% of firms in our sample are performing this collaboration. Fortunately, collaborative firms at national or international level in this field have better innovativeness level.

innovativeness

	N	Mean
no	54	2,64
local	33	2,66
national	43	2,95
internationa	33	3,08
Total	163	2,81



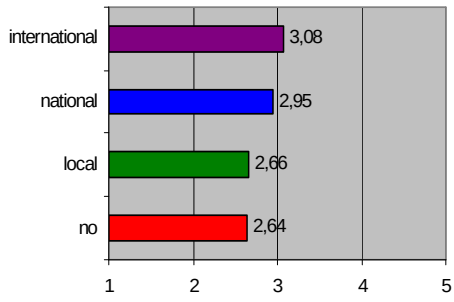


Figure 6.15: Descriptive statistics for collaboration with customers

		N	Mean	Sig.
innovs	>= 2,00	109	2,90	**,059**
	< 2,00	54	2,64	
gen_per	>= 2,00	109	3,75	**,019**
	< 2,00	54	3,54	
incprod_inn	>= 2,00	109	3,14	,908
	< 2,00	54	3,12	
radprod_inn	>= 2,00	109	2,61	,760
	< 2,00	54	2,54	
prod_inn	>= 2,00	109	2,93	,820
	< 2,00	54	2,89	
process_inn	>= 2,00	108	3,00	,144
	< 2,00	54	2,74	
mar_inn	>= 2,00	108	2,65	**,071**
	< 2,00	54	2,32	
org_inn	>= 2,00	108	3,00	**,014**
	< 2,00	54	2,59	
inno_per	>= 2,00	109	3,72	**,013**
	< 2,00	54	3,44	
pro_per	>= 2,00	109	3,95	,103
	< 2,00	54	3,81	
mar_per	>= 2,00	109	4,00	**,009**
	< 2,00	54	3,69	
fin_per	>= 2,00	105	3,30	,607
	< 2,00	54	3,22	

Table 6.20: Effects of collaboration with customers

Table 6.20 examines the effects of collaboration with customers. Findings of the student t-test analysis exposes that this collaboration type makes significantly a difference for general, innovative, marketing performance and organizational innovations at α=95% level and innovativeness and marketing innovations at α=90% level. Therefore firms those perform this collaboration, are more innovative and have better performance.

Figure 6.16 represents findings of collaboration with suppliers. The results imply that 70% of firms in our sample are performing this collaboration. Fortunately, collaborative firms in this field have better innovativeness level.

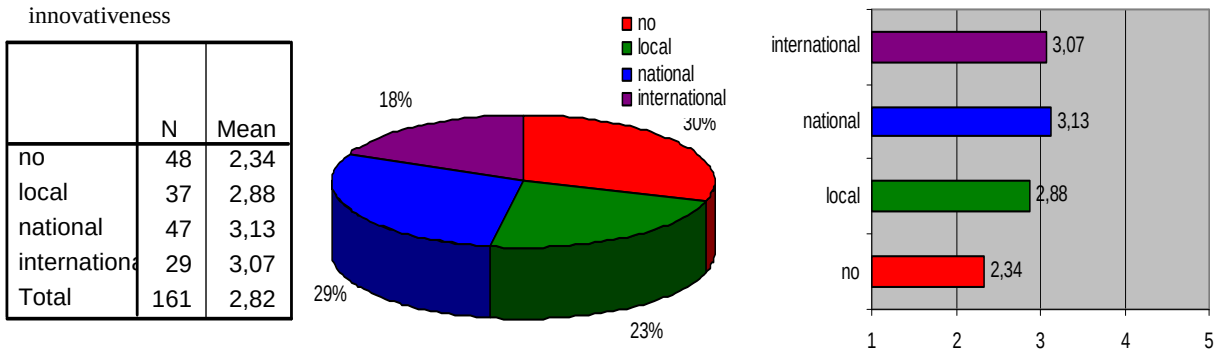


Figure 6.16: Descriptive statistics for collaboration with suppliers

		N	Mean	Sig.
innovs	>= 2,00	113	3,03	**,000**
	< 2,00	48	2,34	
gen_per	>= 2,00	113	3,77	**,003**
	< 2,00	48	3,50	
incprod_inn	>= 2,00	113	3,35	**,000**
	< 2,00	48	2,67	
radprod_inn	>= 2,00	113	2,77	**,021**
	< 2,00	48	2,21	
prod_inn	>= 2,00	113	3,12	**,000**
	< 2,00	48	2,49	
process_inn	>= 2,00	113	3,14	**,000**
	< 2,00	47	2,40	
mar_inn	>= 2,00	112	2,73	**,002**
	< 2,00	48	2,15	
org_inn	>= 2,00	112	3,12	**,000**
	< 2,00	48	2,30	
inno_per	>= 2,00	113	3,74	**,003**
	< 2,00	48	3,39	
pro_per	>= 2,00	113	3,99	**,006**
	< 2,00	48	3,74	
mar_per	>= 2,00	113	4,00	**,012**
	< 2,00	48	3,69	
fin_per	>= 2,00	109	3,34	,311
	< 2,00	48	3,18	

Table 6.21: Effects of collaboration with suppliers

Table 6.21 explores the effects of collaboration with suppliers. Findings of the student t-test analysis show that this collaboration type makes a significant difference for every innovation and performance types but financial performance. Therefore, it is seen that firms that perform this collaboration, are more innovative and have better performance.

Figure 6.17 illustrates findings of complementary collaborations which is defined as the collaboration for a common project/product in which firms that have different specializations come together and do only their own specialty tasks. The results imply that only 28% of firms in our sample are performing this collaboration.

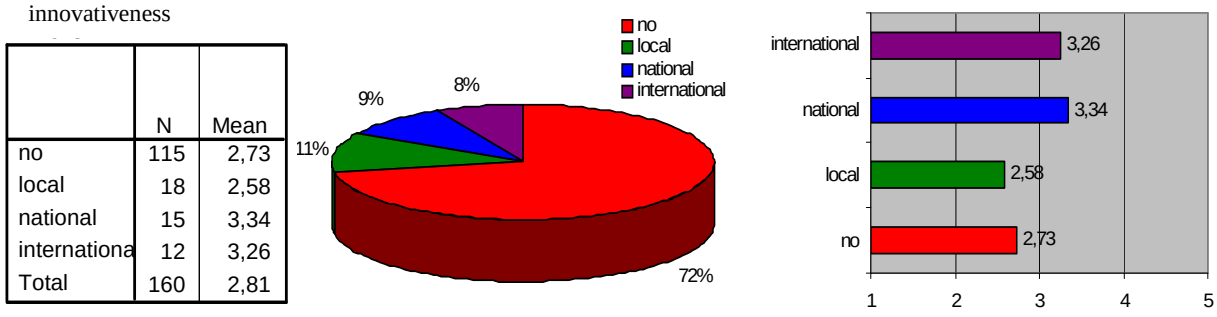


Figure 6.17: Descriptive statistics for complementary collaborations

		N	Mean	Sig.
innovs	>= 2,00	45	3,01	**,059**
	< 2,00	115	2,73	
gen_per	>= 2,00	46	3,73	,572
	< 2,00	114	3,67	
incprod_inn	>= 2,00	45	3,27	,344
	< 2,00	115	3,10	
radprod_inn	>= 2,00	45	2,91	**,056**
	< 2,00	115	2,43	
prod_inn	>= 2,00	45	3,13	**,096**
	< 2,00	115	2,83	
process_inn	>= 2,00	45	3,11	,160
	< 2,00	114	2,85	
mar_inn	>= 2,00	45	2,69	,281
	< 2,00	114	2,48	
org_inn	>= 2,00	45	3,13	**,029**
	< 2,00	114	2,74	
inno_per	>= 2,00	46	3,74	,196
	< 2,00	114	3,58	
pro_per	>= 2,00	46	3,96	,586
	< 2,00	114	3,90	
mar_per	>= 2,00	46	3,86	,562
	< 2,00	114	3,93	
fin_per	>= 2,00	44	3,34	,684
	< 2,00	112	3,27	

Table 6.22: Effects of complementary collaborations

Table 6.22 presents the results of the statistical analysis that investigates the effects of complementary collaborations. Findings of the student t-test analysis depict that this collaboration type makes a significant positive difference for organizational innovations at α=95% level and innovativeness and (radical) product innovations α=90% level. Therefore, it is seen that firms that perform this collaboration, are more innovative.

As a summary, outcomes of statistical analyses indicate several collaboration strategies have major importance for firms in order to obtain higher innovativeness and better performance. Especially R&D collaboration with universities or research centers, training collaboration with firms or training centers, collaboration with customers, collaboration with suppliers and complementary collaborations provide better innovative capabilities. Similarly, different collaborations have positive effects on diverse innovation and performance types.

An R&D collaborations factor is established by aggregating R&D collaboration with universities or research centers, R&D collaboration with competitor firms and R&D collaboration with other firms (except customers and suppliers). The aggregation is formed as a binary scale, whether the firm has performed at least one of these collaboration types (1), or not (0). In the same way, by aggregating production collaboration; purchasing collaboration; service, sales, delivery collaboration; training collaboration with firms or training centers;

collaboration with customers; collaboration with suppliers and complementary collaborations, an operational collaboration factor is set up. ***Table 6.23*** exposes the correlation analysis of this collaboration scales on innovativeness.

	Mean	*S.D.*	*1*	*2*	*3*
1- Innovativeness	2,81	,84	1	,215(**)	,170(**)
2- R&D Collaborations	1,44	,50	(**)	1	204(**)
3- Operational Collaborations	1,85	,36	(**)	(**)	1

** p < ,01
* p < ,05

Table 6.23: Correlation analysis of collaborations

The scale of collaborations is 1 to 2 (1=no collaboration to 2=collaboration), in our sample the mean of firms' R&D collaboration scale is 1.44, and operational collaboration is 1.85. Therefore, while majority of firms executes operational collaborations, more than half do not perform R&D collaboration. The correlation analysis reveals the positive relationship between collaborations and innovativeness factors; therefore, the initial hypothesis **(H17)** which predicts collaborative firms are more innovative is supported.

6.1.1.4 Innovation Outlay

Innovation outlay includes R&D spending; purchasing spending of license, patent, know-how and technical counseling; purchasing spending of software, machinery and equipments; and finally managerial counseling spending (except financial counseling). R&D spending is research based expenditure for obtaining new scientific and technological information and/or improving and designing new product/processes. These spendings contain both purchasing R&D services from outside and developing R&D in inside of company.

Innovation outlay has two aspects: the amount of average innovation spending of years 2003, 2004 and 2005; and the percentage of increase of innovation spending from 2003 to 2005. The initial hypothesis is that those firms with more innovation spending are more innovative. To analyze the effect of innovation outlay, independent student t-tests, correlation and regression analyses are performed.

Descriptive statistics of innovation outlay are summarized in ***Table 6.24***. Correlation analysis is applied in order to inspect one-to-one relationship between firm's innovation outlay and its innovativeness. The results are presented in ***Table 6.25***.

		Innovation Spending Increase (%)	Innovation Spending (M€)
N	Valid	86	100
	Missing	83	69
Mean		,49	1,41
Median		,30	,25
Minimum		-,60	,00
Maximum		2,73	26,30

Table 6.24: Descriptive statistics of innovation outlay

	Mean	*1*	*2*	*3*
1- Innovativeness	2,81	1	,313(**)	,070
2- Amount of Innovation Spending (M€)	1.41	(**)	1	-,204
3- Increase of Innovation Spending (%)	49,2			1

** p < ,01
* p < ,05

Table 6.25: Correlation analysis of innovation outlay

Firstly, it is seen that, average innovation spending per year in our sample is 1.4 M€, while median is 245K€ and maximum spending is 26.3 M€. On the other hand, the average increase (from 2003 to 2005) in innovation outlay is 49%, while median is 30%. Unfortunately, only 86 firms (51% of sample) stated their innovation spending.

Then, findings reveal that only amount of innovation spending (r:0.313; p<0.01) is significantly correlated to innovativeness. The higher innovation outlay correlated to higher innovativeness level, but the increase percentage does not have a significant effect.

Table 6.26 depicts the effects of innovation outlay on innovativeness. For this analysis, the firms which indicated they spent more than 750.000€ on average per year (from 2003 to 2005), judged against other firms. Thus, the initial hypothesis "innovativeness level of these two groups is equal" is tested.

Findings repor that higher innovation spending makes significantly positive difference for innovative, production, marketing and general performance as well as innovativeness at α=95% level and product, process and organizational innovations α=90% level. The difference is not significant only for marketing innovations. Therefore, as a whole, the analysis implies firms which spent more to innovations are more innovative and have better performance.

Similarly, the effects of increase in innovation outlay are reported in ***Table 6.27***. For this analysis, firms which indicated they have increased their innovation outlay at least 50% from 2003 to 2005, judged against other firms. Thus, the initial hypothesis "innovativeness level of these two groups is equal" is tested

	Innovation Spendings (€)	N	Mean	Sig.
inno_per	>= 750.000	29	3,84	**,025**
	< 750.000	71	3,53	
pro_per	>= 750.000	29	4,12	**,012**
	< 750.000	71	3,80	
mar_per	>= 750.000	29	4,21	**,009**
	< 750.000	71	3,80	
fin_per	>= 750.000	29	3,48	**,061**
	< 750.000	71	3,11	
gen_per	>= 750.000	29	3,91	**,003**
	< 750.000	71	3,56	
prod_inn	>= 750.000	29	3,28	**,058**
	< 750.000	70	2,86	
process_inn	>= 750.000	29	3,26	**,076**
	< 750.000	70	2,87	
mar_inn	>= 750.000	28	2,75	,386
	< 750.000	70	2,53	
org_inn	>= 750.000	29	3,09	**,076**
	< 750.000	69	2,69	
innovs	>= 750.000	29	3,11	**,050**
	< 750.000	70	2,74	

Table 6.26: The effects of innovation outlay on innovativeness

	Innovation Spending Increase (%)	N	Mean	Sig.
inno_per	>= 50%	31	3,61	,754
	< 50%	55	3,66	
pro_per	>= 50%	31	3,93	,828
	< 50%	55	3,95	
mar_per	>= 50%	31	3,80	,210
	< 50%	55	3,99	
fin_per	>= 50%	31	3,27	,877
	< 50%	55	3,30	
gen_per	>= 50%	31	3,65	,537
	< 50%	55	3,73	
prod_inn	>= 50%	31	3,12	,958
	< 50%	54	3,11	
process_ inn	>= 50%	31	3,34	,087
	< 50%	54	2,98	
mar_inn	>= 50%	31	2,74	,645
	< 50%	53	2,62	
org_inn	>= 50%	31	3,01	,498
	< 50%	53	2,85	
innovs	>= 50%	31	3,05	,410
	< 50%	54	2,90	

Table 6.27: The effect of innovation outlay increase on innovativeness

Findings of the student t-test analysis demonstrate that higher innovation outlay increase does not make significant difference for any performance or innovation criterion (only for process innovations at $p<0.1$), as correlation findings already pointed. This fact can be explained such as higher innovation outlay increase rate is probable only for firms which spent small amount of innovation outlay in 2003; since the increase is easy for lower quantities. By this point of view, important factor for innovativeness is not the increase percentage but the amount of money spent for innovation.

Finally, multiple linear regression analysis should also be made since previous analyses can not say much about the direction of the relationship between innovation outlay and innovativeness. The regression model that investigates the effects of innovations outlay on innovativeness is presented in ***Figure 6.18*** and ***Table 6.28***.

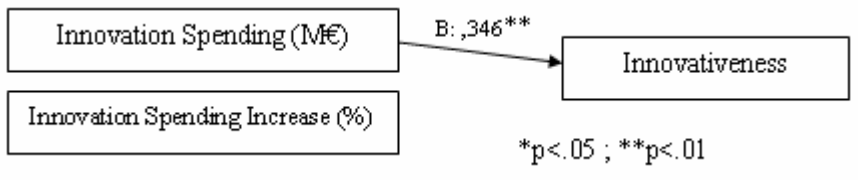


Figure 6.18: Effects of innovation outlay on innovativeness

Independent Variables	**Standard Beta**	**p Value**
Innovation Spending (M€)	0.346	0.002
Innovation Spending Increase (%)	0.342	0.188
R^2 = 0.119 ; p=0.005		

Table 6.28: Effects of innovation outlay on innovativeness

The regression model of the effects of innovation outlay on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables express 11.9% (R^2=0.119) of innovativeness variation. The findings indicate amount of innovation spending (β=0.346; $p<0.01$) have significant positive effect on innovativeness.

Therefore, statistical outcomes explore the positive relationship between innovation outlay and innovativeness; hence, firms which have more innovation outlay are more innovative. As a result, our initial hypothesis **H22** is supported.

6.1.2 Firm Structure

Competitive reflection of firm structure and its innovative orientation depend on the success of converting the challenging new ideas of employees to corporate practices and investments. In the academic literature, two internal climate factors for innovativeness, namely firm culture and intellectual capital are recognized.

6.1.2.1 Intellectual Capital

According to explanatory factor analysis applied with SPSS, the extracted factor structure of firm intellectual capital is illustrated in ***Table 6.29***. For this analysis, all of the intellectual capital questions in the survey are placed together into principal component analysis, and four latent factors are extracted. There are not any items that spoiled the factor structure. The obtained factors are human capital, social capital, organizational capital, and specialization of employees.

The outcome of explanatory factor analysis shows all of the variables in the survey are placed under expected factors. Still, confirmatory factor analysis also should be made in order to test the factor structure. That method is performed in the light of the findings of explanatory factor analysis. So, a single-step confirmatory factor analysis is conducted for the intellectual capital factors. ***Table 6.30*** depicts factor loadings of this analysis.

		Factors			
Questions		1	2	3	4
Human Capital	e1	,832			
	e3	,804			
	e5	,680			
	e2	,636			
	e4	,570			
Social Capital	e8		,775		
	e7		,767		
	e6		,635		
	e9		,569		
	e10		,470		
Organizational Capital	e14			,810	
	e13			,759	
	e12			,735	
	e11			,536	
Specialization	e17				,705
	e18				,654
	e_16				,635
	e15				,506

Total Variance Explained: % 58,493

Table 6.29: Factor structure of intellectual capital

Intellectual Capital Questions	Factor Loadings
Human Capital	
e1, e2, e3, e4, e5	0.690*, 0.654*, 0.767*, 0.741*, 0.712*
Social Capital	
e6, e7, e8, e9, e10	0.717*, 0.697*, 0.752*, 0.493*, 0.599*
Organizational Capital	
e11, e12, e13, e14	0.321*, 0.664*, 0.825*, 0.904*
Specialization	
e15, e_16, e17, e18	0.589*, 0.406*, 0.725*, 0.502*
	*p<0.05

Table 6.30: Factor loadings of CFA for intellectual capital

The results of this analysis are evaluated by the goodness of fit indices. These indices are reported in ***Table 6.31***.

Briefly, confirmatory factor analysis is performed in order to evaluate the measurement properties of the explanatory factor analysis. The overall fit statistics for the model demonstrate an acceptance level for intellectual capital factor structure. Therefore, the factors are consistent and valid.

Goodness of fit indices	Findings	Reference Value
	Intellectual Capital	
χ^2 / degree of freedom	1.719	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.990	0.9<CFI<1
NFI (Normed Fit Index)	0.977	0.9<NFI<1
RFI (Relative Fit Index)	0.970	0.9<RFI<1
IFI (Incremental Fit Index)	0.990	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.987	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.065	RMSEA<0.08

Table 6.31: Goodness of fit indices of CFA for intellectual capital

All of the factor loadings but three (i.e., e9, e11, e_16) have high (>0.50) and significant (p<0.05) values. Still, those three items are also retained since their factor loadings are also reasonably high and significant (p<0.05). Additionally, reliability analysis will indicate that they are reliable items.

As a result of explanatory and confirmatory factor analyses, intellectual capital is represented by four factors namely human capital, social capital, organizational capital and specialization.

For the reliability of the factors, Cronbach α method is used. ***Table 6.32*** presents α values of intellectual capital factors. Reliability analysis demonstrates that all of the factors are internally consistent and reliable since all α values are greater than 0.60.

Factors	**Number of Question**	**α Value**
Human Capital	5	0.833
Social Capital	5	0.784
Organizational Capital	4	0.723
Specialization	4	0.608

Table 6.32: Results of reliability analysis for intellectual capital factors

After intellectual capital scales' reliabilities are tested and approved, correlation analysis is performed in order to inspect one-to-one relationship between the innovativeness and intellectual capital factors. The results are reported in **Table 5.50** with means of the factors. Findings of this analysis give information similar to linear regression between two factors. Thus, this analysis is valuable to test the drivers model hypotheses.

	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*
1- Innovativeness	2,81	,84	1	,295(**)	,271(**)	,518(**)	,206(**)
2- Human Capital	3,62	,65	(**)	1	,582(**)	,389(**)	,513(**)
3- Social Capital	3,65	,59	(**)	(**)	1	,498(**)	,466(**)
4- Organizational Capital	3,41	,88	(**)	(**)	(**)	1	,385(**)
5- Specialization	3,45	,60	(**)	(**)	(**)	(**)	1

** p < ,01
* p < ,05

Table 6.33: Correlation analysis of intellectual capital

All of the factors that are directly related to hypotheses (marked with red in Table 5.30) are significantly correlated as already expected. Thus, the positive correlation between innovativeness and intellectual capital factors supports the aim of the innovation drivers' model.

The amount of variance between variables is convenient for further statistical analyses since factors' standard deviations are between 0.59 and 0.88. According to descriptive

statistics and means, it is seen that firms in our sample employ relatively good and creative employees. The high social capital also indicates that learning from colleagues and employees' capabilities for problem solving are prevalent in the companies. However, relatively low organizational capital is a sign that firms have difficulties in transforming their human and social capital into organizational capital.

The levels of intellectual capital elements of companies are presented in ***Figure 6.19***, where the scale is 1 indicates very low, 2=low, 3= mediocre, 4=high and 5=very high.

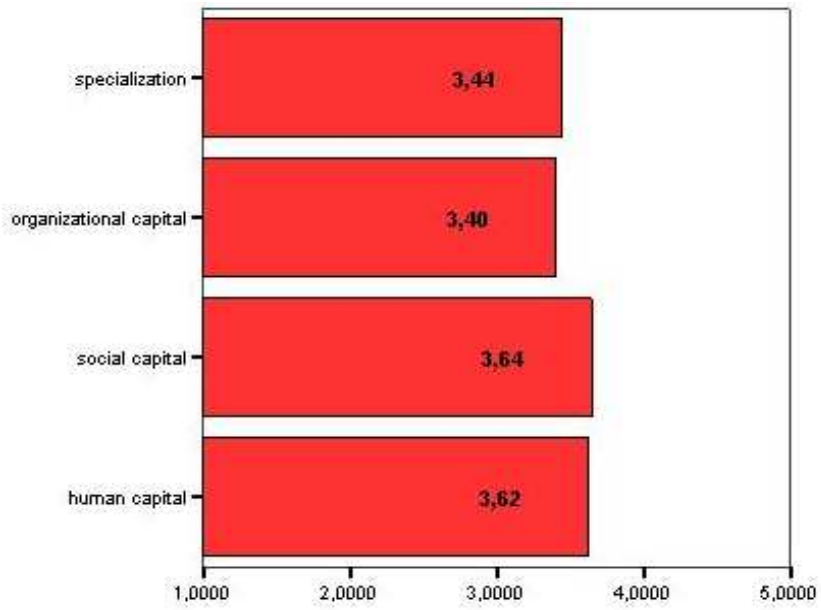


Figure 6.19: Intellectual capital elements

The findings of the correlation analysis extract significant one-to-one positive relationship of the aggregated factors. All of the intellectual capitals correlate significantly to innovativeness scale with $p<.01$. Organizational capital has higher correlation coefficient (r: 0.518), and specialization has lower correlation coefficient (r: 0.206). Very high correlation of organizational capital stresses the major importance of this factor for firms in order to be more innovative.

Briefly, correlation analysis brings up the positive relationship between innovativeness and intellectual capital. However, this analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analysis can provide more insights.

The regression model that investigates the effects of intellectual capital on innovativeness is presented in ***Figure 6.20*** and ***Table 6.34***.

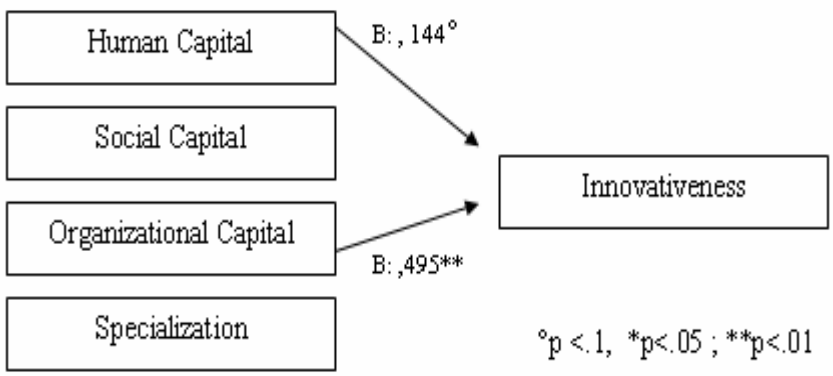


Figure 6.20: Effects of intellectual capital on innovativeness

Independent Variables	**Standard Beta**	**p Value**
Human Capital	0.144	0.100
Social Capital	-0.041	0.646
Organizational Capital	0.495	0.000
Specialization	-0.037	0.648
R^2 = 0.280 ; p=0.000		

Table 6.34: Effects of intellectual capital on innovativeness

The regression model of the effects of intellectual capital on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables express 28.0% ($R^2=0.280$) of innovativeness variation. It is useful to note that high R^2 of the model and high regression coefficient of organizational capital indicate that intellectual capital and especially organizational capital have supreme importance for innovative capability.

However, when the factors are included jointly in the multiple linear regression, only organizational capital ($\beta=0.495$; $p<0.01$) and human capital ($\beta=0.144$; $p<0.1$) result in significant positive effects. On the other hand, when entered separately, all of the intellectual capital factors were significantly and positively correlated to innovativeness. So, despite the fact that the model is significant, multiple linear regression analysis reveals only some intellectual capitals factors have statistically significant effects on innovativeness. This finding implies that there are mediating effects between intellectual capital variables.

Post hoc analysis suggests that specialization and social capital effects on innovativeness are mediated by organization and human capital. Therefore, a path analysis

model for intellectual capital is formed by AMOS v4.0 and it is analyzed according to structural equation modeling method.

Figure 6.21 presents this model with its significantly consistent findings. The model explains 27% of the variability associated with the innovativeness.

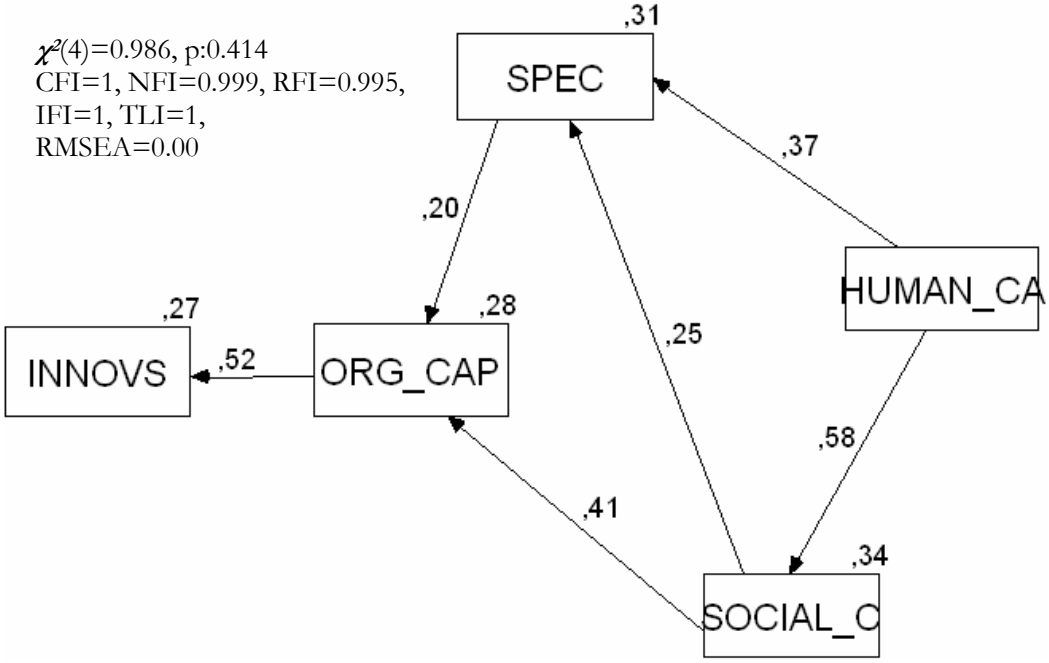


Figure 6.21: Path analysis of intellectual capital

Therefore, the findings expose the positive relationship between intellectual capital and innovativeness despite mediating effects between them; hence, our initial hypotheses **H12**, **H13**, **H14** and **H15** are all supported. Innovativeness is directly affected by organization capital. Social capital and specialization influence organizational capital with social capital influencing specialization as well. Human capital acts as the first step, which affects social capital and specialization of employees.

6.1.2.2 Organization Culture

The other firm structure factor is organization culture. After explanatory factor analysis procedure is applied with SPSS, the extracted factor structure of organization culture is depicted in ***Table 6.35***. For this analysis, all of the organization culture questions in the survey are placed together into principal component analysis, and seven latent factors are extracted. There are not any items that spoiled the factor structure.

The obtained factors are communication, formalization, centralization, management support, time availability, work discretion and reward system.

Questions		Factors						
		1	2	3	4	5	6	7
Management Supoort	k22	,740						
	k20	,726						
	k21	,684						
	k23	,650						
	k24	,629						
	k30	,620						
	k28	,565						
	k25	,562						
	k26	,554						
	k29	,455						
	k27	,442						
Reward System	k40		,805					
	k44		,795					
	k43		,768					
	k42		,761					
	k41		,734					
Centralization	k18			,778				
	k17			,752				
	k19			,750				
	k16			,749				
	k14			,629				
	k15			,613				
Formalization	k11				,713			
	k10				,666			
	k12				,631			
	k8				,611			
	k13				,607			
	k9				,471			
Communication	k6					,696		
	k5					,647		
	k4					,638		
	k3					,619		
	k7					,589		
Work Discretion	k38						,826	
	k39						,817	
	k37						,725	
Time Availability	k35							,724
	k34							,703
	k32							,613
	k31							,507

Total Explained Variance: % 62,774

Table 6.35: Factor structure of organization culture

The result of explanatory factor analysis demonstrates that all of the variables in the survey are placed under expected factors. However, confirmatory factor analysis is necessary in order to test the factors structure. That method is applied according to the findings of explanatory factor analysis.

A single-step confirmatory factor analysis is conducted for the organization culture. ***Table 6.36*** depicts factor loadings of the confirmatory factor analysis.

Organization Culture Questions	Factor Loadings
Management Support	
k20. k21, k22, k23, k24, k25	0.829*, 0.865*, 0.785*, 0.664*, 0.698*, 0.453*
k26, k27, k28, k29, k30	0.538*, 0.531*, 0.691*, 0.652*, 0.758*
Reward System	
k40. k41, k42, k43, k44	0.842*, 0.772*, 0.851*, 0.893*, 0.886*
Centralization	
k14, k15, k16, k17, k18, k19	0.531*, 0.666*, 0.785*, 0.778*, 0.838*, 0.619*
Formalization	
k8, k9, k10. k11, k12, k13	0.760*, 0.684*, 0.398* , 0.693*, 0.316*, 0.589*
Communication	
k3, k4, k5, k6, k7	0.806*, 0.819*, 0.691*, 0.584*, 0.463*
Work Discretion	
k37, k38, k39	0.830*, 0.806*, 0.845*
Time Availability	
k31, k32, k34, k35	0.744*, 0.779*, 0.504*, 0.503*
	*p<0.05

Table 6.36: Factor loadings of CFA for organization culture

The results of this analysis are evaluated by the goodness of fit indices. These indices are presented in ***Table 6.37***.

Goodness of fit indices	Findings	Reference Value
	Organization Culture	
χ^2 / degree of freedom	1.869	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.970	0.9<CFI<1
NFI (Normed Fit Index)	0.938	0.9<NFI<1
RFI (Relative Fit Index)	0.929	0.9<RFI<1
IFI (Incremental Fit Index)	0.970	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.966	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.072	RMSEA<.08

Table 6.37: Goodness of fit indices of CFA for organization culture

Confirmatory factor analysis is performed in order to evaluate the measurement properties of the explanatory factor analysis. The overall fit statistics for the model demonstrate an acceptance level for organization culture factor structure. Therefore, the factors are consistent and valid.

All of the factor loadings but four (i.e., k25, k10. k12, k7) have high (>0.50) and significant ($p<0.05$) loadings. Still, those four items are also retained since their factor loadings are also reasonably high and significant ($p<0.05$). Additionally, reliability analysis will show that they are in deed reliable scales.

As a result of explanatory and confirmatory factor analyses, organizational capital is found to consist of seven factors, namely, communication, formalization, centralization, management support, time availability, work discretion, reward system.

For the reliability of the factors, Cronbach α method is used. ***Table 6.38*** illustrates α values of organization culture factors. Reliability analysis shows that all of the factors are internally consistent and reliable since all α values are greater than 0.70.

Factors	**Number of Question**	**α Value**
Communication	5	0.807
Formalization	6	0.756
Centralization	6	0.854
Management Support	11	0.900
Time Availability	4	0.738
Work Discretion	3	0.866
Reward System	5	0.926

Table 6.38: Results of reliability analysis for organization culture factors

After organization culture scales' reliabilities are tested and approved, correlation analysis is performed in order to inspect one-to-one relationship between the innovativeness and organization culture factors. **Table 6.39** illustrates the results of the analysis and means of the factors. Findings give information similar to simple linear regression between two factors. Thus, this analysis is valuable to test the drivers model hypotheses.

	Mean	S.D.	1	2	3	4	5	6	7	8
1- Innovativeness	2,81	,84	1	,350(**)	,155(*)	-,192(*)	,382(**)	,226(**)	,219(**)	,340(**)
2- Communication	3,95	,63	(**)	1	,293(**)	-,434(**)	,572(**)	,402(**)	,225(**)	,524(**)
3- Formalization	3,39	,70	(*)	(**)	1	-,081	,321(**)	,029	,265(**)	,218(**)
4- Centralization	2,79	,82	(*)	(**)		1	-,450(**)	-,332(**)	-,144	-,357(**)
5- Management Support	3,53	,68	(**)	(**)	(**)	(**)	1	,476(**)	,386(**)	,673(**)
6- Work Discretion	3,23	,75	(**)	(**)		(**)	(**)	1	,381(**)	,419(**)
7- Time Availability	3,21	,94	(**)	(**)	(**)		(**)	(**)	1	,405(**)
8- Reward System	3,68	,93	(**)	(**)	(**)	(**)	(**)	(**)	(**)	1

** p < ,01
* p < ,05

Table 6.39: Correlation analysis of organization culture

The amount of variance between variables is convenient for further statistical analyses since factors' standard deviations are between 0.63 and 0.94. All of the factors which are directly related to hypotheses (marked with red in the Table 5.36) are significantly positive correlated except centralization factor which is significantly negative correlated to innovativeness as already expected. It is understood that providing higher authority and responsibilities to middle level managers facilitates the innovation process in companies. Consequently, the positive correlation between innovativeness and organization culture supports the drivers model.

According to descriptive statistics and means of organization culture, companies give importance mainly to communication and reward system. In contrast, they attach less importance to work discretion and time availability issues. Moreover, companies are rather centralized, thus authorities are gathered generally by top managers. The importance level of organization culture is presented in ***Figure 6.22***, where the scale is 1=not important, 2=slightly important, 3=important, 4=very important, 5= extremely important.

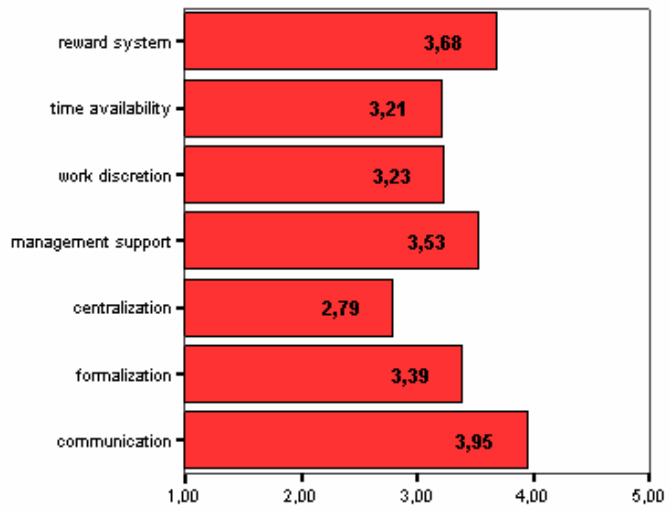


Figure 6.22: Importance level of organization culture factors

Therefore, findings of the correlation analysis extract significant one-to-one positive relationship of the aggregated factors. All of the organization culture factors correlate significantly to innovativeness scale with $p<0.01$ except formalization and centralization whose correlations are at $\alpha=95\%$ level. Management support has higher correlation coefficient (r:0.382), and formalization has lower correlation coefficient (r:0.155) with innovativeness. High correlation of management support stresses the major importance of managerial encouragement to idea generation and support to new projects, in order to be more innovative. Briefly, correlation analysis brings up the positive relationship between innovativeness and organization culture. However, this analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analysis can give more insights.

