EFFECTS of SOME BEHAVIORAL PROPERTIES of FIRMS on FIRM
INNOVATION CAPABILITY:
AN EMPIRICAL STUDY ON MICRO AND SMALL SIZED SOFTWARE
FIRMS IN ODTÜ TEKNOKENT

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ABSTRACT

EFFECTS of SOME BEHAVIORAL PROPERTIES of FIRMS on FIRM INNOVATION CAPABILITY: An Empirical Study on Micro and Small Sized Software Firms in ODTÜ Teknokent

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Today, innovation has great importance in the improvement and having continuance of organizations. In the competitive economy of global world, the only way for organizations to gain advantage against their rivals is to make innovation continuous.

In this study, the effects of some behavioral properties of companies such as organizational climate, shared vision, transformational leadership and knowledge sharing on the perceived innovation capability of the company is investigated through a questionnaire which is obtained from the combination of five different questionnaires from literature.

In addition, information about product, process and marketing innovations and collaborations the company has engaged in the last three years is obtained through the interviews held with the owners or R&D managers of the companies. Whether there is any difference in the perceived innovation capability of the companies when product, process and marketing innovations and collaboration are considered is investigated by applying variance analysis.

All data collected from micro and small sized software companies residing in ODTÜ Teknokent through questionnaires and interviews are analyzed by using SPSS 21.0 software.

In conclusion, the existence of a positive relationship between factors of organizational climate, shared vision, transformational leadership and knowledge sharing and the perceived innovation capability of the company is proved. However, no difference in the perceived innovation capability of the companies when product, process and marketing innovations and collaboration are considered is identified.

Keywords: innovation capability, organizational climate, shared vision, transformational leadership, knowledge sharing, collaboration.

ÖZ

FİRMALARIN BAZI DAVRANIŞSAL ÖZELLİKLERİNİN İNOVASYON YETENEĞİ ÜZERİNDEKİ ETKİSİ: ODTÜ TEKNOKENT'TEKİ MİKRO VE KÜÇÜK ÖLÇEKLİ YAZILIM FİRMALARINDA BİR UYGULAMA

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Günümüzde organizasyonların gelişimi ve devamlılığının sağlanması konusunda inovasyon büyük öneme sahiptir. İçinde bulunduğumuz rekabetçi ekonomide rakiplere karşı avantaj sağlamanın tek yolu organizasyondaki inovasyonları sürekli hale getirebilmektir.

Bu çalışmada; örgütsel iklim, ortak vizyon, dönüşümcü liderlik ve bilgi paylaşımı gibi şirketlerin bazı davranışsal özelliklerinin algılanan yenilikçilik yeteneği üzerindeki etkisinin araştırılması için literatür araştırmalarında karşılaşılan beş farklı anket birleştirilerek kullanılmıştır.

Firma sahibi veya AR-GE yöneticileri ile yapılan görüşmeler ile şirketlerin son üç yıl içerisindeki ürün, süreç, pazarlama yenilikleri ve şirket dışı kurumlarla geliştirdikleri işbirlikleri hakkında bilgiler edinilmiştir. Bu bilgiler ile şirketlerin ürün, süreç, pazarlama yenilikleri ve şirket dışı kurumlarla geliştirdikleri işbirliklerinin algılanan yenilikçilik yeteneği üzerinde etkili olup olmadığı araştırılmıştır.

ODTÜ Teknokent'te ikamet eden mikro ve küçük ölçekli yazılım şirketlerinden edinilen anket ve görüşme verileri SPSS 21.0 istatistiksel analiz programı ile analiz edilmiştir.

Araştırmanın sonucunda, şirketlerin algılanan yenilikçilik yeteneği ile faktör bazında örgütsel iklim, ortak vizyon, dönüşümcü liderlik ve bilgi paylaşımı arasında pozitif ilişkilerin varlığı kanıtlanmıştır. Ancak; ürün, süreç, pazarlama yenilikleri ve şirket dışı kurumlarla geliştirilen işbirliklerinin algılanan yenilikçilik yeteneği üzerindeki etkisi ise tespit edilememiştir.

Anahtar Kelimeler: yenilikçilik yeteneği, örgütsel iklim, ortak vizyon, dönüşümcü liderlik , bilgi paylaşımı, işbirliği.

To My Dear Family

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CHAPTER 1

INTRODUCTION

Innovation has been defined as one of the most crucial ways in order to gain a competitive advantage in today's rapidly changing and highly dynamic business world. In order to keep up the pace with the changes, firms need to develop abilities, in the form of ideas, products, services and processes which are created by innovation activities. Since the importance of innovation has gained the importance it deserves in Turkey in recent decades, firms are now paying more attention to the factors that affect their innovation performance.

1.1. Problem Definition

One of the main reasons to establish techno parks is to improve the relation between universities and companies. They provide the environment that develops a culture of innovation and creativity. Companies in techno parks have more chance to communicate with other companies in global or national networks. In addition, techno parks foster the establishment of new businesses and improve the growth of micro, small and medium sized companies which in turn improves the regional and national wellbeing.[1]

This thesis study is conducted in one of the most prestigious techno parks in Turkey, ODTÜ Teknokent. Subjects of the study are micro and small sized software firms. According to the definition of European Commission, an enterprise is considered micro-sized if number of employees is less than 10 and it is regarded as small-sized if number of employees is greater than 10 and less than 50.

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[1] http://www.iasp.ws/the-role-of-stps-and-innovation-areas

Akman and Yılmaz (2008) cited from Cespedes and Gonzales (2002) that software industry is an opportunity for developing countries since it does not necessitate much capital or investment to begin.

Two approaches are developed the study. In the subjective approach, data are gathered through a questionnaire adapted from the literature. Effects of employees' perception of the organizational climate, shared vision, transformational leadership and knowledge sharing on the perceived innovation capability of the company are analyzed according to the results of the questionnaire.

In the objective approach, interviews are held with the owners or R&D managers of the companies. Information about the number of new products companies developed, process or marketing innovations they engage in and collaborations they performed in the last 3 years is obtained by the interviews.

Relations between the subjective and objective data are also investigated in this study.

1.2. Research Questions

In order to analyze the factors affecting innovation capability, finding answers to the following questions has been the main aspiration for the study:

Q1. Do employees' perception of the organizational climate, shared vision, transformational leadership and knowledge sharing have any effect on the perceived innovation capability of the company? If they do, what kind of an effect they have?

Q2. Is there any relation between company's habit of collaboration and perceived innovation capability of the company? If there is, how is it?

Q3. Does collaboration history of the company have any effect on the number of new products company has developed in the last 3 years? If it does, what kind of an effect it has?

Q4. Does collaboration history of the company have any effect on process or marketing innovations of the company engaged in the last 3 years? If it does, what kind of an effect it has?

Q5. Is there any significant difference between the companies' perceived innovation capabilities when product, process, or marketing innovations are considered?

1.3. Structure of the Thesis

This thesis contains 5 chapters. The first chapter is an introductory explaining the aim of the study and questions arose.

Chapter 2 starts with the definition and types of innovation encountered in the literature. Then it continues with the importance of innovation regarding companies and nations. Lastly, literature review on factors affecting firm innovation capability and related research hypotheses developed are provided.

In Chapter 3, the methodology of the study is explained. Data collection procedures, approaches and tools used to examine the relations that have been questioned are explained in detail.

Chapter 4 presents the findings of the study and related discussions.

Finally, Chapter 5 concludes the thesis by summarizing what has been done and which findings have been obtained.

CHAPTER 2

LITERATURE REVIEW

2.1. The Definition of Innovation

The frequent and almost everywhere use of the word "innovation" nowadays has led to misuses of the subject. Thus, in this section, meaning of innovation encountered in the literature is provided.

Joseph Schumpeter was one of the first who defined innovation and he stated in his seminal papers that "innovation is simply the doing of new things or the doing of things that are already being done in a new way" (Schumpeter, 1934: 65).

The Oslo Manual, produced by the OECD (2005, 3rd edition) defines innovation 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."

In his article "The Definition and Measurement of Innovation", Mark Rogers defined innovation as *the process of introducing new ideas to the firm which result in increased firm performance.*

In his book "Innovation management and new product development" Trott (2002) defined innovation as a process of the management of all the activities from new discovery of the idea to eventual product, process or service. At this point, he also distinguishes between invention and innovation. Since innovation itself contains diversity and variety, it originates from invention. However, it should be noted that

innovation differs from invention at the point that innovation needs to end up with commercial success and needs to add value to the firm.
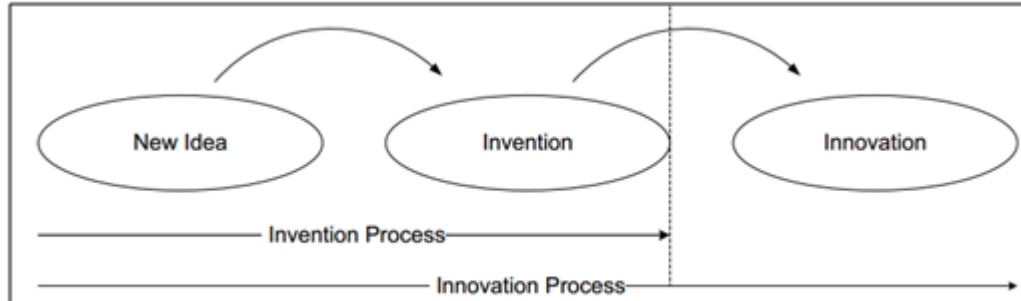
Source: Trott, 2002

Figure 2.1 Innovation Process

By definition, innovation is not a simple form of renewal, instead it is a whole process which starts from core departments of the company and spreads through the marketing activities regarding the renewed product. Thus, innovative activity cannot be separated from the firm's core activities. Instead, it should be accepted as one of the core activities of the firm.

Since innovation itself is a broad concept, an exact definition which will fit in every company or even every country does not exist. However, it can be concluded that there are two minimum requirements for an innovation.

First one is that it has to be **something that is new or significantly improved** to the company. It does not have to be new to the whole world; a change produced by a company that is being used by the other companies is still an innovation for that company. In addition, this change does not need to be generated by the company itself, it could also be acquired and adapted from other firms.

Secondly, **an innovation has to add value to the company.** It must create value for the company and the customer or consumer.

2.2. Types of Innovation

Similar to the plentiful definitions of innovation in the literature, there are also numerous classifications about the types of innovation.

Joseph Schumpeter who is assumed to be the first to draw attention to the importance of innovation defined five types of innovation (Rogers, 1998):

- Introduction of a new product or a qualitative
- Process innovation new to an industry
- Opening of a new market
- Development of new sources of supply for raw materials or other inputs
- Changes in industrial organization

In this part of the thesis, detailed explanation is given about two types of classification which are the most common ones in the literature: "product, process, marketing, and organizational innovations" and "radical and incremental innovations".

2.2.1. Product, process, marketing and organizational innovations

Oslo Manual (OM), 3rd edition, 2005 defined four types of innovation:

Product innovation:

"Product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses."

This includes significant improvements in technical specifications, components, materials, functional characteristics of a product/service when compared to the previous products/services.

Process innovation:

Process innovation is the regeneration or modification of the product manufacturing process or the provision of services by implementing the utilization of new inputs, new technological solutions, new software or new equipment.

According to OM a process innovation is "the implementation of a new or significantly improved production or delivery method."

Purpose of the process innovations may be to decrease unit costs of production or delivery, to produce or deliver technologically new or improved products which cannot be produced or delivered by using existing methods or to increase the efficiency of production or delivery of products already familiar to the firm.