Figure 6.23 and ***Table 6.40*** reports the regression model that investigates the effects of organization culture on innovativeness.

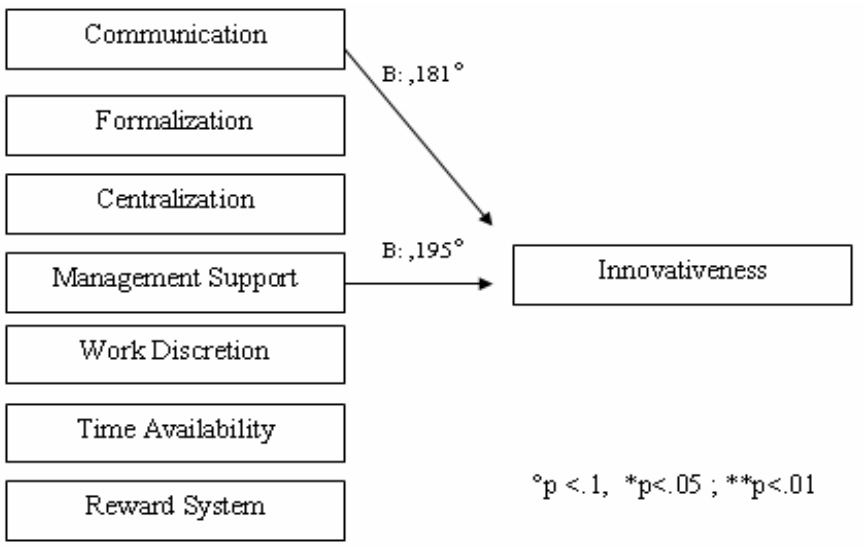


Figure 6.23: Effects of organization culture on innovativeness

The regression model of the effects of organization culture on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables can able to express 18.3% ($R^2=0.183$) of innovativeness variation.

However, when organizational culture factors are included jointly in the multiple linear regression, only communication ($\beta=0.181$; $p=0.058$) and management support ($\beta=0.195$; $p=0.082$) have significant positive effects on innovativeness. But when included individually, all of the organization culture factors were significantly and positively correlated to innovativeness.

Independent Variables	Standard Beta	p Value
Communication	0.181	0.058
Formalization	0.006	0.938
Centralization	0.029	0.733
Management Support	0.195	0.082
Work Discretion	0.012	0.891
Time Availability	0.067	0.427
Reward System	0.095	0.354
R^2 = 0.183 ; p=0.000		

Table 6.40: Effects of organization capital on innovativeness

Therefore, despite the fact that the model is significant, there is mediating effect between organizational culture factors.

Post hoc analysis suggests that communication and management support mediated other organization culture factor effects on innovativeness. A path analysis model for organization culture is formed by AMOS v4.0 and it is analyzed according to structural equation modeling method. ***Figure 6.24*** presents this model with its significantly consistent findings. The model explains 18% of the variability associated with the innovativeness.

The results expose the positive relationship between organizational culture and innovativeness; hence, our initial hypotheses **H5**, **H6**, **H7** (note that centralization is negatively correlated to innovativeness), **H8**, **H9**, **H10** and **H11** are all supported.

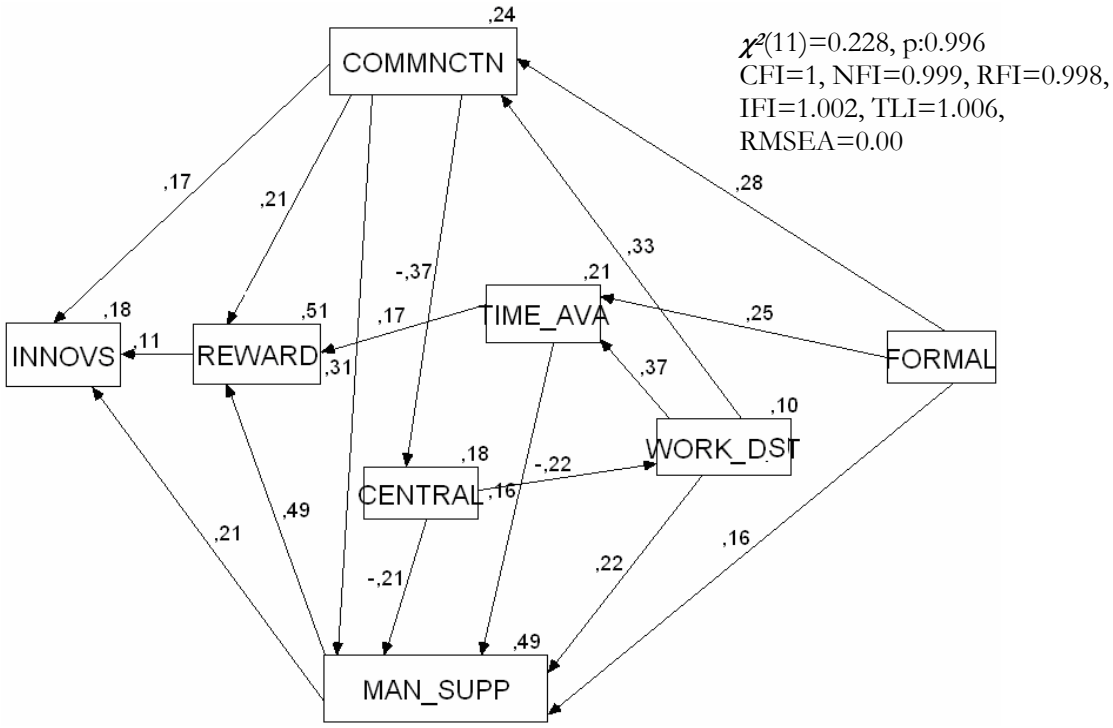


Figure 6.24: Path analysis of organization culture

6.1.3 Market Conditions & Relations

6.1.3.1 Market Structure

One of the important aspects of innovation is that it should be supported by a systematic external framework including market demand and public policies. Successful firm's structure and strategies are related positively with its surroundings. General environmental features such as market dynamism and competitive intensity affect firms' structure and performance. Market dynamism can be described as the rate of change in competitive conditions associated mostly to customers' demand. Competitive intensity is defined as the impact of competition on business environment. Firms in a competitive environment also seem more likely to engage in innovative activities than other firms.

Table 6.41 exposes the extracted factor structure of market and competition intensity obtained using explanatory factor analysis. For this analysis, all of the market questions in the survey are placed together into principal component analysis of SPSS, and four latent factors are extracted.

One of the market and competition intensity questions (p4), namely, "Finding and keeping qualified employees is very difficult in this sector" is kept outside the analysis as it spoiled the factor structure. Also, question (p6) namely "There is a dominant competitor that possesses major market share" formed a factor by itself. Since p6 is an important criterion for measuring the competition intensity, this question is also analyzed with student t-test that will be presented later in this section.

		Factors			
Questions		1	2	3	4
Market Dynamism	p13	,731			
	p14	,691			
	p8	,674			
	p7	,585			
	p9	,446			
	p12	,442			
Demand Structure	p3		,806		
	p10		,653		
	p11	,474	,493		
Market Density	p1			,673	
	p5			,582	
	p2			,476	
Dominant Rival	p6				,856

Total Variance Explained: % 54,204

Table 6.41: Factor structure of market & competition intensity

The obtained factors are market dynamism, demand structure, market density and dominant competitor. In order to test the factors' consistency, confirmatory factor analysis is performed. That method is applied according to the findings of explanatory factor analysis. ***Table 6.42*** depicts factor loadings of this single-step confirmatory factor analysis.

Market Questions	**Factor Loadings**
Market Dynamism	
p7, p8, p9, p12, p13, p14	0.585*, 0.582*, 0.666*, 0.518*, 0.473*, 0.433*
Demand Structure	
p3, p10. p11	0.234*, 0.604*, 0.605*
Market Density	
p1, p2, p5	0.363*, 0.519*, 0.188
Dominant Competitor	
p6	1*
	*p<0.05

Table 6.42: Factor loadings of CFA for market and competition intensity

The results of this analysis are evaluated by the goodness of fit indices. These indices are presented in ***Table 6.43***.

Goodness of fit indices	**Findings**	**Reference Value**
	Market	
χ^2 / degree of freedom	2,089	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.987	0.9<CFI<1
NFI (Normed Fit Index)	0.975	0.9<NFI<1
RFI (Relative Fit Index)	0.963	0.9<RFI<1
IFI (Incremental Fit Index)	0.987	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.980	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.081	RMSEA<0.08

Table 5.43: Goodness of fit indices of CFA for market and competition intensity

Confirmatory factor analysis evaluates the measurement properties of the explanatory factor analysis. The overall fit statistics for the model demonstrate an acceptance level for market factor structure. Nevertheless, five factors (p13, p14, p3, p1, p5) have low (<0.50) loadings, also p5 is not significant (p>0.05). Therefore, related two factors (demand structure and market density) do not seem internally consistent enough. To decide whether these factors will be retained or not, reliability tests had to be made.

For the reliability of the factors, Cronbach α method is used. ***Table 6.44*** reports α values of market factors. Reliability analysis shows that only two factors have α value greater than 0.60 and so, are reliable. Therefore, for the upcoming market analyses, market density and demand structure factors left outside since they are not consistent and reliable. However, market density will be investigated by student t-test analysis using question (p1) namely "The competition is intense in this sector" later in this section.

As a result of explanatory and confirmatory factor analyses, market and competition intensity are determined to be represented by two factors, namely, market dynamism and existence of a dominant competitor in the market.

Factors	**Number of Question**	**α Value**
Market Dynamism	6	0.720
Market Demand	3	0.515
Market Density	3	0.299
Dominant Competitor	1	N/A

Table 6.44: Results of reliability analysis for organization culture factors

After market scales' reliabilities are tested and approved, correlation analysis is applied in order to inspect one-to-one relationship between the innovativeness and market factors. ***Table 6.45*** depicts the results and means of the factors. Findings of the correlation analysis give information similar to simple linear regression between two factors. Thus, this analysis is helpful to test the drivers model hypotheses.

	Mean	*S.D.*	*1*	*2*	*3*
1- Innovativeness	2,81	,84	1	,347(**)	,012
2- Market Dynamism	2,85	,69	(**)	1	,077
3- Dominant Rival	3,10	1,25			1

** p < ,01
* p < ,05

Table 6.45: Correlation analysis of market and competition intensity

The findings point out that market dynamism is significantly positive correlated to innovativeness. But dominant competitor factor is not significantly correlated to innovativeness; therefore, it is not possible to claim that existence of a dominant competitor in the market pushes companies to be more innovative or vice versa. Consequently, although

higher market dynamism is correlated to higher innovativeness, there are not enough findings to say that companies aim for and become more innovative in intense competitive conditions.

The amount of variance between variables is convenient for further statistical analyses since factors' standard deviations are between 0.69 and 1.25. High standard deviation of dominant competitor factor is probably due to sectoral differences. According to descriptive statistics and means of market structure factors, the firms in our sample declare that their sectors are not very dynamic, and existence of a dominant competitor in their market is arguable. In fact, market and competition intensity conditions can differ possibly from sector to sector. The two unreliable factors of market structure analysis can be also due to this fact. Therefore, it is not so healthy to comment on market factors without looking into sectoral differences. Means of market factors are presented in ***Figure 6.25***, where the scale is 1=strongly disagree, 2=slightly agree, 3=agree, 4=very agree, 5= strongly agree.

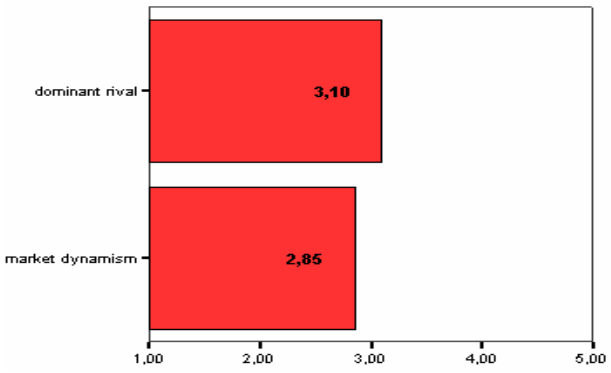


Figure 6.25: Means of market factors

The findings of the correlation analysis extracted significant ($p<0.01$) one-to-one positive relationship between market dynamism and innovativeness (r:0.347). This correlation indicates firms become more innovative in dynamic sectors. However, this analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analyses is applied.

The regression model that investigates the effects of market factors on innovativeness is presented at ***Figure 6.26*** and ***Table 6.46***.

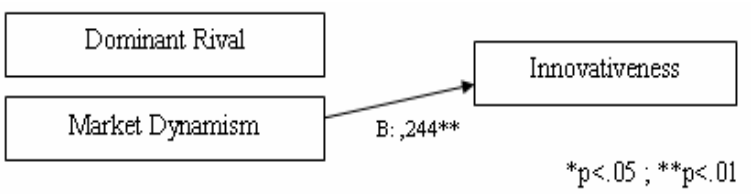


Figure 6.26: Effects of market factors on innovativeness

The regression model of the effects of market factors on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables illustrated 6.0% ($R^2=0.060$) of innovativeness variation.

However, when market factors have entered together or separately to the multiple linear regression, only market dynamism ($\beta=0.244$; $p=0.002$) has significant positive effects on innovativeness. Similarly, correlation analysis already indicated the same finding.

Independent Variables	**Standard Beta**	**p Value**
Market Dynamism	0.244	0.002
Dominant Competitor	-0.006	0.939
$R^2 = 0.060$; $p=0.007$		

Table 6.46: Effects of market factors on innovativeness

Therefore, despite the fact that the model is significant, multiple linear regression analysis reveals that only market dynamism factor has statistically significant effects on innovativeness. Therefore, existence of a dominant competitor in the sector does not push firms to be more innovative.

Nevertheless, in order to investigate probable effects of market and competition intensity on innovativeness, it can be useful to analyze question (p6) namely "There is a dominant competitor that possesses major market share" by also student-t test. Additionally, the question (p1), namely, "The competition is intense in this sector" is also analyzed with the same routine. ***Table 6.47*** and ***Table 6.48*** represent the student t-tests for questions p6 and p1, respectively.

Firstly, for question p6, the firms which indicated there is surely one dominant competitor in their sector (=5 in the scale), judged against the other firms (<5 in the scale). Secondly, for question p1, the firms which indicated the competition is intense in their sector (≥4 in the scale), judged against the other firms (<4 in the scale).

Findings of the analyses indicate that existence of a dominant competitor in the sector has not any effect on innovativeness, and this result is akin to the result of the regression and correlation analyses. On the other hand, it is revealed that competition intensity has significant positive effect on innovativeness, marketing and organizational innovations. Therefore, it is seen that firms that are in competitive sectors, are more innovative especially for marketing and organizational innovations.

Existence of dominant rival in the sector

	p6	N	Mean	Sig.
innovs	>= 5,00	25	2,805	,976
	< 5,00	142	2,811	
incprod_inn	>= 5,00	25	3,200	,749
	< 5,00	142	3,127	
radprod_inn	>= 5,00	25	2,400	,577
	< 5,00	142	2,574	
prod_inn	>= 5,00	25	2,880	,915
	< 5,00	142	2,904	
process_inn	>= 5,00	24	3,058	,444
	< 5,00	142	2,882	
mar_inn	>= 5,00	25	2,432	,565
	< 5,00	141	2,571	
org_inn	>= 5,00	25	2,840	,894
	< 5,00	141	2,869	

Table 6.47: t-test analysis for existence of dominant competitor in the sector

"The competition is intense in this sector"

	p1	N	Mean	Sig.
innovs	>= 4,00	153	2,854	**,048**
	< 4,00	15	2,405	
incprod_inn	>= 4,00	153	3,166	,371
	< 4,00	15	2,911	
radprod_inn	>= 4,00	153	2,539	,618
	< 4,00	15	2,733	
prod_inn	>= 4,00	153	2,913	,791
	< 4,00	15	2,840	
process_inn	>= 4,00	152	2,939	,149
	< 4,00	15	2,533	
mar_inn	>= 4,00	153	2,617	**,026**
	< 4,00	14	1,929	
org_inn	>= 4,00	152	2,942	**,004**
	< 4,00	15	2,156	

Table 6.48: t-test analysis for ability to competition intensity in the sector

Consequently, market dynamism and competition intensity have significant positive effect on innovativeness, and thus, our initial hypothesis **H18** is supported.

6.1.3.2 Barriers to Innovarions

Another sectoral condition component is barriers to innovations. They can be separated into two categories: indigenous firm barriers and exogenous barriers. After explanatory factor analysis procedure is applied with SPSS, the extracted factor structure of barriers of innovation is presented in ***Table 6.49***.

For this analysis, all of the barriers questions in the survey are placed together into principal component analysis, and five latent factors are extracted. Four of barriers of innovation questions, namely, eg14, eg23, eg25 and eg29 are dropped from further analysis as they spoiled the factor structure according to internal and face validity.

		Factors				
		1	2	3	4	5
Internal Resistance	eg13	,805				
	eg12	,753				
	eg15	,732				
	eg8	,666				
	eg16	,655				
	eg10	,598				
	eg9	,593				
	eg11	,485				
Internal Deficiency	eg2		,834			
	eg1		,803			
	eg3		,790			
	eg4		,623			
	eg26		,599			
Internal Limitations	eg7			,705		
	eg6			,676		
	eg17			,663	,469	
	eg18			,626		
	eg5			,521		
External Limitations	eg21				,749	
	eg20				,685	
	eg22				,681	
	eg24				,580	
	eg30				,423	
External Difficulties	eg28					,822
	eg27					,790

Total Variance Explained: % 62,061

Table 6.49: Factor structure of barriers of innovation

The factors obtained are internal resistance, internal deficiency, internal limitations, external limitations and external difficulties. Confirmatory factor analysis is performed in order to test the factors' consistency. That method is applied according to the findings of

explanatory factor analysis while observed variables attached to the latent factors with fixed error terms. ***Table 6.50*** depicts factor loadings of the confirmatory factor analysis.

Barriers Questions	Factor Loadings
Internal Resistance	
eg8, eg9, eg10. eg11	0.607*, 0.652*, 0.711*, 0.482*
eg12, eg13, eg15, eg16	0.649*, 0.720*, 0.765*, 0.714*
Internal Deficiency	
eg1, eg2, eg3, eg4, eg26	0.785*, 0.807*, 0.875*, 0.697*, 0.684*
Internal Limitations	
eg6, eg7, eg17, eg18, eg5	0.658*, 0.741*, 0.683*, 0.618*, 0.604*
External Limitations	
eg20. eg21, eg22, eg30. eg24	0.797*, 0.605*, 0.653*, 0.445*, 0.720*
External Difficulties	
eg27, eg28	1,028*, 0.634*
**Out of analysis due to factor structure spoiling	*p<0.05

Table 6.50: Factor loadings of CFA for barriers of innovation

The results of this analysis are evaluated by the goodness of fit indices. These indices are exposed in ***Table 6.51***.

Goodness of fit indices	Findings	Reference Value
	Market	
χ^2 / degree of freedom	2.423	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.966	0.9<CFI<1
NFI (Normed Fit Index)	0.944	0.9<NFI<1
RFI (Relative Fit Index)	0.932	0.9<RFI<1
IFI (Incremental Fit Index)	0.966	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.959	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.092	RMSEA<0.08

Table 6.51: Goodness of fit indices of CFA for barriers of innovation

Confirmatory factor analysis evaluates the measurement properties of the explanatory factor analysis. The overall fit statistics for the model demonstrate an acceptance level for barriers of innovation factor structure. Therefore, the factors are consistent and valid.

All of the factor loadings but two (i.e., eg11, eg30) have high (>0.50) and significant ($p<0.05$) values. Still, those two items are also retained since their factor loadings are also

reasonably high (>0.40) and significant (p<0.05). Additionally, reliability analysis with Cronbach α will show that they are reliable scales.

As a result of explanatory and confirmatory factor analyses, barriers of innovations have taken form from five factors namely internal resistance, internal deficiency, external limitations, internal limitations, and external difficulties.

For the reliability of the factors, Cronbach α method is used. ***Table 6.52*** presents α values of barriers factors. Reliability analysis demonstrates that all of the factors are internally consistent and reliable since all α values are greater than 0.70.

Factors	**Number of Question**	**α Value**
Internal Resistance	8	0.860
Internal Deficiency	5	0.873
Internal Limitations	5	0.792
External Limitations	5	0.780
External Difficulties	2	0.784

Table 6.52: Results of reliability analysis for barriers of innovations factors

Correlation analysis is applied once barriers of innovation scales' reliabilities are tested and approved. This analysis inspects one-to-one relationship between the innovativeness and barriers factors. **Table 6.53** illustrates the results and means of the factors. Findings of the correlation analysis give information similar to simple linear regression between two factors. Thus, this analysis is useful to test the drivers model hypotheses.

	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*
1- Innovativeness	2,81	,84	1	,230(**)	,038	,181(*)	,013	-,069
2- Internal Resistance	3,68	,77	(**)	1	,471(**)	,564(**)	,309(**)	,266(**)
3- Internal Deficiency	3,28	,98		(**)	1	,531(**)	,489(**)	,448(**)
4- Internal Limitations	3,24	,87	(*)	(**)	(**)	1	,480(**)	,337(**)
5- External Limitations	3,43	,89		(**)	(**)	(**)	1	,506(**)
6- External Difficulties	3,77	,95		(**)	(**)	(**)	(**)	1

** p < ,01
* p < ,05

Table 6.53: Correlation analyses of barriers of innovation

The amount of variance between variables is convenient for further statistical analyses since factors' standard deviations are between 0.77 and 0.98. According to descriptive

statistics and means of barriers of innovation, main difficulties of companies for innovativeness are internal limitations (such as time and financial limitations, higher risk and cost of innovation) and internal deficiency (lack of technical information and experience, lack of qualified employee and R&D manager etc.). In contrast, the least important barrier is external difficulties (such as difficulties of finding necessary components, materials, technological services; difficulty of adoption of new products by customers, etc.). The importance of difficulty level of barriers of innovation is presented in ***Figure 6.27***, where the scale is 1=extremely important obstacle, 2=very important obstacle, 3=important obstacle, 4=slightly important obstacle, 5= not important obstacle.

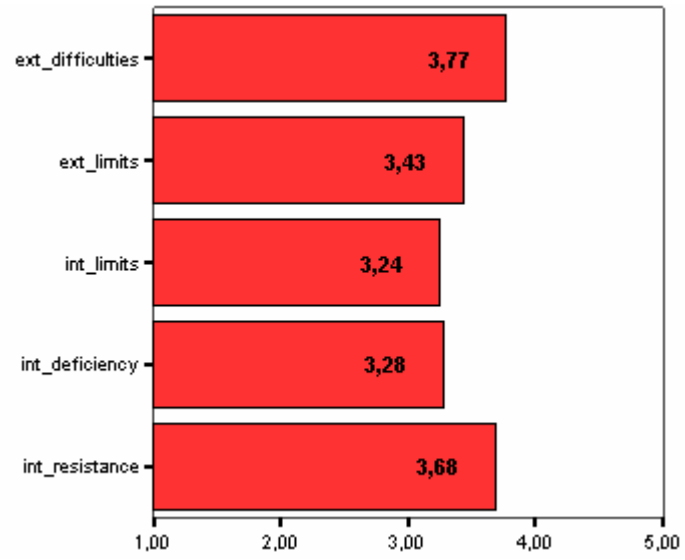


Figure 6.27: Means of barriers of innovation factors

The findings of correlation analysis point out only internal resistance (r:0.230; $p<0.01$), and internal limitations (r:0.181, $p<0.05$) are significantly positive correlated to innovativeness. The positive correlation means that when these barriers are higher, innovativeness level of the firm falls since the scale for the barriers of innovation is reversed. Thus, it seems that the main barrier of innovation is internal resistance.

Consequently, the significant correlation between indigenous barriers of innovation and innovativeness supports the drivers model. However, this analysis can not say much about the direction (cause) of the relationship. For that purpose, the multiple linear regression analyses can provide more insights

The regression model that investigates the effects of barriers of innovation on innovativeness is presented in ***Figure 6.28*** and ***Table 6.54***.

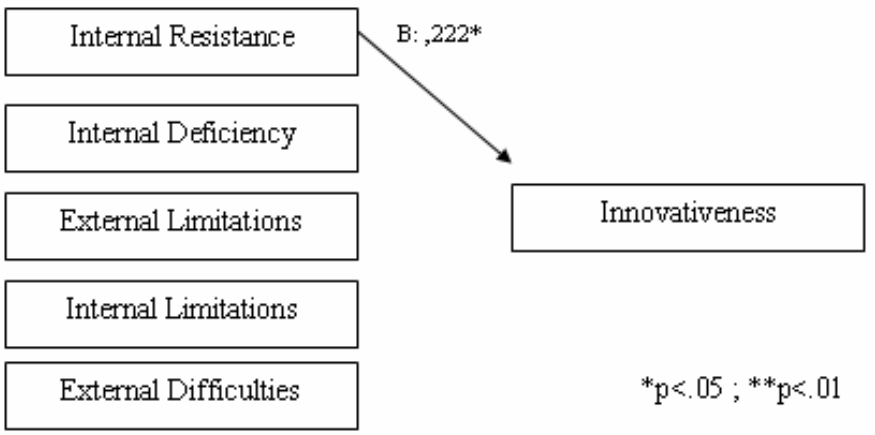


Figure 6.28: Effects of barriers on innovation on innovativeness

Independent Variables	Standard Beta	p Value
Internal Resistance	0.222	,021
Internal Deficiency	-,043	0.667
Internal Limitations	0.148	0.151
External Limitations	-,051	0.602
External Difficulties	-0.139	0.129
R^2 = 0.084 ; p=0.015		

Table 6.54: The effects of barriers of innovation on innovativeness

The regression model of the effects of barriers of innovation on innovativeness is statistically significant ($p<0.05$) and according to this model, the independent variables express 8.4% ($R^2=0.084$) of innovativeness variation.

Even though the model is significant, multiple linear regression analysis reveals only one barrier of innovation, namely internal resistance factor, has statistically significant effects ($\beta=0.222$; $p=0.021$) on innovativeness. But when barriers factors enter separately to multiple linear regression analysis internal resistance and internal limitations are significantly correlated to innovativeness. This finding implies that there are mediating effects between internal barriers to innovation factors.

Post hoc analysis suggests that internal resistance mediated other barriers of innovation factors' effects on innovativeness. Then, a path analysis model for innovation barriers is formed by AMOS v4.0 and it is analyzed according to structural equation modeling method.

Figure 6.29 presents this model with its significantly consistent findings. The model explains 5% of the variability associated with the innovativeness. The results expose that

indigenous barriers significantly hinder innovative capabilities of firms. But there are not enough findings to claim that exogenous barriers obstruct innovativeness. Thus, initial hypotheses **H20** is supported, but **H21** is not supported. Innovativeness is directly affected by internal resistance which is fed by internal limitations and deficiencies.

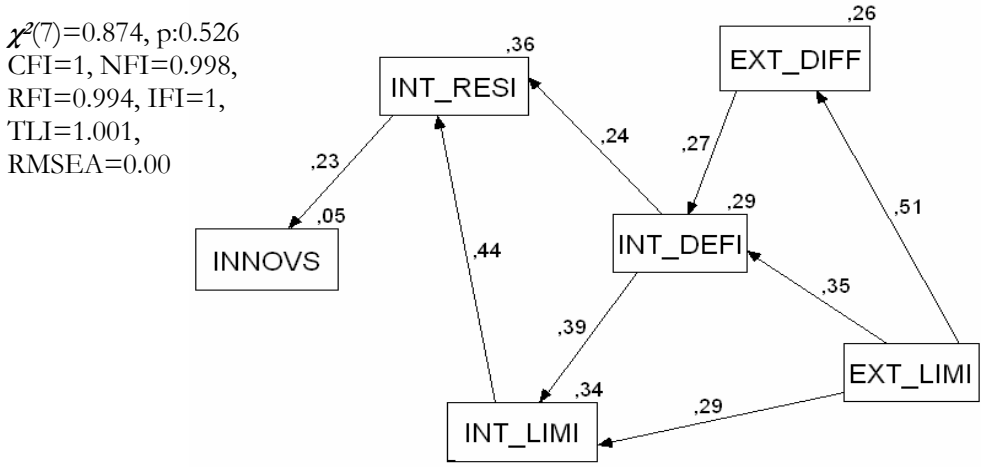


Figure 6.29: Path analysis of barriers of innovation

6.3.1.3 Public Incentives

Public regulations and incentives encourage firms toward innovative activities, either through government/private institution funding or via tax incentives for R&D expenditures. There are several institutions in Turkey which support R&D and innovation activities in manufacturing firms by providing incentives. In this part, the effects of tax rebates and of R&D support from TTGV, TUBITAK, KOSGEB, Halkbank and EU Sixth Framework Program are examined.

Student t-tests are performed in order to analyze the effect of these incentives. The firms which indicated they utilized tax rebates for R&D or innovation (≥2 in the scale), judged against the other firms (<2 in the scale) in terms of innovativeness level (***Figure 6.30***).

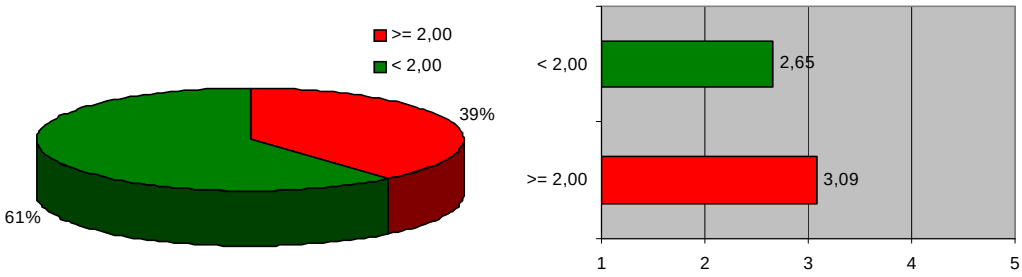


Figure 6.30: Usage of tax rebates

The results imply that only 39% of firms in the sample is profiting from tax rebates for their R&D and innovation activities. The effects of this public regulation are reported in ***Table 6.55***. Findings expose that R&D tax rebates are significantly useful and they make a positive difference for innovative capability ($p<0.01$). Therefore, firms that use tax rebates are more innovative.

Tax Rebates

		N	Mean	Sig.
innovs	>= 2,00	65	3,09	**,001**
	< 2,00	102	2,65	

Table 6.55: Effects of tax rebates usage on innovativeness

Similarly, firms which indicated they utilized R&D or innovation supports at least from one of TTGV, TUBITAK, KOSGEB, Halkbank and EU Sixth Framework Program (≥2 in the scale), judged against the other firms (<2 in the scale) in terms of innovativeness level (***Figure 6.31***).

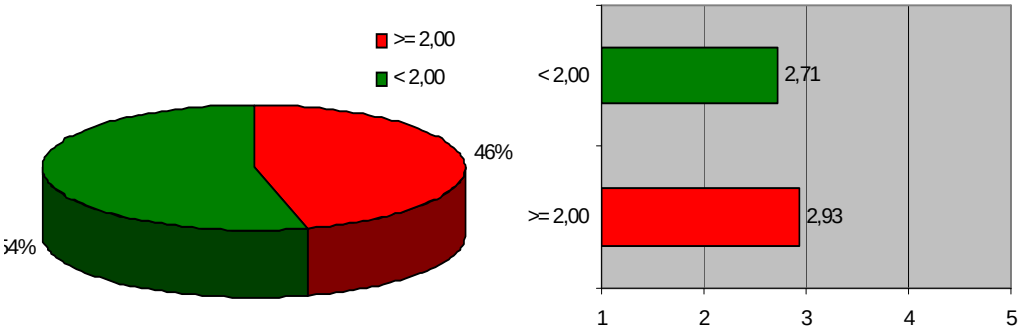


Figure 6.31: Usage of public incentives

The results imply that only 46% of firms in our sample is profiting from public incentives provided by at least one of those institutions.

Public Incentives

		N	Mean	Sig.
innovs	>= 2,00	77	2,93	**,093**
	< 2,00	91	2,71	

Table 6.56: Effects of public incentives on innovativeness

The effects of these public incentives are reported in ***Table 6.56***. Findings indicate that R&D incentives are significantly useful and they make a positive difference for innovative capability ($p<0.1$). Therefore, firms that use public incentives for their R&D activities are more innovative.

The results expose that public incentives for R&D significantly hinder innovative capabilities of firms. Thus, initial hypotheses **H19** is supported.

6.1.4 General Firm Characteristics

General firm characteristics include firm age (in terms of first production year), firm size (in terms of number of full-time employee), firm ownership status and existence of foreign capital. Those characteristics act in fact as a control variable, thus one-way ANOVA or independent student t-tests are conducted while everything else are kept equal in order to analyze their effects (if any) on innovativeness.

The one-way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable (firm characteristic) by a single independent variable (innovativeness). This analysis is useful to test the hypothesis that means of several factors are equal. This technique is an extension of the independent student t-test. Further, in order to find which mean differs, post-hoc Duncan test procedure is used.

Table 6.57 exposes the outcome of correlation analysis which is also applied in order to inspect one-to-one relationship between firm characteristics and innovativeness factors.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1- Innovativeness	1	-,017	,016	,201(*)	,211(*)	-,118	,046	,085	,014
2- Start Year of production		1	-,891(**)	-,246(**)	-,462(**)	,084	-,308(**)	,201(*)	,297
3- Firm Age		(**)	1	,190(*)	,467(**)	-,137	,319(**)	-,158(*)	-,376(*)
4- Number of Employee	(*)	(**)	(*)	1	,420(**)	-,261(**)	,195(*)	,076	,096
5- Firm Size	(*)	(**)	(**)	(**)	1	-,313(**)	,409(**)	,082	-,457
6- Family Company				(**)	(**)	1	-,096	-,372(**)	,012
7- Ownership Status		(**)	(**)	(*)	(**)		1	-,037	-,144
8- Existence of Foreign Capital		(*)	(*)			(**)		1	085
9- Share of Foreign Capital									1

** p < ,01
* p < ,05

Table 6.57: Correlation analysis of firm characteristics

Among the factors that are directly related to drivers model hypotheses (marked with red in the Table 5.8), only firm size (r:0.211; p<0.05) is significantly correlated to innovativeness. ***Figure 6.32*** illustrates first year of production of firms in our sample.

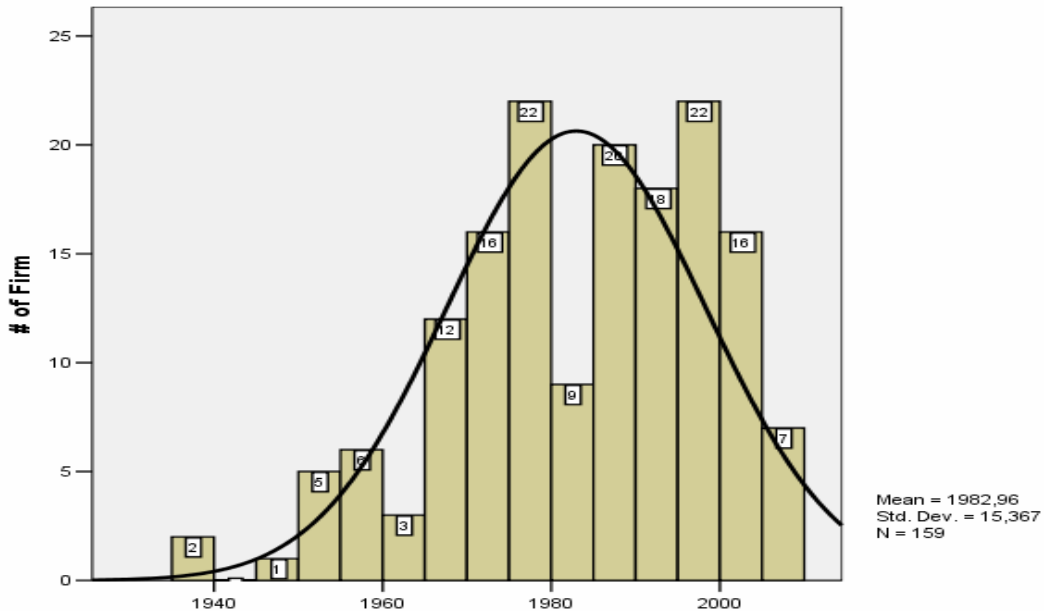
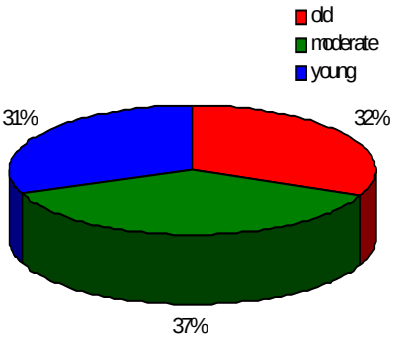


Figure 6.32: First year of production

According to first year of production, firms are divided into three categories: old firms (before 1975), moderate firms (1975 to 1992), and young firms (1992 to present). To analyze the effect of firm age with using one-way ANOVA, innovativeness level of old, moderate and young firms is compared and the initial hypothesis of their means are equal (Ho: $\mu_{old} = \mu_{moderate} = \mu_{young}$) is tested (***Figure 6.33***).

innovativeness

	N	Mean	Sig.
old	50	2,85	,974
moderate	59	2,82	
young	49	2,82	
Total	158	2,83	



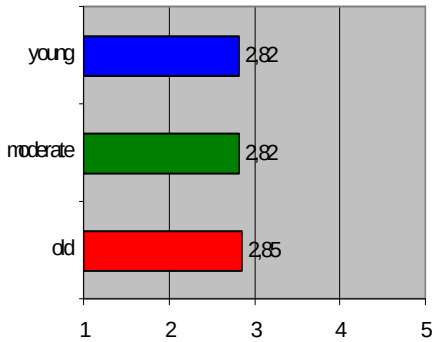


Figure 6.33: Effects of firm age

There is a balanced firm distribution in the sample according to firm age: 37% moderate, 32% old and 31% young. Findings of the one-way ANOVA analysis show that there is not a

significant difference of innovativeness level between these three groups. Therefore, initial hypothesis which foresees that older firms are more innovative (**H2**) is not supported.