Significant changes in delivery or production techniques, equipment and/or software are in the description of process innovations. The implementation of new automation equipment on a production line or the introduction of GPS or barcodes are the examples of new production and service provider methods.

Marketing innovation:

Oslo manual defines marketing innovation as "the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing."

Improving customer satisfaction, entering new markets and increasing sales levels are the basic purposes of the marketing innovations.

The importance of the marketing innovations can be explained by the term 'diffusion of innovation'. OECD (2005a) defines diffusion as the way in which innovations spread, through market or non-market channels, from their first worldwide implementation to different countries and regions and to different industries, markets and firms. An innovation will not have economic impact and thus will not add value to the firm, unless diffusion of innovation is managed successfully.

Examples of the marketing innovations may be switching the distribution channels of the firm such as a change from direct sales to internet sales or to dealers' sales.

Organizational innovation:

OM defines organizational innovation as the application of new methods or improvements in the firm's business practices, workplace organization or external relations.
Purposes of the organizational innovations may be to increase a firm's performance by reducing managerial or operational costs, to improve workplace satisfaction and thus labor productivity or to reduce costs of supplies.

2.2.2. Radical and incremental innovations

Abernathy and Utterback (1978) described two types of innovations. Fist type is about improving the existing products which corresponds to incremental innovations and the second type is to develop the new products corresponding to radical innovations.

Terziovski (2007) defined incremental innovations as continuous improvements which result in minor developments in products or processes while he stated that radical innovations are more long-term and strategic in focus and result in changing the core capabilities of the firm.

Hendersen and Clark (1990) mentioned that radical innovations can change the company's core technological capabilities from head to toe and can open up whole new product and market opportunities for the company. They make the old technological advances obsolete and force industries either to change, adapt or disappear. No improvements in the older technologies can make them competitive again (Kaplan, 1999).

According to Harrington (1995), all organizations need both incremental and radical innovations. However, incremental innovations have more effect than the radical innovations in the improvement of total organizational performance while radical improvements serve to jump-start a few of breakthrough processes.

2.3. Importance of Innovation

In the last century, the importance of innovation is realized not only by companies but also countries realized the importance of innovation and they decide on their strategies accordingly.

In order to make Nordic companies competitive and innovative, with the support of the Nordic Council of Ministers, an institution called "Nordic Innovation" has been established. The aim of this institution is to make the Nordic countries a world-leading region for innovation and sustainable growth.[2]

In the Lisbon Strategy set out in 2000, European Union agreed that innovation is the key element for the economic growth and consequently developed an instrument called "European Innovation Scoreboard". This instrument is used in order to compare the innovation performance of EU members.[3]

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[2] http://www.nordicinnovation.org/about-us/about-nordic-innovation/

[3] (European Union Parliament Website *Lisbon European Council 23 and 24 March Presidency Conclusion*)

Australian government published "Powering Ideas: An Innovation Agenda for the 21st Century", an agenda that outlines its innovation policies over the next decade.[4]

In Turkey, innovation is a newly emerging concept, especially at firm levels. It is not until the law supporting R&D and innovation work enacted in 2008, Turkey began to become more attractive for both local and foreign investors of R&D. According to the EU Innovation Scoreboard published in 2013, Turkey performed below average for most indicators and classified as one of the modest innovators together with Bulgaria, Latvia, Poland, Macedonia and Romania. Relative strengths of Turkey are listed as innovators and economic effects. However, human resources, open, excellent and attractive research systems and intellectual assets are well below average while linkages and entrepreneurship is below average.

When the strategies of successful global firms are analyzed, it becomes apparent that in general three different strategies are applied. These are innovation (ex. 3M and Apple), cost reduction (ex. Wal-Mart), and imitation (ex. IBM, Caterpillar). It can be understood that in order for a firm to achieve success, it does not have to be an innovative firm. However, if it is operating in an industry where technological changes are rapid, innovation becomes a necessity. Software industry is an example of industries where rapid technological changes occur thus firms operating in software industry have to be innovative. Otherwise, they cannot survive. (Practicability of Innovation Theory and Innovation Adoption Model for the Companies Operating in the Defense Industry, and the Importance of the Customer Focused Innovation Studies, Savtek, 2006)

Considering the importance of innovation, there are empirical evidence in the literature that there is a direct relationship between innovation and firm performance (Calantone et al., 2002; Cainelli et al., 2004; Keskin, 2006; Bowen et al., 2010, Jiménez-Jiménez and Sanz-Valle, 2011).

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[4] http://www.innovation.gov.au/innovation/policy/pages/PoweringIdeas.aspx

Leiponen (2000) suggested that innovation is an important determinant of profitability and Cefis and Ciccarelli (2005), Figg (2000), Jonash & Sommerlatte (1999) and Roberts (1999) proved that there exists a clear difference in profitability between innovators and non-innovators.

Guan and Ma (2003) proved that the total improvement of innovation capability is closely and positively related to export growth.

Innovation has a great impact on the economic growth of the countries and well-beings of a society. Firms that engage in innovation activities have better chances to survive both in the domestic market (from imports) and in foreign markets (export opportunities). Thus, these firms will enjoy higher levels of competitiveness than the rest and this will improve its possibilities of increasing its rate of production and its exports, as a result favoring economic growth. In addition, since accumulated knowledge, experienced and skilled human resources are valuable for firms to sustain innovative activities; they also tend to establish more stable relations with their workers in order not to lose them. Consequently, an improvement in levels of well-being in society occurs. This is also verified by the statement that 80% of the increase in productivity, which is a significant determinant in the increase of GDP, is derived from product, process and organizational innovations (Cooke, 1998).

Today, it is accepted that innovation has an undeniable effect on the performance of the firms and on the well-being of the societies. However, innovation is not a onetime tool that will be implemented in order to pioneer the firms once in their history and not be applied again. Instead, innovation activities should be accepted as one of the core and essential activities of the firms and be performed on a continuous base. This means that in order to remain innovative, firms need to give considerable systematic efforts and in return they will gather knowledge, experience and skills that will give them competitive advantages over their rivals.

2.4. Factors Affecting Firm Innovation Capability

In this section, literature review about factors affecting firm innovation capability is given.

2.4.1. Firm Innovation Capability

According to the Oxford dictionary, capability is the power or ability to do something.[5] In the business context, the meaning generally converted into the ability of an organization, department, person or system to achieve the objectives especially in relation to the mission set.

Çetindamar and Günsel (2009) defined capability as the ability to perform coordinated actions in a conventional way with the use of firm resources in order to achieve pre-determined goals.

Innovation capability is also described as a hypothetical construction in order to define the necessary steps to improve the success of innovation activities (Lawson and Samson, 2001).

Hogan et al. (2011) define innovation capability as the ability to process implicit and explicit knowledge, skills and resources through the innovation activities in order to create added value for the firm or its stakeholders.

A consensus has not been reached in the literature about the most proper approach in order to assess or measure the innovation capabilities of individual firms. There are instances of utilization of subjective and objective data in order to measure firm innovation capability in the literature.

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[5] http://www.oxforddictionaries.com/definition/english/capability?searchDictCode=all

Cho and Pucik (2005) and Calantone et al. (2002) measured firm innovation capabilities based on subjective data collected by questionnaires delivered to the employees.

Number of innovations adopted or intellectual property rights gained are a few examples of approaches based on objective data in order to measure firm innovation capability (Love et al., 2009 and Saunila et al., 2014). Rogers (1998) stated that "The SPRU data base (University of Sussex, UK)" uses the number of the new or improved products in order to assess the innovation capability of major UK firms over the period 1945 to 1983. Since then, the data set has been used for a variety of empirical research.

However, using number of products or intellectual property rights as a tool has the drawback that they give no indication of the importance of each innovation (Rogers, 1998). In addition, whether intellectual property rights are a determinant factor for innovation capability or they are the result of innovative activities are another point at issue (Griliches, 1990).

Subramanian and Nilakanta (1996) acknowledge the fact that innovation capability should be considered as a multidimensional construct. They concluded by mentioning that mean number of innovations adopted over time, mean time of adoption of innovations, and the consistency of the time of adoption of innovations are three dimensions in order to achieve un-biased results assessing firm innovation capability.

2.4.2. Organizational Climate

Human resource is one of the most important assets of a firm that affects the potential for innovation. In Maital and Seshadri (2007), it is said that it is the people who gives organizations competitive advantage and who creates and implements new

ideas. Since ideas are the basic foundation of innovation, it is important to know what encourages or impedes the individual innovative behavior in the organization.

Reichers and Schneider (1990) define organizational climate as the collective perceptions of organizational policies, practices, behaviors, and procedures.

Ekvall (1996) describes climate as an "attribute of the organization, a conglomerate of attitudes, feelings, and behaviors which characterizes life in the organization, and exists independently of the perceptions and understandings of the members of the organization".

Ivancevich, Konopaske, and Matteson (2010) defined climate as a set of properties of the work environment perceived directly or indirectly by the employees and stated that it has a great influence on employee behavior.
Creativity of an individual is not only an innate ability which is determined by his or her intellectual abilities, knowledge, personality, style of thinking but instead it is affected by environment and individuals can actually learn to be creative and innovative (Schilling, 2005). A working environment in which even the most extraordinary ideas are encouraged and respected is the most important factor to achieve this (Csikszentmihalyi, 1996).

In addition, organizational climate is one of many determinants that have influence on the way employees do their jobs, how they work together and how they treat each other as well as customers which in turn constitutes mutual trust and respect in the relations (Hisrich and Lutz, 2007).

A few of the instruments developed in earlier studies to measure organizational climate are 'Climate for Innovation' by Scott and Bruce (1994), Creative Climate Questionnaire (CCQ) by Ekvall (1996), The Team Climate Inventory (TCI) by Anderson and West (1996) and Amabile's KEYS: Assessing the Climate for Creativity (Amabile et al., 1996). The instrument developed by Scott and Bruce is

based on two main factors: support for innovation and resource supply. Support for innovation is about the encouragement employees are provided for their creative and different ideas; and resources supply is about the existence of adequate resources such as time, personnel and financials.

The relationship between organizational climate and innovativeness of both firms and individuals is also examined in detail in the literature. Most of the results support a positive relationship. Scott and Bruce (1994) investigated the effect of climate on individual behavior and they concluded the existence of a positive relationship. Özbağ (2014) concluded that organizational climate is positively related to both individual creativity and organizational innovation.

2.4.3. Shared vision

Shared vision is about commitment to and agreement with the direction the company is proceeding (Sinkula et al, 1997). Unless there is a common purpose and direction, many creative ideas could not be implemented because of the diverse interests of employees (Hult, 1998). Employees focusing on common goals and interests would have a better disciplined method of learning and would know better what to search and learn avoiding waste of time (Calantone et al., 2002).

In addition, in the presence of a shared vision, communication between individuals from different departments of a company would be easier. For example, a market researcher person may possess the information R&D personnel needs and unless there is a coordinated and common focus created among departments, this information would remain hidden (Brown and Eisenhardt, 1995).

Calantone et al. (2002) found out that shared vision is positively related to perceived firm innovativeness mediated by learning orientation.

2.4.4. Transformational leadership

Along with organizational climate, leadership style is accepted as one of the most important factors affecting employees' innovative behaviors (Jung et al., 2003). Leaders can affect their follower's creativity both directly and indirectly. Directly, they can provide support for followers' needs and motivation which are accepted to be crucial sources of creativity (Tierney et al., 1999). Indirectly, they can establish a work environment that encourages employees' to think more different and be more innovative (Amabile, Conti, Coon, Lazenby, & Herron, 1996).

Transformational leadership is a leadership theory which was first introduced by Burns (1978). It examines the quality of exchange between the leader and follower in which both parties focus on day-to-day tasks. According to Burns, the purpose of the transformational leader is to attain compliance by giving or retaining rewards. On the other hand, they understand and adapt to the needs and motives of the followers in order to achieve organizational goals through follower empowerment (Zafft, 2013). Yukl and Gordon (2002) accepted transformational leadership theory as the most valuable one compared to other theories, since it examines not only one but both parties, after Yukl's comprehensive research on leadership theories.

According to Podsakoff et al. (1990), transformational leaders have in common that they not only provide support and motivation in order for the routine work done but they also cause employees to do more than they are expected to do and make them exceed the level of expectations. The reason for willingness of followers to do more than they are expected to do is that they foster feelings of trust and loyalty for their leader. In addition, House (1996) lists vision, symbolic behavior, self sacrifice, confidence and high performance expectations, encouragement of motives, risk-taking, and positive evaluations of subordinates as typical behaviors of transformational leaders.

In the literature, a number of different tools have been developed to measure transformational leadership characteristics. Some of most familiar ones are the Charismatic Leadership Scale (House, 1977), the Multifactor Leadership Questionnaire (MLQ) (Avolio et al., 1995 and Bass and Avolio, 1995) and the Transformational Leadership Inventory (TLI) (Podsakoff et al., 1990).

Transformational Leadership Inventory (TLI) developed by Podsakoff et al.(1990) has six transformational sub-dimensions which are supposed to cover typical behaviors of transformational leaders. These are defined by Podsakoff et al. (1990) as follows:

Identifying and Articulating a Vision is the behavior leader has if he/she targets at identifying opportunities for the organization and using a vision of the future to inspire others.

Providing an Appropriate Model is about leader's actions being consistent with the values he/she adopted. Thus, leader set an example for employees.

Fostering the Acceptance of Group Goals is the behavior when leaders aim at improving employee cooperation with each other in order to achieve a common purpose.

High Performance Expectations are about leaders expecting high performance, quality, and standards of excellence from followers.

Individualized Support indicates that the leader respects followers and is concerned about their personal feelings and needs.

Intellectual Stimulation is about leader challenging followers to re-examine some of their assumptions about their work and rethink how it can be performed.

There is empirical evidence in the literature that transformational leadership has positive effect on innovation capability. Gümüşlüoğlu and İlsev (2009) studied on micro and small sized software firms and concluded that there is positive influence of transformational leadership on organizational innovation. They also pointed out that technical and financial support received from outside is more effective to improve innovativeness than an innovation-supporting internal climate.

Jung et al. (2003) confirmed that transformational leadership and organizational innovation have a direct and positive relationship. They also clarified that transformational leadership has a significant and positive effect on the organizational climate supporting innovation.

2.4.5. Knowledge sharing

In today's challenging global world, companies which have knowledge also have the power to create differences and to get ahead. However, companies cannot create knowledge without individuals who therefore play a critical role in knowledge creation and innovation processes (Camelo-Ordaz et al., 2011).

On the other hand, in an organization with high levels of innovation capability, it is not the individual performances that are considered as essential but it is the interaction between individuals accepted as an inseparable part of the organization. Cohen and Levinthal (1990) stated that the interaction among people who have different knowledge is important to improve the organization's ability to innovate. Similarly, Boland and Tenkasi (1995) defined innovation capability of an organization as the result of the interaction among individuals who have distinct knowledge. In addition, Ipe (2003) concluded that unless knowledge sharing is effectively performed, it would hinder the innovativeness of the firm.

Knowledge sharing affects innovation capability in such a way that firms which have high levels of knowledge sharing are more prone to creating unique and rare ideas that are difficult for competitors to imitate which in turn improves firms' innovativeness (Lin, 2007). In the same way, Liao (2006) mentioned that in order to create unique products, structures, or operations, a diversity of knowledge and the ability to share it throughout the organization is required. Additionally, firms which have the ability to manage, create and exploit knowledge are better at responding abrupt changes in the environment since they develop the ability of rapid reaction to new knowledge.

Knowledge accumulates slowly and constantly in organizations and stock of knowledge of firms evolve with creating and sharing new ideas (Nonaka and Takeuchi, 1995 and Leonard, 1998). As knowledge sharing activities and behavior becomes widespread in a company, the amount of knowledge processed and created increases which in turn expand the stock of knowledge of firm and creating the opportunity of having knowledge-based competitive advantage since knowledge sharing is an initiator and motivator of all types of innovation activities.

Latest empirical studies also support the positive effect that knowledge sharing has on the firm innovation capability. Liao (2006) confirmed that knowledge sharing is a determinant of firm innovativeness and there is a significant relationship between two. Similarly, Saenz et al. (2009) proved that knowledge sharing is important to improve the innovation capability. Lin (2007) pointed out that employees' willingness to both donate and collect knowledge is significantly related to firm innovation capability.

2.4.6. Collaboration

In order to survive in today's highly competitive and knowledge based environment, more firms feel the need to engage in collaborations. However, because of some

reasons such as unintentional knowledge leakage, management difficulties, loss of control, they may hesitate in building collaborations.

In Oslo Manual (2005), it is stated that collaboration behavior of a firm depends on the market. Firms operating in technology oriented sectors will need to innovate frequently thus will need to establish more linkages in order to get more knowledge while firms that operate in a steady and mature sector will innovate less and focus on incremental innovations. Since software industry is the best example of a high technology industry which is characterized by a high rate of product and process innovations, high knowledge intensity, rapidly decreasing product and technology life cycles (Nambisan, 2002), these firms need to collaborate more compared to the other firms.

James C. McGroddy stated in his article "Raising mice in the elephants' cage" that firms' collaborations with other firms, universities, government… customers are of great importance in order to overcome the limitations of technical scope in the firm and reducing the institutional constraints on creating new, destructive products, in other words radical innovations.

In his book "Sources of innovation", Eric Von Hippel (1988) mentioned networks, linkages and knowledge exchanges established with units and individuals beyond the boundaries of the firm as major driving forces of innovations.

In the Australian report published in 2010, collaboration has been found to be positively related to the innovation performance of the firms and it is also specified that firms engaging in formal networks tend to carry out more R&D activities (Palangkaraya et al., 2010).

In the international conference of "technologic and economic improvement and IPRs" held in 2004 in METU, it is indicated that sustainable success in innovation requires strong private and public partnerships. As a result of linkages and

collaborations, collaborators have the chance to share the high-risk of R&D activities.

Collaborations with governments, universities, suppliers, customers, other firms and competitors are the most common types encountered in the business area. George, Zahra, & Wood (2002) investigated the effects of business-university collaborations on innovative outputs and financial performance. They could not find any significant relationship between business-university collaboration and number of new products under development or on the market. However, they pointed that rather than the lone existence or absence of a link, quality of the link is more important to innovation outcomes. On the other hand, Wu (2011) proved that collaboration with other companies has a positive effect on product innovation.

Nieto and Santamaria (2007) studied the effects of different types of collaborations on the product innovations and the degree of novelties. They found out that collaboration with suppliers, customers and universities have a positive effect on the novelty of product innovations while collaboration with competitors has negative effect. They pointed out to the fact that performing collaborations with different types of alliances has the greatest positive effect on the degree of innovation novelty.

Tether (2002) defends that the tendency of the firms to collaborate depends both on the type of the firm and novelty of the innovation. Firms that engage in innovations that are 'new to the market' are more likely to collaborate with other firms or institutions than the firms that work on innovations that are 'new to the firm'. He also specifies that most firms still tend to develop their own products, processes and services without engaging into any kind of cooperative activity.

Gnyawali and Park (2009) drew attention to the importance of co-opetition (simultaneous pursuit of competition and collaboration) for small and medium sized enterprises and in 2011 for large firms on technological innovation. Wu (2014) mentioned the existence of a bell-shaped relationship between co-opetition and

product innovation performance. He also concluded that collaboration with universities weakens the relationship. Ritala (2012) investigated the conditions when a co-opetition becomes successful and when it does not.

Belderbos, Carree and Lokshin (2004) studied the effects of different types of R&D collaborations which are competitors, suppliers, customers and universities and research institutes on labor productivity and new to the market sales. They concluded that customers and universities are crucial sources of knowledge and collaboration with these parties foster new to the market sales.

CHAPTER 3

METHODOLOGY

In this study, two approaches are developed. In the subjective approach, data is gathered through a questionnaire adapted from the literature. Relationships between employees' perception of the innovation capability of the company and their perception of the organizational climate, shared vision, transformational leadership and knowledge sharing are analyzed based on the results of the questionnaire.

In the objective approach, interviews are held with the owners or R&D managers of the companies. Information about the number of new products companies developed, process or marketing innovations they engage in and collaborations they performed in the last 3 years is obtained by these interviews.

In addition, relations between the subjective and objective data are investigated in this study.

3.1. Boundaries and Subject of the study

In this thesis study, micro and small-sized software companies located in ODTÜ Teknokent form the subject of the study. From these companies that have the properties described below are later selected:

- Companies that are located only in ODTÜ Teknokent or
- Companies that have only a managerial office other than the ODTÜ Teknokent office.

Reasons to limit the study only by software companies are;

- Majority of the companies residing in ODTU Teknokent are software companies.

- Akman and Yılmaz (2008) cited from Cespedes and Gonzales (2002) that software industry is an opportunity for developing countries because of the reason it does not necessitate more capital or investment to begin. Thus, software companies are of great importance in the progress of Turkey which is a developing country.

3.2. Subjective Approach

3.2.1. Preparation of the Questionnaire

After a comprehensive literature review, 5 separate questionnaires developed earlier for the measurement of organizational climate, shared vision, innovation capability, transformational leadership and knowledge sharing are combined in this order and used in this study as they are. Original versions of the questionnaires are in English. For this reason, translation is done and whether the Turkish translations can be understood clearly as intended is tested by performing a pilot study on 5 employees working in Aselsan.

All questions in the questionnaire are measured with a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The questionnaire is designed in three parts:

1. First part including a total of 32 questions selected from the literature are related to organizational climate, shared vision and innovation capability.

The first 22 questions in this part are adapted from the test instrument developed by Scott and Bruce (1994) and used for the measurement of organizational climate properties of the company.

Questions [23-26] are related to shared vision quality of the firm and derived from Sinkula et al. (1997).

The last six questions, 27-32, are adapted from the 6-item scale Calantone et al. (2002) developed and used to measure employees' perception of company's innovation capability.

2. Second part is about the transformational leadership behaviors. These 22 questions are derived from Podsakoff et al.'s (1990) transformational leadership behavior inventory (TLI).

3. In the third and last part of the questionnaire, 7 questions about knowledge sharing behaviors of the companies are chosen from Van den Hooff & Ridder J.a.D (2004).

As a result, questionnaire delivered to respondents in this study consists of a total of 61 questions from the literature. In the below Table 3.1, numbers of questions and their corresponding variable aimed to measure in the study are provided. The first number following the abbreviation "Q" which stands for "question" represents the part of the questionnaire in which that question is located. For example, Q1.15 corresponds to the 15th question in the first part of the questionnaire which is related to organizational climate. The questionnaire delivered to respondents can be found in Appendix A.