For the classification of firms regarding their size, a widely accepted EU classification of firm size classification is used. As suggested earlier, firms are divided into three categories according to their number of full-time employees: small firms (up to 50 employees), medium sized (50 to 250 employees), and large firms (250+ employees). To analyze the effect of firm size with using one-way ANOVA, innovativeness level of small, medium and large firms is compared and the initial hypothesis of their means are equal (Ho: $\mu_{small} = \mu_{medium} = \mu_{large}$) is tested (***Figure 6.34***).

innovativeness

	N	Mean	Sig.
small	31	2,51	,040
medium	61	2,91	
large	33	3,03	
Total	125	2,84	

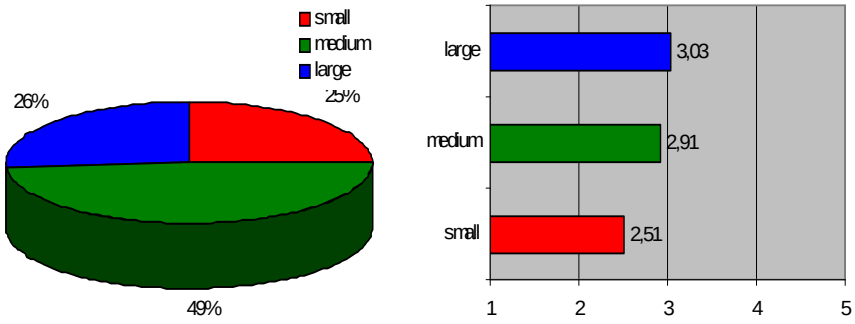


Figure 6.34: Effects of firm size

There is a nearly balanced firm distribution in the sample according to firm size: 25% small, 49% medium and 26% large. Findings of the one-way ANOVA analysis report that innovativeness level of these three groups significantly differ. Hence, there is a significant relationship between company size and implementation of innovativeness practices in companies. ***Table 6.58*** indicates post-hoc Duncan test procedure that determines which firms are significantly more innovative in terms of firm size.

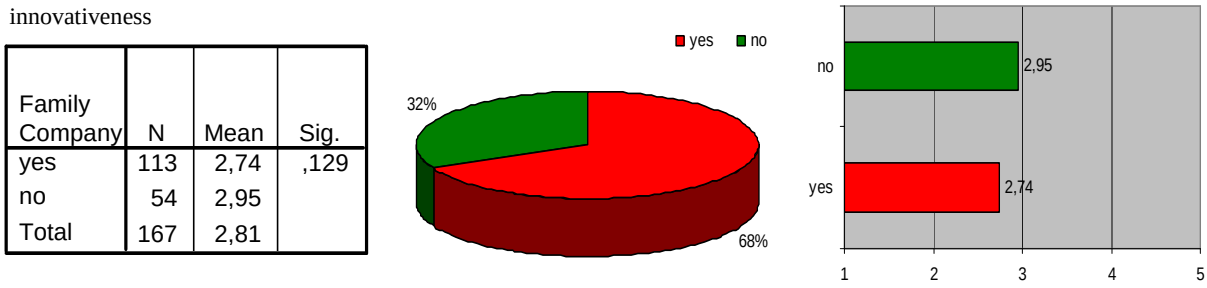
innovativeness

		Subset for alpha = .05	
firm size	N	1	2
small	31	2,5104	
medium	61		2,9138
large	33		3,0306

Table 6.58: Post-hoc Duncan test for firm size

The results reveal that large- and medium-size companies are performing better than the small-size companies in implementing innovations. Although, there is no significant difference between medium- and large-sized companies from this aspect, initial hypothesis which foresees that large firms are more innovative (**H1**), is supported.

Ownership status is examined under two phases, first whether the firm is a family establishment or not; and second, whether the firm is "joint stock company" or "limited partnership". To analyze the effect of family establishment and ownership status by using independent student t-test (***Figure 6.35*** and ***Figure 6.36*** respectively), the innovativeness level of firms is compared, and the initial hypotheses of means equality are tested.

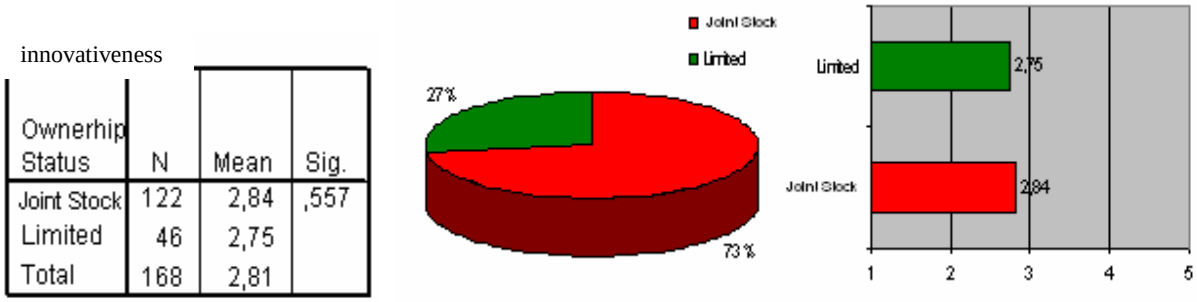


innovativeness

Family Company	N	Mean	Sig.
yes	113	2,74	,129
no	54	2,95	
Total	167	2,81	

Figure 6.35: Effects of family ownership

68% of firms in the sample announced that they are family establishment. Despite the fact that family owned firms are less innovative, findings expose that there is not a significant difference of innovativeness level between these two groups.



innovativeness

Ownerhip Status	N	Mean	Sig.
Joint Stock	122	2,84	,557
Limited	46	2,75	
Total	168	2,81	

Figure 6.36: Effects of ownership status

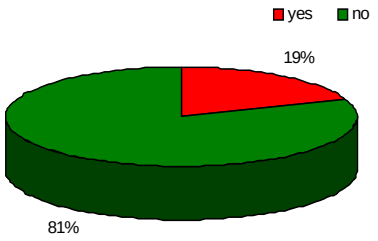
73% of firms in the sample announced that their ownership status is joint stock company. Despite the fact that limited partnership firms are less innovative, findings show that there is not a significant difference of innovativeness level between these two groups. Therefore, as a result of both correlation and student t-test analyses, initial hypothesis which foresees that joint stock companies/not family owned firms are more innovative (**H3**) is not supported.

Foreign capital is examined under two phases, first whether the firm has direct foreign capital or not; and second, between firms with foreign capital, whether the share of foreign capital is 100%. To analyze the effect of existence of foreign capital and share of foreign capital (***Figure 6.37*** and ***Figure 6.38*** respectively) with using independent student t-test and

one way ANOVA, innovativeness level of these groups is compared, and the initial hypotheses of the means equality are tested.

innovativeness

Foreign Capital	N	Mean	Sig.
yes	32	2,96	,275
no	136	2,78	
Total	168	2,81	



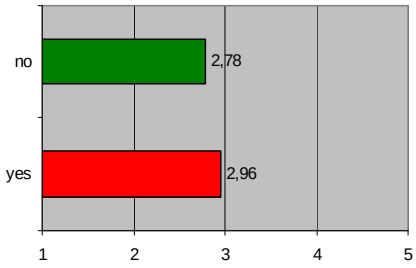
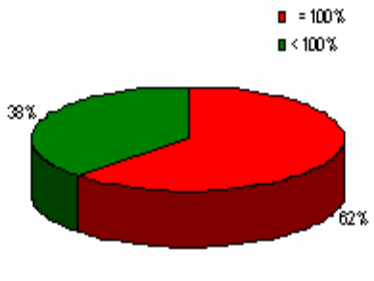


Figure 6.37 : Effects of foreign capital

The majority (81%) of companies in the sample has domestic capital only. The fraction of companies with foreign capital is 19% and the share of foreign capital averages 83%. Despite the fact that firms with foreign capital are more innovative, findings indicate that there is not a significant difference of innovativeness level between these two groups.

innovativeness

Share of foreign capital	N	Mean	Sig.
= 100%	20	2,92	,420
< 100%	12	3,14	



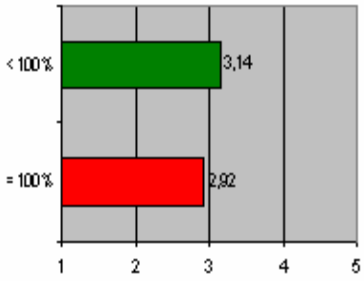


Figure 6.38: Effects of share of foreign capital

There are 32 of firms in the sample which possess direct foreign capital. In 62% of those firms the share of foreign capital is 100%. Despite the fact that firms which have 100% direct foreign capital are less innovative, findings of the student t-test analysis demonstrate that there is not a significant difference of innovativeness level between these two groups.

Therefore, as a result of both correlation and student t-test analyses, initial hypothesis which foresees that firms with foreign capital are less innovative (**H3**) is not supported. In fact, foreign capital is not a significant factor for innovative capability in our sample.

6.2 Complementary Analyses on the Drivers of Innovativeness Model

The statistical analyses in the previous section deal with innovation determinants and their effects on innovativeness level of a firm. However, modeling the innovation at firm level is a difficult objective; in addition to the essential drivers of innovativeness recently mentioned, there are also additional features which contribute to firm's innovative capability. Here, these additional features will be discussed and their effects on innovativeness will be examined with one-way ANOVA and student t-tests analyses.

Firstly, managerial strategies such as production investment in other countries, existence of written strategic plan, competition strategies (price, quality, spectrum of targeted market, width of product spectrum) and top management strategies will be investigated.

It is reasonable that firms that have production investments in other countries (outside Turkey) have better performance results and thus are more innovative. In order to analyze the effect of production investments, innovativeness level of firms is compared, and the initial hypothesis of means equality is tested with using student t-test analysis (***Figure 6.39***).

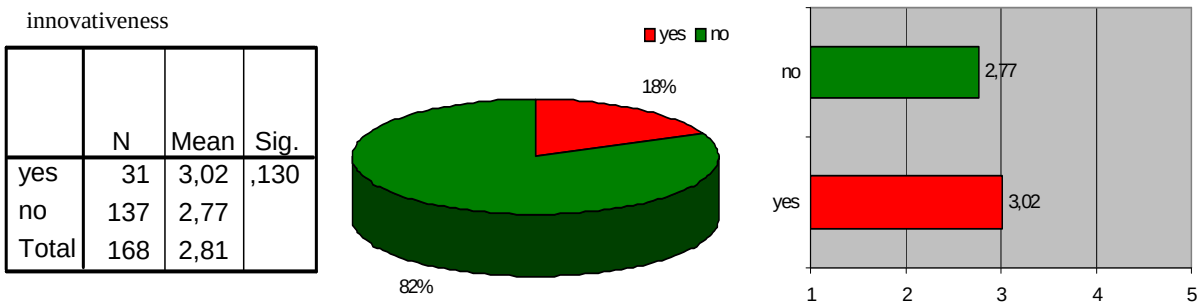
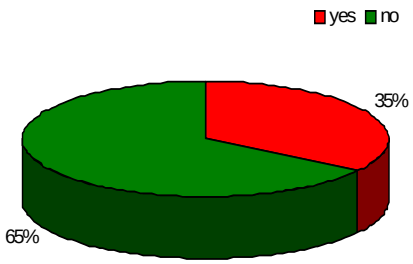


Figure 6.39: Effects of production investment in other countries

Only 31 firms in our sample (18%) have production investments in other countries. Even though the innovativeness level of these companies is higher than other firms, this difference is not statistically significant. However, 27 of the remaining 137 firms are in fact planning to realize production investments in other countries in five years. When student t-test is performed after firms that have production investments in other countries grouped with firms that are planning to have (35% of our sample), the positive effect of this analysis becomes significant ($p<0.1$) (***Figure 6.40***).

innovativeness

	N	Mean	Sig.
yes	58	2,98	,064
no	110	2,73	
Total	168	2,81	



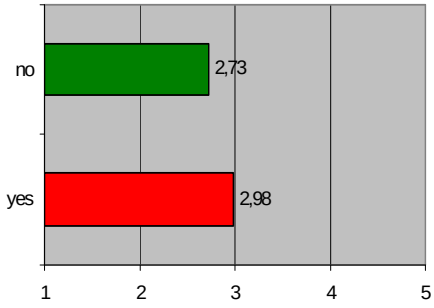


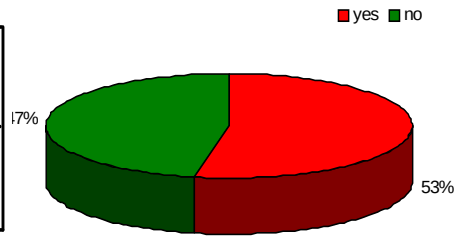
Figure 6.40: Effects of production investment and plan in other countries

Written strategic plan is essential for a well-organized company, not only for innovativeness but also for various performance measures. ***Figure 6.41*** demonstrates the effect of existence of strategic plan in a company in terms of innovativeness. Unfortunately, only 53% of firms in our sample have a written strategic plan. The findings support that firms with a written strategic plan are significantly more innovative ($p<0.01$) than other firms.

Moreover, the time horizon of this plan is also critical. According to findings, firms prefer mostly having strategic plan covering three or five years of period; the time horizon significantly makes difference, and the longer horizon of this plan denotes higher innovative capability (***Figure 6.42***).

innovativeness

	N	Mean	Sig.
yes	89	3,01	,001
no	79	2,60	
Total	168	2,81	



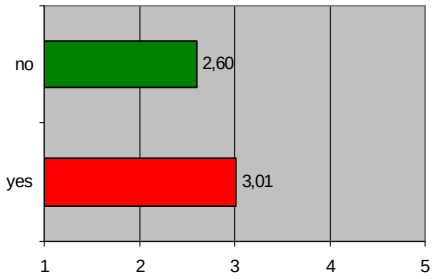


Figure 6.41: Effect of existence of written strategic plan

innovativeness

	N	Mean	Sig.
0	79	2,60	,001
1	9	2,48	
2	4	2,80	
3	27	2,99	
4	2	2,87	
5	36	3,05	
10	9	3,17	
15	2	4,71	
Total	168	2,81	

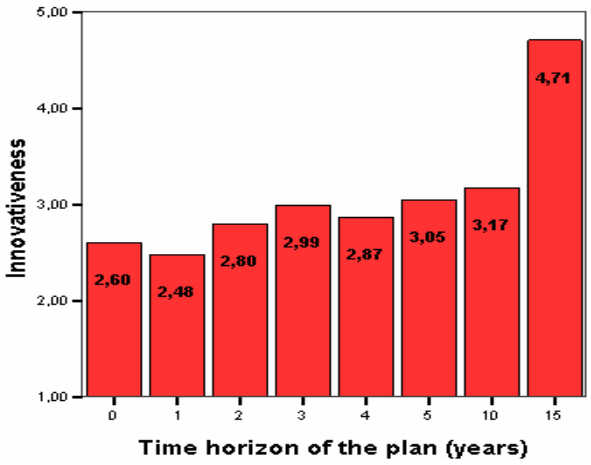


Figure 6.42: Effect of time horizon of written strategic plan

Competition strategies depend mostly on four aspects: price, quality, focus (targeted markets) and product spectrum. Innovation tendency of a firm is an important indicator to determine these competition strategies. In this part, analyses will try to explore which competition strategy is related to which innovation types. ***Figure 6.43*** illustrates price strategies in our sample.

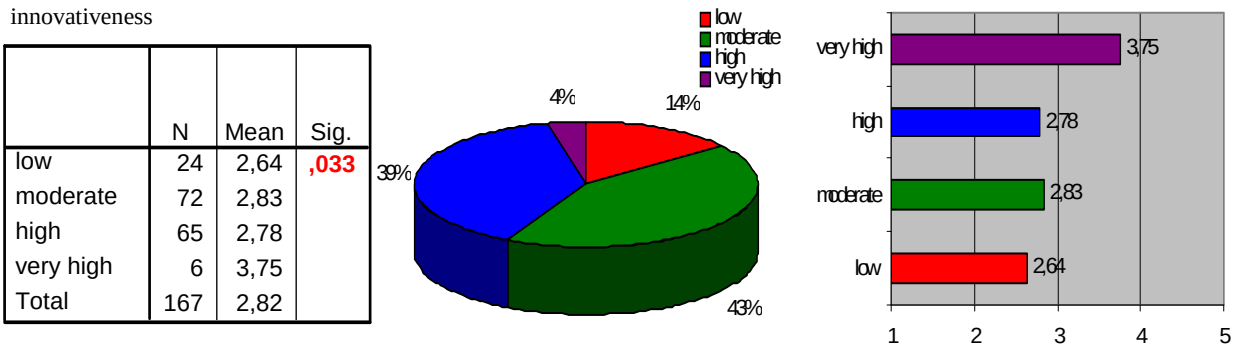


Figure 6.43: Effect of price strategies

Findings reveal that innovative firms sell their product at relatively very high price (4% of sample). In other words, firms which sell their product at relatively very high price are significantly more innovative than their competitors in the market. ***Table 6.59*** indicates these firms are better in every innovation type except organizational innovations, and they concentrate mainly to radical product innovations.

	Price	N	Mean	Sig.
innovs	= very high	6	3,75	,005
	< very high	161	2,78	
incprod_inn	= very high	6	4,06	,031
	< very high	161	3,11	
radprod_inn	= very high	6	4,25	,003
	< very high	161	2,49	
prod_inn	= very high	6	4,13	,002
	< very high	161	2,86	
process_inn	= very high	6	3,73	,048
	< very high	160	2,88	
mar_inn	= very high	6	3,67	,013
	< very high	160	2,52	
org_inn	= very high	6	3,48	,136
	< very high	160	2,86	

Table 6.59: Effect of price strategies on innovation types

Figure 6.44 presents the quality strategies in our sample, 43% of the firms claimed their products are very high quality. Findings reveal firms which produce relatively very high quality products are significantly more innovative than others. ***Table 6.60*** indicates these firms are better especially in process innovations and organizational innovations. They also prefer to make incremental product innovations rather than radical ones. This implies that quality strategies are related mainly to product improvements.

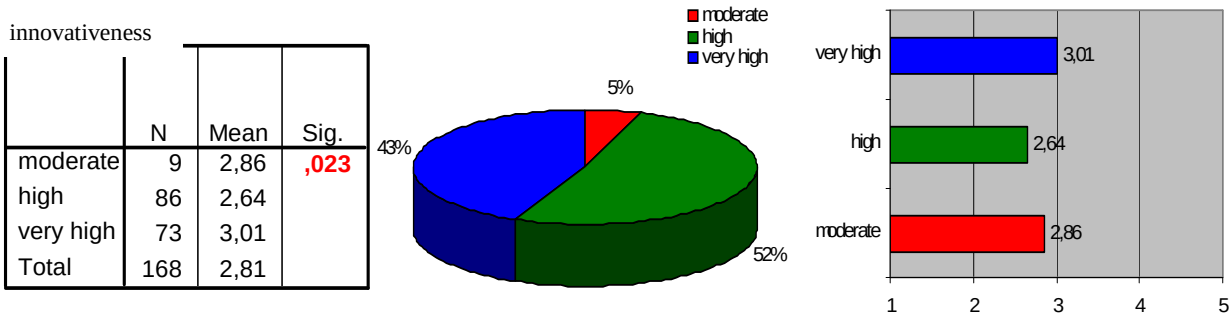


Figure 6.44: Effect of quality strategies

	Qaulity	N	Mean	Sig.
innovs	= very high	73	3,01	,008
	< very high	95	2,66	
incprod_inn	= very high	73	3,32	,055
	< very high	95	3,01	
radprod_inn	= very high	73	2,65	,457
	< very high	95	2,48	
prod_inn	= very high	73	3,05	,104
	< very high	95	2,79	
process_inn	= very high	72	3,10	,035
	< very high	95	2,76	
mar_inn	= very high	73	2,71	,124
	< very high	94	2,44	
org_inn	= very high	73	3,17	,001
	< very high	94	2,64	

Table 6.60: Effect of quality strategies on innovation types

Figure 6.45 exposes the targeted market strategies in our sample; only 13% of firms claimed their target markets' spectrum is narrow, which means they specialize only for a few market in the sector. Findings reveal focusing only a few markets is an unfavorable strategy for innovativeness; the larger number of targeted market provides the higher innovative capability. Firms which target multiple markets are significantly more innovative than others.

innovativeness

	N	Mean	Sig.
very narrow	5	2,17	,003
narrow	17	2,49	
mediocre	46	2,65	
broad	71	2,87	
very broad	29	3,25	
Total	168	2,81	

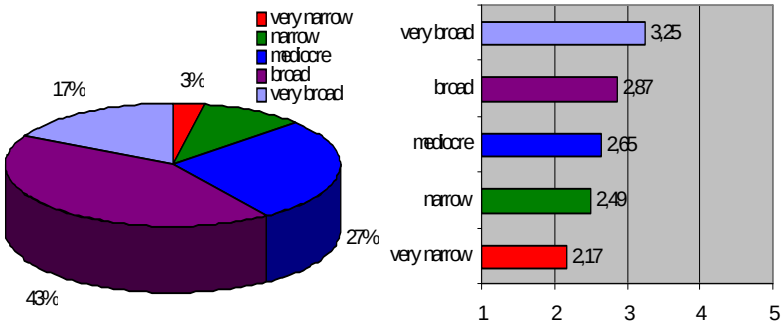


Figure 6.45: Effect of targeted market strategies

Post-hoc Duncan test procedure signifies the difference more clearly between market strategies in terms of innovativeness (***Table 6.61***). Therefore, firms which deal with multiple markets are significantly more innovative than firms which have marketing channels to a limited number of markets.

innovativeness

Targeted markets	N	Subset for alpha = .05		
		1	2	3
very narrow	5	2,1689		
narrow	17	2,4894	2,4894	
mediocre	46	2,6456	2,6456	2,6456
broad	71		2,8686	2,8686
very broad	29			3,2501

Table 6.61: Post-hoc Duncan test for targeted markets

Table 6.62 reveals that firms which target multiple markets are better in every innovation type compared to other firms.

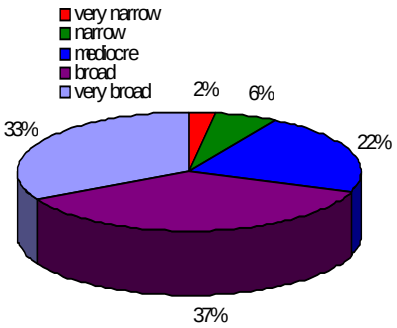
	Targeted Markets	N	Mean	Sig.
innovs	= very broad	29	3,25	,002
	< very broad	139	2,72	
incprod_inn	= very broad	29	3,60	,010
	< very broad	139	3,05	
radprod_inn	= very broad	29	3,10	,023
	< very broad	139	2,44	
prod_inn	= very broad	29	3,39	,005
	< very broad	139	2,81	
process_inn	= very broad	29	3,45	,002
	< very broad	138	2,79	
mar_inn	= very broad	29	2,95	,036
	< very broad	138	2,48	
org_inn	= very broad	29	3,21	,046
	< very broad	138	2,80	

Table 6.62: Effect of market strategies on innovation types

Figure 6.46 highlights the width of product spectrum strategies of firms. Only 8% of the firms in the sample claimed that their product spectrum is narrow, which means they produce mostly a single type product in the market. Findings point out that focusing only on a few products is not a favorable strategy for innovativeness. The width of the product spectrum provides higher innovative capability. Thus, firms which produce multiple type of product are significantly more innovative than others.

innovativeness

	N	Mean	Sig.
very narrow	4	2,27	,016
narrow	10	2,34	
mediocre	37	2,67	
broad	62	2,77	
very broad	55	3,09	
Total	168	2,81	



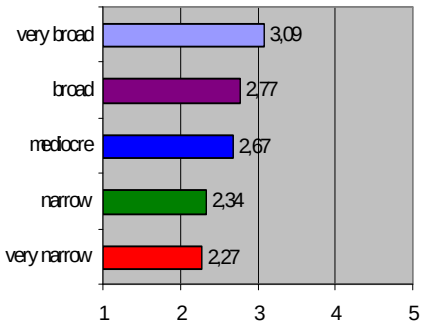


Figure 6.46: Effect of product spectrum strategies

Post-hoc Duncan test procedure emphasizes more clearly the difference between product strategies in terms of innovativeness. Therefore, firms which have very broad product spectrum are significantly more innovative than firms which have narrow spectrum.

Table 6.63 depicts firms which have very broad product spectrum are better especially in marketing and radical product innovations compared to other firms.

	Product Spectrum	N	Mean	Sig.
innovs	= very broad	55	3,09	,003
	< very broad	113	2,68	
incprod_inn	= very broad	55	3,33	,112
	< very broad	113	3,05	
radprod_inn	= very broad	55	3,21	,000
	< very broad	113	2,24	
prod_inn	= very broad	55	3,28	,001
	< very broad	113	2,72	
process_inn	= very broad	55	3,09	,095
	< very broad	112	2,81	
mar_inn	= very broad	55	2,92	,003
	< very broad	112	2,38	
org_inn	= very broad	55	3,05	,101
	< very broad	112	2,78	

Table 6.63: Effect of product strategies on innovation types

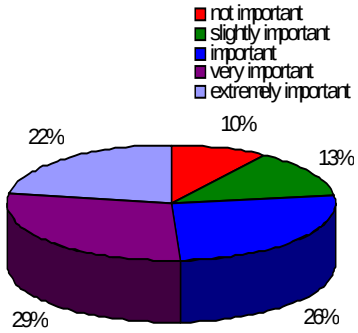
As a summary of competition strategies, it is found that innovative firms fabricate more quality product and sell them at a higher price; also, they target many markets and their product spectrum is large.

On the other hand, top management strategies such as entering new markets or strengthening firm's position into current market, focusing on new products development or making improvements for existing products, putting resource on new technology development or improving existed technology, profiting from other firms' technologies or improving other firms' technologies can all give very useful insights about firm's innovative capability.

Figure 6.47 reports the importance level of making small improvements for existing products in current market strategy. 10% of firms claim they do not give importance to this strategy, and 22% designate this strategy as extremely important for them. ***Table 6.64*** summarizes the effects of this strategy in terms of innovation types.

innovativeness

	N	Mean	Sig.
not important	16	2,40	,051
slightly important	22	2,49	
important	44	2,88	
very important	48	2,90	
extremely import	37	2,98	
Total	167	2,81	



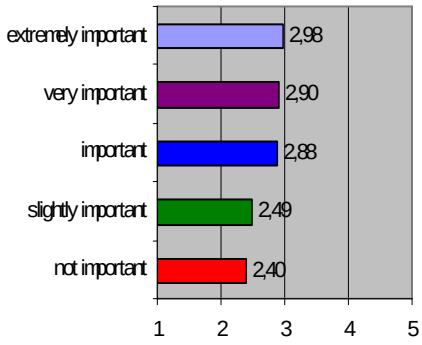


Figure 6.47: Making small improvement for existing product in current market

	Importance Level	N	Mean	Sig.
innovs	>= Very important	85	2,94	,050
	< Very important	82	2,68	
incprod_inn	>= Very important	85	3,20	,466
	< Very important	82	3,08	
radprod_inn	>= Very important	85	2,64	,426
	< Very important	82	2,46	
prod_inn	>= Very important	85	2,97	,356
	< Very important	82	2,83	
process_inn	>= Very important	85	3,11	,007
	< Very important	81	2,68	
mar_inn	>= Very important	84	2,65	,277
	< Very important	82	2,46	
org_inn	>= Very important	85	2,99	,125
	< Very important	82	2,75	

Table 6.64: Effect of making small improvement for existing product in current market

Findings reveal that firms which indicate making small improvement for existing products is at least very important, are slightly more innovative than other ones; and these firms are especially better in process innovations compared to other firms.

Figure 6.48 illustrates the importance level developing new products for current market strategy. 6% of firms claim they do not give importance to this strategy, and 37% designate this strategy as extremely important for them. ***Table 6.65*** summarizes the effects of this strategy in terms of innovation types.

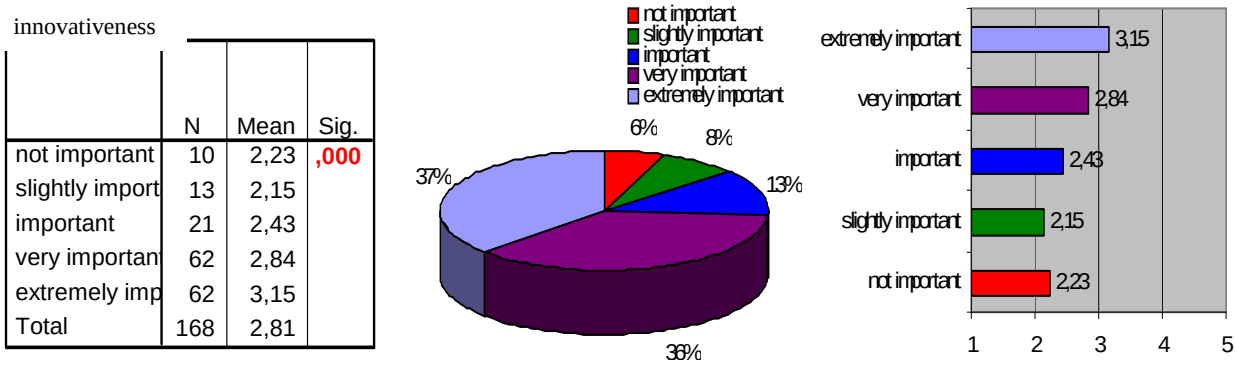


Figure 6.48: Developing new products for current market

	Importance Level	N	Mean	Sig.
innovs	>= Very important	124	3,00	,000
	< Very important	44	2,30	
incprod_inn	>= Very important	124	3,30	,001
	< Very important	44	2,71	
radprod_inn	>= Very important	124	2,95	,000
	< Very important	44	1,45	
prod_inn	>= Very important	124	3,15	,000
	< Very important	44	2,21	
process_inn	>= Very important	123	3,02	,016
	< Very important	44	2,58	
mar_inn	>= Very important	123	2,81	,000
	< Very important	44	1,85	
org_inn	>= Very important	123	2,98	,018
	< Very important	44	2,56	

Table 6.65: Effect of developing new products for current market

Findings reveal that firms which indicate developing new products for their current market as at least very important are strongly more innovative than other ones. These firms are better in every innovation type as well compared to other firms.

Figure 6.49 depicts the importance level of entering new markets with existing products strategy. 5% of firms claim they do not give importance to this strategy, and 21% announce this strategy as extremely important for them. ***Table 6.66*** summarizes the effects of this strategy in terms of innovation types.

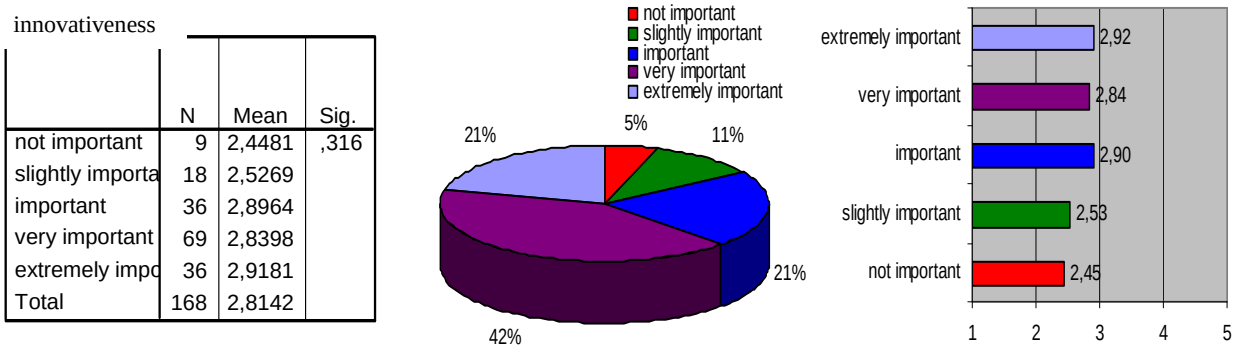


Figure 6.49: Entering new markets with existing products

	Importance Level	N	Mean	Sig.
innovs	>= Very important	105	2,87	,299
	< Very important	63	2,73	
incprod_inn	>= Very important	105	3,16	,840
	< Very important	63	3,12	
radprod_inn	>= Very important	105	2,63	,402
	< Very important	63	2,44	
prod_inn	>= Very important	105	2,94	,531
	< Very important	63	2,84	
process_inn	>= Very important	105	3,01	**,085**
	< Very important	62	2,72	
mar_inn	>= Very important	105	2,59	,682
	< Very important	62	2,51	
org_inn	>= Very important	104	2,92	,419
	< Very important	63	2,79	

Table 6.66: Effect of entering new markets with existing products

Findings reveal that firms which indicate entering new markets with existing products is at least very important for them, are not significantly more innovative than others; nor are these firms better in any innovation types compared to other firms except process innovations at α=90% level. The results are extremely consistent since without developing new product for new markets, it is not possible to differentiate from competitors in that market in terms of innovativeness.

Figure 6.50 represents the importance level entering new markets with new products strategy in our sample. 6% of firms claim they do not give importance to this strategy, and 37% announce this strategy is extremely important for them. ***Table 6.67*** summarizes the effects of this strategy in terms of innovation types.

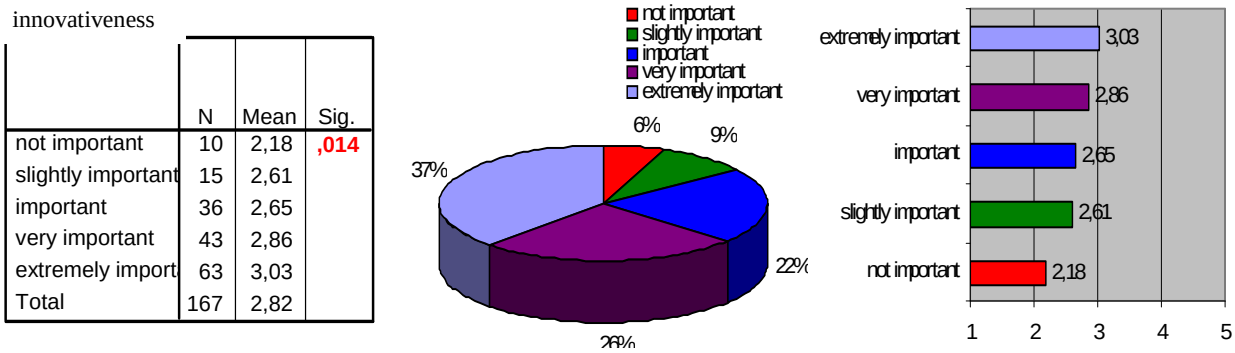


Figure 6.50: Entering new markets with new products

	Importance Level	N	Mean	Sig.
innovs	>= Very important	106	2,96	**,003**
	< Very important	61	2,56	
gen_per	>= Very important	106	3,76	**,021**
	< Very important	60	3,56	
incprod_inn	>= Very important	106	3,19	,438
	< Very important	61	3,06	
radprod_inn	>= Very important	106	2,89	**,000**
	< Very important	61	2,00	
prod_inn	>= Very important	106	3,07	**,008**
	< Very important	61	2,64	
process_inn	>= Very important	105	2,98	,234
	< Very important	61	2,78	
mar_inn	>= Very important	106	2,79	**,000**
	< Very important	60	2,17	
org_inn	>= Very important	105	3,01	**,017**
	< Very important	61	2,62	

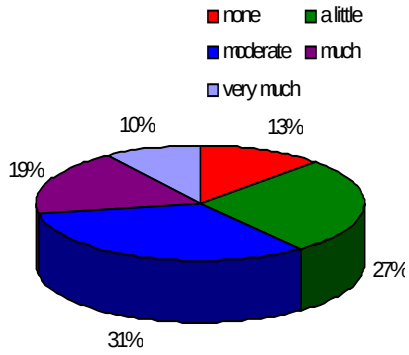
Table 6.67: Effect of entering new markets with new products

Findings reveal that firms, which indicate entering new markets with new products as at least very important, are strongly more innovative than other ones; and these firms are better in every innovation type as well, except incremental product innovations and process innovations. The results are reasonable since new product development necessitates radical product innovations rather than incremental product innovations.