Table 3.1 Structure of the questionnaire

Question Number	Variable	Resource of the questionnaire
[Q1.1 – Q1.22]	Organizational Climate	Scott and Bruce, 1994
[Q1.23 – Q1.26]	Shared Vision	Sinkula et al., 1997
[Q1.27 – Q1.32]	Innovation Capability	Calantone et al., 2002
[Q2.1 – Q2.22]	Transformational Leadership	Podsakoff et al.'s (1990) TLI
[Q3.1 – Q3.7]	Knowledge sharing	Van den Hooff & Ridder J.a.D, 2004

3.2.2. Execution of the Questionnaire

The study was conducted on R&D employees of micro and small sized software companies in ODTÜ Teknokent. Questionnaire was designed in two formats; online and print. Majority of the responses (79.2%) are collected through print questionnaire. A total of 322 responses from 47 companies were collected during November and December 2014. 23 out of 47 companies are micro sized and the rest 24 are small sized companies.

Questionnaires were not delivered to the owners or R&D managers of the company since there are questions about leadership styles of the managers in the questionnaire.

3.3. Objective Approach

Throughout the study, interviews were held with the owners or R&D managers of the companies. However, 9 out of 47 company managers agree to answer the questions only via e-mail indicating that last months of the year is extremely busy. Because of the limited time of the study, no other attempt was made for these companies.

List of the questions directed to the owners / managers are given below.

1. When is the establishment year of the company?
2. What is the total number of employees in the company?
3. What is the number of new products[6] emerged in the last 3 years?
    a. How many of these products are developed on customer request and how many on the anticipated needs of the market?
4. Have you made any working method changes in the last 3 years? (Y/N)
5. Have you made any marketing changes in the last 3 years? (Y/N)
6. Have you performed any collaboration in R&D projects in the last 3 years? (Y/N) If yes, on how many projects / products and with whom you performed collaborations?

By definitions of process and marketing innovations, questions numbered 4 and 5 are about process and marketing innovations respectively.

3.4. Statistical Analysis

All data collected through the questionnaires and interviews were analyzed statistically by using SPSS 21.0 software program. Analysis was done in the following order:

1. In order to determine the factor structure of the questionnaire, factor analysis was performed for each five of the measurement tools in the questionnaire separately. After that, probable relationships between perceived innovation capability and factors obtained from organizational climate, shared vision, transformational leadership and knowledge sharing were searched and types of the relationships, if there is any, were examined.

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[6] It is sufficient to consider a product new if it is new to the firm; meaning it is the first time firm engages generating that product.

2. After that, it was investigated whether product, process and marketing innovations differ significantly if companies developed collaborations or not.

3. Whether there is any difference in the perceived innovation capability of the companies when product, process and marketing innovations and collaboration are considered was investigated.

CHAPTER 4

DISCUSSION OF THE RESULTS AND RECOMMENDATIONS

In this part, data collected through subjective and objective approaches were analyzed. Descriptive statistics for all items in the questionnaire is presented in Appendix C.

4.1. Analysis of the questionnaire

4.1.1. Factor Analysis

Factor analysis is the most commonly used method to assess construct validity (Altaban, 2013). In this study, principal component analysis (PCA) which is commonly used in similar studies was chosen to determine factors.

In PCA, the first factor has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding factor in turn has the highest variance possible under the constraint that it is orthogonal to (i.e., uncorrelated with) the preceding factors. At the end of PCA procedure, factors which are not highly correlated with each other are obtained (Büyüköztürk, 2002).

Whether data set is suitable for factor analysis is tested before performing PCA. There are two statistical tests for assessment adequacy of sample size for factor analysis. First of them is KMO (Kaiser–Meyer–Olkin) index. If the value of KMO test statistics is less than 0.50, then it means data set is not suitable for factor analysis because of inadequate sample size (Kalaycı, 2008).

The other one is Bartlett test used for testing null hypothesis which proposes correlation matrix is an identity matrix. If the significance value is smaller than 0.05,

null hypothesis is rejected meaning there are high correlations between variables, and thus data set is suitable for factor analysis.

Factor loadings are coefficients representing the relationship between item and factor. If a factor loading of an item is greater than 0.60, then there is a strong relationship between item and factor. A factor loading between 0.30 and 0.59 indicates a moderate relationship. If there is a set of items which have loadings on one factor, then it means that these items measure the same latent variable/structure/factor together.

Before performing PCA, it is expected that an item/variable is correlated with only one factor. These types of variables are called pure variables. The variable correlated with more than one factor is called complexity variable (Büyüköztürk, 2002). Büyüköztürk (2002) also stated that observed variables which have high loadings only in one factor and low loadings in other factors facilitate interpretation and denominating of factors. Thus, in this study, items whose difference between two highest factor loadings less than 0.1 are extracted.

In this study, in each PCA implementation, varimax rotation technique which is one of the orthogonal rotation techniques was used.

In following sections, KMO and Bartlett's test and factor analysis were performed separately for each five of the measurement tools in the questionnaire.

Factor Analysis for Organizational Climate

In order to test whether data set which is composed of 322 responses on 22 questions is suitable for factor analysis, KMO and Bartlett test are performed. Since KMO test result is higher than 0.50, it is concluded that sample size is adequate. In addition, significance value for Bartlett's test is less than 0.05, meaning there are high correlations between items thus; data set is also suitable for factor analysis.

Table 4.1 KMO and Bartlett's Test Result for Organizational Climate

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.901
Bartlett's Test of Sphericity	Approx. Chi-Square	4934.337
	df	231
	Sig.	0.000

At first, in the initial solution 4 factors were found by SPSS. However, one item is excluded from the analysis since the difference between its two highest loadings is smaller than 0.1. After exclusion of the item, KMO result increases to 0.903 and Bartlett's test gives the same results.

As can be seen in the final rotated component matrix given in Table 4.2, remaining 21 items are loaded on 3 factors. These 3 factors explain approximately 72.2 % of total variance. It should be noted that although factor 1 and factor 2 loadings of the question "The reward system here benefits mainly those who don't rock the boat" are very close to each other (difference is 0.119), the question is grouped under factor 2 which has a slightly higher loading. Similarly, factor 1 and factor 3 loadings of the question "There are adequate resources devoted to innovation in this organization" are very close. Since it is more reasonable to group this question under factor 3 and in addition factor 3 has the slightly higher loading, question is grouped under factor 3. Scree plot and table of total variance explained obtained from factor analysis are given in Appendix B.

As mentioned earlier, test instrument used to measure organizational climate is the one Scott and Bruce (1994) developed. Authors adapted the instrument from the studies of Siegel and Kaammer (1978). The initial instrument contained 26 items and was based on 4 dimensions which were support-for-innovation, tolerance-for-differences, reward-innovation and adequate-resources. However, they performed a factor analysis using PCA and varimax rotation and came up with a four-factor solution. After the interpretation of the scree plot, they concluded that only one factor should be maintained. An examination of the loadings showed that most of the resource items were loaded on factors 2, 3, and 4 and other items related to other

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dimensions were loaded on factor 1. For this reason, they forced the items to load on two factors. In the two-factor solution, they extracted 4 items and ended up with 22-item test instrument which was composed of two dimensions: *support for innovation* and *resources supply.*

Result of the factor analysis in this study indicates that 21 items are loaded on 3 factors. Items grouped under factor 1 are basically related with the support that employees encounter in the organization for their creative ideas and related with the company's general attitude towards the idea of innovation. For this reason, factor 1 can be called "support for innovation". This factor explains approximately 61.77% of total variance.

Items loaded on factor 2 are about attitude of the company for those who are and act different from majority. This factor can be called "tolerance for difference" and it explains 5.62% of total variance.

Items grouped under factor 3 are about adequate resources regarding time, financials and human resources. Thus, this factor can be called "resource supply" and it explains 4.77% of total variance.

Except three questions, which are "The reward system here encourages innovation", "Around here, people are allowed to try to solve the same problems in different ways", "The reward system here benefits mainly those who don't rock the boat", all loadings of the questions are greater than 0.6 which implies a strong relationship between factor and question.

Table 4.2 Final Rotated Matrix for Organizational Climate

	Component		
	1	2	3
Creativity is encouraged here.	0.777		
This organization is open and responsive to change.	0.77		
This organization publicly recognizes those who are innovative.	0.735		
This organization can be described as flexible and continually adapting to change.	0.721		
Assistance in developing new ideas is readily available.	0.682		
Our ability to function creatively is respected by the leadership.	0.659		
This place seems to be more concerned with the status quo than with change.	0.633		
The reward system here encourages innovation.	0.58		
Around here, people are allowed to try to solve the same problems in different ways.	0.562		
A person can't do things that are too different around here without provoking anger.		0.759	
Around here, a person can get in a lot of trouble by being different.		0.753	
In this organization, we tend to stick to tried and true ways.		0.729	
The best way to get along in this organization is to think the way the rest of the group does.		0.707	
The main function of members in this organization is to follow orders which come down through channels.		0.687	
People around here are expected to deal with problems in the same way.		0.649	
The reward system here benefits mainly those who don't rock the boat.	0.41	0.529	
There is adequate time available to pursue creative ideas here.			0.82
This organization gives me free time to pursue creative ideas during the workday.			0.801
Lack of funding to investigate creative ideas is a problem in this organization.			0.768
Personnel shortages inhibit innovation in this organization.			0.731
There are adequate resources devoted to innovation in this organization.	0.506		0.617
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 9 iterations.			

Factor Analysis for Shared Vision

In literature review, there came up no evidence of any factor analysis for the test instrument developed by Sinkula et al. (1997) in order to measure shared vision. This is expected in a way that the tool is composed of only 4 questions. In this study, factor analysis for this tool is performed in order to experiment and observe the results of the analysis.

KMO and Bartlett's test results for shared vision are given in below Table 4.3. Since KMO test result is higher than 0.50 and Bartlett result is less than 0.05, it is concluded that data set is suitable for factor analysis.

Table 4.3 KMO and Bartlett's Test Result for Shared Vision

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.793
Bartlett's Test of Sphericity	Approx. Chi-Square	705.633
	df	6
	Sig.	0.000

At first PCA, SPSS found only one factor. It means all 4 items related to shared vision are highly correlated with only one factor which explains approximately 72.72% of total variance.

Factor loadings of the items and total variance explained are given in below tables. As can be seen from Table 4.4, all loadings of questions are higher than 0.60 which implies a strong relationship between factor, in this case: shared vision, and question.

Table 4.4 Factor Loadings of Items Related to Shared Vision

	Component
	1
All employees are committed to the goals of this organization.	.910
There is total agreement on our organizational vision across all levels, functions, and divisions.	.895
Employees view themselves as partners in charting the direction of the organization.	.806
There is a commonality of purpose in my organization.	.794
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

Table 4.5 Total Variance Explained for Shared Vision

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.909	72.718	72.718	2.909	72.718	72.718
2	.519	12.974	85.692			
3	.383	9.584	95.276			
4	.189	4.724	100.000			
Extraction Method: Principal Component Analysis.						

Factor Analysis for Innovation Capability

Similar to shared vision test instrument, no evidence of factor analysis of the tool measuring innovation capability did come up in the literature. For this reason, in order to observe the results, a factor analysis is performed in this study.

KMO and Bartlett's test results for innovation capability are given in below Table 4.6. Since KMO test result is higher than 0.50 and Bartlett result is less than 0.05, it is concluded that data set is suitable for factor analysis.

Table 4.6 KMO and Bartlett's Test Result for Innovation Capability

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.808
Bartlett's Test of Sphericity	Approx. Chi-Square	768.378
	df	15
	Sig.	0.000

At first PCA, SPSS found only one factor. It means all 6 items which are related to "innovation capability" are highly correlated with only one factor which explains 54.76% of total variance.

Factor loadings of the items and total variance explained are given in below tables. 5 out of 6 questions' loadings are higher than 0.6, which is a sign of strong relationship between questions and the factor "innovation capability".