Figure 6.51 exposes how much resource (money) is allocated by firms for new technology development. 13% of firms claimed they did not allocate any, and 10% announced they allocated very much resource. ***Table 6.68*** summarizes the effects of this strategy in terms of innovation types.

innovativeness

	N	Mean	Sig.
none	21	2,06	,000
a little	45	2,64	
moderate	54	2,93	
much	31	3,20	
very much	16	3,25	
Total	167	2,83	



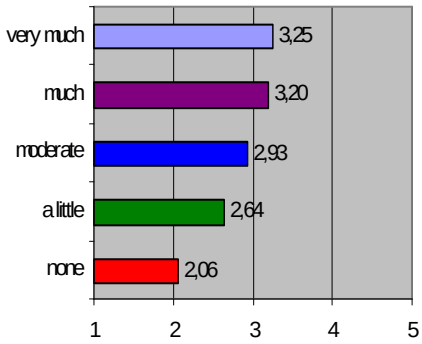


Figure 6.51: Developing new technology

	Resource Allocated	N	Mean	Sig.
innovs	>= much	47	3,22	,000
	< much	120	2,67	
incprod_inn	>= much	47	3,50	,006
	< much	120	3,02	
radprod_inn	>= much	47	2,97	,023
	< much	120	2,41	
prod_inn	>= much	47	3,28	,003
	< much	120	2,78	
process_inn	>= much	47	3,37	,000
	< much	119	2,74	
mar_inn	>= much	46	2,88	,023
	< much	120	2,45	
org_inn	>= much	47	3,31	,000
	< much	119	2,71	

Table 6.68: Effect of developing new technology

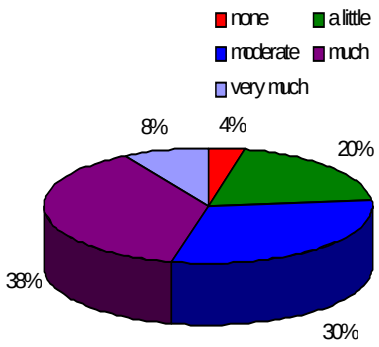
Findings reveal that firms which allocate much or more resource for developing new technology are strongly more innovative than other ones; and these firms are better in every innovation types as well. This fact fortifies the expected positive relationship of technology development and innovativeness.

Figure 6.52 highlights how much resource (money) is allocated by firms for improving their own current technology. 4% of firms claim they did not allocate any, and 8% announced

they allocated very much resource. ***Table 6.69*** summarizes the effects of this strategy in terms of innovation types.

innovativeness

	N	Mean	Sig.
none	6	2,52	,000
a little	33	2,38	
moderate	50	2,74	
much	63	3,04	
very much	14	3,47	
Total	166	2,83	



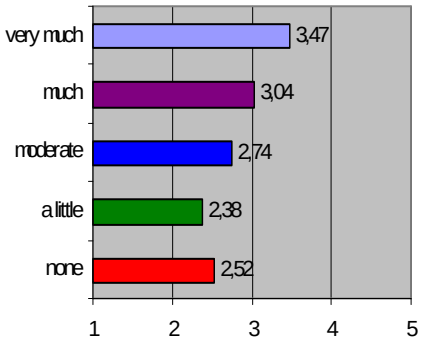


Figure 6.52: Improving its own current technology

	Resource Allocated	N	Mean	Sig.
innovs	>= Much	77	3,1141	,000
	< Much	89	2,5923	
incprod_inn	>= Much	77	3,5108	,000
	< Much	89	2,8727	
radprod_inn	>= Much	77	2,7857	,078
	< Much	89	2,3933	
prod_inn	>= Much	77	3,2169	,000
	< Much	89	2,6809	
process_inn	>= Much	76	3,2395	,000
	< Much	89	2,6539	
mar_inn	>= Much	76	2,7283	,102
	< Much	89	2,4449	
org_inn	>= Much	77	3,2496	,000
	< Much	88	2,5795	

Table 6.69: Effect of improving its own current technology

Findings reveal that firms which allocate much or more resource for improving their own current technology are strongly more innovative than other ones; and these firms are better in every innovation types except marketing innovations. Also, these firms are significantly better for incremental product innovations rather than radical products innovations, which is quite acceptable verdict as well.

Figure 6.53 reports how much resource (money) is allocated by companies for improving technologies developed by other firms. 28% of firms claim they did not allocate any, and 4% announce they allocate very much resource. The difference between the innovativeness levels of firms is not significant for this strategy except between allocating

none and very much resource. ***Table 6.70*** summarizes the effects of this strategy in terms of innovation types.

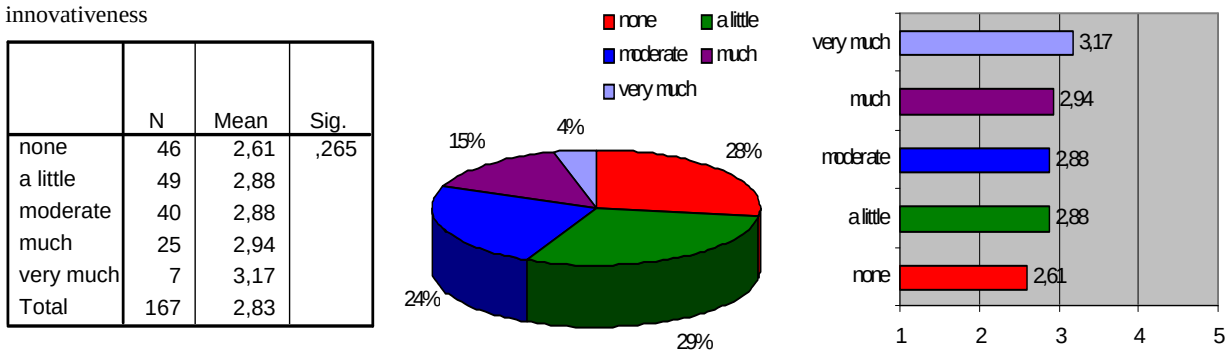


Figure 6.53: Improving technologies developed by other firms

	Resource Allocated	N	Mean	Sig.
innovs	>= Much	32	2,99	,212
	< Much	135	2,79	
incprod_inn	>= Much	32	3,44	**,088**
	< Much	135	3,09	
radprod_inn	>= Much	32	2,69	,595
	< Much	135	2,54	
prod_inn	>= Much	32	3,13	,191
	< Much	135	2,87	
process_inn	>= Much	32	3,25	**,040**
	< Much	134	2,83	
mar_inn	>= Much	32	2,49	,673
	< Much	134	2,59	
org_inn	>= Much	32	3,09	,193
	< Much	134	2,83	

Table 6.70: Effect of improving technologies developed by other firms

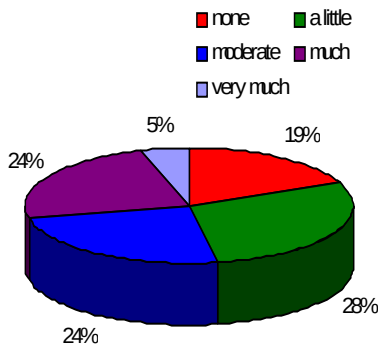
Findings reveal that firms which allocate much or more resource for improving technologies developed by others, are not more innovative than other firms; these companies are better only for process innovations and incremental product innovations at α=90% level. Therefore, utilization and improvement of other firms' technologies is unfavorable for innovative capability.

Figure 6.54 presents how much resource (money) is allocated by firms for utilization of technologies developed by other firms. 19% of firms claim they did not allocate any, and 5% announce they allocate very much resource. The difference between the innovativeness levels

of firms is not significant for this strategy. ***Table 6.71*** summarizes the effects of this strategy in terms of innovation types.

innovativeness

	N	Mean	Sig.
none	31	2,95	,328
a little	48	2,71	
moderate	40	2,73	
much	40	2,86	
very much	8	3,29	
Total	167	2,83	



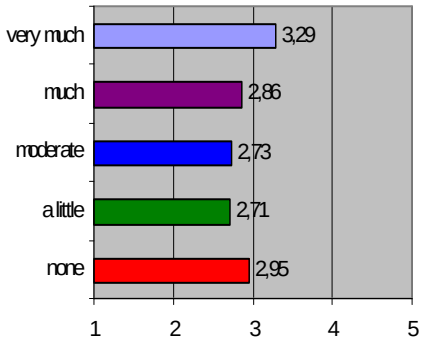


Figure 6.54: Usage of technologies developed by other firms

	Resource Allocated	N	Mean	Sig.
innovs	>= Much	48	2,93	,288
	< Much	119	2,78	
incprod_inn	>= Much	48	3,25	,458
	< Much	119	3,12	
radprod_inn	>= Much	48	2,64	,692
	< Much	119	2,54	
prod_inn	>= Much	48	3,00	,517
	< Much	119	2,89	
process_inn	>= Much	47	3,11	,124
	< Much	119	2,84	
mar_inn	>= Much	48	2,59	,888
	< Much	118	2,56	
org_inn	>= Much	48	3,03	,221
	< Much	118	2,82	

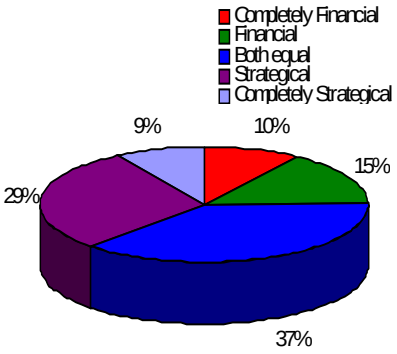
Table 6.71: Effect of usage of technologies developed by other firms

Findings indicate firms which allocate much or more resource for utilization of technologies developed by other firms, are not more innovative than others; these firms are not even significantly better for any innovation types. Therefore, utilization of other firms' technologies is unfavorable for innovative capability.

On the other hand, investment decisions of top management have also an undeniable impact on innovativeness. "Is the main expectation financial return or strategic importance while deciding on an investment?" The answer is related to the firms' short and long-term expectations. ***Figure 6.55*** illustrates the main factors.

innovativeness

	N	Mean	Sig.
Completely Finan	16	2,21	,048
Financial	25	2,82	
Both equal	63	2,90	
Strategical	48	2,85	
Completely Strate	15	2,95	
Total	167	2,81	



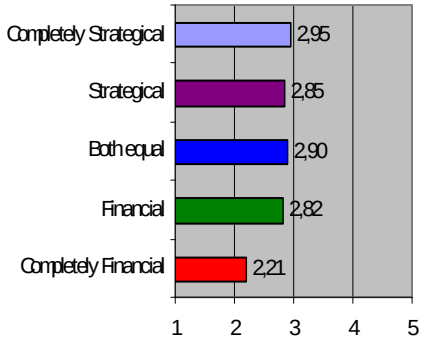


Figure 6.55: Investment decision

25% of firms claim they look for financial return while making an investment decision, and 66% announce they emphasize strategic importance. The difference between the innovativeness levels of firms is significant for this strategy. Thus, firms which look after completely financial return are less innovative. ***Table 6.72*** summarizes the effects of this strategy in terms of innovation types.

	Investment Decision	N	Mean	Sig.
innovs	>= Both equal	126	2,89	**,042**
	< Both equal	41	2,58	
incprod_inn	>= Both equal	126	3,21	,140
	< Both equal	41	2,93	
radprod_inn	>= Both equal	126	2,60	,332
	< Both equal	41	2,35	
prod_inn	>= Both equal	126	2,97	,148
	< Both equal	41	2,70	
process_inn	>= Both equal	125	3,00	**,021**
	< Both equal	41	2,57	
mar_inn	>= Both equal	125	2,61	,338
	< Both equal	41	2,42	
org_inn	>= Both equal	125	2,95	**,075**
	< Both equal	41	2,62	

Table 6.72: Effect of investment decisions

Findings reveal that firms which consider mostly strategic importance while making investment decisions are more innovative than others; and these firms are especially better in process innovations and organizational innovations.

Accordingly, all of the discussed managerial strategies indicate that top management has critical role on innovative capability of firms. Generally, business and financial decisions are taken by top managers, also short and long-term strategies and actions plan are decided by

them. Therefore, top managers' experience and education level are vital factors influencing these strategic decisions. ***Table 6.73*** depicts the career backgrounds of top managers and the differences in terms of innovation types. ***Figure 6.56*** reports the dispersion of top managers' career background and related innovativeness level.

	Top managers career background	N	Mean	Sig.
innovs	Production/procurement	103	2,70	,107
	Finance	16	3,17	
	R&D	22	3,03	
	Marketing/Sales	26	2,84	
	Total	167	2,81	
incprod_inn	Production/procurement	103	3,03	,284
	Finance	16	3,42	
	R&D	22	3,42	
	Marketing/Sales	26	3,17	
	Total	167	3,14	
radprod_inn	Production/procurement	103	2,28	**,005**
	Finance	16	2,88	
	R&D	22	3,41	
	Marketing/Sales	26	2,65	
	Total	167	2,54	
prod_inn	Production/procurement	103	2,73	**,018**
	Finance	16	3,20	
	R&D	22	3,42	
	Marketing/Sales	26	2,95	
	Total	167	2,90	
process_inn	Production/procurement	103	2,87	,872
	Finance	16	2,98	
	R&D	21	3,05	
	Marketing/Sales	26	2,82	
	Total	166	2,90	
mar_inn	Production/procurement	102	2,35	**,002**
	Finance	16	3,38	
	R&D	22	2,90	
	Marketing/Sales	26	2,62	
	Total	166	2,56	
org_inn	Production/procurement	102	2,83	,623
	Finance	16	3,13	
	R&D	22	2,74	
	Marketing/Sales	26	2,97	
	Total	166	2,87	

Table 6.73: Effect of top managers' career background

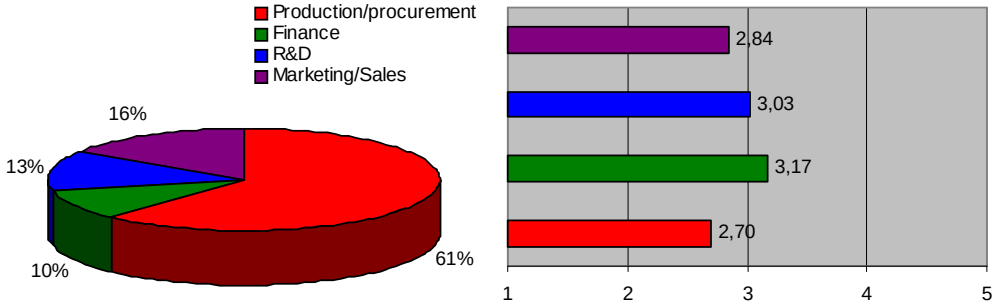


Figure 6.56: Top managers' career background and related innovativeness levels

61% of top managers have production/procurement background, 10% come from finance, 13% from R&D and 16% from marketing/sales. The one-way ANOVA points out that there is significant difference regarding top management education background only for radical product and marketing innovations. Hence, top managers with R&D and finance background are more innovative than production/procurement/marketing/sales background.

To be more precise, a comparison between R&D and production/procurement background reveal that top managers from R&D are significantly more innovative. These managers give especially more importance to radical product and marketing innovations (***Figure 6.57).***

	Top managers background	N	Mean	Sig.
innovs	Production/procuren	103	2,70	**,099**
	R&D	22	3,03	
incprod_inr	Production/procuren	103	3,03	,108
	R&D	22	3,42	
radprod_in	Production/procuren	103	2,28	**,001**
	R&D	22	3,41	
prod_inn	Production/procuren	103	2,73	**,003**
	R&D	22	3,42	
process_in	Production/procuren	103	2,87	,491
	R&D	21	3,05	
mar_inn	Production/procuren	102	2,35	**,038**
	R&D	22	2,90	
org_inn	Production/procuren	102	2,83	,690
	R&D	22	2,74	

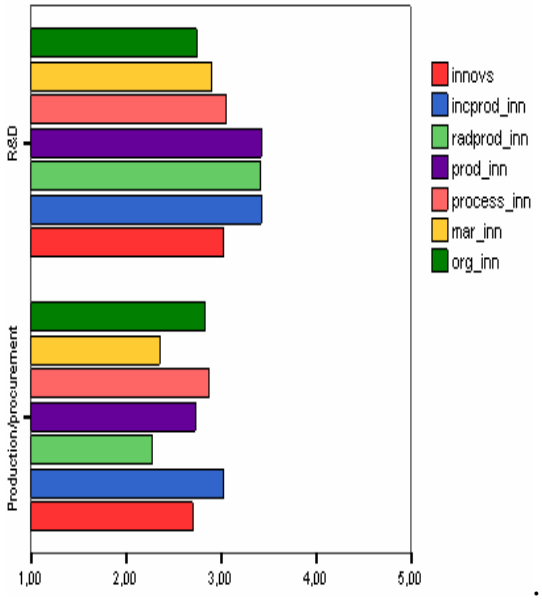


Figure 6.57: Top managers' career background comparison for innovativeness

Findings support the close relationship between managerial strategies and innovations; similarly, organizational culture is also important for innovativeness as previous drivers of innovativeness model analyses proved. Therefore, official written firm procedures such as organization handbook and new product development documents are also useful indicators to assess firm's tendency towards innovativeness.

Figure 6.58 presents the effect of existence of organization handbook in a company in terms of innovativeness. Fortunately, 81% of firms in our sample have an official written organization handbook. The findings support that firms with such a handbook are significantly more innovative ($p<0.01$) that other firms.

innovativeness

	N	Mean	Sig.
yes	136	2,93	,000
no	32	2,33	
Total	168	2,81	

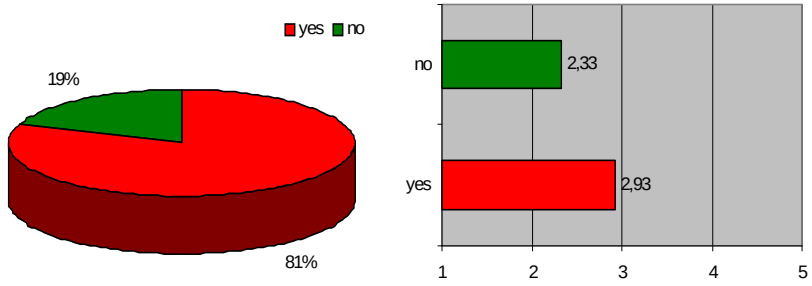


Figure 6.58: Effect of existence of organization handbook to innovativeness

Correspondingly, ***Figure 6.59*** demonstrates the effect of existence of official written handbook in a company for new product development procedures in terms of innovativeness. 64% of firms in our sample have an official written NPD handbook, the findings support that firms with this handbook are significantly more innovative ($p<0.01$) than other firms.

innovativeness

	N	Mean	Sig.
yes	108	2,99	,000
no	60	2,50	
Total	168	2,81	

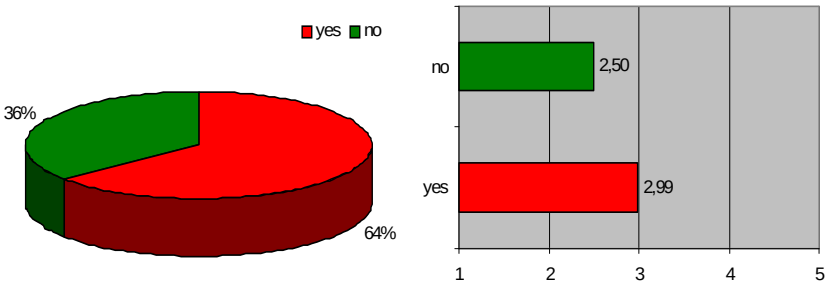


Figure 6.59: Existence of NPD procedures

	NPD handbook	N	Mean	Sig.
innovs	yes	60	2,50	,000
	no	108	2,99	
gen_per	yes	59	3,52	,003
	no	108	3,78	
incprod_inn	yes	60	2,66	,000
	no	108	3,41	
radprod_inn	yes	60	2,15	,006
	no	108	2,78	
prod_inn	yes	60	2,46	,000
	no	108	3,16	
process_inn	yes	59	2,56	,002
	no	108	3,09	
mar_inn	yes	60	2,41	,206
	no	107	2,64	
org_inn	yes	60	2,55	,002
	no	107	3,05	

Table 6.74: Effect of existence of NPD procedures to innovativeness

Table 6.74 examines the NPD handbook effect with student t-test. Findings reveal that existence of such procedures makes a positive significant difference for all of the innovation types except marketing innovation.

Thus far, innovation outputs such as acquired patents, patent applications, design registrations, trademark registrations, etc. have not been analyzed yet. However, it is known that innovation performance can also be measured by numbers of patented or patentable process and products, copyrights, trademarks, and the new productc launched on the market.

The discussion in the section on literature review pointed out that these innovation outputs are important factors in order to compute the creativity and innovative performance, as well as in order to keep the competitive advantage obtained by newly developed products and processes. ***Figure 6.60*** exposes how the firms those have at least one patent differentiate from other firms in terms of various innovation criteria.

	Patent	N	Mean	Sig.
innovs	>= 1	25	3,18	**,003**
	< 1	63	2,62	
gen_per	>= 1	25	3,97	**,002**
	< 1	63	3,61	
incprod_inn	>= 1	25	3,25	,309
	< 1	63	3,02	
radprod_inn	>= 1	25	3,36	**,004**
	< 1	63	2,46	
prod_inn	>= 1	25	3,30	**,027**
	< 1	63	2,79	
process_inn	>= 1	25	3,18	**,068**
	< 1	62	2,74	
mar_inn	>= 1	24	2,99	**,014**
	< 1	63	2,34	
org_inn	>= 1	25	3,19	**,011**
	< 1	63	2,62	

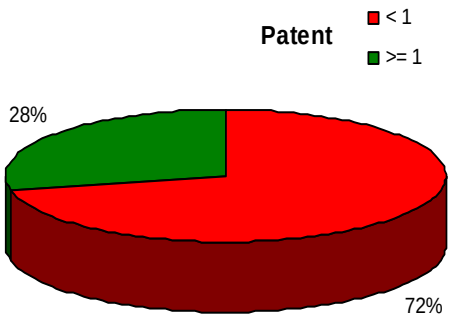


Figure 6.60: Effects of patents

Only 28% of firms in the sample possess at least one patent; however only 88 firms announced this information, thus almost half of firms did not. The results imply that patents are critical indicators to reveal firms innovative capability. Firms which have at least one patent are more innovative and have better general performance. These firms perform better at every innovation type as well, except incremental product innovation; and this is reasonable since patents are taken generally after radical product innovations.

Very similar results are obtained when the same analysis applied for patent application. ***Figure 6.61*** indicates that firms which have at least one on-going patent application (28%) are more innovative (except incremental product and process innovations) and have better general performance.

	Patent Application	N	Mean	Sig.
innovs	>= 1	24	3,30	**,000**
	< 1	62	2,62	
gen_per	>= 1	24	3,96	**,004**
	< 1	62	3,61	
incprod_inn	>= 1	24	3,35	,156
	< 1	62	3,03	
radprod_inn	>= 1	24	3,60	**,000**
	< 1	62	2,42	
prod_inn	>= 1	24	3,45	**,002**
	< 1	62	2,78	
process_inn	>= 1	24	3,08	,226
	< 1	61	2,77	
mar_inn	>= 1	23	3,25	**,001**
	< 1	62	2,34	
org_inn	>= 1	24	3,38	**,000**
	< 1	62	2,57	

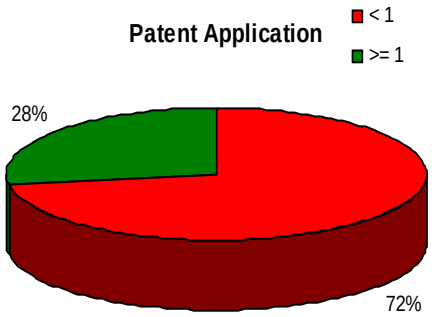


Figure 6.61: Effects of patent applications

Figure 6.62 depicts how the firms those have at least one design registration differentiate from other firms in terms of various innovation criteria.

	Design Registration	N	Mean	Sig.
innovs	>= 1	16	3,49	**,000**
	< 1	67	2,61	
incprod_inn	>= 1	16	3,67	**,007**
	< 1	67	2,99	
radprod_inn	>= 1	16	3,50	**,006**
	< 1	67	2,51	
prod_inn	>= 1	16	3,60	**,001**
	< 1	67	2,79	
process_inn	>= 1	16	3,56	**,001**
	< 1	66	2,65	
mar_inn	>= 1	16	3,38	**,001**
	< 1	67	2,36	
org_inn	>= 1	16	3,41	**,002**
	< 1	67	2,62	

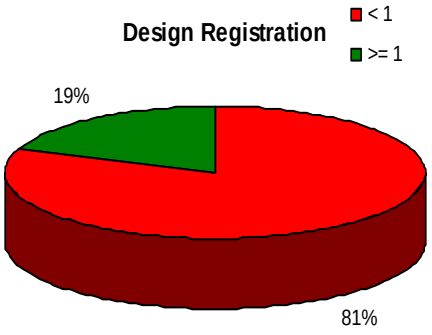


Figure 6.62: Effects of design registrations

Only 19% of firms in the sample possess at least one design registration. The results imply design registrations are also important innovative performance indicators to disclose firms' innovative capability. It is seen that firms that have at least one design registration are more innovative in every innovative type.

Figure 6.63 illustrates how the firms those have at least one trademark registration differentiate from other firms in terms of various innovation criteria.

	Trademark Registration	N	Mean	Sig.
innovs	>= 1	51	3,03	**,002**
	< 1	36	2,49	
incprod_inn	>= 1	51	3,24	,148
	< 1	36	2,94	
radprod_inn	>= 1	51	2,88	,166
	< 1	36	2,47	
prod_inn	>= 1	51	3,09	**,092**
	< 1	36	2,75	
process_inn	>= 1	51	3,18	**,002**
	< 1	35	2,49	
mar_inn	>= 1	51	2,87	**,003**
	< 1	36	2,16	
org_inn	>= 1	50	2,98	**,048**
	< 1	36	2,55	

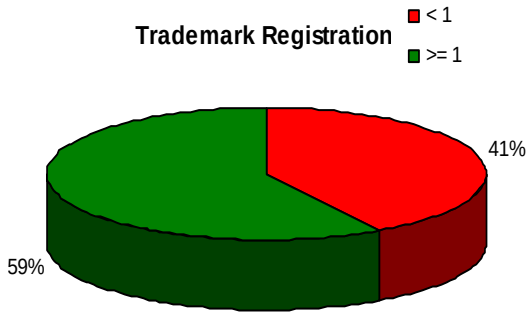


Figure 6.63: Effects of trademark registrations

59% of firms in the sample possess at least one trademark. The results imply that trademark registrations are also innovative performance indicators to unveil firms' innovative capability. It is seen that firms which have at least one trademark are more innovative especially at process, marketing and organizational innovations.

Figure 6.64 highlights how the firms those have at least one useful model differentiate from other firms in terms of various innovation criteria.

Only 22% of firms in the sample possess at least one useful model. The results imply that useful models are also innovative performance indicators to reveal firms' innovative capability. It is seen that firms that have at least one useful model are more innovative ($p=0.01$), especially at radical product innovations. They have also higher innovative performance for process and marketing innovations at $\alpha=90\%$ significance level.

	Useful Model	N	Mean	Sig.
innovs	>= 1	19	3,24	**,010**
	< 1	68	2,71	
incprod_inn	>= 1	19	3,46	**,087**
	< 1	68	3,04	
radprod_inn	>= 1	19	3,55	**,005**
	< 1	68	2,60	
prod_inn	>= 1	19	3,49	**,009**
	< 1	68	2,86	
process_inn	>= 1	19	3,27	**,058**
	< 1	67	2,77	
mar_inn	>= 1	18	3,00	**,074**
	< 1	68	2,47	
org_inn	>= 1	19	3,11	,118
	< 1	68	2,72	

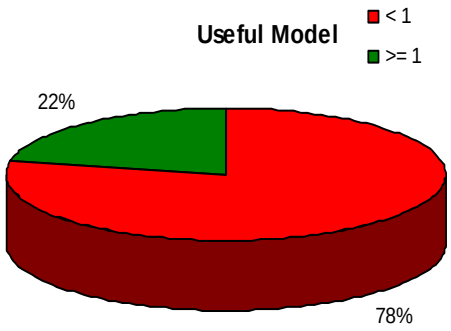


Figure 6.64: Effects of useful model

Although patenting is the most significant means of intellectual property protection, substitute protection manners such as secrecy and lead-time are also used by a majority of firms in diverse sectors. ***Figure 6.65*** presents how firms those use efficiently the time advantage while passiong on production before their competitors, differentiate from other firms in terms of various innovation criteria.

	Time Advantage	N	Mean	Sig.
innovs	>= efficient	71	2,98	**,058**
	< efficient	82	2,72	
gen_per	>= efficient	71	3,79	**,027**
	< efficient	81	3,59	
incprod_inn	>= efficient	71	3,15	,940
	< efficient	82	3,16	
radprod_inn	>= efficient	71	2,99	**,001**
	< efficient	82	2,25	
prod_inn	>= efficient	71	3,08	**,084**
	< efficient	82	2,79	
process_inn	>= efficient	71	3,00	,415
	< efficient	82	2,86	
mar_inn	>= efficient	71	2,87	**,006**
	< efficient	81	2,37	
org_inn	>= efficient	71	2,99	,372
	< efficient	82	2,84	

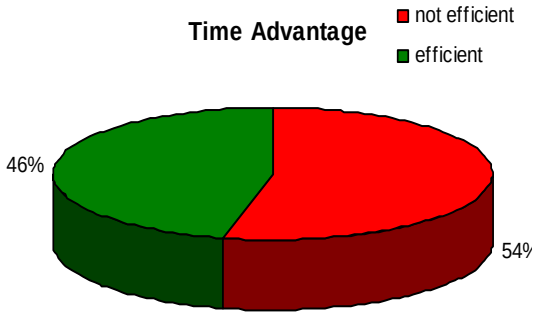


Figure 6.65: Effects of effective usage of time advantage

46% of firms in the sample use efficiently time advantage by passing to production before competitors. The results imply that this strategy is an also innovative performance indicator to expose firms' innovative capability. It is seen that firms that use time advantage have better performance and they are more innovative ($p<0.1$) especially at radical product and marketing innovations.

Figure 6.66 represents how firms those use secrecy strategy differentiate from other firms in terms of various innovation criteria.

	Secrecy	N	Mean	Sig.
innovs	>= efficient	75	3,07	**,002**
	< efficient	82	2,65	
gen_per	>= efficient	75	3,88	**,000**
	< efficient	81	3,50	
incprod_inn	>= efficient	75	3,23	,401
	< efficient	82	3,09	
radprod_inn	>= efficient	75	2,85	**,032**
	< efficient	82	2,37	
prod_inn	>= efficient	75	3,08	**,084**
	< efficient	82	2,79	
process_inn	>= efficient	75	3,13	**,023**
	< efficient	81	2,76	
mar_inn	>= efficient	74	2,84	**,015**
	< efficient	82	2,41	
org_inn	>= efficient	75	3,20	**,000**
	< efficient	82	2,63	

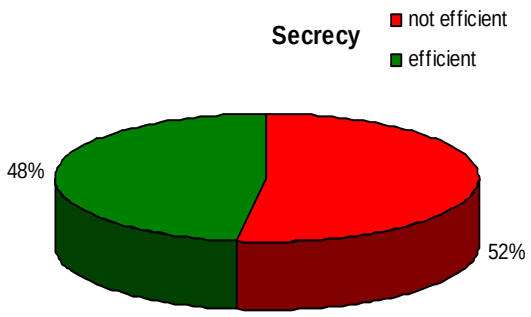


Figure 6.66: Effects of effective secrecy strategy

48% of firms in the sample use efficiently secrecy strategy which is an also innovative performance indicator to expose firms' innovative capability. Firms which use secrecy have better performance and are more innovative ($p<0.1$) especially at radical product, process, organizational and marketing innovations.

Finally, existence of R&D department is another vital factor to determine the innovativeness level of a firm. In order to emphasize the importance of R&D, a statistical analysis using number of R&D employees is applied. Basing the assumption of existence of at least five R&D employees signifies existence of a R&D department in company, the possible effects of R&D department in a firm on innovativeness is examined with using student t-test analysis (***Figure 6.67***).

	R&D employee	N	Mean	Sig.
innovs	>= 5	54	3,10	**,003**
	< 5	78	2,65	
gen_per	>= 5	54	3,84	**,004**
	< 5	78	3,56	
incprod_inn	>= 5	54	3,44	**,014**
	< 5	78	2,99	
radprod_inn	>= 5	54	2,68	,811
	< 5	78	2,62	
prod_inn	>= 5	54	3,14	,101
	< 5	78	2,84	
process_inn	>= 5	54	3,29	**,001**
	< 5	78	2,70	
mar_inn	>= 5	54	2,80	,107
	< 5	78	2,48	
org_inn	>= 5	53	3,17	**,002**
	< 5	78	2,60	
inno_per	>= 5	54	3,77	**,029**
	< 5	78	3,51	
pro_per	>= 5	54	4,00	,261
	< 5	78	3,88	
mar_per	>= 5	54	4,06	**,050**
	< 5	78	3,81	
fin_per	>= 5	54	3,53	**,002**
	< 5	77	3,04	

Number of R&D employees

N	Valid	133
	Missing	36
Mean		6,97
Median		3,00
Maximum		85

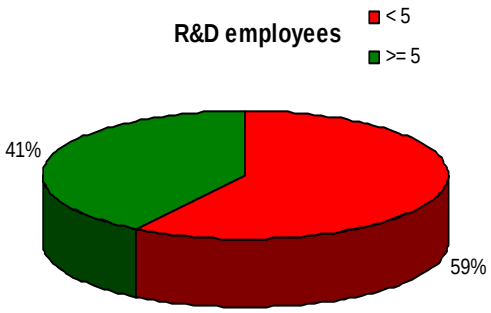


Figure 6.67: Effects of R&D employees

The average of R&D employees in our sample is almost seven (133 firms gave this information and 36 firms didn't), but it is seen that there are a few companies that employ many R&D personnel (maximum is 85) since the median is only three. Similarly, the pie chart indicates that only 41% of firms in the sample have more than five R&D employees.

It is shown that firms having at least five R&D employees have better general, innovative, marketing and financial performance ($p<0.05$) and they are more innovative ($p<0.01$) especially at incremental product, process and organizational innovations. Therefore, this finding unveils the importance of R&D activities in companies.

As a summary, both primary determinants of innovation and supplementary features which contribute to firm's innovative capability are examined, and their effects on innovativeness are discussed. The findings point out the importance of managerial strategies, top managements decisions and official organization handbooks on innovative capability of a firm. Also, the effects of various innovation outputs have been analyzed and their reliability as an innovation output measure is supported.

CHAPTER 7

SYNTHESIS

7.1 Sectoral Differences

Previous analyses have embraced the whole firms in the sample without considering sectoral differentiations. Whereas, each sector has its own conditions, strategies, needs and sources; therefore innovation tendency of a firm can discriminate seriously according to the sector it belongs. In this section, sectoral differences in terms of innovative capabilities will be explored not only using statistical tests but also data visualization techniques.

Firstly, as previous findings revealed, innovativeness is significantly positive related with number of employee in a firm. It is possible to categorize number of employees in two ways: according to their education level and with blue/white collar definition.

Blue collar work may be skilled or unskilled, and may involve factory work, building mechanical work, maintenance or technical installations. The white-collar worker, by contrast, performs non-manual labor often in an office; and s/he performs labor involving customer interaction, entertainment, retail and outside sales, management, finance, planning and the like (These definitions are taken from wikipedia).

According to educational classification, employees are grouped such as elementary school, high school and university degrees. ***Table 7.1*** reports classifications of number of employees. It is seen that 61% of white collar workers have university degree, 34% high school and 4% elementary school. Similarly, 46% of blue collar workers have elementary school degree, 51% high school and 3% university. The percentage of white collar worker is 29% on average, and finally 20% of workers have university degree on average.

Employees Classification	Maximum	Mean
Elementary School (White Collar)	62	3,62
% of Elementary School (White Collar)	1,00	,04
High School (White Collar)	457	23,20
% of High School (White Collar)	1,00	,34
University (White Collar)	709	40,76
% of University (White Collar)	1,00	,61
Elementary School (Blue Collar)	1098	85,65
% of Elementary School (Blue Collar)	1,00	,46
High School (Blue Collar)	828	102,48
% of High School (Blue Collar)	,92	,51
University (Blue Collar)	156	6,56
% of University (Blue Collar)	,36	,03
Total White Collar	1590	81,33
Total Blue Collar	7613	276,80
% of White Collar	1,00	,29
Total University Worker	783	47,94
% of Total University Worker	,76	,20

Table 7.1: Descriptive statistics for employee classifications

Figure 7.1 depicts the distribution of education levels according the sectors. Chemical sector has higher percentage of employees with university degree (33.3%), while textile has the lowest percentage (11.3%). Similarly, textile has higher percentage of employees with elementary school degree (45.6%), while chemical and domestic appliances sectors have the lowest percentage (22.2% and 22.6%, respectively).

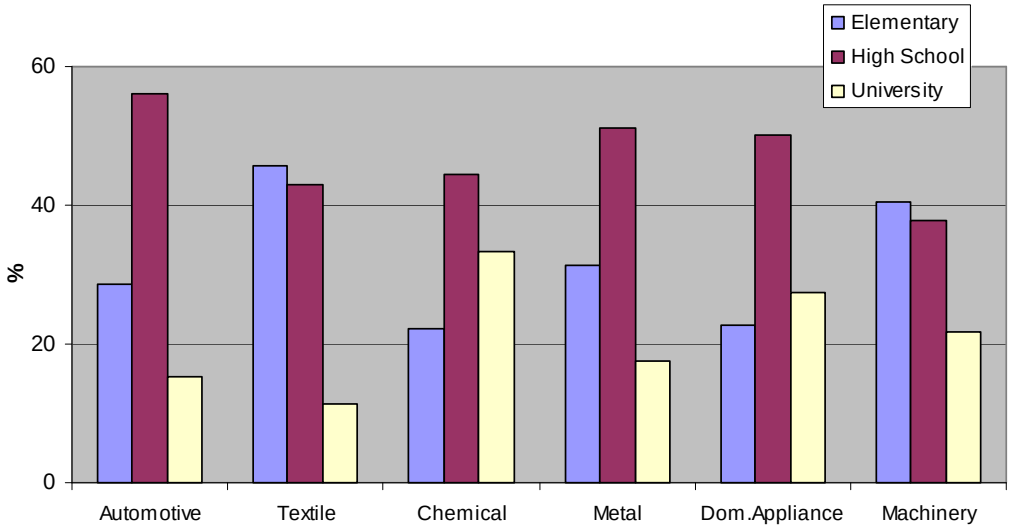


Figure 7.1: Distribution of education levels of employees according to sectors

Figure 7.2 illustrates the similar distribution of education level among both white and blue collar worker at each sector. Consequently, textile and machinery sector firms in the sample have lowest qualified workers according to education level, while chemical and domestic appliances sectors firms have highest qualified workers on average.

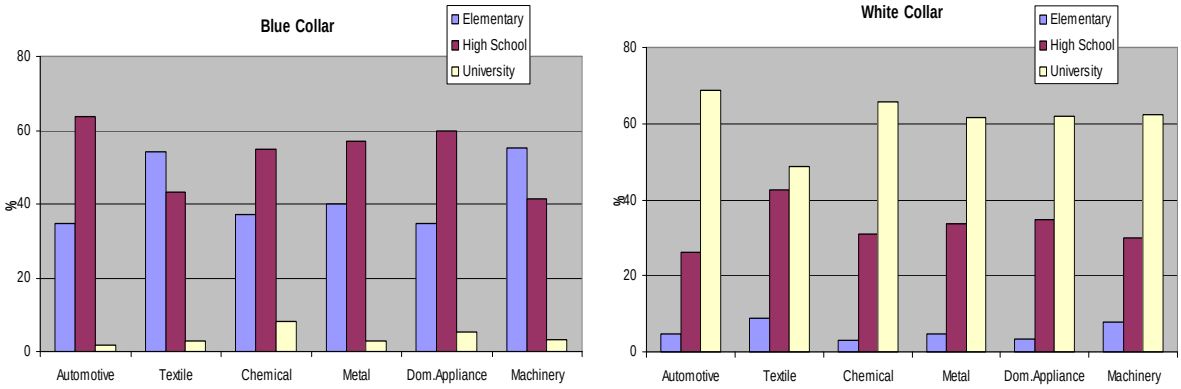


Figure 7.2: Distribution of education levels among both blue/white collar workers

Table 7.2 examines the sectoral differentiations of employees' qualifications by using one-way ANOVA tests. Findings reveal that there is significant difference between workers' education profile at sectors; except university degree percentage among blue collars. As a whole, textile has lowest qualified workers, and chemical sector has highest. 46% of chemical sector employees are white collar, and 29% of them have university degree (both highest among sectors).

Finally, ***Figure 7.3*** and ***Table 7.3*** report the distribution of white collar employees according to their department at each sector. This distribution is generally similar, and most of the white collar employees work in operations. The average percentage of R&D workers among all white collars in a sector is approximately 13%.

The analysis about R&D employees in previous section indicated that firms those have at least five R&D employees have better general, innovative, marketing and financial performance ($p<0.05$) and are more innovative ($p<0.01$) especially at incremental product, process and organizational innovations than other firms. Similarly, ***Table 7.4*** also supports this finding since firms in which percentage of R&D white collar employees is higher than 5% among all white collars are significantly more innovative for each innovation type.

		N	Mean	Sig.
% of Elementary School (White Collar)	automotive	26	,03	**,077**
	textile	30	,10	
	chemical	20	,02	
	metal	22	,02	
	domestic appliance	12	,02	
	machinery	17	,04	
	Total	127	,04	
% of High School (White Collar)	automotive	26	,25	**,073**
	textile	30	,45	
	chemical	20	,31	
	metal	22	,34	
	domestic appliance	12	,30	
	machinery	17	,30	
	Total	127	,34	
% of University (White Collar)	automotive	26	,72	**,001**
	textile	30	,44	
	chemical	20	,64	
	metal	22	,63	
	domestic appliance	12	,68	
	machinery	17	,66	
	Total	127	,61	
% of Elementary School (Blue Collar)	automotive	26	,38	**,007**
	textile	28	,65	
	chemical	19	,40	
	metal	22	,42	
	domestic appliance	12	,36	
	machinery	17	,49	
	Total	124	,46	
% of High School (Blue Collar)	automotive	26	,58	**,014**
	textile	28	,33	
	chemical	19	,61	
	metal	22	,56	
	domestic appliance	12	,60	
	machinery	17	,48	
	Total	124	,51	
% of University (Blue Collar)	automotive	26	,04	,357
	textile	28	,02	
	chemical	19	,06	
	metal	22	,02	
	domestic appliance	12	,04	
	machinery	17	,03	
	Total	124	,03	
% of White Collar	automotive	27	,23	**,000**
	textile	28	,23	
	chemical	20	,46	
	metal	23	,28	
	domestic appliance	13	,32	
	machinery	17	,28	
	Total	128	,29	
% of Total University Worker	automotive	26	,19	**,000**
	textile	29	,11	
	chemical	20	,29	
	metal	22	,20	
	domestic appliance	12	,26	
	machinery	17	,23	
	Total	126	,20	

Table 7.2: Distribution of employees in sectors according to education level

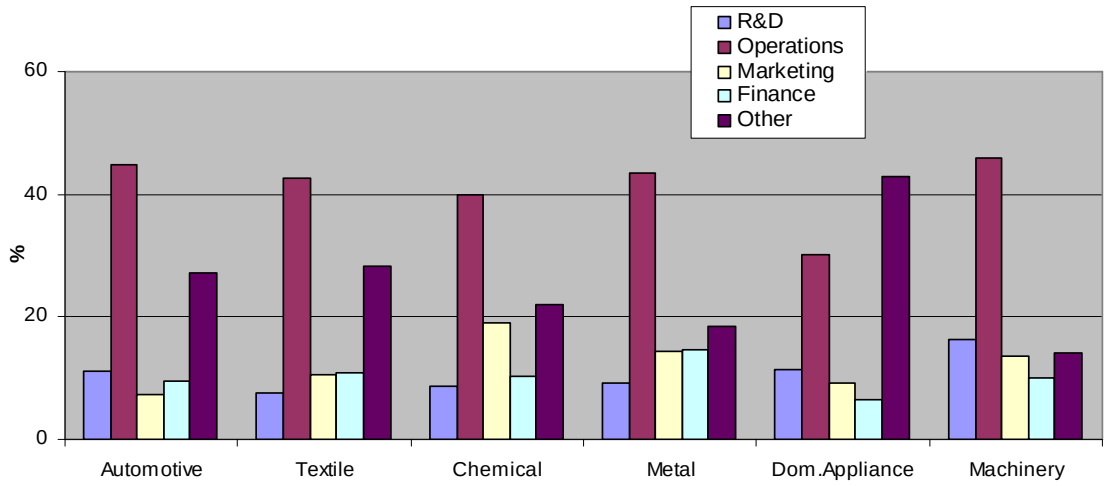


Figure 7.3: Distribution of white collar workers according to their department

White Collars	N	Mean
% of R&D	131	,13
% of Operation	131	,37
% of Marketing	131	,15
% of Finance	131	,16
% of Other	131	,20
Valid N (listwise)	131	

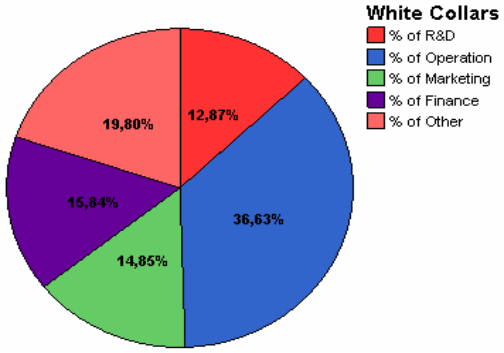


Table 7.3: Distribution of white collar workers according to their department

	% of R&D (White Collars)	N	Mean	Sig.
innovs	>= 5	92	2,98	**,003**
	< 5	38	2,49	
incprod_inn	>= 5	92	3,27	**,100**
	< 5	38	2,94	
radprod_inn	>= 5	92	2,78	**,090**
	< 5	38	2,32	
prod_inn	>= 5	92	3,08	**,049**
	< 5	38	2,69	
process_inn	>= 5	92	3,12	**,002**
	< 5	38	2,51	
mar_inn	>= 5	92	2,74	**,060**
	< 5	38	2,33	
org_inn	>= 5	92	3,00	**,004**
	< 5	38	2,42	

Table 7.4: Effects of higher R&D percentage among white collar employees

Examination of employees' distribution in sectors indicates both workers' profiles (education level) and their tasks (blue/white collar) significantly differentiate. As a summary, textile has lowest qualified and chemical has highest qualified employees. Forthcoming analyses are going to investigate the differences of sectors in terms of innovativeness, innovation types, firm performance and innovation determinants.

Table 7.5 demonstrates the one-way ANOVA analysis where innovativeness level of sectors are compared, and the initial hypothesis of the means are equal is tested. Findings show that although there is not a significant difference of innovativeness level between all sectors, chemical and domestic appliances sub-industries are more innovative than others.

	Sectors	N	Mean	Sig.
innovs	automotive	35	2,75	,509
	textile	35	2,74	
	chemical	29	3,01	
	metal	32	2,74	
	dom.appliance	14	3,10	
	machinery	23	2,71	
	Total	168	2,81	

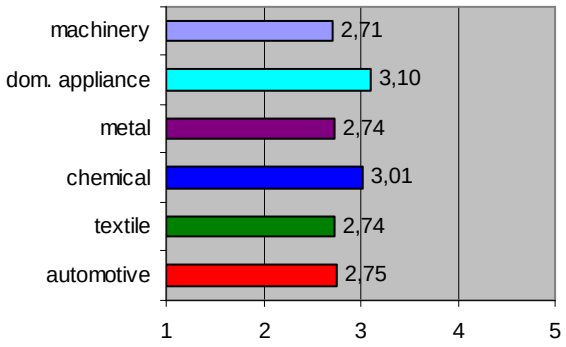
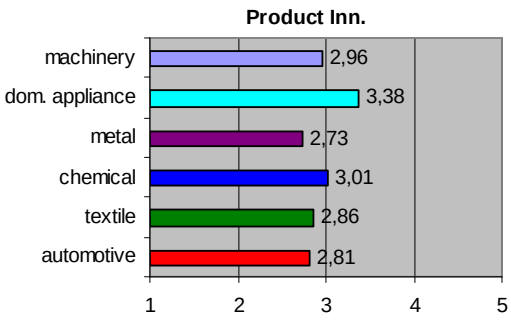


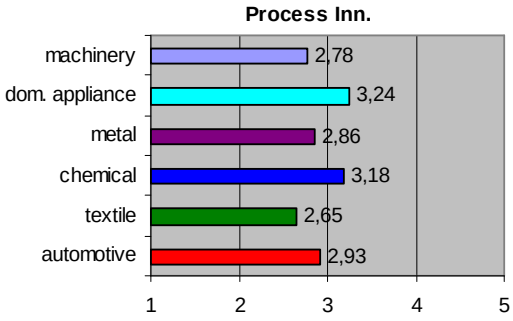
Table 7.5: Innovativeness level of sectors

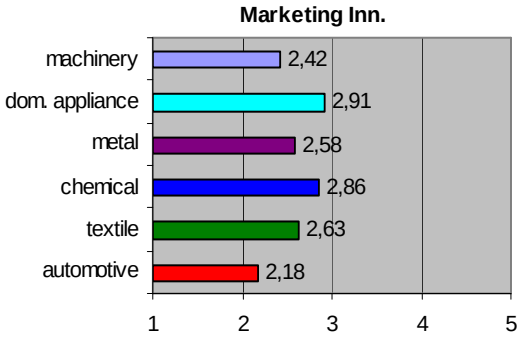
Table 7.6 presents the one-way ANOVA analysis where sectoral tendency for innovation types are compared, and the initial hypothesis of means equality is tested.

In fact, there is not a significant sectoral distinction for innovation types except incremental innovations, where domestic appliances sector is more innovative than others. Also, as overall, it is understood that firms are generally performs incremental product innovations (mean: 3.14), and they are least innovative for radical product and marketing innovations (mean: 2.56). Nevertheless, the results point out that automotive sector is the least innovative sector for radical product and marketing innovations and most innovative for organizational innovations. Textile sector is generally the least innovative sector particularly for process innovations. Metal sector is the least innovative sector for product and especially for incremental product innovations. Machinery sector is the least innovative sector for organizational innovations, but it has good scores for product innovations. Chemical sector is the second best innovative sector after domestic appliances, and it is most innovative for radical product innovations. Finally, domestic appliances sector is the most innovative sector for marketing, process and (incremental) product innovations.

	Sectors	N	Mean	Sig.
incprod_inn	automotive	35	3,16	**,060**
	textile	35	3,02	
	chemical	29	3,16	
	metal	32	2,88	
	dom. appliance	14	3,93	
	machinery	23	3,17	
	Total	168	3,14	
radprod_inn	automotive	35	2,29	,822
	textile	35	2,61	
	chemical	29	2,79	
	metal	32	2,50	
	dom. appliance	14	2,61	
	machinery	23	2,63	
	Total	168	2,56	
prod_inn	automotive	35	2,81	,444
	textile	35	2,86	
	chemical	29	3,01	
	metal	32	2,73	
	dom. appliance	14	3,38	
	machinery	23	2,96	
	Total	168	2,91	
process_inn	automotive	35	2,93	,308
	textile	35	2,65	
	chemical	28	3,18	
	metal	32	2,86	
	dom. appliance	14	3,24	
	machinery	23	2,78	
	Total	167	2,90	
mar_inn	automotive	35	2,18	,149
	textile	35	2,63	
	chemical	29	2,86	
	metal	32	2,58	
	dom. appliance	13	2,91	
	machinery	23	2,42	
	Total	167	2,56	
org_inn	automotive	35	3,07	,693
	textile	35	2,83	
	chemical	29	3,00	
	metal	31	2,76	
	dom. appliance	14	2,75	
	machinery	23	2,70	
	Total	167	2,87	







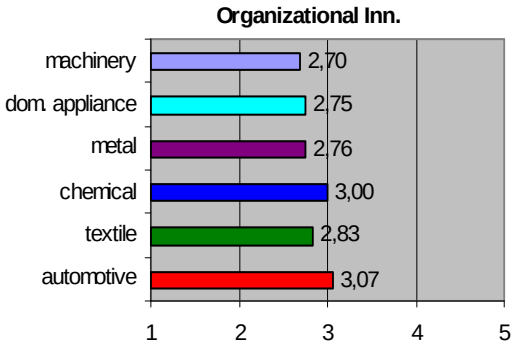
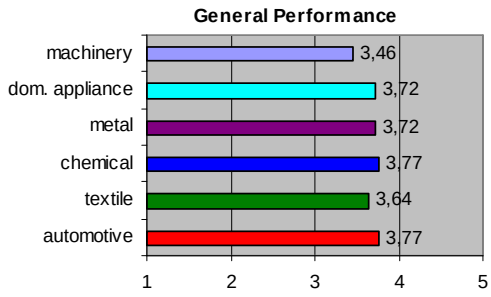


Table 7.6: Sectoral differences for innovation types

Table 7.7 depicts the one-way ANOVA analysis, where performance criteria of sectors are compared, and the initial hypothesis of the means are equal is tested. Findings expose that there is not a significant sectoral distinction except for innovative and market performance. For instance, automotive sector has significantly higher innovative performance than machinery whose innovative performance and marketing performance scores are lowest.

	Sectors	N	Mean	Sig.
General Performance	automotive	34	3,77	,303
	textile	36	3,64	
	chemical	29	3,77	
	metal	32	3,72	
	dom. appliance	14	3,72	
	machinery	22	3,46	
	Total	167	3,69	
Innovative Performance	automotive	34	3,89	,093
	textile	36	3,61	
	chemical	29	3,67	
	metal	32	3,54	
	dom. appliance	14	3,53	
	machinery	22	3,36	
	Total	167	3,63	
Production Performance	automotive	34	3,81	,596
	textile	36	4,03	
	chemical	29	3,93	
	metal	32	3,91	
	dom. appliance	14	3,93	
	machinery	22	3,82	
	Total	167	3,91	
Market Performance	automotive	34	4,07	,085
	textile	36	3,94	
	chemical	29	3,89	
	metal	32	3,96	
	dom. appliance	14	3,98	
	machinery	22	3,50	
	Total	167	3,90	
Financial Performance	automotive	33	3,29	,128
	textile	36	2,97	
	chemical	28	3,55	
	metal	31	3,44	
	dom. appliance	14	3,45	
	machinery	21	3,13	
	Total	163	3,29	



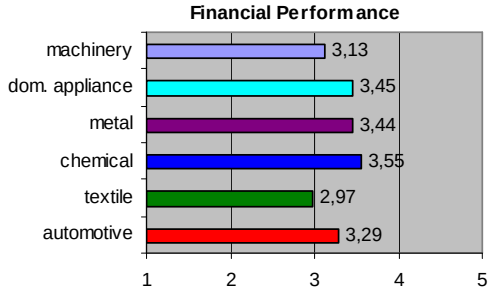


Table 7.7: Sectoral differences for performance criteria

The results point out that automotive sector has higher innovative and marketing performance, but lower production performance score. Chemical and domestic appliances sectors are more successful than others in terms of financial and general firm performance.

Table 7.8 exposes the one-way ANOVA analysis where innovation outlay, sales and exports of sectors are compared, and the initial hypothesis of the means are equal is tested. Findings show that there is significant sectoral distinction fore sales and exports, even for innovation outlay.

	Sectors	N	Mean	Sig.
Innovation Outlay (M€)	automotive	18	1,07	,240
	textile	20	1,64	
	chemical	16	2,62	
	metal	19	,45	
	dom. appliance	12	2,83	
	machinery	15	,29	
	Total	100	1,41	
Sales (M€)	automotive	24	38,63	,002
	textile	24	19,82	
	chemical	16	37,36	
	metal	15	14,49	
	dom. appliance	9	332,60	
	machinery	16	3,16	
	Total	104	50,60	
Exports (M€)	automotive	21	6,65	,008
	textile	26	12,85	
	chemical	16	8,03	
	metal	16	6,03	
	dom. appliance	9	112,72	
	machinery	15	1,12	
	Total	103	16,80	

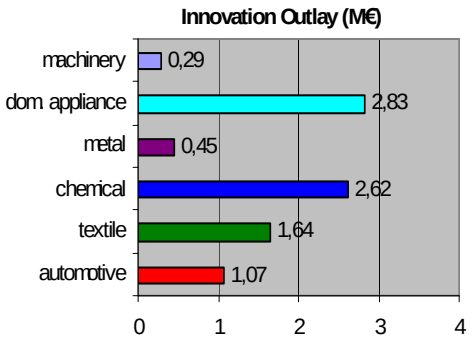


Table 7.8: Sectoral differences for sales, exports and innovation outlay

Domestic appliances sector has significantly higher sales (332M€) and exports (112M€), and machinery has lowest sales (3.2 M€) and exports (10.1M€) on average. Similarly, domestic appliances and chemical sectors have significantly higher innovation outlay (2.8 and 2.6M€ respectively) than others. These two sectors are found the most innovative ones at previous analyses; therefore the results are not surprising.

Table 7.9 represents the one-way ANOVA analysis where R&D collaboration, operational collaboration and public incentive usage (the scale is 1=no, 2=yes) of sectors are compared, and the initial hypothesis of the means are equal is tested. Findings indicate that there is significant sectoral distinction for R&D collaboration and public incentive usage.

Domestic appliances and chemical sectors have higher R&D and operational collaboration tendency, while machinery, textile and metal product sectors are least collaborative ones. Similarly, automotive and domestic appliances sectors are used public incentive more than others.

	Sectors	N	Mean	Sig.
R&D Collaboration	automotive	35	1,49	**,072**
	textile	36	1,36	
	chemical	29	1,55	
	metal	32	1,41	
	dom. appliance	14	1,71	
	machinery	23	1,26	
	Total	169	1,44	
Operational Collaboration	automotive	35	1,91	,299
	textile	36	1,78	
	chemical	29	1,93	
	metal	32	1,78	
	dom. appliance	14	1,93	
	machinery	23	1,83	
	Total	169	1,85	
Public Incentives	automotive	35	1,80	**,041**
	textile	36	1,47	
	chemical	29	1,55	
	metal	32	1,47	
	dom. appliance	14	1,71	
	machinery	23	1,57	
	Total	169	1,59	

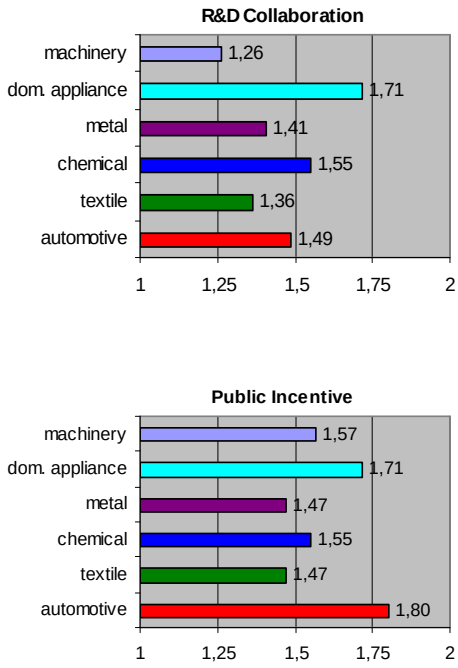


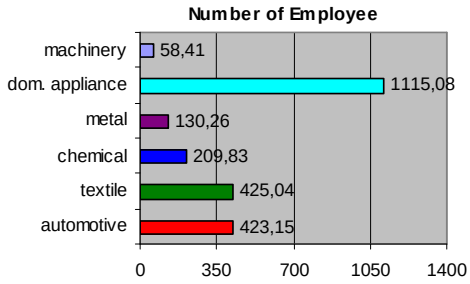
Table 7.9: Sectoral differences for collaborations and public incentives

Table 7.10 illustrates the one-way ANOVA analysis for firm age (the scale is 1=young, 2=moderate, 3=old), number of employee (full-time and direct employees), family ownership (the scale is 1=yes, 2=no) and ownership status (the scale is 1=joint stock company, 2=limited partnership) differences of sectors.

According to findings, it is revealed that there is significant difference for number of employee and ownership status. Nevertheless, domestic appliances and machinery industries in our sample are relatively young. On the other hand, it is possible to say that domestic appliance and chemical sectors are generally not family establishments.

Domestic appliances sector has significantly higher number of employees, while machinery sector have lower on average. Firms in the chemical sector are mostly joint stock companies but machinery firms are mostly limited partnerships in our sample.

	Sectors	N	Mean	Sig.
Firm Age	automotive	34	2,21	,135
	textile	29	2,07	
	chemical	28	2,11	
	metal	32	1,97	
	dom. appliance	13	1,69	
	machinery	23	1,70	
	Total	159	2,00	
Number of Employee	automotive	27	423,15	**,031**
	textile	28	425,04	
	chemical	18	209,83	
	metal	23	130,26	
	dom. appliance	13	1115,08	
	machinery	17	58,41	
	Total	126	361,81	
Family Ownership	automotive	35	1,31	,132
	textile	36	1,28	
	chemical	29	1,52	
	metal	31	1,29	
	dom. appliance	14	1,43	
	machinery	23	1,17	
	Total	168	1,33	
Ownership Status	automotive	35	1,20	**,053**
	textile	36	1,31	
	chemical	29	1,14	
	metal	32	1,28	
	dom. appliance	14	1,29	
	machinery	23	1,52	
	Total	169	1,28	



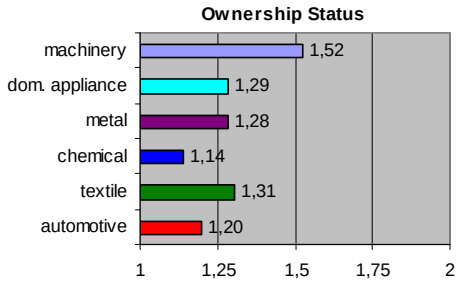
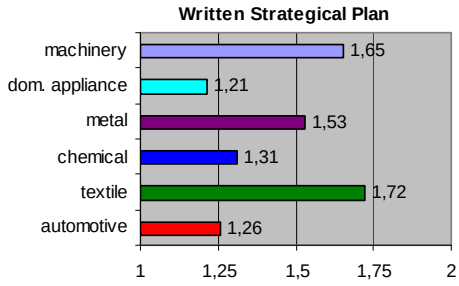


Table 7.10: Sectoral differences for firm characteristics

Table 7.11 presents the one-way ANOVA analysis for existence of written official strategic plan (the scale is 1=yes, 2=no), official written organization handbook (1=yes, 2=no) and official written handbook for new product development procedures (1=yes 2=no) differences of sectors.

Previous analyses about them have already shown these written handbooks have key importance in terms of innovative capability of a firm. Findings of sectoral comparison expose that there is a significant sectoral distinction for existence of all of the three organizational documents.

	Sectors	N	Mean	Sig.
Written Strategical Plan	automotive	35	1,26	,000
	textile	36	1,72	
	chemical	29	1,31	
	metal	32	1,53	
	dom. appliance	14	1,21	
	machinery	23	1,65	
	Total	169	1,47	
Organization Handbook	automotive	35	1,03	,000
	textile	36	1,50	
	chemical	29	1,10	
	metal	32	1,13	
	dom. appliance	14	1,07	
	machinery	23	1,22	
	Total	169	1,19	
NPD handbook	automotive	35	1,17	,000
	textile	36	1,69	
	chemical	29	1,28	
	metal	32	1,38	
	dom. appliance	14	1,07	
	machinery	23	1,35	
	Total	169	1,36	



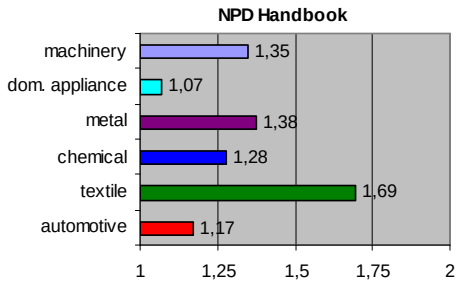


Table 7.11: Sectoral differences for organizational documents

The results indicate that firms in the domestic appliances are significantly better in generating organizational documents and handbooks. In contrast, textile, machinery and metal sectors have a long way to go in order to possess established organizational written documents. Not surprisingly, these three sectors are the least innovative ones in our sample.

Table 7.12 depicts the one-way ANOVA analysis for existence of production investment or plan within five year in other countries (the scale is 1=yes, 2=no), and importance of production cost strategy (1=strongly unimportant, …, 5=strongly important) differences in sectors.

Findings of sectoral comparison show that there is significant sectoral distinction for these production strategies. Firms in textile, machinery and metal sectors have so little interest to perform production investment in other countries; also, these sectors (especially textile) focus on production cost reduction as a manufacturing strategy. This strategy, opposing to product differentiation in the market, has negative impact on innovativeness.

	Sectors	N	Mean	Sig.
Production Investment in Other Country	automotive	35	1,49	**,019**
	textile	36	1,67	
	chemical	29	1,52	
	metal	32	1,81	
	dom. appliance	14	1,64	
	machinery	23	1,83	
	Total	169	1,65	
Production Cost	automotive	35	4,31	**,007**
	textile	36	4,66	
	chemical	29	4,30	
	metal	32	4,46	
	dom. appliance	14	4,16	
	machinery	23	4,35	
	Total	169	4,40	

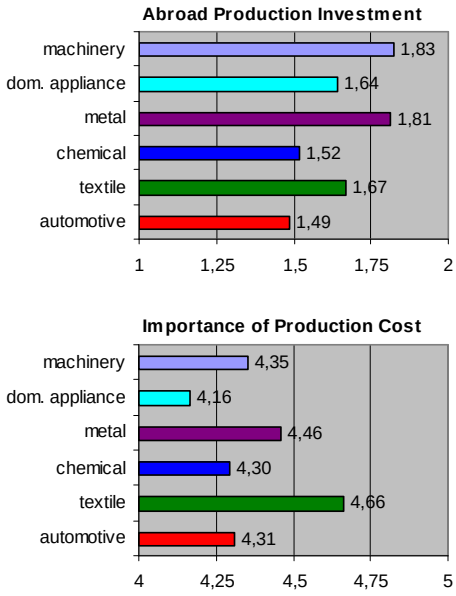


Table 7.12: Sectoral differences for production strategy

Table 7.13 reports the one-way ANOVA analysis where human capital, organizational capital and internal resistance to innovations (the scale is 1=great barrier, 5=not a barrier) of firms in different sectors are compared, and the initial hypothesis of the means are equal is tested.

	Sectors	N	Mean	Sig.
Human Capital	automotive	35	3,68	,575
	textile	36	3,56	
	chemical	29	3,77	
	metal	32	3,59	
	dom. appliance	14	3,67	
	machinery	23	3,45	
	Total	169	3,62	
Organizational Capital	automotive	35	3,46	,294
	textile	36	3,26	
	chemical	29	3,58	
	metal	32	3,36	
	dom. appliance	14	3,77	
	machinery	23	3,18	
	Total	169	3,41	
Internal Resistance	automotive	34	3,68	,927
	textile	36	3,60	
	chemical	29	3,62	
	metal	32	3,70	
	dom. appliance	14	3,81	
	machinery	23	3,78	
	Total	168	3,68	

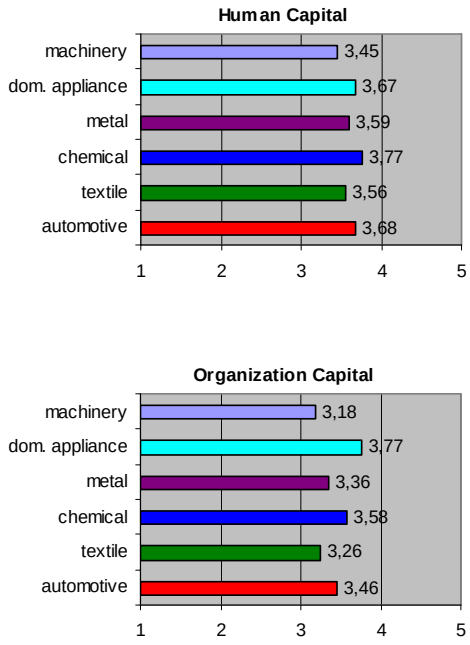


Table 7.13: Sectoral differences for intellectual capital and internal resistance

Findings report that there is not a significant sectoral distinction for intellectual capital and internal resistance of firms in sectors. However, it is found that most successful sectors domestic appliances and chemical have higher human and organization capital as well.

Table 7.14 indicates the one-way ANOVA analysis where firm strategies about market focus and resource allocation for developing technologies in different sectors are compared, and the initial hypothesis of the means are equal is tested. Findings of sectoral comparison confirm that there is a significant sectoral distinction particularly for new product development for current market and improvement of current technology strategies.

	Sectors	N	Mean	Sig.
Small modifications for products in the current market	automotive	35	3,29	,290
	textile	36	3,58	
	chemical	29	3,55	
	metal	31	3,42	
	dom. appliance	14	3,64	
	machinery	23	2,87	
	Total	168	3,39	
New product for current market	automotive	35	3,51	**,019**
	textile	36	4,17	
	chemical	29	4,14	
	metal	32	3,88	
	dom. appliance	14	4,43	
	machinery	23	3,43	
	Total	169	3,89	
Developing new technology	automotive	35	2,91	,494
	textile	35	2,66	
	chemical	29	3,03	
	metal	32	3,03	
	dom. appliance	14	3,07	
	machinery	23	2,57	
	Total	168	2,87	
Improving current technoogy	automotive	35	3,49	**,029**
	textile	34	3,00	
	chemical	29	3,62	
	metal	32	3,16	
	dom. appliance	14	3,64	
	machinery	23	2,96	
	Total	167	3,29	

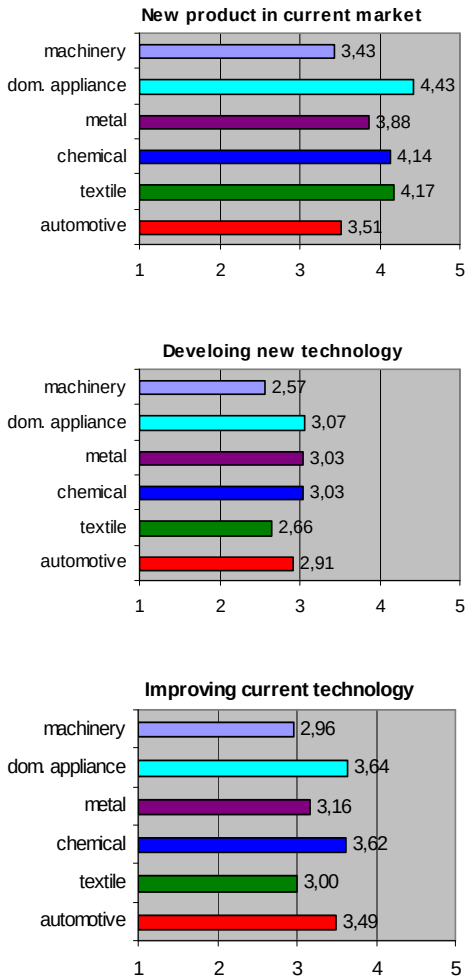


Table 7.14: Sectoral differences for market strategy

The results point out that firms of domestic appliances sector allocate significantly more resource for improving current technology and developing new product in current market; in

addition, these firms allocate also more resource for developing new technology and they are better at making small modifications for products in current market. Chemical sector firms come second in these market strategies. In contrast, metal, machinery and textile sector firms have rather unsuccessful scores for them.

Table 7.15 illustrates the one-way ANOVA analysis where qualified employees in sectors are compared, and the initial hypothesis of the means are equal is tested. Findings of sectoral comparison confirm that there is a significant sectoral distinction for percentage of white collar employees and percentage of university degree employees.

	Sectors	N	Mean	Sig.
Percentage of white collar employees	automotive	27	,23	**,000**
	textile	28	,23	
	chemical	20	,46	
	metal	23	,28	
	dom. appliance	13	,32	
	machinery	17	,28	
	Total	128	,29	
Percentage of university degree employees	automotive	26	,19	**,000**
	textile	29	,11	
	chemical	20	,29	
	metal	22	,20	
	dom. appliance	12	,26	
	machinery	17	,23	
	Total	126	,20	

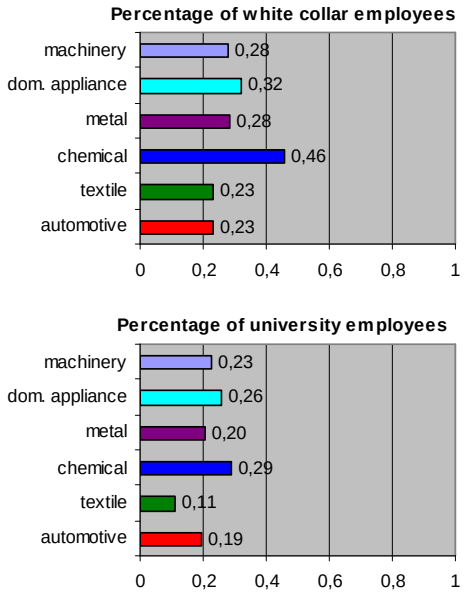


Table 7.15: Sectoral differences for qualified employees

The results point out that chemical sector employs more qualified workers than other sectors. The percentage of white collar employees and the percentage of employees those have university degree are both highest in chemical sector. Domestic appliances sector firms are just behind in these qualified employees percentages. In contrast, textile firms have rather unqualified workers. It is reasonable that chemical firms employ more qualified employees since tasks in that sector demand more specialization and qualification.

As a summary, the analyses reveal innovation tendency of a firm can differ seriously according to the sector it belongs. All of the findings about sectoral differences reveal that domestic appliances and chemical sectors are significantly more innovative than other sectors, while metal, machinery, and textile sectors are the least innovative ones. The determinants of innovations are also more convenient in domestic appliances and chemical sectors as well.

Figure 7.4 visualizes sectors and innovativeness level of firms in the same chart (y axis is innovativeness and x axis is sectors). The circles illustrate firms according to their age (colors: red=old, yellow=moderate, green=young) and their size (size of circles). The numbers in the circles mean there are multiple firms in the same location, and color of these circles are white due to this conflict.

This visualization supports the fact that domestic appliances and chemical sectors are the most innovative sector on average, and textile, metal and machinery are the least innovative ones. Furthermore this graphic also points out machinery sector generally consists of small and young firms in our sample. In metal sector young firms are significantly more innovative than old firms, but in domestic appliances and automotive sectors, older firms are more innovative. In metal and textile sector, firm size has no significant effect on innovativeness.

Figure 7.4: Comparison of innovativeness levels of sectors

7.2 Synopsis

The innovativeness model of this thesis has included two phases which are drivers of innovativeness model and performance model of innovation. The drivers of innovativeness model is about how innovations are born at firm level and how innovation determinants constitute the innovative capabilities of companies.

On the other hand, the performance model of innovation is about how innovative capability of a firm influences firm performance, whether there is really a positive relationship between realized innovations and firm's innovative, production, marketing and financial performance. More clearly, it is about how innovation capabilities of firms can predict their performance level.

In previous chapter, descriptive and statistical analyses are performed in order to reveal the relationships between innovation determinants, innovativeness and firm performance. The initial hypotheses of the discussed models are also tested. In this chapter, the results of these analyses will be briefly summarized.

Firstly, findings of performance model of innovation clearly disclose the positive relationship between innovativeness and firm performance. All of the 15 initial hypotheses are supported (H6 is partially supported since only correlation analysis supports it) except H5, H7 and H8.