Only the loading of "Innovation in our company is perceived as too risky and is resisted" is less than 0.6 indicating a moderate relationship.

Table 4.7 Factor Loadings of Items Related to Innovation Capability

	Component
	1
Our company is creative in its methods of operation.	.850
Our company tries out new ideas.	.834
Our company seeks out new ways to do things.	.824
Our company is the first to market with new products and services.	.736
Our new product introduction has increased over the last 3 years.	.675
Innovation in our company is perceived as too risky and is resisted.	.438
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

Table 4.8 Total Variance Explained for Innovation Capability

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.285	54.756	54.756	3.285	54.756	54.756
2	.922	15.368	70.124			
3	.687	11.450	81.574			
4	.529	8.825	90.398			
5	.331	5.521	95.920			
6	.245	4.080	100.000			
Extraction Method: Principal Component Analysis.						

Factor Analysis for Transformational Leadership

KMO and Bartlett's test results for transformational leadership are given in below Table 4.9.

Since KMO test result is higher than 0.50 and Bartlett result is less than 0.05, it is concluded that data set is suitable for factor analysis.

Table 4.9 KMO and Bartlett's Test Result for Transformational Leadership

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.920
Bartlett's Test of Sphericity	Approx. Chi-Square	5328.481
	df	231
	Sig.	0.000

At first, in the initial solution 4 factors were found by SPSS. However, eventually three items were excluded from the analysis. After exclusion of the items, KMO result increases to 0.923 and Bartlett's test gives the same results.

As can be seen in the final rotated component matrix given in Table 4.10, remaining 19 items are loaded on 4 factors. These 4 factors explain approximately 68.9 % of total variance. It should be noted that although factor 2 and factor 3 loadings of the question "Leads by "doing" rather than simply by "telling"" are close to each other,

the question is grouped under factor 3 since factor 3 has a slightly higher loading and it is more reasonable to group under factor 3. Similarly, factor 1 and factor 4 loadings of the question "Acts without considering my feelings" are close. Since it is more reasonable to group this question under factor 4 and in addition factor 4 has the slightly higher loading, question is grouped under factor 4. Except for the question "Acts without considering my feelings", all factor loadings are higher than 0.6, a sign of strong relationship between factor and the question. Scree plot and table of total variance explained obtained from factor analysis are given in Appendix B.

Podsakoff's et al.'s (1996) investigated the factor structure of TLI. They revealed a 6 dimension structure which is different from the structure in this study. Two out of three questions which are extracted are *"has provided me with new ways of looking at things which used to be a puzzle for me"* and *"has ideas that have forced me to rethink some of my own ideas I have never questioned before"*. They are about the dimension "Intellectual Stimulation". In Podsakoff's et al.'s (1990), while developing the test instrument, authors had already mentioned about the hesitation whether including intellectual stimulation as one of the transformational leadership dimensions since only Bass and his colleagues in Avolio and Bass (1988); Bass (1985) argued that intellectual stimulation should be considered an aspect of transformational leadership. Third question about intellectual stimulation which is *"has stimulated me to think about old problems in new ways"* is included in articulating a vision dimension in this study. The reason for this may be that some employees might have considered new ways that their leaders leading them into as the same as to articulating a vision.

The third and the last question which is extracted is *"insists on only the best performance"*. Through the process of data entry, it is observed that most of the time respondents who gave higher points for their managers give lower points for this question. The reason may be that they think this question associates with the qualities of an average leader rather than a competent one. Maybe this is the reason that this question is not statistically significant and has no correlation with any dimensions.

In addition, two remaining questions about dimension high performance expectations are *"shows us that he/she expects a lot from us"* and *"will not settle for second best"* and they are grouped under the dimension fostering the acceptance of group goals. The reason for this may be that respondents might have thought these two questions are about improving motivation in the workplace. In principle, in order to foster the acceptance of group goals, leaders should be capable of creating a highly motivated organization (Podsakoff's et al.'s, 1990).

The questions in factor 3 are about behaviors of leaders who set an example for employees to follow. The questions in this factor are exactly the same as the original instrument.

Factor 4 is about behaviors of leaders which indicate that they respect and are concerned about their employees' personal feelings. Similarly with factor 3, the questions in this factor are also the same as the original instrument.

For these reasons, it is concluded to continue with the original names of the dimensions given by developers of the tool. Thus, factor 1 is called "articulating a vision", factor 2 is "fostering the acceptance of group goals", factor 3 is named as "providing an appropriate model" and factor 4 is called "individualized support".

Table 4.10 Final Rotated Matrix for Transformational Leadership

	Component			
	1	2	3	4
Is always seeking new opportunities for the unit/department/organization.	.851			
Is able to get others committed to his/her dream of the future.	.830			
Paints an interesting picture of the future for our group.	.767			
Has a clear understanding of where we are going.	.762			
Inspires others with his/her plans for the future.	.758			
Has stimulated me to think about old problems in new ways.	.754			
Develops a team attitude and spirit among his/her employees.		.735		
Encourages employees to be "team players."		.713		
Will not settle for second best.		.693		
Fosters collaboration among work groups.		.687		
Gets the group to work together for the same goal.		.679		
Shows us that he/she expects a lot from us.		.677		
Leads by example.			.662	
Provides a good model to follow.			.649	
Leads by "doing" rather than simply by "telling."		.404	.625	
Treats me without considering my personal feelings.				.777
Shows respect for my personal feelings.				.712
Behaves in a manner that is thoughtful of my personal needs.				.614
Acts without considering my feelings.	.388			.554
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 5 iterations.				

Factor Analysis for Knowledge Sharing

KMO and Bartlett's test results for knowledge sharing are given in below Table 4.11. Since KMO test result is higher than 0.50 and Bartlett result is less than 0.05, it is concluded that data set is suitable for factor analysis.

Table 4.11 KMO and Bartlett's Test Result for Knowledge Sharing

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	1607.635
	df	21
	Sig.	0.000

At first iteration of PCA, SPSS found two factors. It means all 7 items related to knowledge sharing are highly correlated with two factors which explain 73.79% of total variance. Factor loadings of the items and total variance explained are given in below tables. All questions have factor loadings which are higher than 0.6.

In order to measure knowledge sharing, test instrument developed by Van den Hooff and Ridder J.a.D (2004) is adapted for this study. Authors also defined two dimensions of which first one is knowledge donating and second is knowledge collecting. According to the results of factor analysis, dimensions are found to be the same as authors proposed. Thus, factor 1 will be named as "knowledge collecting" and factor 2 will be referred to as "knowledge donating".

Table 4.12 Factor Loadings of Items Related to Knowledge Sharing

	Component	
	1	2
I share my skills with colleagues when they ask for it.	.887	
I share information I have with colleagues when they ask for it.	.857	
Colleagues in my company share their skills with me when I ask them to.	.717	.493
Colleagues in my company share knowledge with me when I ask them to.	.670	.504
When they have learned something new, my colleagues tell me about it.		.829
Knowledge sharing among colleagues is considered normal in my company.		.818
When I have learned something new, I tell my colleagues about it.		.764
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Table 4.13 Total Variance Explained for Knowledge Sharing

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.07	58.10	58.10	4.07	58.10	58.10
2	1.10	15.70	73.79	1.10	15.70	73.79
3	0.91	12.97	86.76			
4	0.38	5.37	92.13			
5	0.29	4.14	96.27			
6	0.18	2.61	98.87			
7	0.08	1.13	100.00			
Extraction Method: Principal Component Analysis.						

4.1.2. Validity of the Questionnaire

In this study, the questionnaires developed earlier and utilized many times in similar studies are preferred in order to increase validity. All of them were developed by experts of the field and aimed to measure the similar organizational characteristics. In this way, it has been aimed to increase the content-validity of the questionnaire.

Regarding two of the questionnaires, which are shared vision and innovation capability, there was no evidence of performing factor analysis. According to the results of the factor analysis performed in this study, no factor structure is detected. In addition, factor loadings of the questions, except one question from innovation capability questionnaire, are higher than 0.6 implying a strong relationship between questions and factors. This result can be interpreted as both test instruments represent a high level of construct validity.

As for the knowledge sharing questionnaire, results of the factor analysis reveal the exact same structure as the developers'. This is an implication to construct validity.

As mentioned earlier, factor structure obtained from organizational climate questionnaire used in this study is different from what authors (Scott and Bruce, 1994) proposed. However, since the third dimension, tolerance for difference, is one of the dimensions authors first aimed to construct but then could not achieved at the end, it can be concluded that factor structure obtained in this study does not violate the construct-validity.

Transformational leadership questionnaire also reveals a different factor structure from Podsakoff's et al.'s (1996). Authors proposed 6 dimensions while in this study there are four dimensions. The reasons to believe the questionnaire used in this study is construct-valid were explained earlier in the section about factor analysis of this tool.

In addition, Harputlu (2014) mentioned that according to the literature if factors explain more than 50% of total variance, then this contributes to validity of the questionnaire. All test instruments used in this study explain more than 70% of total variance except innovation capability and transformational leadership, which explain 54.76% and 68.93% respectively. For this reason, it can be concluded that the questionnaire is valid.

4.1.3. Reliability of the Questionnaire

All dimensions obtained from factor analysis are tested for the reliability in this section. Cronbach Alpha Model which is commonly used for testing reliability is used.

According to Kalaycı (2008), reliability of a test instrument can be interpreted in the light of the following information after obtaining the value of cronbach alpha coefficient:

- If $0.00 \leq \alpha < 0.40$, then the instrument is not reliable,
- If $0.40 \leq \alpha < 0.60$, then reliability of the instrument is low,
- If $0.60 \leq \alpha < 0.80$, then the instrument is quite reliable,
- If $0.80 \leq \alpha < 1.00$, then the instrument is highly reliable.

Alpha results for each of the five questionnaires and their dimensions are given in the below Table 4.14. Since all coefficients are greater than 0.80, it can be concluded that the questionnaire is highly reliable.

Table 4.14 Cronbach's Alpha Coefficients

	Cronbach's Alpha	N of Items
Organizational Climate	0.938	22
Support for innovation	0.920	9
Tolerance for difference	0.832	7
Resource supply	0.864	5
Shared Vision	0.873	4
Innovation Capability	0.824	6
Transformational Leadership	0.945	22
Articulating a vision	0.873	6
Fostering the acceptance of group goals	0.832	6
Providing an appropriate model	0.900	3
Individualized support	0.835	4
Knowledge Sharing	0.876	7
Knowledge collecting	0.869	4
Knowledge donating	0.811	3

4.1.4. Mean Values of All Factors Related to Organizational Climate, Shared Vision, Innovation Capability, Transformational Leadership and Knowledge Sharing

Before computing descriptive statistics of each factor, in order to identify extreme responses and exclude them for more reliable results if necessary, outlier analysis is done. For this purpose, box plots of all factors are examined.

Regarding the three factors of organizational climate, no outlier is detected.

In shared vision data set, two outliers are detected and after extracting those and repeating the procedure, no other outliers are detected.

In innovation capability data set, one outlier is detected and after extracting it and repeating the procedure, no other outliers are detected.

In the first outlier analysis for articulating a vision (factor 1 of transformational leadership), there are two outliers determined. After 2 iterations, no outlier is

remained but total of 6 observations are extracted. No outliers are detected in fostering the acceptance of group goals factor. In the analysis of providing an appropriate model factor, after 2 iterations, total of 6 outliers are determined and extracted. In individualized support factor, total of 4 observations are extracted from the data set.