Therefore, the results indicate that innovations performed in firms (all of the product, process, marketing and organizational innovations) have positive impacts on innovative and production performance of a firm. Nevertheless, the relationship between innovations and market performance is found not significant, only process innovations have significant positive correlation to market performance.

Finally, it is also found that financial performance can be expressed by innovative, production and market performance; all three performance indexes have significant positive effects on financial performance.

Table 7.16 summarizes the results based on the performance model.

	Hypothesis	Sign of Relationship		Result
		Before	After	
1	Product Innovations – Innovative Performance	+	+	Supported
2	Process Innovations – Innovative Performance	+	+	Supported
3	Marketing Innovations – Innovative Performance	+	+	Supported
4	Organizational Innovations – Innovative Performance	+	+	Supported
5	Product Innovations – Market Performance	+	±	Not supported
6	Process Innovations – Market Performance	+	+	Partial support
7	Marketing Innovations – Market Performance	+	±	Not supported
8	Organizational Innovations – Market Performance	+	±	Not supported
9	Product Innovations – Production Performance	+	+	Supported
10	Process Innovations – Production Performance	+	+	Supported
11	Marketing Innovations – Production Performance	+	+	Supported
12	Organizational Innovations – Production Performance	+	+	Supported
13	Innovative Performance – Financial Performance	+	+	Supported
14	Production Performance – Financial Performance	+	+	Supported
15	Market Performance – Financial Performance	+	+	Supported

Table 7.16: Summary findings of performance model

Secondly, after the analysis about drivers model of innovativeness is conducted, the findings extract the effects of innovation drivers and signs of relationship of innovation determinants on innovativeness. Fortunately, all of our initial hypotheses are supported except H2, H3 and H4 and H21. ***Table 7.17*** summarizes the results based on the drivers of innovativeness model.

	Hypothesis	Sign of Relationship		Result
		Before	After	
1	Firm size	+	+	Supported
2	Firm age	+	±	Not supported
3	Ownership Status	+	±	Not supported
4	Foreign Capital	-	±	Not supported
5	Communication	+	+	Supported
6	Formalization	+	+	Supported
7	Centralization	-	-	Supported
8	Management Support	+	+	Supported
9	Work Discretion	+	+	Supported
10	Time Availability	+	+	Supported

11	Reward System	+	+	Supported
12	Human Capital	+	+	Supported
13	Social Capital	+	+	Supported
14	Organizational Capital	+	+	Supported
15	Specialization	+	+	Supported
16	Business Strategies	+	+	Supported
17	Collaboration	+	+	Supported
18	Market Competition & Intensity	+	+	Supported
19	Public Regulations & Incentives	+	+	Supported
20	In-Firm Barriers to Innovations	-	-	Supported
21	Out-Firm Barriers to Innovations	-	±	Not supported
22	Innovation Outlay	+	+	Supported

Table 7.17: Summary findings of drivers of innovativeness

Therefore, the results denote determinants of innovations such as firm culture, firm intellectual capital, firm strategies, collaborations, market condition, public incentives, firm size, firm innovation spending have all significant positive and indigenous barriers of innovation have significant negative effects on innovative capability of a firm.

However, the results do not expose firm characteristics such as firm age, firm ownership status, and existence of foreign capital in a firm have significant effects on innovativeness; similarly, the relationship between exogenous barriers of innovation and innovativeness is not significant either.

Also, before the analyses about drivers model of innovativeness and its initial hypotheses are concluded, multiple linear regression method is used in order to find out contribution level of innovation determinants on innovativeness. The regression model that investigates the effects of innovation determinants on innovativeness can be seen in ***Table 7.18***.

Independent Variables	**Standard Beta**	***p value***
Communication	0.109	0.288
Formalization	-0.088	0.347
Centralization	0.106	0.255
Management Support	-0.100	0.429
Work Discretion	0.048	0.621
Time Availability	0.073	0.428
Reward System	0.162	0.159
Human Capital	0.175	0.093
Social Capital	-0.057	0.550

Organizational Capital	0.568	0.000
Specialization	-0.232	0.047
Production Quality	-0.065	0.523
Production Cost	0.280	0.007
Production Flexibility	0.042	0.660
On-time Production and Delivery	0.086	0.385
Market Focus	0.140	0.099
Resource for Technology	0.198	0.021
Monitoring Inner Milieu	0.031	0.778
Monitoring Outer Milieu	0.010	0.933
Monitoring Technical Sources	-0.229	0.027
R&D Collaboration	0.177	0.058
Operational Collaboration	0.259	0.003
Market Dynamism	0.007	0.939
Dominant Competitor	-0.050	0.538
Internal Resistance	-,0.56	0.539
Internal Deficiency	0.007	0.949
Internal Limits	-0.055	0.627
External Limits	0.215	0.055
External Difficulties	-0.110	0.221
Innovation Spending (M€)	0.121	0.152
Innovation Spending Increase (%)	0.166	0.046
Public Incentives	0.134	0.095
R^2 = 0.764 ; p=0.000		

Table 7.18: Effects of innovation determinants on innovativeness

The regression model of the effects of innovation determinants on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables express 76.4% ($R^2=0.764$) of innovativeness. However, when the innovation types have entered together to the multiple linear regression, only human capital (β=0.175; p=0.093), organizational capital (β=0.568; p=0.000), specialization (β=-0.232; p=0.047), production cost (β=0.280; p=0.007), market focus (β=0.140; p=0.099), resource for technology (β=0.198; p=0.021), monitoring technical sources (β=-0.229; p=,027), R&D collaboration (β=0.177; p=0.058), operational collaboration (β=0.259; p=0.003), external limits (β=0.215; p=0.055), public incentives (β=0.134; p=0.095) and innovation spending increase (β=0.166; p=0.046) have significant effects. Note that the previous analyses have disclosed all of these variables significantly and positively correlated to innovativeness.

This finding implies that there are mediating effects between drivers of innovation factors. Nevertheless, the important fact here is 76.4% of the innovativeness can be explained

in such a linear model. Therefore, it is possible to predict innovativeness level of a firm by these innovation determinants with small errors with techniques that would handle the complex and nonlinear relations among the determinants and the inoovativeness. ***Table 7.19*** summarizes residual statistics and ***Figure 7.5*** shows standardized regression residuals (observed-predicted) histogram.

	Minimum	Maximum	Mean	Std. Deviation	N
Std. Predicted Value	-2,23	2,80	,00	1,00	91
Adjusted Predicted Value	,68	4,76	2,91	,74	91
Residual	-,86	1,06	,00	,39	91

Table 7.19: Residual statistics

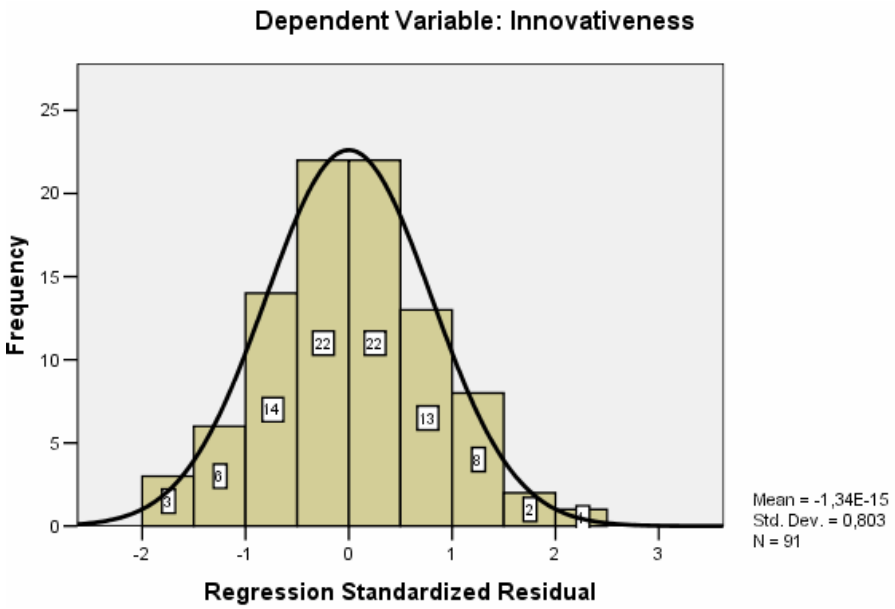


Figure 7.5: Standardized regression residuals (observed-predicted) histogram

This multiple linear regression analysis was conducted over 91 firms because some of the innovation determinants were missing (especially innovation outlay) for the rest. That is to say, there are only 91 firms which shared all of those data about innovation determinants together. According to residual statistics, the predicted innovation values are between [0.68, 4.7]; while residuals are between [-0.86, 1.06]. These ranges indicate good fitted estimations. Also, Figure 7.5 points out that the residuals are normally distributed with mean 0, so the estimations are statistically acceptable.

As a result, ***Figure 7.6*** and ***Figure 7.7*** indicate scattering of regression standardized predicted values and regression adjusted predicted values respectively.

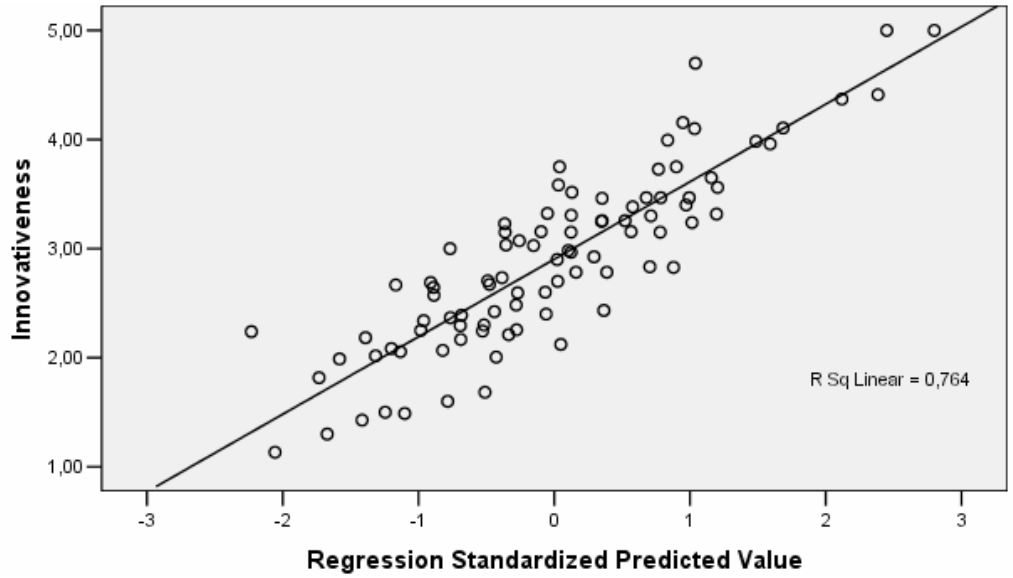


Figure 7.6: Scatter plot of *standardized* predicted values

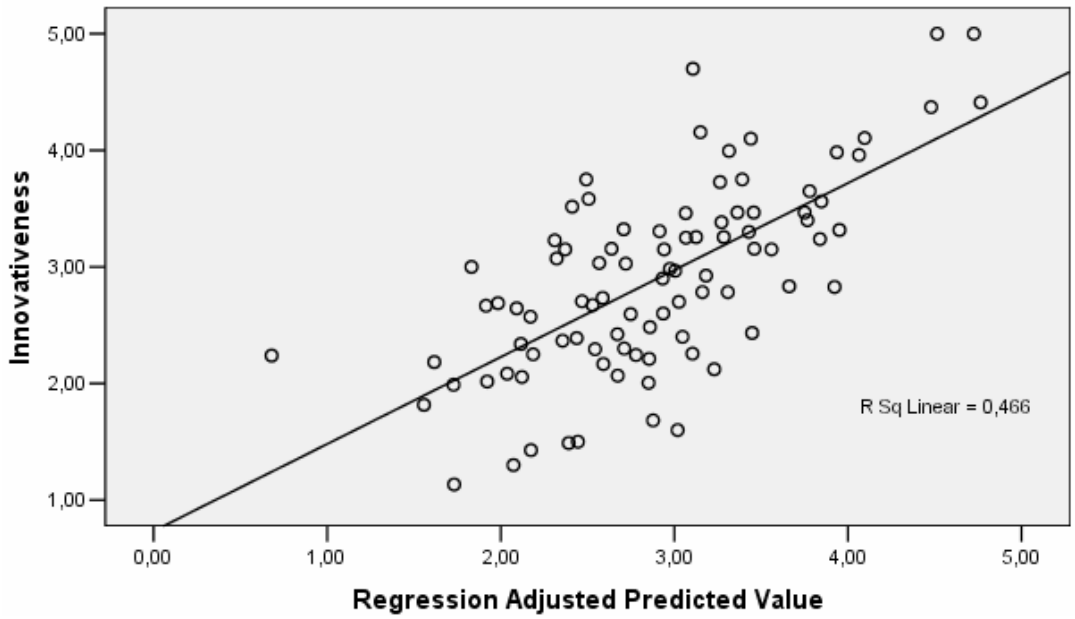


Figure 7.7: Scatter plot of *adjusted* predicted values

The scatter plots support the proposed drivers model of innovativeness visually. Apparently, the prediction of innovativeness level of a firm by using the data of innovation determinants is considerably accurate.

Nonetheless, the multiple linear regression model performed with innovation determinants all together reveal the mediating effects between factors. But, it is not possible

to conduct a path analysis with them since there are too many innovation determinants. In order to solve this problem, an experimental explanatory factor analysis procedure is applied with SPSS, the extracted factor structure of innovation determinants can be seen in ***Table 7.20***.

For the analysis, main drivers of innovativeness factors which have similar scales in the survey are placed together into principal component analysis, and five latent factors are extracted. Pleasingly, none of the determinants spoiled the factor structure except specialization and dominant competitor factors which is kept out of the analysis. The resulting factors are firm culture, barriers of innovation, intellectual capital, production strategies and market strategies.

The outcome of explanatory factor analysis demonstrate that the entire innovation determinants are grouped under the expected factors except formalization (placed with intellectual capital) and market dynamism (placed with market strategies). Nevertheless, to test the factor structure, a single-step confirmatory factor analysis is conducted based on the results of the explanatory factor analysis. ***Table 7.21*** depicts factor loadings of the confirmatory factor analysis.

		Factors				
Items		1	2	3	4	5
Firm Culture	Work Discretion	,809				
	Management Support	,703				
	Reward	,681				
	Centralization (r)	,625				
	Communication	,581				
	Time Availability	,539				
Barriers of Innovation	External Limits		,791			
	Internal Deficiency		,744			
	External Difficulties		,740			
	Internal Limits		,702			
	Internal Resistance		,541			
Intellectual Capital	Organization Capital			,700		
	Formalization			,684		
	Social Capital			,600		
	Human Capital			,492		
Production Strategies	Production Speed				,788	
	Production Cost				,759	
	Production Quality				,684	
	Production Flexiblity				,671	
Market Strategies	Market Focus					,734
	Resource for Technology					,626
	Market Dynamism					,507

Total Variance Explained: % 57,639

Table 7.20: Factor structure of innovation determinants

Performance Questions	Factor Loadings	Performance Questions	Factor Loadings
Firm Culture		***Intellectual Capital***	
Work Discretion	0.553*	Organization Capital	0.707*
Management Support	0.874*	Formalization	0.512*
Reward	0.762*	Social Capital	0.736*
Centralization (r)	0.497*	Human Capital	0.663*
Communication	0.688*		
Time Availability	0.461*		
Barriers of Innovation		***Production Strategies***	
External Limits	0.608*	Production Speed	0.656*
Internal Deficiency	0.723*	Production Cost	0.741*
External Difficulties	0.518*	Production Quality	0.677*
Internal Limits	0.780*	Production Flexibility	0.521*
Internal Resistance	0.663*		
		Market Strategies	
		Market Focus	0.367*
		Resource for Technology	0.663*
		Market Dynamism	0.397*
			*p<.05

Table 7.21: Factor loadings of CFA for innovation determinants

Next, the results of these analyses are evaluated by the goodness of fit indices. These indices are depicted in ***Table 7.22***.

Goodness of fit indices	Findings	Reference Value
	Innovation Determinants	
χ^2 / degree of freedom	1.770	$1< \chi^2 /df <5$
CFI (Comparative Fit Index)	0.988	0.9<CFI<1
NFI (Normed Fit Index)	0.973	0.9<NFI<1
RFI (Relative Fit Index)	0.966	0.9<RFI<1
IFI (Incremental Fit Index)	0.988	0.9<IFI<1
TLI (Tucker-Lewis Fit Index)	0.985	0.9<TLI<1
RMSEA (Root Mean Square Error)	0.065	RMSEA<.08

Table 7.22: Goodness of fit indices of CFA for innovation determinants

Recall, that the confirmatory factor analysis evaluates the measurement properties of the explanatory factor analysis. The overall fit statistics of the model yield an acceptance level for innovation determinant factor structure. Therefore, we can conclude that the factors are consistent and valid.

All of the factor loadings but four (i.e. centralization, time availability, market focus, market dynamism) have high (>0.50) and significant (p<0.05) loadings. Still, two of these four items are also retained since their factor loadings are also reasonably high (>0.45) and significant (p<0.05).

For the reliability of the factors, Cronbach α method is used. ***Table 7.23*** presents α values of innovation determinants factors. Reliability analysis shows that all of the factors are internally consistent and reliable except market strategies (α=0.464) since all α values are greater than 0.70.

Factors	**Number of Question**	**α Value**
Firm Culture	6	0.795
Barriers of Innovation	5	0.798
Intellectual Capital	4	0.738
Production Strategies	4	0.725
Market Strategies	3	0.464

Table 7.23: Results of reliability analysis for innovation determinants factors

As a result of explanatory and confirmatory factor analyses, innovation determinants have taken form four factors namely firm culture, barriers of innovation, intellectual capital and production strategies. Market strategies factor is left outside the analysis since both CFA and reliability analysis with Cronbach α indicate it is not a reliable factor.

After innovation determinants scales' reliabilities are tested and approved, correlation analysis is conducted in order to inspect one-to-one relationship between the innovativeness and innovation determinant factors. The results are presented in **Table 7.24** as well as the means of the factors.

	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*
1- Innovativeness	2,81	,84	1	,393(**)	,093	,430(**)	,268(**)
2- Firm Culture	3,47	,56	(**)	1	,280(**)	,520(**)	,322(**)
3- Barriers of Innovations	3,48	,66		(**)	1	,423(**)	,103
4- Intellectual Capital	3,52	,53	(**)	(**)	(**)	1	,188(*)
5- Production Strategies	4,29	,42	(**)	(**)		(*)	1

** p < ,01
* p < ,05

Table 7.24: Correlation analysis of innovation determinants

The amount of variance between the variables is suitable for further statistical analyses since factors' standard deviations are between 0.42 and 0.84. All of the factors those are directly related to the hypotheses (marked with red in the Table 5.102) are significantly positively correlated with $p<0.01$ except barriers of innovation factor. Note that this factor includes both internal and external barriers and previous analyses already have demonstrated that external barriers had no significant effect on innovativeness.

Intellectual capital has higher significant correlation coefficient (r:0.480), and production strategies has lower significant correlation coefficient (r:0.268) with innovativeness compared to ???. High correlation of intellectual capital stresses the major importance of human, social and organizational capital of a firm in order to be more innovative. Consequently, the positive correlation between innovativeness and innovation determinants validates the drivers of innovativeness model.

However, this analysis can not say much about the direction of the relationship. For that purpose, the multiple linear regression analysis can provide more insights.

The regression model that investigates the effects of innovation determinants on innovativeness can be seen at ***Figure 7.8***.

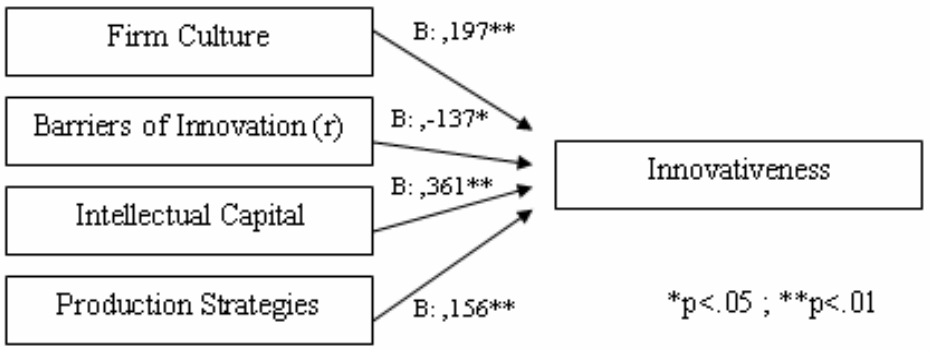


Figure 7.8: Effects of innovation determinants on innovativeness

The regression model about the effects of innovation determinants on innovativeness is statistically significant ($p<0.01$) and according to this model, the independent variables express 26.2% ($R^2=0.262$) of innovativeness.

The multiple linear regression analysis implies that all of the factors (firm culture ($\beta=0.197$; $p=0.017$), barriers on innovation ($\beta=-0.137$; $p=0.071$), intellectual capital ($\beta=0.361$; $p=0.000$), production strategies ($\beta=-0.156$; $p=0.029$)) have significant effects on innovativeness.

A path analysis model for innovation determinants is formed by AMOS v4.0 and it is analyzed according to structural equation modeling method. ***Figure 7.9*** presented this model with its significantly consistent findings. 27% of the variability regarding the innovativeness can be explained with this model. Barriers of innovation influence intellectual capital which assists shaping of firm culture and firm strategies are determined by that organization culture. Innovativeness is directly affected by all those determinant factors.

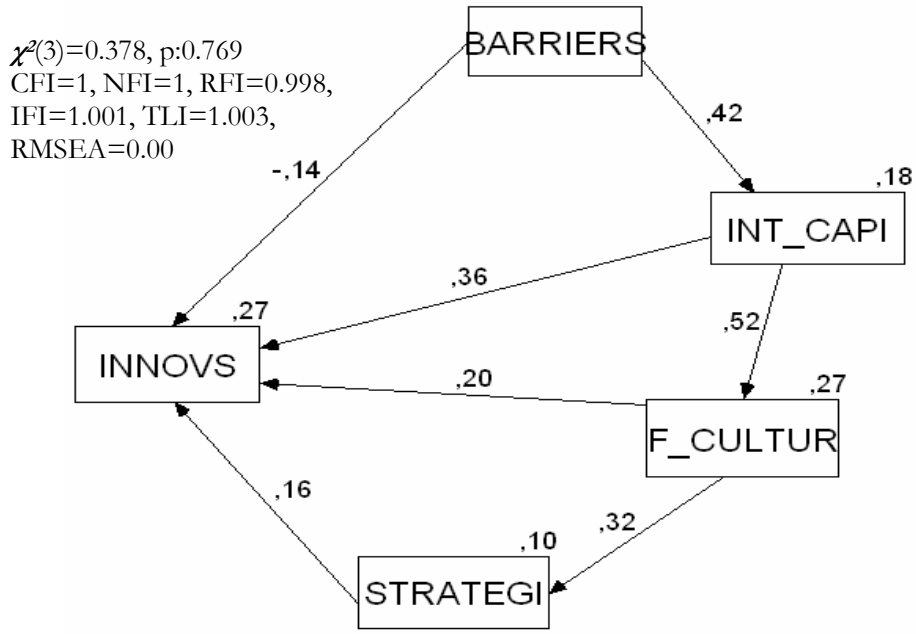


Figure 7.9: Path analysis of innovation determinants

Summing up, the initial hypotheses of both the drivers model and the performance model of innovation are supported. Various statistical tests are conducted in order to extract the relationship between innovation determinants, innovation types, innovativeness, and firm performance. Also, analyses are performed about how innovations are realized at firm level, what the significant innovation determinants are and what their contribution level of innovation determinants are. Furthermore the relationship between innovativeness and firm performance is also explored.

Figure 7.10 visualizes the firms in our sample on a chart where innovativeness and innovative performance scales constitute y and x axes respectively. Each circle symbolizes a firm, size of the circle represents firm size and the colors represent firm age (red=old, yellow= moderate, green=young). This figure also indicates the positive relationship (r^2=0.263) between firm innovative performance and its innovativeness level.

Figure 7.10: The relationship between innovativeness and firm innovative performance

In this study, innovation performance is measured by a factor formed by seven types of innovation indicators, namely ability to offer the new product before competitors, percentage of new products in the existing product line diversity, number of new products and projects, innovations developed about work processes and methods, quality of new products and services, number of patented or patentable innovations, renewal of managerial structures and mentality due to the environment conditions.

Figure 7.11 illustrates the percentage of firms which responded with 5 (very successful) on a 1 to 5 Likert scale to these innovation performance items.

Consequently 22.8% of firms say they are very successful in last three years in quality of new products and services. However, only 9.5% of firms claim to be very successful in the number of patented or patentable innovations. Similarly, the share of new products in existing product portfolio is also low with only 12.5% of firms claiming they are very successful in this criterion.

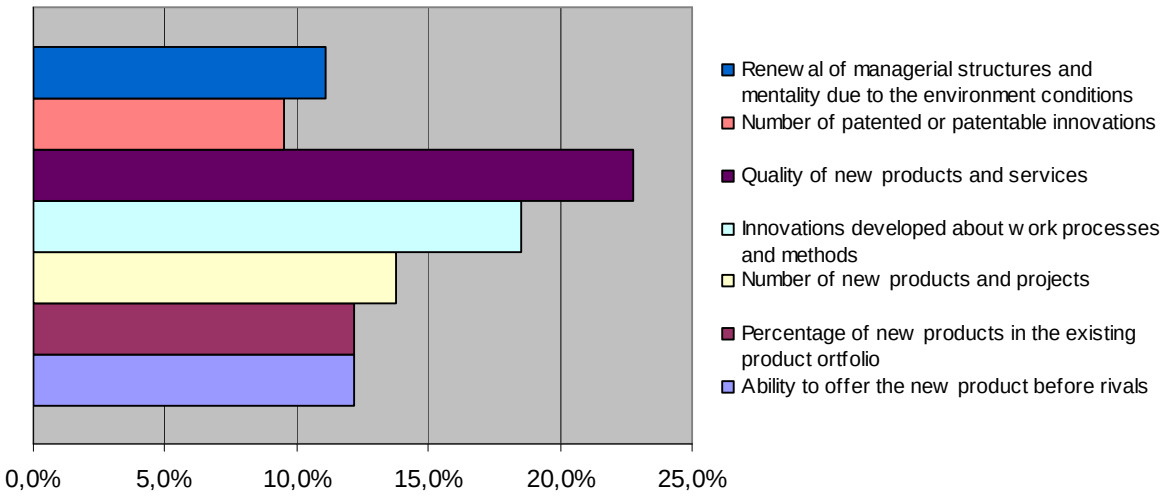


Figure 7.11: Innovative performance items

On the other hand, in the light of previous statistical analyses, firm size is expressed as an important indicator for innovativeness. ***Figure 7.12*** displays percentage of number of firms responded 5 (very successful) on a 1 to 5 Likert scale on innovative performance indicators based on size classification. The percentages are highest for large firms and there is a clear linear positive effect of firm size for each innovative performance indicator. A most likely explanation would be that small firms' priorities are costs reductions, efficiency improvements and adaptations in order to move towards large scale production capability rather than innovations.

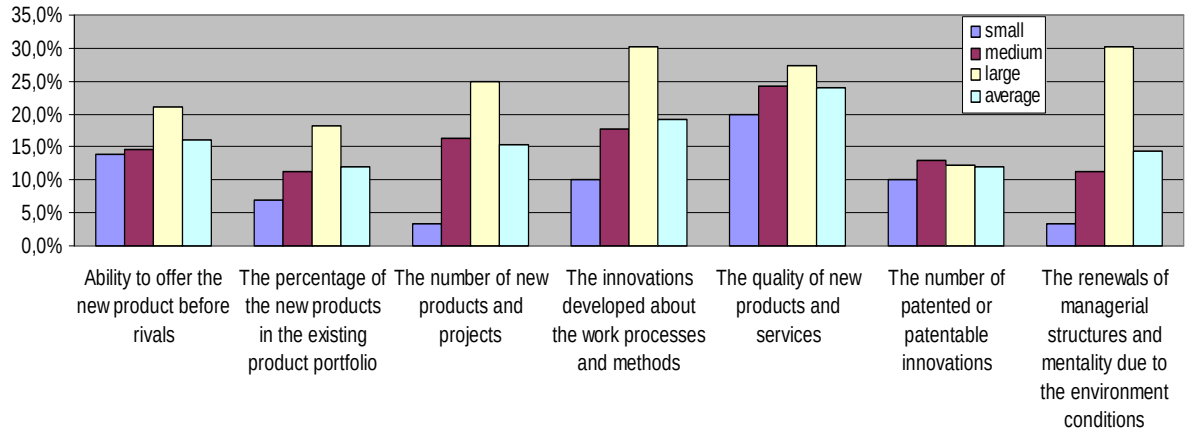


Figure 7.12: Innovative performance items regarding firm size

In fact, these findings are also along the same lines with the Schumpeterian hypothesis that large firms are the most innovation intensive. However, even large firms are not

successful in the number of patented or patentable innovations; probably due to the cost and difficulties involved in the registration process and insufficient incentives for intellectual property management.

Briefly, most common innovative performance measures in literature are the number of patentable products, share of innovations in existing product portfolio and share of new product sales in turnover. In this study, innovative performance is measured by seven criteria above; the findings clearly indicate a linear correlation between firm size and innovative performance. On the average, the least successful measures of firms in this study are patentable product and percentage of new products in existing product portfolio.

Time to market is an important innovative performance measure as well. Firms, which are successful in launching new products into market in a shorter period of time than their competitors, are significantly better in terms of performance and innovativeness.

As a result of the analyses, firstly we notice the significant positive relationship between innovativeness and firm performance (for innovative, market and production performance). Process and organizational innovations act as basic innovation activities where product and marketing innovations are built over them.

A significant amount of time might be necessary for the reflection of innovations on firm performance measures to occur. This fact explains why top managers frequently complain about stating they do not harvest enough positive results of their innovative efforts. Nonetheless, findings reveal significant positive correlation between financial performance and innovative, market, production performance. It is clearly revealed that innovative firms are rewarded by higher general performance.

Furthermore, it is noticed that firms, which are more innovative have higher total sales and higher total exports. However, exports by our sample firms do not depend on radical product innovations; in other words, firms, which have higher total exports, are not significantly better than other firms in developing radically new products. As a whole, higher innovativeness results in a significantly positive difference for total sales, exports, innovative performance, production performance, and financial performance.

Innovation outlay is firmly linked with innovative outputs. Innovative firms have significantly more innovation spending. Therefore, investing in R&D and allocating more funds for innovations clearly raise innovative capability and hence firm performance.

An important finding of the study is that the firms do not widely prefer doing collaborations. Vertical collaborations (with customers and suppliers) and operational collaborations are relatively common but the real positive impact for innovativeness comes

from R&D collaboration that firms mostly fail to realize. Firms those perform R&D collaborations are more innovative and have better general performance on average.

The analyses noticeably emphasize that intellectual capital is the most important determinant of innovativeness. Human capital which covers the skills, creativity and experience of individuals is the valuable resource for innovation. Companies should invest in human capital by improving education, training and learning opportunities and also they should develop innovation skills of their staff. Therefore, firstly, firms should work with qualified and competent employees. Such a high quality human capital will result in higher social capital and consequently organizational capital of the firm will increase. The most innovative sectors in our sample, namely, domestic appliances and chemical sectors have higher human and organizational capital.

In terms of organizational culture, companies give importance mainly to communication and reward system. On the other hand, they have some deficiency for formalization. High correlation of management support to innovativeness emphasizes the importance of managerial encouragement to idea generation and their support to new projects for innovative capabilities.

Furthermore, firms become more innovative in dynamic sectors (higher market dynamism can be described as the rate of changes in competitive conditions associated mostly to customers' demand), but although higher market dynamism is correlated to higher innovativeness, there are not enough findings to say that companies prefer and become more innovative in intensive competitive conditions. Firms those are in competitive sectors are more innovative especially for marketing and organizational innovations.

Regarding to the barriers to innovation, main difficulties of companies are internal limitations (such as time and financial limitations, higher risk and cost of innovation) and internal deficiency (lack of technical information and experience, lack of qualified employee and R&D manager, etc.). In contrast, the least important barrier is external difficulties (such as difficulties of finding necessary components, materials, technological services, difficulty of adopting new products by customers, etc.).

The findings point out that internal resistance is statistically the most important one of the barriers. As a result, indigenous barriers significantly hinder innovative capabilities of firms. But there are not enough findings to claim that exogenous barriers obstruct innovativeness. On the contrary, external barriers challenge the firm to perform more innovations. Firms should look inside and solve internal problems in order to be more innovative.

Public incentives and tax rebates facilitate firms' innovative activities by reducing some of the existing barriers of innovation especially by providing financial funds for R&D undertakings. Among all of the firms in our sample, only 39% of them are profiting from tax rebates.Our analysis indicate that the firms that use tax rebates are more innovative as expected.

Correspondingly, 46% of firms in our sample are profiting from public incentives at least one of those institutions: TTGV, TUBITAK, KOSGEB, Halkbank and EU Sixth Framework Program. The results expose that public incentives for R&D significantly improve innovative capabilities of firms.

Textile, machinery and metal sectors (especially textile) focus on production cost reduction as a manufacturing strategy. This strategy, opposing to product differentiation in the market, has a negative impact on innovativeness. Firms of domestic appliances sector allocated significantly more resource for improving current technology and developing new product in current market. In addition, these firms allocated also more resource for developing new technology and they are better at making small modifications for products in current market. Chemical sector firms come second in these market strategies. In contrast, metal, machinery, and textile sector firms have rather unsuccessful scores for them.

As a summary of competition strategies, innovative firms fabricate more quality products and sell them at a higher price; also, they target many markets and their product spectrum is large.

CHAPTER 8

CONCLUSION

8.1 Conclusions

This thesis reports on an innovativeness study in the Turkish manufacturing industry. The research is based on the results obtained from an innovation questionnaire followed by structured interviews and mail application covering 169 companies. The general objective was to better understand firms' innovation activities. Questions among others such as 'which are the most innovative firms', 'what kind of innovations do they launch', 'why do firms innovate', and 'what is the impact of innovations on firm performance' are evaluated.

Innovation is a complex and nonlinear process that involves many players such as firms, customers, competitors, suppliers, research centers and governmental regulations. A successful innovation process adds value to manufacturing and industrial processes, improves the range and delivery of services, and creates growth, new markets and efficiencies to the work processes of firms.

A general and inevitable conclusion of the study is that firms are aware of the importance and the strategic value of innovativeness but they resist taking necessary steps, investing necessary resources and establishing effective organizational culture of innovation. Innovations are crucial component of firm activities for raising the productivity, competitiveness and growth potential in modern economies.

Firms in our sample perform mostly incremental product innovations rather than radical ones. Process and organizational innovations are also made at a mediocre level, but marketing innovations are relatively low. Moreover, innovations are generally at imitation level. The innovations are mostly new to the firm but not for the market. Hence, it can be concluded that firms are using the spillover effects.

Among firm characteristics, only firm size is significantly correlated to innovativeness. All of findings indicate medium and large sized firms are more innovative than small ones. The relation between firm size and innovativeness is almost linear rather than U-shaped as many other studies in the literature concluded. Large-sized companies outperform the others both in terms of their success in implementing innovations and in achieving high operational outcomes covering also financial performance. On the other hand, firm characteristics such as firm age, firm ownership status, and existence of foreign capital in a firm do not have significant effects on innovativeness.

Large firms are more likely to be involved in collaborations; more likely to invest more on R&D and finally they are more likely to be more competent in intellectual property management since they are more successful on research and patent indicators. Contrary, small firms have weak results for patent applications, collaborations, use of public incentives and R&D investments.

Sectors employing relatively high technology such as domestic appliances and chemical sectors are more innovative than other manufacturing sectors in our sample. Innovation tendency of a firm can differ seriously according to sector it belongs. All of the findings about sectoral differences reveal that metal, machinery and textile sectors are the least innovative ones.

The largest part of firms' expenditure for innovation is linked to the adoption of technologies through machinery and equipment purchases, which absorbs 48% of firms' innovation costs. R&D activities are also an important ingredient of firms' innovation outlay, which on the average account for 33% of total innovation expenditure. Other activities such as purchasing of patents, know-how and licenses account for 10% and managerial counseling (except financial counseling) for 9% of firms' total innovation expenditure.

As a summary, determinants of innovations such as firm culture, firm intellectual capital, firm strategies, collaborations, market condition and public incentives, firm size, firm innovation spending have all significant positive effects on innovative capability of a firm whereas indigenous barriers of innovation display a significant negative effect.

As a final word, it is clear that despite observable strong correlation, innovation is not only a matter of R&D. Many firms struggle in technological innovations such as product and process innovations but they are successful on commercial innovations such as organizational and marketing. In general, despite some good intentions and long term initiatives in implementing innovations, companies are not yet very successful in converting their innovative practices into improved operational outcomes.

8.2 Future Research

This thesis covers only six manufacturing sectors in northwest region of Turkey, especially in Istanbul and Kocaeli provinces. The research area can broaden further by including other regions all over Turkey. This may be beneficial in order to compare regional innovation tendency and geographical differentiations of companies in terms of innovativeness and strategic orientations. In addition, the research can be extended to other manufacturing industries such as food and construction, which can provide valuable insights for their sector in this field of study.