In knowledge collecting factor, only one outlier is detected in the first iteration. Similarly, two outliers are extracted from the knowledge donating factor data set.

After the outlier analysis, descriptive statistics of total 11 variables corresponding to factors obtained from factor analysis and defined as new variables in SPSS were examined. Mean values of these new 11 variables according to size of the companies are provided in Table 4.15 and in Figure 4.1. In addition, descriptive statistics for the all items in the questionnaire is in Appendix C.

Table 4.15 Descriptive statistics of all factors in the questionnaire

| | Company size | | | | | |
| | Total | | Micro | | Small | |
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
support for innovation	3.57	0.85	3.59	0.79	3.61	0.49
tolerance for difference	3.14	0.79	3.13	0.64	3.15	0.43
resource supply	3.12	1.01	3.20	0.93	3.14	0.56
shared vision	3.42	0.91	3.38	0.84	3.46	0.47
innovation capability	3.46	0.82	3.52	0.72	3.44	0.46
articulating a vision	3.42	0.78	3.34	0.78	3.44	0.45
fostering the acceptance of group goals	3.61	0.72	3.62	0.71	3.65	0.37
providing an appropriate model	3.39	0.98	3.34	0.95	3.41	0.52
individualized support	3.71	0.79	3.67	0.70	3.75	0.45
knowledge collecting	4.45	0.55	4.50	0.29	4.44	0.23
knowledge donating	4.08	0.67	4.13	0.28	4.08	0.28

At first glance to Figure 4.1, it can be concluded that mean values of all factors are nearly the same for micro and small sized companies. For most of the factors (except "resource supply", "innovation capability" and "knowledge collecting and donating"), mean values of small sized companies are very slightly higher than the micro sized companies. In addition, it should be noted that mean values of software companies participated in the study are above the average for all 11 variables. However, it can also be concluded that, except knowledge sharing factors, companies

could not reach even 4 points meaning some changes in behavioral characteristics of the company will surely improve these values.
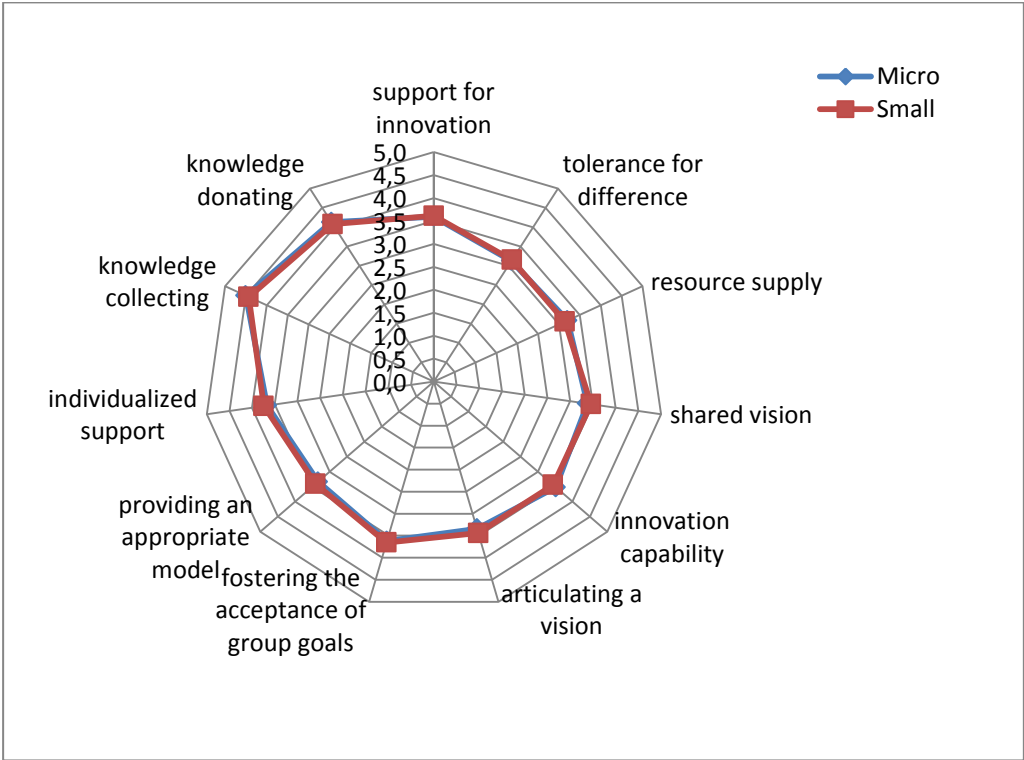
Figure 4.1 Radar chart for mean values of all factors in the questionnaire according to size of the companies

The factor which has the highest mean out of three organizational climate factors is "support for innovation". According to employees, their companies are open to change and welcome new ideas. However, they are not satisfied with the current reward system (Q1.20. Mean = 2.79). They think the reward system does not support innovation sufficiently.

"Tolerance for difference" and "resource supply" are the lowest valued factors in the questionnaire. Employees participated in the study think that not much sympathy exists for the ones whose acts and thoughts differ from the majority. The question with the lowest value in "tolerance for difference" factor is *"the main function of members in this organization is to follow orders which come down through*

channels" which in a way hinders the creativity of the individuals (Scott and Bruce, 1994). They also think they lack financial and human resources and in addition free time to create innovative ideas.

Employees who participate in this research believe in the existence of a common goal in their organizations however, they do not see themselves as partners in charting the direction of the organization (Q1.26. Mean = 2.95).

According to the results of "innovation capability", respondents think highly of their companies' innovation capability. The question with the lowest value in this part is *"our company is the first to market with new products and services"* which has a mean of 3.03. Employees do not think their companies are good enough with the degree of novelty of new products.

Mean value of the factor "articulating a vision" is 3.42. Employees think that their leaders are clear and understandable with the goals of the organization. Lowest valued question is *"is able to get others committed to his/her dream of the future"* which has a mean value of 2.99. This may be hint for the leaders in what area they should spend more effort. As mentioned earlier, one of the questions which is grouped originally under "intellectual stimulation" factor is grouped under "articulating a vision" in this study. This question which is *"has stimulated me to think about old problems in new ways"* has a mean value of 3.37.

Mean value of the factor "fostering the acceptance of group goals" is 3.61. Employees in this cluster think that their leaders are capable of building a highly motivated working environment by improving the commitment of both individuals and working groups. 2 out of 6 questions in this factor actually grouped under "high performance expectations" in the original test instrument which are *"shows us that he/she expects a lot from us"* and *"will not settle for second best"*. The mean value of the later question is the lowest one in the factor which is 3.13.

Factor "providing an appropriate model" is the lowest valued factor in the transformational leadership which has a mean value of 3.40. Employees are not satisfied that much about their leaders' consistency between actions and sayings.

Employees think that their leaders respect them and are concerned about their personal feelings. Mean value of "individualized support" is 3.71 corresponding to the highest valued factor in transformational leadership.

"Knowledge collecting" and "knowledge donating" factors have the highest values in means compared to the whole questionnaire, which are 4.45 and 4.08 respectively. Thus, trust between employees is high in this cluster and they share knowledge with their colleagues spontaneously or when asked for.

4.1.5. Findings from Correlation Tests

In this section, probable relationships between perceived innovation capability and factors obtained from organizational climate, shared vision, transformational leadership and knowledge sharing are searched through some correlation tests, and types of the relationships, if there is any, are examined.

Before correlation tests, there are two things to do. First one is to set alternative hypotheses to null hypotheses. They are set as the following:

Organizational Climate:

1. There is a direct and positive relationship between "support for innovation" and "perceived innovation capability".
2. There is a direct and positive relationship between "tolerance for difference" and "perceived innovation capability".

3. There is a direct and positive relationship between "resource supply" and "perceived innovation capability".

Shared vision:

1. There is a direct and positive relationship between "shared vision" and "perceived innovation capability".

Transformational Leadership:

1. There is a direct and positive relationship between "articulating a vision" and "perceived innovation capability".
2. There is a direct and positive relationship between "fostering the acceptance of group goals" and "perceived innovation capability".
3. There is a direct and positive relationship between "providing an appropriate model" and "perceived innovation capability".
4. There is a direct and positive relationship between "individualized support" and "perceived innovation capability".

Knowledge Sharing:

1. There is a direct and positive relationship between "knowledge collecting" and "perceived innovation capability".
2. There is a direct and positive relationship between "knowledge donating" and "perceived innovation capability".

Secondly, underlying distributions for all variables should be examined. Results of the normality tests for 11 variables are given in Appendix D. It is observed that none of the variables are normally distributed.

In all correlation tests in this part, Spearman rank correlation test which is nonparametric is used, since normality assumption does not hold and data (responses given to questions) is ordinal (capable of being ranked).

In addition, it is assumed that p-value is based on significance level of 5% for all analysis in this thesis. A small p-value ($p \leq 0.05$) indicates strong evidence against the null hypothesis; however, a large p-value ($p > 0.05$) indicates weak evidence against the null hypothesis. In order to make strong presumption against null hypothesis, p-value is taken as 0.05. Thus, null hypothesis is rejected in favor of the alternative hypothesis when p-value is less than predetermined significance level of 0.05 ($p < 0.05$), otherwise it is fail to reject ($p > 0.05$).

Table 4.16 Correlation between perceived innovation capability and organizational climate factors

			perceived innovation capability
Spearman's rho	support for innovation	Correlation Coefficient	.720**
		Sig. (2-tailed)	.000
	tolerance for difference	Correlation Coefficient	.108
		Sig. (2-tailed)	.089
	resource supply	Correlation Coefficient	.668**
		Sig. (2-tailed)	.000

**. Correlation is significant at the 0.05 level (2-tailed).

According to the results given in Table 4.16, there is a strong, positive relationship between support for innovation and perceived innovation capability (r=0.72, p<0.05). Thus, establishing a working environment in which creativity and uniqueness is encouraged, employees who display innovative behavior are recognized and awarded, assistance is ready for improving new and creative ideas is positively

related with the perceived innovation capability. This result is expected in a way and in accordance with the results in the literature. Özbağ (2014) did also use the instrument she derived from Scott and Bruce and came up with the same result that an organizational climate supporting creative ideas and individuals is an important determinant of perceived innovation capability.

However, since p>0.05 for tolerance for difference, null hypothesis cannot be rejected meaning there is no significant relationship between tolerance for difference and perceived innovation capability.

In addition, resource supply and perceived innovation capability are significantly and positively correlated (r=0.668, p<0.05). Tool developers Scott and Bruce could not find a positive relationship regarding resource supply. The reason for this may be that their respondents were from a large, centralized R&D facility of a major company. However, respondents in this study are from micro and small sized software companies thus chances that employees are experiencing financial and personnel shortages are much higher.

Table 4.17 Correlation between perceived innovation capability and shared vision

		perceived innovation capability
Spearman's rho shared vision	Correlation Coefficient	.625[**]
	Sig. (2-tailed)	.000

**. Correlation is significant at the 0.05 level (2-tailed).

As to the relation between perceived innovation capability and shared vision, the existence of a positive relationship is observed (r=0.625, p<0.05). This result is in accordance with the findings in the literature (Calantone et al., 2002; Pearce and Ensley, 2004; Tsai and Ghoshal, 1998) meaning that in companies where leaders

share their vision and make employees a part of it, perception of innovation capability increases.