Furthermore, service sectors can also be interesting for such a research. Research on innovations in the service sectors is rather limited. Banking, education and health sectors invest considerable resources to develop new and different services into their markets. Innovation in service sector may necessitate a different methodology and analysis, but it can certainly offer an attractive and fascinating challenge.

Modeling the innovation process and innovation relationship network by using some dynamical tools and agent base models will greatly enhance the analysis and causality part of this research. Particularly, system dynamics approach will be a very useful tool for exploring the causality between innovation determinants, innovativeness and firm performance.

In this thesis, innovativeness measure as an aggregate of four innovation types (i.e., product, process, marketing and organizational innovations) is used for the proposed innovation model and analyses. But in lieu of such a unique measure, innovation types can be used separately or as even only technological innovations (product plus process), and commercial innovations (marketing plus organizational). Such an extension will provide deeper and dedicated results about how these measures influence firm performance alone, what are the important innovation determinants dedicated for these measures and what are the diverse effects of different innovation types about firm performance, etc.

Briefly, this thesis forms a basis for the forthcoming studies in modeling innovation processes. It focuses on the factors, which would accelerate the improvement performance of firms in the Turkish manufacturing industry.

BIBLIOGRAPHY

[1] Ahuja, G., Katila, R., (2001). Technological acquisitions and the innovation performance of acquiring firms: a longitudinal study. *Strategic Management Journal,* 22: (3), 197–220.

[2] Akova, B., Ulusoy, G., Payzın, E., Kaylan, A. R., (1998). New product development capabilities of the Turkish electronics industry. *Proc. 5th International Product Development Management Conference*, Como, 863-876.

[3] Alpkan, L., Ergün, E., Bulut, Ç., Yılmaz, C., (2005). Şirket girişimciliğinin şirket performansına etkileri. *Doğuş Üniversitesi Dergisi* 6: (2).

[4] Antoncic, B., Hisrich, R. D., (2001). Entrepreneurship: Construct refinement and cross-cultural validation. *Journal of Business Venturing,* 16, 495–527.

[5] Archibiugi, D., Pianta, M., (1996). Measuring technological change through patents and innovation surveys. *Technovation,* 16: (9), 451-468.

[6] Avermaete, T., Viaene, J., Morgan, E. J., Crawford, N., (2003). Determinants of innovation in small food firms. *European Journal of Innovation Mgmt.*, 6, 8–17.

[7] Baldwin, J.R., Johnson, J., (1996). Business strategies in more- and less innovative firms in Canada. *Research Policy,* 25, 785–804.

[8] Baron R., and Kenny D., (1986). The moderator-mediator variable distinction in social psychological research. *Journal of Personality and Social Pyschology*, 51, 1173-1182.

[9] Barringer, B. R., Bluedorn, A.C., (1999). The relationship between corporate entrepreneurship and strategic management. *Strategic Management Journal*, 20. 421-444.

[10] Becheikh, N., Landry, R., Amara, N., (2006). Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993–2003. *Technovation,* 26, 644–664.

[11] Belderbos, R., (2001). Overseas innovations by Japanese firms: an analysis of patent and subsidiary data. *Research Policy,* 30. 313–332.

[12] Benavente, J., M., (2006). The role of research and innovation in promoting productivity in chile. *Economics of Innovation and New Technology*, 15: (4), 301-315.

[13] Bentler, P.M. and Bonett, D.G., (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588–606.

[14] Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107, 238–246.

[15] Bishop, P., Wiseman, N., (1999). External ownership and innovation in the United Kingdom. *Applied Economics,* 31, 443–450.

[16] Bollen, K.A., (1986). Sample size and Bentler and Bonett's nonnormed fit index. *Psychometrika*, 51, 375–377.

[17] Bollen, K.A., (1989). Structural Equations with Latent Variables. *John Wiley & Sons*, New York, NY.

[18] Bollen, K.A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods and Research*, 17, 303–316.

[19] Boyer, K.K., Leong, G., Ward, P.T., Krajewski, L., (1997). Unlocking the potential of advanced manufacturing technologies. *Journal of Operations Management*, 15: (4), 331–347.

[20] Browne, M.W. and Cudeck, R. (1993). Alternative ways of assessing model fit. In Bollen, Testing structural equation models. Newbury Park, California: Sage, 136–162.

[21] Bugelsdijk, S., Cornet, M., (2002). A far frind is worth more than a good neighbour: proximity and innovation in a small country. *Journal of Management & Governance*, 6: (2), 169.

[22] Cainelli, G., Evangelista, R., Savona, M., (2005). Innovation and economic performance in services: a firm-level analysis. *Cambridge Journal of Economics*. August, 1-26.

[23] Camison-Zornoza, C., Lapiedra-Alcami, R., Segarra-Cipres, M., Boronat-Navarro, M., (2004. A meta-analysis of innovation and organizational size. *Organization Studies*, 25: (3), 331-361.

[24] Cantillon, R., (1755). Essai sur la nature du commerce in general (Essay on the nature of trade in general). http://cepa.newschool.edu/het/profiles/cantillon.html.

[25] Carlsson, B., (2006). Internationalization of innovation systems: A survey of the literature. *Research Policy,* 35, 56–67.

[26] Chin, W.W, (1998). Issues and opinion on structural equation modeling. *MIS Quarterly*, 22: (1), 7-16.

[27] Choi, T., Y., Eboch, K., (1998). The TQM paradox: relations among TQM practices, plant performance and customer satisfaction. *Journal of Operation Management*, 17: (1), 59-75.

[28] Cissell, M.J. (1987). Designing effective reward systems. *Compensation and Benefits Review*, Nov/Dec, 19: (6), 49-55.

[29] Cohen, W., M., Levinthal, D. A., (1989). Innovation and learning, the two faces of R&D. *Economic Journal*, 99, 569-96.

[30] Conte, A., (2002). Innovation in Italian industry: a firm-level analysis. *University of Turin Research Paper*.

[31] Cooper, R. G., (1999). From experience: The invisible success factors in product innovation. *Journal of Product Innovation Management*, 16, 115-133.

[32] Covin, J. G., Slevin, D. P., (1989). Strategic management of small firms in hostile and benign environments. *Strategic Management Journal*, 10: (1), 75–87.

[33] Crépon, B., Duguet, E., Mairesse, J., (1998). Research, innovation and productivity: an econometric analysis at the firm level. *NBER Working Paper*, 6696, 43p.

[34] Cronbach, L.J. and Shavelson, R.J., (2004). My current thoughts on coefficient alpha and successor procedures. *Educational and Pyschological Measurement Review*, 24: (3), 522-537.

[35] Çetindamar, D. (2002). *Türkiye'de Girişimcilik*, TÜSİAD: İstanbul.

[36] Damanpour, F., (1991). Organizational Innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 14: (4), 555-590.

[37] Darroch, J., McNaughton, R., (2002). Examining the link between knowledge management practices and types of innovation. *Journal of Intellectual Capital,* 3: (3), 210–222.

[38] Dess, G.G., Robinson, R.B., (1984). Measuring organizational performance in the absence of objective measures: the case of the privately-held firm and conglomerate business unit. *Strategic Management Journal* 5: (3), 265-273.

[39] Doyle, P., (1998). *Marketing, Management and Strategy*. Prentice Hall Europe.

[40] Drucker, P. F., (1984). Our entrepreneurial economy. *Harvard Business Review*, 84105, 5p.

[41] Drucker, P.F., (1985). *Innovation and Entrepreneurship*. Oxford, Butterworth-Heinemann.

[42] Elçi, Ş., (2006). *İnovasyon: Kalkınmanın ve Rekabetin Anahtarı*, Referans Gazetesi.

[43] Edvinson, L., (1997). Developing intellectual capital at Skandia. *Long Range Planning*, 30: (3), 366 - 373.

[44] European Commission Communication, (1996). Living and working in the information society: People first. COM, (Green Paper), Jul, 389.

[45] European Commission Communication, (1996). The way forward: Advanced communications, economic growth and social development in Europe. Project FAIR (ACTS), Annual Reports, June.

[46] Evangelista, R., Sandven, T., Sirilli G., Smith, K., (1998). Measuring innovation in European industry. *International Journal of the Economics of Business*, 5: (3), 311-333.

[47] Fagerberg, J., Mowery, D. C., Nelson, R. R., (2004). *The Oxford Handbook of Innovation*. Oxford University Press, USA.

[48] Ferdows, K., De Meyer, A., (1990). Lasting improvements in manufacturing performance. *Journal of Operations Management*, 9: (2), 168-184.

[49] François, J.P., Favre, F., Negassi, S., (2002). Competence and organization: two drivers of innovation. A micro-econometric study. *Economics of Innovation and New Technology,* 11: (3), 249–270.

[50] Freeman, C., Soete, L., (1997). *The Economics of Industrial Innovation*. London, Washington.

[51] Fry, A. S., (1987). The post it note: An intrapreneurial success. *SAM Advanced Management Journal*, 52: (3), 4-9.

[52] Galende, J., De la Fuente, J.M., (2003). Internal factors determining a firm's innovative behaviour. *Research Policy,* 32, 715–736.

[53] George, G., Zahra, S., Wiklund, J., (2005). Ownership and the internationalization of small firms. *Journal of Management*, 31, 210-233.

[54] Geroski, P., (1995). Innovation and competitive advantage. *OECD Working Paper*, 52p.

[55] Gupta, A. K., Wilemon, D. L., (1990). Accelerating the development of technology-based new products. *California Management Review*, 32, 24-44.

[56] Hair, J.F.Jr., Bush, R.P., Ortinau, D.J., (2003). Marketing research within a changing information environment. McGraw-Hill/Irwin: New York.

[57] Hall, B., H., and Mairesse, J., (2006). Empirical studies of innovation in the knowledge driven economy. *United Nations University Working Paper*, 28.

[58] Hagedoorn, J., M. Cloodt., (2003). Measuring innovative performance: is there an advantage in using multiple indicators? *Research Policy*, 32, 1365–1379.

[59] Hermann, A., Tomczak, T., Befurt, R., (2006). Determinants of radical product innovations. *European Journal of Innovation Mgmt.*, 9, 20–43.

[60] Hisrich, R.D., Peters, M.P., (1986). Establishing a new business venture unit within a firm. *Journal of Business Venturing*, 1, 307-322.

[61] Hitt, M.A., Hoskisson, R. E., Kim, H., (1997). International diversification: effects on innovation and firm performance in product-diversified firms. *Academy of Management Journal,* 40: (4), 767–798.

[62] Hitt, Michael A., Ireland, R. D., Camp, S. M., Sexton, D. L. (2001). Guest editors' introduction to the special issue strategic entrepreneurship: entrepreneurial strategies for wealth creation. *Strategic Management Journal*, 22, 479–491.

[63] Honig, B., (2001). Learning strategies and resources for entrepreneurs and intrapreneurs. *Entrepreneurship Theory and Practice*, 26: (1), 21-35.

[64] Hornsby, J.S., Naffziger, D.W., Kuratko, D.F., Montagno, R.V., (1993). An interactive model of the corporate entrepreneurship process. *Entrepreneurship Theory Practice,* 17: (2), 29-37.

[65] Hornsby, J.S., Kuratko, D.F., Zahra, S.A., (2002). Middle managers' perception of the internal environment for corporate entrepreneurship: assessing a measurement scale. *Journal of Business Venturing*, 17, 253–273.

[66] Hult, G. T. M., Snow C. C., Kandemir D., (2003). The role of entrepreneurship in building cultural competitiveness in different organizational types. *Journal of Management*, 29: (3), 401–426.

[67] Institute of Standards and Technology, (2003). Between invention and innovation, an analysis of funding for early-stage technology development, *http://www.atp.nist.gov/eao/gcr02-841/chapt2.htm*.

[68] Jaumotte, F., Pain, N., (2005). Innovation in the business sector. *OECD Economics Department Working Papers*, no. 459.

[69] Jaworski, B., Kohli A., (1993). Market orientation: Antecedents and consequences. *Journal of Marketing*, 57: (3), 53.

[70] Kanter, R.M. (1985). Supporting innovation and venture development in established companies, *Journal of Business Venturing*, 1: (1), 47-60.

[71] Kappel T. A., Rubenstein A. H., (1999). Creativity in design: The contribution of information technology. *IEEE Transactions on Engineering Management*, 46, 132-143.

[72] Khazanchi, S., Lewis M. W., Boyer K. K., (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*, 25, 871–884.

[73] Keizer, J. A., Dijkstra, L., Halman, J. I.M., (2002). Explaining innovative efforts of SMEs. An exploratory survey among SMEs in the mechanical and electrical engineering sector in The Netherlands. *Technovation*, 22, 1-13.

[74] Kemelgor, B., (2002). A comparative analysis of corporate entrepreneurial orientatation between selected firms in the Netherlands and the USA. *Entrepreneurship & Regional Development*, 14, 67-87.

[75] Kerr, S., (1975). On the folly of rewarding A while hoping for B. *Academy of Management Review*, 18: (4), 769-783

[76] Kluge, J., I. Beyer, R. Deger, D. Düsedaui (1996). *Shrink to Grow*. McKinsey&Company, Macmillan Press, London,

[77] Koberg, C.S., Uhlenbruck, N., Sarason, Y., (1996). Facilitators of organizational innovation: the role of life-cycle stage. *Journal of Business Venturing,* 11, 133–149.

[78] Kuratko, D. F., Montagno, R. V., (1989). The intrapreneurial spirit. *Training and Development Journal,* 43: (10), 83-87.

[79] Kuratko, D. F., Montagno, R. V., Hornsby, J.S., (1990). Developing an intrapreneurial assessment instrument for an effective corporate entrepreneurship. *Strategic Management Journal*, 11: (5), 49-58.

[80] Kuratko, D.F., Hodgetts, R.M., (1998). Entrepreneurship: A contemporary approach, *Dryden Press, London*.

[81] Kuratko, D.F., Ireland, R.D., Covin, J.G., Hornsby, J.S. (2005). A model of middle-level managers' entrepreneurial behaviour. *Entrepreneurship Theory and Practice*, 29: (6), 699-716.

[82] Lawler, E. A., Porter L. W., (1967). The effect of performance on job satisfaction. *Industrial Relations*, 7, 20-28.

[83] Liao, C., Chuang, S., (2006). Exploring the role of knowledge management for enhancing firm's innovation and performance. *Proceedings of the 39th Hawaii International Conference on System Sciences*.

[84] Loch, C., L. Stein, C. Terwiesch, (1996). Measuring development performance in the electronics industry. *Journal of Product Innovation Management*, 13, 3-20.

[85] Love, J.H., Ashcroft, B., Dunlop, S., (1996). Corporate structure, ownership and the likelihood of innovation. *Applied Economics,* 28, 737–746.

[86] Love, J.H., Ashcroft, B., (1999). Market versus corporate structure in plant-level innovation performance. *Small Business Economics*, 13:(2), 97-109.

[87] Lööf, H., Heshmati, A., (2002). Knowledge capital and performance heterogeneity: A firm-level innovation study. *International Journal of Production Economics,* 76: (1), 61-85.

[88] McAdam, R., Keogh, K., (2004). Transitioning towards creativity and innovation measurement in SMEs. *Creativity and Innovation Management,* 13: (2), 126-141.

[89] Menon, A., Bharadwaj, S., Adidam, P., and Edison S., (1999), Antecedents and consequences of marketing strategy making. *Journal of Marketing*, 63: (2), 18–40.

[90] Meredith, J. R., Raturi, A., Amoako-Gyampah, K., Kaplan, B., (1989). Alternative research paradigms in operations. *Journal of Operations Management*, 8: (4), 297 - 326.

[91] Metcalfe, J. S., (1998). *Evolutionary Economics and Creative Destruction*, London: Routledge.

[92] Metz, P.D., (1996). Integrating technology planning with business planning. *Research Technology Management*, 39: (3), 19-22.

[93] Miller, D., Friesen, P. H. (1982). Innovation in conservative and entrepreneurial firms: two models of strategic momentum. *Strategic Management Journal*, 3: (1), 1-25.

[94] Moenaert, R. K., Souder, W. E., De Meyer, A., Deschoolmeester, D., (1994). R&D-marketing integration mechanisms, communication flows, and innovation success. *Journal of Product Innovation Management*, Vol. 11, 31-45.

[95] Montalyo, C., (2004). What triggers change and innovation? *Technovation,* 26, 312–323.

[96] Motowidlo, S.J., (2003). Job performance. In comprehensive handbook of psychology, volume twelve: Industrial and organizational psychology. New York, NY: Wiley, 39-53.

[97] Motwani, J., Dandridge, T., Jiang, J., Soderquist, K., (1999). Managing innovation in French small and medium-sized enterprises. *Journal of Small Business Management,* 37: (2), 106–114.

[98] Nardi, P. M., (2003). Doing survey research: A guide to quantitative methods. *Boston: Pearson Education.*

[99] Narver, J.C., Slater S.F., (1990). The effect of a market orientation on business profitability. *Journal of Marketing* 54, 20-35.

[100] Norusis, M.J., (2003). *SPSS 12.0 Statistical Procedures Companion*. Prentice Hall, Inc., New Jersey.

[101] Oczkowski, E., Farrell, M., (1998). Discriminating between measurement scales using non-nested tests and two stages least squares: The case of market orientation. *International Journal of Research in Marketing*, 15: (4), 349-366.

[102] OECD (1997). *Oslo Manual: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, Paris.

[103] OECD (2005). *Oslo Manual: Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, Paris.

[104] Olson, E. M., Walker, O. C., Ruekert, R. W., Bonner, J., (2001). Patterns of cooperation during new product deveopment among marketing, operations and R&D: Implications for project performance. *The Journal of Product Innovation Management*, 18, 258-271.

[105] Özçelik, E., Taymaz, E., (2004). Does innovativeness matter for international competitiveness in developing countries? The case of Turkish manufacturing industries. *Research Policy*, 33, 409-424.

[106] Payzın E., Ulusoy G., Kaylan A. R., Akova B., (1998). New product development capabilities of the Turkish electronics industry. *Proceedings of the 5th International Product Development Management Conference, Como*: 863-876.

[107] Pearce, J.A., Robbins, D.K., Robinson, R.B., (1987). The impact of grand strategy and Planning formality on financial performance. *Strategic Management Journal*, 8: March-April, 125-134.

[108] Pelham, A. E. (1999). Influence of environment, strategy, and market orientation on performance in small manufacturing firms. *Journal of Business Research*, 45, 33-46.

[109] Pandya, K.V., Karlsson, A., Sega, S. and Carrie, A., (1997). Towards the manufacturing enterprise of the future. *International Journal of Operation & Production Management*, 17: (5), 502-521.

[110] Pavitt, K., (1990). What we know about the strategic management of technology?. *California Management Review*, 52: (3): 17-26.

[111] Peeters, C., Van Pottelsberghe, B., (2003). Measuring innovation competencies and performances: a survey of large firms in Belgium. Working Papers, CEB 04-005.RS. Université Libre de Bruxelles, *Solvay Business School*, Centre Emile Bernheim (CEB).

[112] Pelham, A. E., (1999). Influence of environment, strategy, and market orientation on performance in small manufacturing firms. *Journal of Business Research*, 45, 33-46.

[113] Pinchot, G., (1985). Intrapreneuring: why you don't have to leave the corporation to become and entrepreneur. *New York, NY Harper and Row Publishers*.

[114] Porter, M.E., (1979). The structure within industries and companies' performance. *Review of Economics and Statistics*, 61, 214–227.

[115] Porter, M.E. (1998). Clusters and the new economics of competition. *Harvard Business Review*, Nov. - Dec: 77-90.

[116] Probert, D. and Gregory, M., (1995). A process model for the management of technology: mapping techniques and sectoral characteristics. *Proceedings of the International Association for Management of Technology Conference*, Aston, 431-438.

[117] Romer, P., (2005). The arc of science. Paper presented at World Bank/CREI conference on R&D and Innovation in the Development Process. *A New Look at Theory, Evidence and Policies*, Universitat Pompeu Fabra, Barcelona.

[118] Roper, S., Love, J.H., (2002). Innovation and export performance: evidence from the UK and German manufacturing plants. *Research Policy,* 31: (7), 1087-1102.

[119] Sáez, C. B., Marco, T. G., Arribas, E. H., (2002). Collaboration in R&D with universities and research centres: an empirical study of Spanish firms. *R&D Management*, 32: (4), 321–341.

[120] Salavou, H., (2004). The concept of innovativeness: should we need to focus? *European Journal of Innovation Management,* 7, 33-44.

[121] Sathe, V., (1985). Managing an entrepreneurial dilemma; nurturing entrepreneurship and control in large corporations. *Frontiers of Entrepreneurship Research* 37: (2), 636-656.

[122] Schumpeter, J.A., (1934). *The Theory of Economic Development. An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Cambridge, Harvard University Press.

[123] Schumpeter, J. A., (1950). *Capitalism, Socialism and Democracy*. Third Expanded Edition, New York: Harper.

[124] Simon, M., Elango, B., Houghton, S. M., Savelli, S., (2002). The successful product pioneer: Maintaining commitment while adapting to change. *Journal of Small Business Management*, 40: (3), 187-203.

[125] Slevin, D. P., and Covin, J. G., (1990). Juggling entrepreneurial style and organizational structure. *Sloan Management Review*, 31: (2), 43-53.

[126] Souder, W. E., (1981). Encouraging entrepreneurship in large corporations. *Research Management*, 24: (3), 18-22.

[127] Souitaris, V., (2001). External communication determinants of innovation in the context of a newly industrialised country: a comparison of objective and perceptual results from Greece. *Technovation,* 21, 25–34.

[128] Souitaris, V., (2002). Technological trajectories as moderators of firm-level determinants of innovation. *Research Policy*, 31, 877–898.

[129] Streiner, D.L., (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment*, 80: (1), 99-103.

[130] Stevenson, H. H., Jarillo, C. J. (1990). A paradigm of entrepreneurship: entrepreneurial management. *Strategic Management Journal*, 11 (5), 17-27.

[131] Subramaniam, M., Youndth, R. A., (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48: (3), 450–463.

[132] Stopford, J., Baden–Fuller, C., (1994). Creating corporate entrepreneurship. *Strategic Management Journal*, 15, 521-536.

[133] Sundbo, J., (1999). Empowerment of employees in small and medium-sized service firms. *Employee Relations*, 21: (2), 105-127.

[134] Sykes, H.B., Block, Z., (1989). Corporate venturing obstacles: sources and solutions. *Journal of Business Venturing*, 4: (3), 159-167.

[135] Taş, R. (2006). Ar-Ge yoğunluğu - rekabet gücü ilişkisi açısından Türkiye - AB karşılaştırmalı analizi. *Pamukkale Üniversite Maliye Sempozyumu Bildirisi*.

[136] Tatikonda, M. V., Rosenthal, S. R., (2000). Successful execution of product development projects: balancing firmness and flexibility in the innovation process. *Journal of Operations Management*, 18, 401–425.

[137] Terwiesch, C., C. Loch, M. Niederkofler, (1996). Does product development make a difference?. *INSEAD Working Paper*, June.

[138] Tether, B. S., (2002). Who co-operates for innovation, and why: An empirical analysis. *Research Policy*, 31, 947-967.

[139] Ulusoy, G., Toker, A., Karabatı, S., Barbarosoğlu, G., İkiz, İ., (1999). *Beyaz Eşya Yan Sanayiinde Rekabet Stratejileri Ve Iş Mükemmelliği*, TÜSİAD, İstanbul.

[140] Ulusoy, G., (2000*). Moving Forward: Assessment of Competitive Strategies and Business Excellence in the Turkish Manufacturing Industry: A Benchmarking Study*, TÜSİAD, İstanbul.

[141] Venkatraman, N., Ramanujam, V., (1986). Measurement of business performance in strategy research: A comparison of approaches. *The Academy of Management Review*, 11: (4), 801-814.

[142] Veugelers, R., Cassiman, B., (1999). Make and buy in innovation strategies: evidence from Belgian manufacturing firms. *Research Policy,* 28, 63–80.

[143] Vinding, A., L., (2006). Absorptive capacity and innovative performance: A human capital approach. *Economics of Innovation and New Technology*, 15: (4), 507-517.

[144] Yılmaz, C., Alpkan, L., Ergun, E., (2005). Cultural determinants of customer- and learning-oriented value systems and their joint effects on firm performance. *Journal of Business Research,* 58: 1340-1352.

[145] Zahra, S.A., Neubaum, D.O., and Huse, M., (2000). Entrepreneurship in medium-size companies: exploring the effects of ownership and governance systems. *Journal of Management*, 26: (5), 947–976.

[146] Zahra, S.A. (1993). Environment, corporate entrepreneurship and financial performance: a taxonomic approach. *Journal of Business Venturing*, 8: (4), 319-340.

[147] Zahra, S.A., (1996). Technology strategy and financial performance: examining the moderating role of the firm's competitive environment. *Journal of Business Venturing*, 11: (3), 189–219.

[148] Walker, Orville C. and Robert W. Ruekert (1987). Marketing's role in the implementation of business strategies: a critical review and conceptual framework. *Journal of Marketing*, 51 (July), 15–33.

[149] Wan, D., Ong, C. H., Lee, F., (2005). Determinants of firm innovation in Singapore. *Technovation,* 25: 261–268.

[150] Wang, C., Ahmed, P., (2004). Development and validation of the organizational innovativeness. *European Journal of Innovation Management,* 7: (4), 303-313.

[151] Ward, P., T., and Duray, R., (2000). Manufacturing strategy in context: environment competitive strategy and manufacturing strategy. *Journal of Operations Management*, 18: (3), 123-138.

[152] Wheaton, B., Muthén, B., Alwin, D., F., and Summers, G., F., (1977). Assessing reliability and stability in panel models. *Sociological methodology*, San Francisco: Jossey-Bass, 84–136.

[153] Womack, P.J., Jones, D.T., Roos, D., (1991). *The Machine That Changed the World: How Japan's Secret Weapon in the Global Auto Wars Will Revolutionize Western Industry*. Harper Perennial, New York.

APPENDIX A: Survey Design Process

				Survey Headings										
				General Firm Characteristics	*Market Conditions and Competiton*	*Firm Strategies*	*Innovation Types*	*Intellectual Capital*	*Public Incentives*	*Organization Culture*	*Barriers of Innovation*	*Collaboration*	*Performance*	*Quantitative Data*
Innovation Determinants	*General Firm Characteristics*		Firm Size	G4-SB										SB22-SB23
			Firm Age	G2										
			Ownership Status	G3-G4										
			Foreign Capital	G5-G6-G7										
	Firm Structure	*Intellectual Capital*	Human Capital					E1-E2-E3-E4-E5						SB17-SB18-SB19-SB20-SB21
			Social Capital					E6-E7-E8-E9-E10						
			Org. Capital					E11-E12-E13-E14-E19-E20-E21-E22-E23-E24-E25-E26-E27-E30						
			Specialization					E15-E16-E17-E18						
		Organization Culture	Communication							K3-K4-K5-K6-K7				
			Formalization							K8-K9-K10-K11-K12-K13				
			Centralization							K14-K15-K16-K17-K18-K19				
			Management Support							K20-K21-K22-K23-K24-K25-K26-K27-K28-K29-K30				
			Work Discretion							K31-K32-K33-K34-K35-K36				
			Time Availability							K37-K38-K39				
			Reward System							K40-K41-K42-K43-K44				
	Firm Strategies	Innovation Outlay												SB13-SB14-SB15-SB16
		Collaborations										I1-I2-I3-I4-I5-I6-I7-I8-I9-I10		
		Business Strategies	Market Strategies and Monitoring			S1-S2-S3-S4-S7-S8-S9-S10-S11-S12-S13-S14-S15-S16-S17-S18-S19				K1-K2		I11-I12-I13-I14-I15-I16-I17-I18-I19-I20-I21-I22		
			Manufacturing Strategies: Cost			S5-S26-S27-S28-S29-S30-S31								
			Manufacturing Strategies: Quality			S6-S20-S21-S22-S23-S24-S25								
			Manufacturing Strategies: Flexibility			S32-S33-S34-S35-S36-S37-S38								
			Manufacturing Strategies: On-Time Delivery			S40-S41-S42-S43-S44-S45								
	Sectoral Conditions and Relations	Barriers to Innovation	In-Firm								Eg1-Eg2-Eg3-Eg4-Eg5-Eg6-Eg7-Eg8-Eg9-Eg10-Eg11-Eg12-Eg13-Eg14-Eg15-Eg16-Eg17-Eg18-Eg19			
			Out-Firm								Eg20-Eg21-Eg22-Eg23-Eg24-Eg25-Eg26-Eg27-Eg28-Eg29-Eg30-Eg31			
		Public Incentives							KD1-KD2-KD3-KD4-KD5-KD6-KD7-KD8-KD9-KD10-KD11					
		Market Dynamism & Intensity			P1-P2-P3-P4-P5-P6-P7-P8-P9-P10-P11-P12-P13-P14									SB1-SB2-SB3-SB4-SB7-SB8
Innovativeness	*Production Innovation*						Y1-Y2-Y3-Y4-Y5							
	Process Innovation						Y6-Y7-Y8-Y9-Y10							
	Marketing Innovation						Y11-Y12-Y13-Y14-Y15							
	Organizational Innovation						Y16-Y17-Y18-Y19-Y20-Y21-Y22-Y23Y24							
Performance Indicators	*Innovative Performance*												Pe1-Pe2-Pe3-Pe4-Pe5-Pe6-Pe7	SB9
	Market Performance												Pe12-Pe13-Pe14	SB5-SB6-SB10-SB11
	Financial Performance												Pe15-Pe16-Pe17-Pe18	SB10-SB11
	Production Performance												Pe8-Pe9-Pe10-Pe11	

APPENDIX B: Questionnaire Form

FİRMA ve FORMU DOLDURAN BİLGİLERİ

Lütfen firmanızla ilgili aşağıdaki bilgileri veriniz.

Firma Adı:	Sektör:	Adres
Telefon:	Faks:	E-posta:
Formu Dolduranın Adı-Soyadı:	Görevi:	

GENEL FİRMA BİLGİLERİ

Lütfen firmanızın ana ürün (satışlarda en fazla paya sahip olan ürün) ya da ürün grubunu belirtiniz.

G1. Ana ürün (grubu): G2. Üretime başlanan yıl:

G3. Firmanız bir aile şirketi olarak nitelendirilebilir mi? **Evet** ☐ **Hayır** ☐

G4. Firmanızın hukuki statüsü nedir?

☐Anonim Şirket, ☐Limited Şirket, ☐Komandit Şirket, ☐Kolektif Şirket, ☐ Şahıs İşletmesi, ☐diğer

G5. Firmanızda yabancı sermaye bulunuyor mu? **Evet** ☐ **Hayır** ☐

G6. Evet ise, Yabancı sermaye oranı nedir? %

G7. Yabancı sermaye ile ortaklığa başlangıç yılı nedir?

PAZAR ÖZELLİKLERİ VE REKABETİN YAPISI

Lütfen, firmanızın hedef pazarını (iç veya dış) göz önüne alarak, <u>kendi algılamanıza göre</u> aşağıdaki ifadelere ne derece katıldığınızı belirtiniz.

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

		1	2	3	4	5
P1	Endüstrimizdeki rekabet oldukça şiddetlidir	☐	☐	☐	☐	☐
P2	Bu sektörde şirketlerin uzun vadede ayakta kalmaları zordur	☐	☐	☐	☐	☐
P3	Bu sektörde mevcut ürünlere olan rağbet azalmaktadır	☐	☐	☐	☐	☐
P4	Bu sektörde yetenekli işgücü bulmak ve/veya elde tutmak çok zordur	☐	☐	☐	☐	☐
P5	Rakipler, birbirlerinin yaptığı bir yeniliği kolaylıkla taklit edip pazara sunabilir	☐	☐	☐	☐	☐
P6	Bu sektörde, büyük pazar payına sahip egemen bir rakip vardır	☐	☐	☐	☐	☐
P7	Pazarda, müşteri ihtiyaçlarındaki değişimler çok hızlıdır	☐	☐	☐	☐	☐
P8	Müşteri ihtiyaçları son derece karmaşık ve birbirine benzemez niteliktedir	☐	☐	☐	☐	☐
P9	Pazarda, rakiplerin stratejileri ve faaliyetleri sürekli değişir	☐	☐	☐	☐	☐
P10	Rakiplerin davranışları karmaşık, birbirine benzemez ve anlaşılmaz niteliktedir	☐	☐	☐	☐	☐
P11	Pazarda, ürünler, hızlı bir şekilde eskir (demode olur).	☐	☐	☐	☐	☐
P12	Rakiplerce çok farklı ve karmaşık ürün kombinasyonları geliştirilmiştir	☐	☐	☐	☐	☐
P13	Pazarda, teknolojik değişim oranı çok yüksektir	☐	☐	☐	☐	☐
P14	Uygulanan teknolojiler karmaşık, birbirine benzemez ve anlaşılmaz niteliktedir	☐	☐	☐	☐	☐

FİRMA STRATEJİLERİ

S1. Başka ülkelerde üretim yatırımınız var mı? **Evet** ☐ **Hayır** ☐

S2. **Hayır ise,** önümüzdeki 5 sene içinde yurt dışında üretim için yatırım hedefiniz var mı? **Evet** ☐ **Hayır** ☐

S3. Üst düzey yöneticiler tarafından onaylanan, açık bir biçimde ifade edilmiş olan bir *yazılı stratejik plan* bulunmaktadır.

Evet ☐ **Hayır** ☐ S4. **Evet ise** kaç yıllık bir zaman ufkuna sahip?

S5. Başlıca rakiplerinize kıyasla benzer ürünlerde **Fiyat** açısından Firmanızın ürünlerini nasıl değerlendiriyorsunuz?

	1	2	3	4	5	
Çok düşük fiyat	☐	☐	☐	☐	☐	Çok yüksek fiyat

S6. Başlıca rakiplerinize kıyasla benzer ürünlerde **Kalite** açısından Firmanızın ürünlerini nasıl değerlendiriyorsunuz?

	1	2	3	4	5	
Çok düşük kalite		☐	☐	☐	☐	☐ Çok yüksek kalite

S7. Başlıca rakiplerinize kıyasla benzer ürünlerde **Odaklanma (Hedef Pazar Büyüklüğü)** açısından Firmanızı nasıl değerlendiriyorsunuz?

	1	2	3	4	5	
Çok dar		☐	☐	☐	☐	☐ Çok geniş

S8. Başlıca rakiplerinize kıyasla benzer ürünlerde **Çeşitlendirme (Ürün Yelpazesinin Genişliği)** açısından Firmanızı nasıl değerlendiriyorsunuz?

	1	2	3	4	5	
Çok dar		☐	☐	☐	☐	☐ Çok geniş

Şirketin son üç yıllık (2003-2005) döneminde aşağıdaki hususlara verdiği önemi belirtiniz.

1-Önemli değil	2-Az Önemli	3-Orta derecede Önemli	4-Çok Önemli	5-Son derece Önemli

		1	2	3	4	5
S9.	Mevcut pazarlar için mevcut ürünlerde küçük değişiklikler yapmak.	☐	☐	☐	☐	☐
S10.	Mevcut pazarlar için yeni ürünler geliştirmek.	☐	☐	☐	☐	☐
S11.	Yeni pazarlara mevcut ürünlerle girmek.	☐	☐	☐	☐	☐
S12.	Yeni pazarlara yeni ürünlerle girmek.	☐	☐	☐	☐	☐

Son 3 yılda (2003-2005), pazara sunduğunuz yeni ürünlerinizde, aşağıdaki yeni ürün geliştirme stratejilerini uygulamak için ayırdığınız kaynak ağırlığını belirtiniz.

1-Hiç kaynak ayrılmadı	2-Az kaynak ayrıldı	3-Kaynak ayrıldı	4-Çok kaynak ayrıldı	5-Tüm kaynaklar ayrıldı

		1	2	3	4	5
S13.	Yeni teknoloji geliştirmek	☐	☐	☐	☐	☐
S14.	Kendi mevcut teknolojisini iyileştirmek	☐	☐	☐	☐	☐
S15.	Başkalarınca geliştirilen teknolojileri iyileştirmek	☐	☐	☐	☐	☐
S16.	Başkalarınca geliştirilen teknolojileri kullanmak	☐	☐	☐	☐	☐

Yatırım kararlarında kararı etkileyen temel etmeni değerlendiriniz:

1-Tamamen Finansal	2-Finansal	3-Eşit derecede	4-Stratejik	5-Tamamen Stratejik

S17. Büyük yatırımlarda: **Finansal geri dönüş**	☐	☐	☐	☐	☐	**Stratejik önem**
S18. Küçük yatırımlarda: **Finansal geri dönüş**	☐	☐	☐	☐	☐	**Stratejik önem**

S19. Firmanızda stratejik kararları alan üst düzey yöneticilerin sahip oldukları iş tecrübesi birikimi ağırlıklı olarak hangi alandadır? (çok gerekli görüldüğü takdirde birden fazla seçenek işaretlenebilir.)

☐Üretim/Satın Alma ☐Muhasebe/Finans ☐Personel ☐AR-GE ☐Pazarlama/Satış ☐Diğer.:……..

Aşağıdaki her bir başarı kriterlerine firmanızın ne ölçüde önem verdiğini belirtiniz.