Table 4.18 Correlation between perceived innovation capability and transformational leadership factors

			perceived innovation capability
Spearman's rho	articulating a vision	Correlation Coefficient	.708[**]
		Sig. (2-tailed)	.000
	fostering the acceptance of group goals	Correlation Coefficient	.674[**]
		Sig. (2-tailed)	.000
	providing an appropriate model	Correlation Coefficient	.666[**]
		Sig. (2-tailed)	.000
	individualized support	Correlation Coefficient	.189
		Sig. (2-tailed)	.156

**. Correlation is significant at the 0.05 level (2-tailed).

According to the Table 4.18, there exists a positive relationship between articulating a vision and perceived innovation capability (r=0.708, p<0.05). This factor of transformational leadership is about leadership's competency for creating new and exciting future for the company and making employees believe in this future. In this regard, this factor shows similarities with shared vision; both are about indicating a clear goal which is also to be adopted by all employees in the organization. Jung et al., 2003 already confirmed that transformational leaders in an organization have a significant and positive effect on the organizational climate that supports innovation. For this reason, it may be concluded that transformational leaders have the ability to improve the shared vision through the organization.

The relationship regarding fostering the acceptance of group goals is found to be significant (r=0.674, p<0.05). As discussed earlier, the questions in this factor do not purely consist of the questions about motivation of the group goals but also they are about individual motivation. Leaders who have the abilities to motivate groups and individuals in an organization improve the creativity of groups and individuals which in turn increase the innovativeness of the organization (Gümüşlüoğlu and İlsev, 2009).

Behaviors of leaderships which are about providing an appropriate model and individualized support establish the mutual trust in the organizations. Employees respect and trust their leaders since they value the consistency in the leader's promises and actions. In addition, by providing individualized support to the employees, leaders have the opportunity to show that they respect their followers and are concerned about their feelings. The positive effects of building trust in the organizations on innovativeness are proved in earlier studies in the literature (Abrams et al., 2003). In this study, the existence of a positive relationship between providing an appropriate model and perceived innovation capability is also proved (r=0.666, p<0.05). However, according to the results, no significant relationship exists between individualized support and perceived innovation capability.

Table 4.19 Correlation between perceived innovation capability and knowledge sharing factors

			perceived innovation capability
Spearman's rho	knowledge collecting	Correlation Coefficient	.370[**]
		Sig. (2-tailed)	.000
	knowledge donating	Correlation Coefficient	.383[**]
		Sig. (2-tailed)	.000

**. Correlation is significant at the 0.05 level (2-tailed).

The results regarding the factors of knowledge sharing show that both factors have positive relationships with perceived innovation capability (r=0.370, p<0.05 and r=0.383, p<0.05) which is in accordance with the results in the literature (Liao, 2006; Lin, 2007; Saenz et al. (2009); Atahan, 2012).

However, it is worth noting that these relationships are less strong than the other relationships which are proved earlier since correlation coefficients are relatively lower. The reason for this less strong relationship may be that since the subjects of the study are micro and small sized companies, it is easier and more natural for employees to share knowledge with the colleagues which may weaken its connection to innovation capability. But in the end, knowledge sharing is proved to be effective on perceived innovation capability.

4.2. Analysis of the Interviews

Throughout the research, interviews are held with the owner or R&D manager of 47 companies. 38 out of 47 interviews are completed face to face and the remaining 9 company managers agree to answer the questions only via e-mail indicating that last months of the year is extremely busy.

Information about the age and size of the companies can be found in the below Table 4.20. Average age of the total 47 companies participated in the survey is 7. It is 5 for micro sized and 9 for small sized companies. 5 out of 47 companies are established in the last 2 years and establishment year of 10 companies dates back to more than 10 years.

Table 4.20 Frequencies of age and number of employees of companies

		Frequency	Valid Percent	Cumulative Percent
AGE	1-2	5	10.6	10.6
	3-5	11	23.4	34.0
	6-8	14	29.8	63.8
	9-11	10	21.3	85.1
	12-14	6	12.8	97.9
	20	1	2.1	100.0
Number of employees	5-9	23	48.9	48.9
	10-15	8	17.0	66.0
	15-20	10	21.3	87.2
	20-25	1	2.1	89.4
	35-40	1	2.1	91.5
	40-45	2	4.3	95.7
	45-50	2	4.3	100.0

Considering the questions discussed in the interview; distribution of the new products developed, percentage of the companies that participated in process and marketing innovations and percentage of companies that perform collaboration will be introduced in the upcoming sections.

4.2.1. New products developed in the last 3 years

5 out of 47 companies generate, develop and market only standardized products. In the analysis of data, the numbers of modifications that are implemented for the

product and of which customers pay for are accepted to be numbers of products that these types of companies generated.

From Table 4.21, it can be concluded that more than half of the companies interviewed developed up to 10 new products in the last 3 years.

Table 4.21 Frequencies of number of new products developed

		Frequency	Valid Percent	Cumulative Percent
	3-5	11	23.4	23.4
	6-10	19	40.4	63.8
Number of new products	11-15	8	17.0	80.9
	16-20	6	12.8	93.6
	21-25	2	4.3	97.9
	36-40	1	2.1	100.0

In addition, 63% of total products are developed on customer request and 37% on the anticipated needs of the market. As can be seen from Figure 4.2, small sized companies have higher percentages on the products that are developed on the anticipated needs of the market than the micro sized companies. The reason for this result may be derived from the fact that products which are developed for the market needs take more time, energy, and investment than the products that are developed on customer requests. Considering the fact that companies larger in size generally have more excess resources (human, financial resources…), this result is presumable.

60
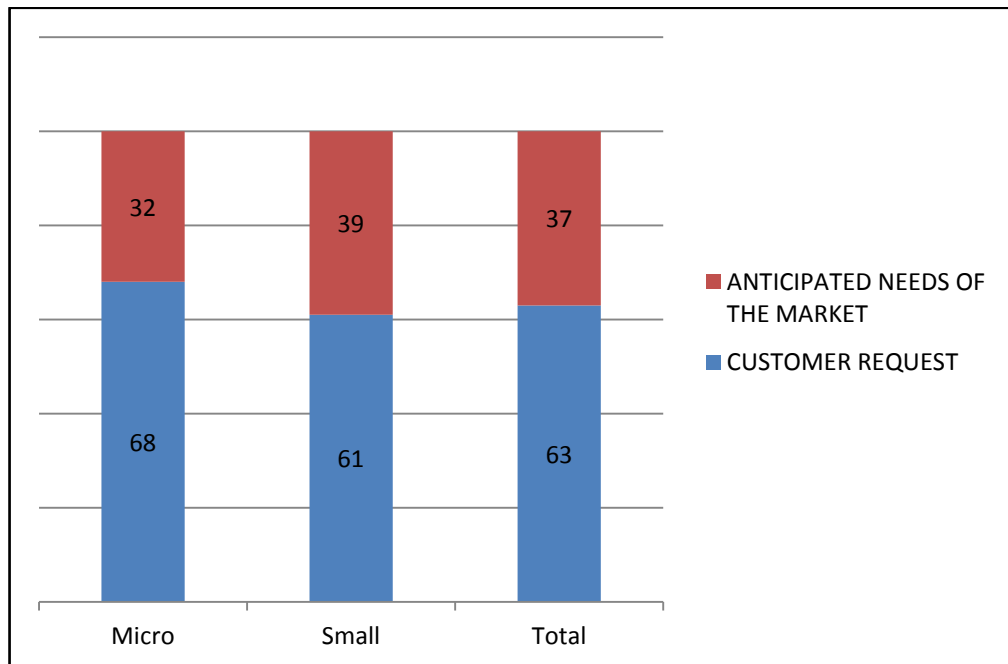
Figure 4.2 Percentages of products based on customer request or anticipated needs of the market

Majority of the companies develop products on customer request while fewer companies develop regarding the market needs. In addition, it is mentioned in the interviews that companies develop products for the market if only they can guarantee the customer before development phase.

4.2.2. Process and Marketing Innovations in the last 3 years

According to the interview results, 31 out of 47 companies corresponding to 66% of total have implemented process innovations while only 18 companies which correspond to 38% of all have performed marketing innovations. The fact that majority of the companies develop products on customer requests may be the reason why they do not need any change in the marketing methods.

Percentages of companies that implemented process or marketing innovations are provided in the below Figure 4.3. According to the figure, 43% of micro sized

companies engaged in process innovations while the ratio is 88% for small sized companies. Both types of companies have higher results for process innovations.
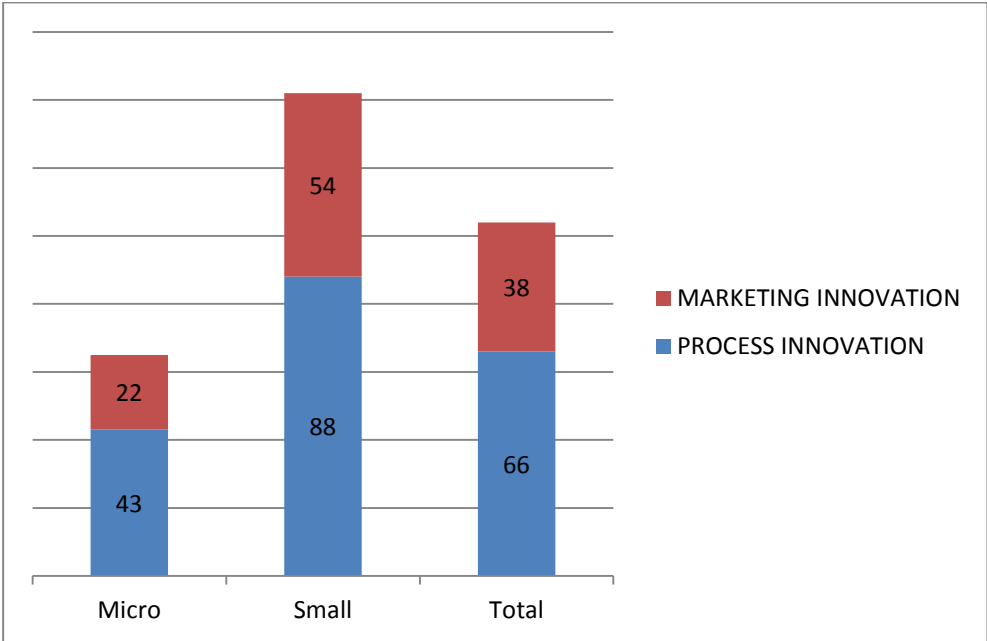
Figure 4.3 Percentages of companies engaged in process or marketing innovations

4.2.3. Collaborations Developed in the last 3 years

According to the interviews, the number of projects in which companies collaborate in the last 3 years and type of the collaboration is summarized in the below Table 4.22.