1- Hiç Önemi Yok	2- Az önemli	3- Orta Derecede Önemli	4- Oldukça Önemli	5-Son Derece Önemli

	İmalat Kalitesi	1	2	3	4	5
S20.	Müşteri gözünde ürün ve hizmet kalitemizin artması	☐	☐	☐	☐	☐
S21.	Rakiplere kıyasla ürün ve hizmet kalitemizin artması	☐	☐	☐	☐	☐
S22.	Müşteri şikâyetlerinin azalması	☐	☐	☐	☐	☐
S23.	Hatalı ve defolu nihai veya ara mamul sayısının azalması	☐	☐	☐	☐	☐
S24.	İsraf, ıskarta ve yeniden işlemelerin sayısının azalması	☐	☐	☐	☐	☐
S25.	Müşterilerden gelen ürün iadelerinin sayısının azalması	☐	☐	☐	☐	☐
	İmalat Maliyeti					
S26.	Girdi maliyetlerinin azalması	☐	☐	☐	☐	☐
S27.	Personel maliyetlerinin azalması	☐	☐	☐	☐	☐
S28.	Personelin verimliliğinin artması	☐	☐	☐	☐	☐
S29.	İşlem maliyetlerinin azalması	☐	☐	☐	☐	☐
S30.	İç ve dış lojistik süreçlerdeki toplam maliyetlerin azaltılması	☐	☐	☐	☐	☐
S31.	İmalat sürecindeki toplam maliyetlerin azalması	☐	☐	☐	☐	☐
	İmalat Esnekliği					
S32.	İmalat süreçlerindeki esnek üretim yeteneğinin arttırılması	☐	☐	☐	☐	☐
S33.	İş önceliklerini siparişlerin durumuna göre değiştirebilme esnekliğinin artması	☐	☐	☐	☐	☐
S34.	Değişen iş önceliklerinin durumuna göre her bir işe atanan teçhizatın değiştirilebilmesi	☐	☐	☐	☐	☐
S35.	Farklı müşteri siparişlerine göre standart olmayan ürünler üretebilme yeteneğinin artması	☐	☐	☐	☐	☐
S36.	İmalatta çalışan personelin değişken ve farklı görevlerde çalışabilme yeteneğinin artması	☐	☐	☐	☐	☐
S37.	Farklı spesifikasyonlardaki ürün siparişlerini reddetme sıklığının azalması	☐	☐	☐	☐	☐
S38.	Standart olmayan ürünlerin üretimi için mevcut donanım ve personeli esnek bir şekilde kullanabilme yeteneğinin artması	☐	☐	☐	☐	☐
	İmalat ve Teslimat Hızı					
S40.	Siparişin alınması ile teslimatın yapılması arasındaki sürenin azaltılması	☐	☐	☐	☐	☐
S41.	İmalat sürecinin başlaması ile teslimatın yapılması arasındaki sürenin azaltılması	☐	☐	☐	☐	☐
S42.	Bitmiş ürünlerin teslimat hızının arttırılması	☐	☐	☐	☐	☐
S43.	Teslimatla ilgili önceden verilmiş olan sözleri tutma yeteneğinin arttırılması	☐	☐	☐	☐	☐
S44.	Tam zamanında teslimat yeteneğinin arttırılması	☐	☐	☐	☐	☐
S45.	Dağıtım ve teslimat ile ilgili zorlukların en aza indirilmesi	☐	☐	☐	☐	☐

YENİLİK TÜRLERİNİN UYGULAMA DÜZEYLERİ

Aşağıdaki sorularda son üç yılda (2003-2005) ürün ve süreç yönetimi alanlarında yapmış olduğunuz yeniliklerle ile ilgili olarak ne ölçüde başarılı olduğunuza yönelik 1'den 5'e kadar bir puan vermeniz istenmektedir.

A= bu türden herhangi bir yenilik yapılmadı;
B= yurt içinde mevcut bu türden uygulamalar firma bünyesine ilk defa uyarlandı
C= yurt dışında mevcut bu türden uygulamalar yurt içinde ilk defa firmanız tarafından uyarlandı
D= bu türden mevcut uygulamalar firmanız tarafından biraz daha geliştirilip iyileştirildi
E= bu türden uygulamalardan çok farklı tamamen orijinal yenilikler firmanız tarafından sunuldu

	Ürünlerle (Mallarla/ Hizmetlerle) ilgili Yenilik Türleri	**Uygulama düzeyi**				
		A	**B**	**C**	**D**	**E**
Y1.	Mevcut ürünlerin bileşen ve malzemelerinde çıktı kalitesini arttırıcı yenilikler yapılması	☐	☐	☐	☐	☐
Y2.	Mevcut ürünlerin bileşen ve malzemelerinde çıktı maliyetini azaltıcı yenilikler yapılması	☐	☐	☐	☐	☐
Y3.	Mevcut ürünlerin teknik spesifikasyonlarında ve/veya işlevsel özelliklerinde kullanıcı (müşteri) açısından kullanım kolaylığı ve tatminini artırıcı yenilikler yapılması	☐	☐	☐	☐	☐
Y4.	Mevcut ürünlerden tamamen farklı teknik spesifikasyonlara ve işlevsel özelliklere sahip yeni ürünlerin piyasaya sunulması	☐	☐	☐	☐	☐
Y5.	Mevcut ürünlerden tamamen farklı bileşen ve malzemelerden mamul yeni ürünlerin piyasaya sunulması	☐	☐	☐	☐	☐

Son üç yılda yapmış olduğunuz Ürünlerle ilgili Yeniliklere örnekleri aşağıdaki alanda bizimle paylaşabilirsiniz

	Üretim Süreçleri ile ilgili Yenilik Türleri	**Uygulama düzeyi**				
		A	**B**	**C**	**D**	**E**
Y6.	Üretim süreçlerindeki değer katmayan faaliyet adımlarının tespiti ve ayıklanması	☐	☐	☐	☐	☐
Y7.	Üretim usul, teknik, donanım ve yazılımlarında (örnek: fabrika otomasyonu, CAD-CAM vs. gibi ileri imalat teknolojileri) değişken maliyetleri azaltıcı yenilikler yapılması	☐	☐	☐	☐	☐
Y8.	Üretim usul, teknik, donanım ve yazılımlarında çıktı kalitesini arttırıcı yenilikler yapılması	☐	☐	☐	☐	☐
Y9.	Teslimatla ilgili lojistik süreçlerinde değer katmayan faaliyet adımlarının tespiti ve ayıklanması	☐	☐	☐	☐	☐
Y10	Teslimatla ilgili lojistik süreçlerinde (*örn:* barkodlu malzeme teslimat sistemine geçiş) değişken maliyetleri azaltıcı ve/veya hızı artırıcı yenilikler yapılması	☐	☐	☐	☐	☐

Son üç yılda yapmış olduğunuz Üretim Süreçleri İle ilgili Yeniliklere örnekleri aşağıdaki alanda bizimle paylaşabilirsiniz

Aşağıdaki sorularda son üç yılda (2003-2005) pazarlama ve kurumsal yönetim alanlarında yapmış olduğunuz yeniliklerle ile ilgili olarak ne ölçüde başarılı olduğunuza yönelik 1'den 5'e kadar bir puan vermeniz istenmektedir.

A= bu türden herhangi bir yenilik yapılmadı;
B= yurt içinde mevcut bu türden uygulamalar firma bünyesine ilk defa uyarlandı
C= yurt dışında mevcut bu türden uygulamalar yurt içinde ilk defa firmanız tarafından uyarlandı
D= bu türden mevcut uygulamalar firmanız tarafından biraz daha geliştirilip iyileştirildi
E= bu türden uygulamalardan çok farklı tamamen orijinal yenilikler firmanız tarafından sunuldu

	Pazarlama Yöntemleri ile ilgili Yenilik Türleri	**Uygulama düzeyi** A	B	C	D	E
Y11	Mevcut ve/veya yeni ürünlerimizin temel işlevsel özelliklerini değiştirmeksizin form veya ambalaj büyüklüğü gibi görünüş, biçim, hacim vb. ile ilgili tasarım yeniliklerinin yapılması	☐	☐	☐	☐	☐
Y12	Mevcut ve/veya yeni ürünlerimizin müşterilerimize ulaştırılması ile ilgili lojistik süreçler değiştirilmeksizin sadece ürünün pazardaki satış kanallarını yenilemeye yönelik (toptancı, perakendeci, bayii, doğrudan satış, vs. ile ilgili) yeni ürün konumlandırma tekniklerinin geliştirilmesi	☐	☐	☐	☐	☐
Y13	Mevcut ve/veya yeni ürünlerimizin tanıtımında kullanılan medya, reklam, müşteriye özel tanıtımlar, yeni marka sembolleri, vs. gibi yeni promosyon tekniklerinin geliştirilmesi	☐	☐	☐	☐	☐
Y14	Mevcut ve/veya yeni ürünlerimizin fiyatlandırılmasında talebe göre, maliyete göre, marka imajına göre, müşteri grubuna göre, vs., yeni fiyatlama tekniklerinin geliştirilmesi	☐	☐	☐	☐	☐
Y15	Genel pazarlama yönetimi faaliyetlerinin yenilenmesi	☐	☐	☐	☐	☐

Son üç yılda yapmış olduğunuz pazarlama yenilikleri ile ilgili olarak örnekler vermek için aşağıdaki alanı kullanabilirsiniz.

	Kurumsal Yönetim Sistemleri ile ilgili Yenilik Türleri	**Uygulama düzeyi** A	B	C	D	E
Y16	Firma içindeki genel iş yapış şekilleri ile ilgili rutin, usul ve prosedürlerin yenilenmesi.	☐	☐	☐	☐	☐
Y17	Tedarik zinciri yönetimi (tedarikçiler, yan sanayi, taşeronlar, vs.) ile ilgili sistemin yenilenmesi	☐	☐	☐	☐	☐
Y18	Üretim ve kalite yönetimi ile ilgili sistemin yenilenmesi	☐	☐	☐	☐	☐
Y19	İnsan kaynakları (personel seçim, eğitim, performans ve kariyer yönetimi) sisteminin yenilenmesi	☐	☐	☐	☐	☐
Y20	Firma içi bilgi işlem ve paylaşım sisteminin yenilenmesi	☐	☐	☐	☐	☐
Y21	Takım çalışmasını kolaylaştırmaya yönelik olarak organizasyon yapısının yenilenmesi	☐	☐	☐	☐	☐
Y22	Departmanlar arası (örn: üretim ve pazarlama) koordinasyonu kolaylaştırmaya yönelik olarak organizasyon yapısının yenilenmesi	☐	☐	☐	☐	☐
Y23	Proje bazında çalışmayı sağlayacak yeni bir organizasyon yapısının oluşturulması	☐	☐	☐	☐	☐
Y24	Stratejik ittifaklar ve uzun vadeli ticari işbirliklerini kolaylaştırıcı yeni bir organizasyon yapısının oluşturulması	☐	☐	☐	☐	☐

Son üç yılda yapmış olduğunuz Kurumsal Yönetim Sistemlerine yönelik yenilikler ile ilgili olarak örnekler vermek için aşağıdaki alanı kullanabilirsiniz

ENTELEKTÜEL SERMAYE

Firmanın son üç yıldaki faaliyetlerini düşünerek her bir cümledeki (sorudaki) kurumunuzun **Entelektüel Sermaye** yapısını inceleyen aşağıdaki ifadelere ne ölçüde katıldığınızı belirtiniz.

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	İnsan Sermayesi	**1**	**2**	**3**	**4**	**5**
E1.	Çalışanlarımız çok yeteneklidir	☐	☐	☐	☐	☐
E2.	Çalışanlarımız sektörün en iyileridir	☐	☐	☐	☐	☐
E3.	Çalışanlarımız zeki ve yaratıcıdır	☐	☐	☐	☐	☐
E4.	Çalışanlarımız işlerinde uzmandır	☐	☐	☐	☐	☐
E5.	Çalışanlarımız yeni fikir ve bilgiler üretirler	☐	☐	☐	☐	☐
	Sosyal Sermaye					
E6.	Çalışanlarımız arasında problem / fırsat teşhis ve çözümü konusunda sıkı bir işbirliği mevcuttur	☐	☐	☐	☐	☐
E7.	Aynı departmanlarda çalışanlarımız arasında bilgi paylaşımı ve birbirinden öğrenme çok yaygındır	☐	☐	☐	☐	☐
E8.	Farklı departmanlarda çalışanlar arasında etkileşim ve bilgi paylaşımı yüksektir	☐	☐	☐	☐	☐
E9.	Problem/ fırsat teşhis ve çözümü konusunda çalışanlarımız müşteri ve tedarikçilerimiz ile sıkı bir işbirliği içindedir	☐	☐	☐	☐	☐
E10.	Çalışanlarımız belli bir alanda sahip oldukları mesleki uzmanlığı başka bir alandaki problem/ fırsat teşhis ve çözümü konusunda kullanma yeteneğine sahiptirler	☐	☐	☐	☐	☐
	Örgütsel Sermaye					
E11.	Kurumumuz tüm sahip olduğu özgün bilgi birikimini korumak amacıyla patent ve lisans gibi maddi olmayan duran varlıklar almaktadır	☐	☐	☐	☐	☐
E12.	Tüm kurumsal bilgi birikimimiz veri tabanları ve el kitaplarında kayıt altına alınmıştır	☐	☐	☐	☐	☐
E13.	Kurumumuza özgü etkin iş yapma fikir ve yöntemleri kurum kültürünün çeşitli araçları (liderler, toplantılar, kutlamalar, sloganlar vs.) sayesinde çalışanlarımıza benimsetilmiştir	☐	☐	☐	☐	☐
E14.	Kurumsal bilgi birikimimiz tüm kurumsal sistem ve süreçlere yansıtılmıştır	☐	☐	☐	☐	☐

Çalışanlarınızın uzmanlık düzeyleri ile ilgili aşağıdaki önermelere katılım düzeyinizi belirtiniz.

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

		1	2	3	4	5
E15.	Dar faaliyet alanlarında derin uzmanlık bilgisine sahip pek çok uzman personele sahibiz	☐	☐	☐	☐	☐
E16.	Vasıflı personelimizin, görev ve sorumluluk alanlarındaki her türlü iş hakkında sadece bir miktar genel bilgi ve tecrübesi olup, belirli konularda özel ve derin uzmanlığı yoktur	☐	☐	☐	☐	☐
E17.	Vasıflı personelimiz görev ve sorumluluk alanlarındaki tüm konuların uzmanı olan kişilerdir	☐	☐	☐	☐	☐
E18.	Vasıflı personelimiz görev ve sorumluluk alanlarında sadece kendi uzmanlık alanları ile ilgili işlerde derinlemesine özel bilgi ve tecrübeye sahiptir	☐	☐	☐	☐	☐

Son 3 yılda (2003-2005) geliştirmiş olduğunuz yeni ürün ve teknolojilerinin kullanımı ile elde edilen rekabet üstünlüğünü korumak için aşağıdaki yöntemlere kaç defa başvurduğunuzu ve başvurduğunuz yöntemlerin etkinliğini belirtiniz.

1-Etkin değil	2-Az etkin	3-Orta derecede etkin	4-Çok etkin	5-Son derecede etkin

		Sayı	Uygulamada Etkinlik				
			1	2	3	4	5
E19.	Patent		☐	☐	☐	☐	☐
E20.	Patent başvurusu		☐	☐	☐	☐	☐
E21.	Tasarımların tescil edilmesi		☐	☐	☐	☐	☐
E22.	Marka tescil edilmesi		☐	☐	☐	☐	☐
E23.	Faydalı model belgesi		☐	☐	☐	☐	☐
E24.	Rakiplere göre daha önce üretime geçme sayesinde süre avantajını kullanma		☐	☐	☐	☐	☐
E25.	Gizliliğin sağlanması		☐	☐	☐	☐	☐
E26.	İlgili personelin şirkette devamının sağlanması		☐	☐	☐	☐	☐
E27.	Ürünün karmaşıklığı		☐	☐	☐	☐	☐
E28.	Diğer(belirtiniz:)		☐	☐	☐	☐	☐

KAMU DÜZENLEMELERİ

Aşağıdaki Ar-Ge ve yenilik konularında verilen desteklerden haberdar mısınız ve kullandınız mı? (ilgili hücreye işaret koyunuz)ve kullandı iseniz firmanıza yaptığı katkıyı değerlendirir misiniz?

1= hiç katkı yapmadı **2=** üzerinde değişiklik yapmadığımız yenilik transferi
3= üzerinde biraz değişiklik yaptığımız yenilik transferi
4= bizim yenilik yapmamıza biraz katkı yaptı **5=** bizim yenilik yapmamıza çok katkı yaptı

		Haberim yok	Haberim var	Kullanıldı	Kullandı iseniz katkı düzeyi				
					1	2	3	4	5
KD1.	Vergi İndirimleri	☐	☐	☐	☐	☐	☐	☐	☐
KD2.	TTGV	☐	☐	☐	☐	☐	☐	☐	☐
KD3.	TÜBİTAK-TEYDEB	☐	☐	☐	☐	☐	☐	☐	☐
KD4.	KOSGEB_TEKMER	☐	☐	☐	☐	☐	☐	☐	☐
KD5.	KOSGEB-Girişimcilik Enstitüsü	☐	☐	☐	☐	☐	☐	☐	☐
KD6.	KOSGEB	☐	☐	☐	☐	☐	☐	☐	☐
KD7.	HALKBANK	☐	☐	☐	☐	☐	☐	☐	☐
KD8.	AB Altıncı Çerçeve Programı	☐	☐	☐	☐	☐	☐	☐	☐

KURUMSAL KÜLTÜR

K1. Firmanızda organizasyon el kitabı gibi resmi ve yazılı genel bir prosedürünüz var mı ?

Evet ☐ **Hayır** ☐

K2. Yeni ürün geliştirme projelerinin organizasyonu ve yönetimi için resmi ve yazılı bir prosedürünüz var mı?

Evet ☐ **Hayır** ☐

Çalışanlarınız ile aşağıdaki konularda, firmanızın operasyonu ve stratejilerine yönelik iletişim kurmak için yerleşmiş prosedürlerinizi değerlendiriniz.

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	1	2	3	4	5
K3. Firmanın planları hakkında çalışanları bilgilendirmek	☐	☐	☐	☐	☐
K4. Büyük değişiklikler hakkında çalışanları bilgilendirmek	☐	☐	☐	☐	☐
K5. Büyük değişiklikler konusunda çalışanlardan fikir ve geri besleme almak	☐	☐	☐	☐	☐

Firmanızda birimler arasında iletişim kanalları yeterince açık mı?

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	1	2	3	4	5
K6. Üst yönetim ile çalışanlar arasında	☐	☐	☐	☐	☐
K7. Aynı seviyedeki çalışanlar arasında	☐	☐	☐	☐	☐

Kurumunuzda resmi kural ve prosedürlerin ne ölçüde yerleşik olduğunu belirtiniz.

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	1	**2**	**3**	**4**	**5**
K8. Çalışanların iş tanımları açık ve yazılı olarak mevcuttur	☐	☐	☐	☐	☐
K9. Gündelik uygulamaların, standart faaliyet prosedürleri ile uyumlu olması beklenir	☐	☐	☐	☐	☐
K10. Çalışanlarımızın gözünde kurumumuz tam bir bürokratik yapı olarak kabul edilir.	☐	☐	☐	☐	☐
K11. Çalışanlarımız herhangi bir konuda karar vereceklerinde organizasyon el kitabı, prosedür ve talimatlar gibi önceden hazırlanmış yazılı dokümanlara başvururlar	☐	☐	☐	☐	☐
K12. Çalışanlarımız kendi işleri ile ilgili kararlar alırken kendi kurallarını geliştiremezler	☐	☐	☐	☐	☐
K13. Çalışanlarımızın inisiyatif kullanarak kurumsal kural ve prosedürleri ihlal edip etmedikleri sürekli kontrol edilir	☐	☐	☐	☐	☐

Çalışanların kararlara katılım düzeyinizi belirtiniz

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	1	**2**	**3**	**4**	**5**
K14. Kararlar genellikle organizasyonel hiyerarşinin üst kademelerinde alınır	☐	☐	☐	☐	☐
K15. Orta kademe yöneticilerine işlerin yürütülmesinde çok fazla inisiyatif verilmez	☐	☐	☐	☐	☐
K16. Orta ve alt kademelerde çalışanların kendi başlarına karar vermeleri özendirilmez	☐	☐	☐	☐	☐
K17. Önemsiz konularda bile karar verme yetkisi üst kademe yöneticilerindedir.	☐	☐	☐	☐	☐
K18. Orta ve alt kademe çalışanlarımızın karar alma özerklikleri çok kısıtlıdır	☐	☐	☐	☐	☐
K19. Gündelik karar ve uygulamaların, hayata geçirilebilmesi için üst düzey yöneticilerin onayı şarttır	☐	☐	☐	☐	☐

Yenilik yapabilmek için çalışanlara aşağıdaki imkan ve destekler ne ölçüde sağlanır?

1- Kesinlikle Katılmıyorum 2- Katılmıyorum 3- Kararsızım 4- Katılıyorum 5- Kesinlikle Katılıyorum

	1	2	3	4	5
FİKİR GELİŞTİRME DESTEĞİ					
K20. Firmamızda bireyin kendi fikirlerini geliştirmesi, kurumun gelişmesi için cesaretlendirilir.	☐	☐	☐	☐	☐
K21. Üst yönetim, personelin fikir ve önerilerimize dikkat eder, ilgi gösterir.	☐	☐	☐	☐	☐
K22. Yeni ve ilerici fikirlerin geliştirilmesi genellikle teşvik edilir.	☐	☐	☐	☐	☐
K23. Üst yönetim, gelecek vadeden yeni fikirlerin oluşumunu katı kural ve yöntemlere dayanarak baltalamaz.	☐	☐	☐	☐	☐
K24. Firmamız çalışanları arasında öyle bir hava oluşturmuştur ki, herkes yeni fikirler üretme arzusu içindedir.	☐	☐	☐	☐	☐
PROJE DESTEĞİ					
K25. Çalışanlar görevlerini yapabilmek için ihtiyaç duydukları bilgilere erişebiliyorlar	☐	☐	☐	☐	☐
K26. Yeni proje fikirlerini hayata geçirmek isteyenlere genellikle parasal destek sağlanır.	☐	☐	☐	☐	☐
K27. Yenilikçi proje ve fikirleri desteklemek için ayrılmış çok sayıda kurum içi mali kaynak imkânı mevcuttur.	☐	☐	☐	☐	☐
K28. Sonuçta başarısız bile olsalar, yeni proje veya fikir geliştirerek bireysel risk alanlar takdir edilirler.	☐	☐	☐	☐	☐
K29. Firmamızda kişilerin yenilik (inovasyon) yapmak için risk almaları olumlu görülen ve hoş karşılanan bir davranıştır	☐	☐	☐	☐	☐
K30. Farklı bölümde çalışanların yeni proje fikirleri hakkında konuşmak için bir araya gelmelerine destek verilir	☐	☐	☐	☐	☐
İŞTEKİ ÖZERKLİK					
K31. Çalışanlarımız işleriyle ilgili kararlar verirken kendilerini özgür hissederler.	☐	☐	☐	☐	☐
K32. Çalışanlarımızın kendi yargı ve yöntemlerini kullanmalarına izin verilir.	☐	☐	☐	☐	☐
K34. Her bir çalışanın işini nasıl yapılacağı kendi sorumluluğumdadır.	☐	☐	☐	☐	☐
K35. Çalışanlarımız gündelik ve rutin görevleri yapmak için farklı çalışma metotları kullanmakta özgür bırakılırlar.	☐	☐	☐	☐	☐
ZAMAN TAHSİSİ					
K37. Çalışanlarımız, işleri ile ilgili yeni fikirler geliştirmek için yeterince zamana sahiptirler.	☐	☐	☐	☐	☐
K38. Tüm işlerini tamamlayabilmek için personelin yeterince zamanı vardır.	☐	☐	☐	☐	☐
K39. Çalışanlarımızın rutin iş yükleri, yenilikçi projelere zaman ayırabilmelerine engel olmayacak şekilde düzenlenmiştir.	☐	☐	☐	☐	☐
ÖDÜLLENDİRME					
K40. Personel şunu bilir ki aldıkları ve alacakları ödüller iş performanslarına bağlıdır.	☐	☐	☐	☐	☐
K41. İşini başarıyla yapanların yetki ve sorumlulukları artırılır.	☐	☐	☐	☐	☐
K42. Personel şunu iyi bilir ki işinde başarılı olanlar takdir edilir.	☐	☐	☐	☐	☐
K43. Firmamızda inovasyon (yenilik) yapan her seviyedeki personel ödüllendirilir	☐	☐	☐	☐	☐
K44. Başarılı yenilikçi proje üretenler fazlasıyla ödüllendirilerek çabalarının karşılığını alırlar.	☐	☐	☐	☐	☐

YENİLİK SÜRECİ ÖNÜNDEKİ ENGELLER

Aşağıdaki iç faktörlerin, şirketinizde, son 3 yılı (2003-2005) dikkate alarak yenilikçilik yönetimi başarısına engel olup olmadığını belirtiniz.

1-Çok büyük engel	2-Büyük engel	3-Engel	4-Az Engel	5-Engel Değil

		1	2	3	4	5
Eg1.	Teknik bilgi eksikliği	☐	☐	☐	☐	☐
Eg2.	Teknik deneyim eksikliği	☐	☐	☐	☐	☐
Eg3.	Kalifiye eleman eksikliği	☐	☐	☐	☐	☐
Eg4.	Kalifiye Ar-Ge yöneticisi eksikliği	☐	☐	☐	☐	☐
Eg5.	Gerekli teknoloji edinme organizasyonunun kurulamaması	☐	☐	☐	☐	☐
Eg6.	Firma içi teknolojinin geliştirilmesinde zaman kısıtlarının bulunması	☐	☐	☐	☐	☐
Eg7.	Finansman kaynaklarının yetersiz olması	☐	☐	☐	☐	☐
Eg8.	İşyerimizde yenilikçiliğe karşı direnç bulunması	☐	☐	☐	☐	☐
Eg9.	Yenilik süreçlerine dayalı strateji eksikliği	☐	☐	☐	☐	☐
Eg10.	Yenilik projelerinin hedeflerinde belirsizlik	☐	☐	☐	☐	☐
Eg11.	Çok fazla monoton ve rutin iş yükü	☐	☐	☐	☐	☐
Eg12.	Üst düzey yöneticilerin onaylarında hatalı/yavaş davranmaları	☐	☐	☐	☐	☐
Eg13.	Yenilik için firmada uygun iklimin olmaması	☐	☐	☐	☐	☐
Eg14.	Aynı anda çok sayıda yenilik projesinin yürütülmesi	☐	☐	☐	☐	☐
Eg15.	Firmada sürekli iyileştirme yaklaşımına önem verilmemesi	☐	☐	☐	☐	☐
Eg16.	Yenilik sürecinin yeterince denetlenmemesi	☐	☐	☐	☐	☐
Eg17.	Yenilik maliyetinin yüksekliği	☐	☐	☐	☐	☐
Eg18.	Yenilik riskinin yüksekliği	☐	☐	☐	☐	☐
Eg19.	Diğer (Belirtiniz) :…….	☐	☐	☐	☐	☐

Aşağıdaki dış faktörlerin, şirketinizde, son 3 yılı (2003-2005) dikkate alarak, yenilik yönetimi başarısına engel olup olmadığını belirtiniz.

1-Çok büyük engel	2-Büyük engel	3-Engel	4-Az Engel	5-Engel Değil

		1	2	3	4	5
Eg20.	Devlet desteğinin ve teşviklerin yetersizliği	☐	☐	☐	☐	☐
Eg21.	Yasalar, yönetmelikler, standartlar ile gelen kısıtlamalar	☐	☐	☐	☐	☐
Eg22.	Diğer şirketlerle ve kamu araştırma kurumları ile işbirliği yapabilmenin güçlüğü	☐	☐	☐	☐	☐
Eg23.	Teknolojik bilgi kaynaklarına ulaşmada güçlükler	☐	☐	☐	☐	☐
Eg24.	Dış finansman temin sorunları	☐	☐	☐	☐	☐
Eg25.	Talep belirsizliği	☐	☐	☐	☐	☐
Eg26.	Kalifiye eleman bulmanın ve/veya işe almanın güçlüğü	☐	☐	☐	☐	☐
Eg27.	Firma dışından edinilecek teknolojik hizmetlerin eksikliği (teknik ve bilimsel danışmanlık, denetim, muayene, standartlar, vd.)	☐	☐	☐	☐	☐
Eg28.	Gerekli malzeme, parça, ekipman bulma zorluğu	☐	☐	☐	☐	☐
Eg29.	Müşterinin yeni ürünü benimseme güçlüğü	☐	☐	☐	☐	☐
Eg30.	Fikri mülkiyet haklarının korunmasındaki mevcut boşluk	☐	☐	☐	☐	☐
Eg31.	Diğer (Belirtiniz): ……..	☐	☐	☐	☐	☐

İŞBİRLİĞİ

Firmanız aşağıdaki alanlardan herhangi birinde başka firmalarla işbirliği yapıyor mu?

		Evet							
		Bölge				Birden fazla firma ile ağ oluşturarak		Bir sözleşmeye bağlı olarak	
		Hayır	Yerel (<50km)	Ulusal (>50km)	Uluslar arası	Evet	Hayır	Evet	Hayır
İ1.	Araştırma merkezi veya üniversiteler ile Ar-Ge işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ2.	Rakiplerle Ar-Ge işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ3.	Diğer firmalarla Ar-Ge işbirliği (müşteri veya tedarikçiler hariç)	☐	☐	☐	☐	☐	☐	☐	☐
İ4.	Üretim işbirliği (toplam sistem teklifleri veya kapasite açıklarını kapatmak için)	☐	☐	☐	☐	☐	☐	☐	☐
İ5.	Satın alma işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ6.	Hizmet/satış/dağıtım işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ7.	Firmalar ve/veya eğitim kurumları ile eğitim işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ8.	Müşterilerle işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ9.	Tedarikçilerle işbirliği	☐	☐	☐	☐	☐	☐	☐	☐
İ10	Tamamlayıcı işbirlikleri *	☐	☐	☐	☐	☐	☐	☐	☐

Son üç yılda (2003-2005), yenilik alanında (ürün, üretim, pazarlama, organizasyon) görülen gelişmelerin izlenmesinde, şirketin değişik bilgi kaynaklarından yararlanma sıklığını ve bu kaynaklardan sağlanan katkıyı belirtiniz.

Sıklık	1- Hiç yararlanılmıyor	2-Çok az yararlanılıyor	3-Ara sıra yararlanılıyor	4-Genellikle yararlanılıyor	5-Çok sık yararlanılıyor
Katkı	1- Çok az katkı	2-Az katkı	3-Orta derecede katkı	4-Büyük katkı	5-Çok büyük katkı

		Sıklık					**Katkı**				
		1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
İ11.	Bilimsel ve teknik yayınlar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ12.	İnternet ve e-veri tabanları	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ13.	Bilimsel ve mesleki toplantılar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ14.	Fuarlar, sergiler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ15.	Açıklanmış patentler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ16	Müşteriler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ17.	Tedarikçiler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ18.	Bayiler / satıcılar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ19.	Üniversiteler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ20.	Başka sektörlerden şirketler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ21.	Benchmarking (kıyaslama)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
İ22.	Rakipler	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

* :Farklı yetkinliklere sahip şirketlerin, ortak bir ürün/projeyi bu çekirdek yetkinliklerini kullanarak yapmaları.

PERFORMANS

Son üç yılı (2003-2005) dikkate aldığınızda, **firmanızı geçmiş dönemlere kıyasla** aşağıdaki her bir başarı kriteri açısından değerlendiriniz

1-Çok daha başarısız	2-Daha başarısız	3-Aynı derecede başarılı	4-Daha başarılı	5-Çok daha başarılı

		1	2	3	4	5
	Genel Yenilik Performansı					
Pe1.	Yeni ürünleri rakiplerden önce pazara sunabilme	☐	☐	☐	☐	☐
Pe2.	Mevcut ürün yelpazesinde yeni ürünlerin oranı	☐	☐	☐	☐	☐
Pe3.	Yeni ürün ve hizmet projelerinin sayısı	☐	☐	☐	☐	☐
Pe4.	İş süreç ve yöntemlerine dair geliştirilen yenilikler	☐	☐	☐	☐	☐
Pe5.	Geliştirilen yeni ürün ve hizmetlerin kalitesi	☐	☐	☐	☐	☐
Pe6.	Fikri mülkiyet hakkı altına (patent, patent başvurusu, tasarımların tescil edilmesi, marka tescil edilmesi, faydalı model belgesi) alınmış yeniliklerin sayısı	☐	☐	☐	☐	☐
Pe7.	İdari yapı ve zihniyetin çevresel şartlara göre yenilenmesi	☐	☐	☐	☐	☐
	İmalat Performansı					
Pe8.	İmalat Kalitesi	☐	☐	☐	☐	☐
Pe9.	İmalat Maliyeti	☐	☐	☐	☐	☐
Pe10.	İmalat Esnekliği	☐	☐	☐	☐	☐
Pe11.	İmalat ve Teslimat Hızı	☐	☐	☐	☐	☐
	Pazar Performansı					
Pe12.	Müşteri memnuniyeti	☐	☐	☐	☐	☐
Pe13.	Toplam satışlar	☐	☐	☐	☐	☐
Pe14.	Pazar payı büyüklüğü	☐	☐	☐	☐	☐
	Finansal Performans					
Pe15.	Ciro Karlılığı (Kar/Toplam satışlar)	☐	☐	☐	☐	☐
Pe16.	Aktif Karlılığı (Kar/Toplam varlıklar)	☐	☐	☐	☐	☐
Pe17.	Firmanın genel karlılık durumu	☐	☐	☐	☐	☐
Pe18.	Yatırım dışı nakit akışı	☐	☐	☐	☐	☐

SAYISAL FİRMA BİLGİLERİ

2005 ve 2006 yılları için kendi algılamanıza göre pazar büyüklükleri ve payları:
(Para birimi olarak istediğinizi –Euro,$, YTL- kullanabilirsiniz)

	2005	2006
Ana ürün grubunun Türkiye'deki pazar büyüklüğü	SB1.	SB2.
Ana ürün grubunun dünya ölçeğindeki pazar büyüklüğü	SB3	SB4
Firmanızın ana ürün grubu için yurt içi pazar payı	SB5 %	SB6 %
Yurtiçinde en büyük ana ürün grubu üreticisinin yurtiçi pazar payı	SB7 %	SB8 %

Lütfen firmanızla ilgili aşağıdaki bilgileri belirtiniz. (Para birimi olarak –Euro,$, YTL- kullanabilirsiniz)	*2003*	*2004*	*2005*
SB9 (1-2-3). Kapasite kullanım oranı	%	%.	%
SB10 (1-2-3). Toplam satışlar			
SB11 (1-2-3). Toplam ihracat			

Son üç yılı (2003-2005) dikkate aldığınızda, girdilerin satın alındığı ve ürünlerin pazarlandığı coğrafi bölgelere göre parasal dağılımlarını yaklaşık olarak belirtin.

	SB12.1. Girdilerin dağılımı		SB12.2. Satışların dağılımı	
Marmara	%		%	
Ülkenin Diğer Bölgeleri	%		%	
Avrupa Birliği Ülkeleri	%		%	
Rusya, Ukrayna ve Balkanlar	%		%	
Kafkasya ve Orta Asya	%	=%100	%	=%100
Orta Doğu ve Afrika	%		%	
Doğu ve Güneydoğu Asya	%		%	
Amerika	%		%	
Diğer:……	%		%	

Şirketinizin üç yıllık (2003-2005) verilerini dikkate alarak aşağıdaki tabloyu doldurunuz.

	Para birimi olarak istediğinizi –Euro,$, YTL- kullanabilirsiniz	*2003*	*2004*	*2005*
SB13. (1-2-3)	Ar-Ge harcamaları†			
SB14. (1-2-3)	Lisans, patent, know-how ve teknik danışmanlık alımı harcamaları			
SB15. (1-2-3)	Firma dışından yazılım/makine /teçhizat edinme harcamaları‡			
SB16. (1-2-3)	Yönetim danışmanlığı (mali denetim danışmanlığı hariç)			

2005 yılı sonunu göz önüne alarak, beyaz yakalı personelinizin aşağıdaki alanlara göre sayılarını veriniz? (Birden fazla alanda çalışan kişileri bu alanlara ayırdığı zamana göre.)

SB17.	Araştırma geliştirme ve tasarım	
SB18.	Operasyonlar (Planlama, satın alma, lojistik, dağıtım, üretim)	
SB19.	Pazarlama	
SB20.	Finans/Muhasebe	
SB21.	Diğer (yönetim, insan kaynakları, BT, Satış sonrası hizmet, bakım, vs.)	

2005 yılı sonunu göz önüne alarak, beyaz ve mavi yakalı personelinizin sayılarını, eğitim alanı ve düzeylerine göre belirtiniz.

PERSONEL	İlköğretim	Meslek Lisesi	Lise	Üniversite / yüksekokul	Lisansüstü	Toplam
SB22. Beyaz Yakalı						
SB23. Mavi Yakalı						

† Araştırma ve Geliştirme (Ar-Ge); yeni bilimsel ve teknolojik bilgi elde etmek; yeni ürün ve prosesleri tasarlamak ve geliştirmek; yeni elde edilmiş bilgileri, ürün ve proseslerin teknik olarak önemli bir biçimde iyileştirilmesinde kullanmak amacıyla yapılan, araştırmaya dayalı çalışmadır. Ar-Ge çalışmalarına; şirketiniz tarafından yapılan Ar-Ge çalışmaları, diğer işletmelerden satın alınan Ar-Ge hizmetleri, şirketiniz için ilgili birimler tarafından yapılan Ar-Ge çalışmaları dahildir. Ar-Ge harcamaları, yukarıdaki Ar-Ge faaliyetleri ile ilgili giderlerdir.

‡ Dış kaynaklardan teçhizat edinme harcamaları: Makine ve teçhizat alımı için yapılan harcamalardır.