Table 4.22 Number of projects in which companies collaborates

	Micro Companies	Small Companies	TOTAL
KOSGEB	12	1	13
ANKA[7]	7		7
TÜBİTAK	16	24	40
EU[8]	1	13	14
MEB[9]		1	1
MSB[10]		5	5
ASPB[11]		1	1
BSTB[12]	1	3	4
SSM[13]		1	1
UNIVERSITIES	9	26	35
COMPANIES IN ODTÜ TEKNOKENT	3	11	14
OTHER NATIONAL COMPANIES	2	27	29
FOREIGN COMPANIES	3	11	14

It should be noted that KOSGEB, ANKA, TÜBİTAK and EU projects are the type of collaborations in which financial assistance is provided for the company by the government. Percentage of projects in which companies had governmental financial

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[7] ANKA: Ankara Development Agency

[8] EU: European Union

[9] MEB: Ministry of Education

[10] MSB: Ministry of Defense

[11] ASPB: Ministry of Family and Social Policies

[12] BSTB: Ministry of Science, Industry and Technology

[13] SSM: Undersecretariat for Defense Industries

assistance and built other types of collaborations is given in Figure 4.4. It should be noted that micro sized companies are more dependent to government supports than small sized companies. This result is consistent with the fact that micro sized companies which have an average age of 5, which is young, will need more support from the government. On the other hand, small sized companies, with an average age of 9, develop more engagements with universities, and other companies compared to micro sized companies.
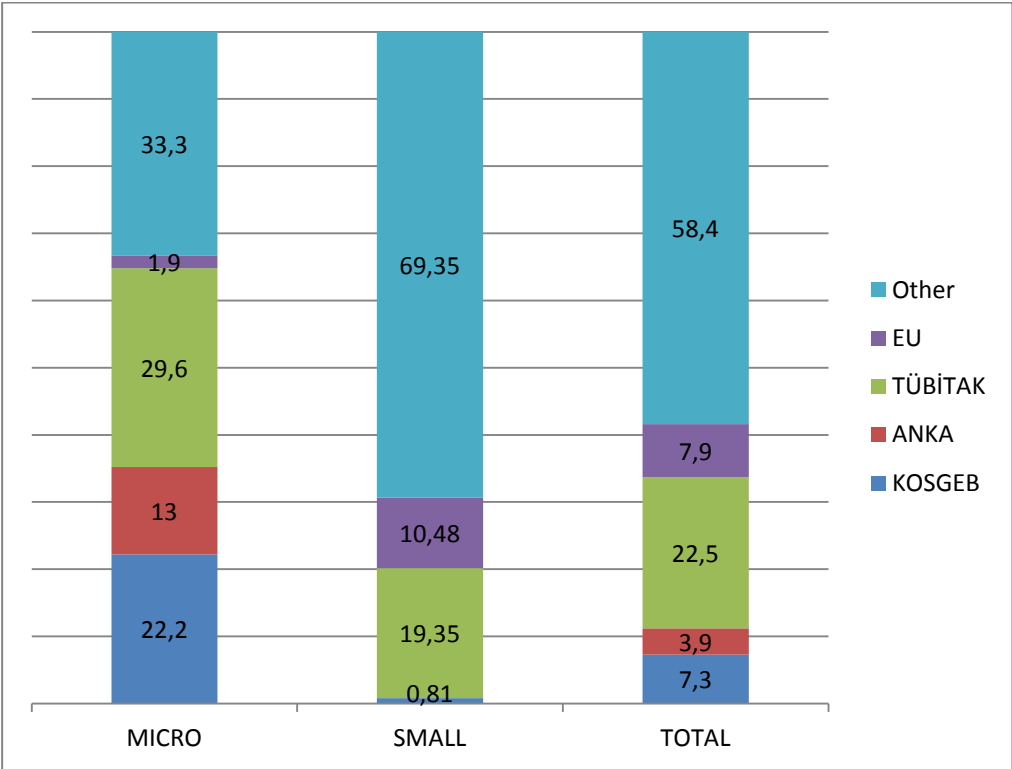
Figure 4.4 Percentage of projects in which companies had governmental financial assistance and had other types of collaborations

Since type of collaborations which will be interested in this study is the ones in which companies exchange ideas and knowledge with second parties and thus widen their knowledge pool, collaborations in which purpose is only financial assistance will be ignored in the data analysis from now on. KOSGEB and ANKA are this type of collaborations in which there is no obligation for the companies to develop relationships with second parties; only financial support is granted. In TÜBİTAK and

EU collaborations, companies are supported financially besides the obligations to develop relationships with universities or other companies.

According to this new arrangement, 10 out of 47 companies developed no collaborations in the last 3 years while remaining 37 companies engaged in at least one type of collaboration. The following two figures give the distributions of collaborations that micro and small sized companies developed in the last 3 years (collaborations with KOSGEB and ANKA are excluded).
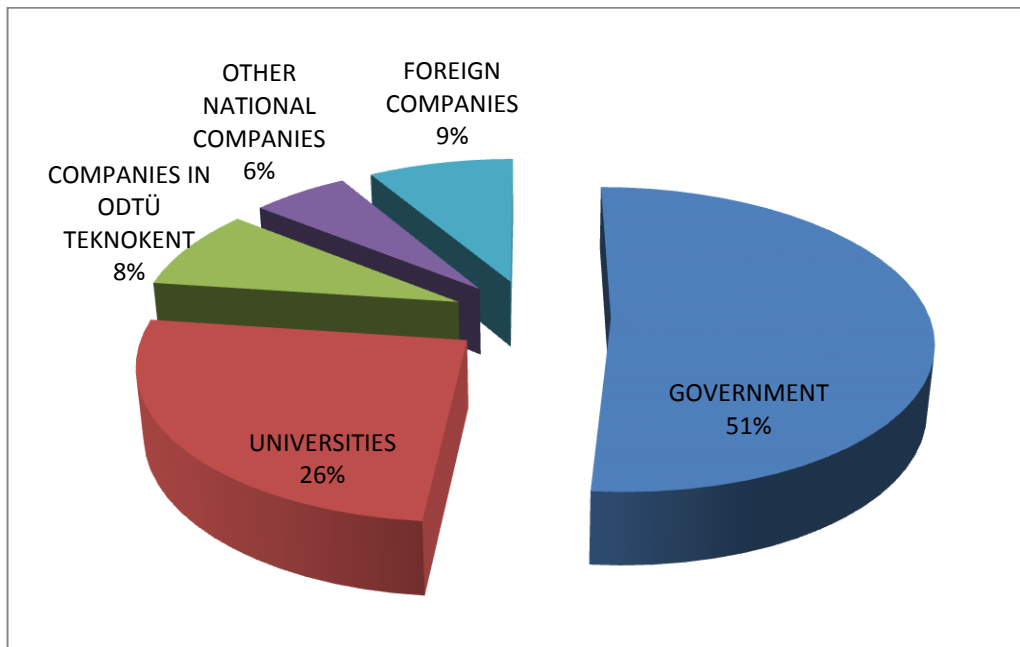
Figure 4.5 Distribution of collaborations micro sized companies developed
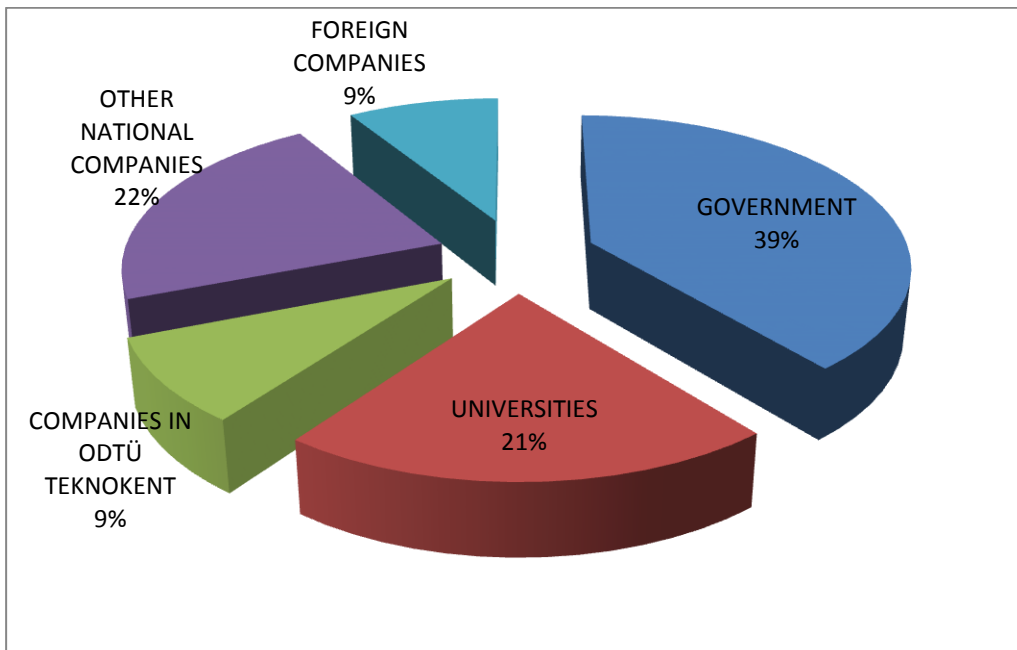
Figure 4.6 Distribution of companies small sized companies developed

It can be seen from the figures that both types of companies rely mostly on first government and then university collaborations which are expected in the case of techno parks. Since average age of the companies participated in this study is considerably young, their need for the projects which are also financially supported are understandable. In addition, physical proximity to the areas of universities fosters collaborations with universities.

It can also be concluded from the above figures that small sized companies have more capability developing collaborations with other companies compared to micro sized companies.

4.2.4. Findings about Effects of Collaboration on Product, Process & Marketing Innovations

In this part, it is investigated whether proportion of companies regarding product, process and marketing innovations differ significantly if companies developed collaborations or not.

Firstly, alternative hypotheses to null hypotheses are set as the following:

1. There is a significant difference in the product innovation rates between companies which collaborate and which do not collaborate.

2. There is a significant difference in the process innovation rates between companies which collaborate and which do not collaborate.

3. There is a significant difference in the marketing innovation rates between companies which collaborate and which do not collaborate.

In order to test the first hypothesis, companies are divided into two groups according to their number of new products developed: first group includes companies which develop <u>less than</u> average number of new products; second group includes companies which develop <u>more than or equal to</u> average number of new products. To test the second hypothesis, companies are divided into two groups: ones that perform at least one process innovation and ones that did not perform process innovations in the last 3 years. For the third hypothesis, similar to second one, there are two groups of companies: ones that perform at least one marketing innovation and ones that perform none marketing innovations.

In order to test this, Fisher's exact test which is nonparametric and a special form of chi-square test is used since this test is about the analysis of a 2*2 contingency

table[14]. To meet the requirements of a 2*2 contingency table, at the beginning companies are divided into two regarding collaboration: the ones that performed collaboration and the ones that did not. Further strategy is that if one of the relationships is proved to be significant then the effects of types of collaborations will be investigated in groups of two. For this reason, companies are given attributes from 1 to 7 that correspond to the type of collaboration they developed. The meanings are given in below Table 4.23.

Table 4.23 Collaboration attributes for the companies and their meanings

Collaboration attribute	Meaning
0	if the firm performed no collaboration
1	if the firm performed collaboration only with government
2	if the firm performed collaboration only with universities
3	if the firm performed collaboration only with other firms
4	if the firm performed collaboration both with government and universities
5	if the firm performed collaboration both with government and other firms
6	if the firm performed collaboration both with universities and other firms
7	if the firm performed collaboration both with government, universities and other firms

However, according to the results provided in below tables, there is no difference in the proportions of companies grouped according to product, process and marketing innovations if companies developed collaborations or not ($p > 0.05$).

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[14] In statistics, a contingency table (also referred to as cross tabulation or crosstab) is a type of table in a matrix format that displays the (multivariate) frequency distribution of the variables. (Resource: http://en.wikipedia.org/wiki/Contingency_table)

Table 4.24 Frequency distribution of companies based on product groups and collaboration

			Product Group		Total
			less than 11	11 and more	
Collaboration	did not collaborate	Number of companies	7	3	10
		Percentage of companies	70.0 %	30.0%	100.0%
	did collaborate	Number of companies	23	14	37
		Percentage of companies	62.2%	37.8%	100.0%
Total		Number of companies	30	17	47
		Percentage of companies	63.8%	36.2%	100.0%

Chi square= 0.209; p=0.474

Table 4.25 Frequency distribution of companies based on process innovation and collaboration

			Process Innovation		Total
			did not make any process innovations	made process innovations	
Collaboration	did not collaborate	Number of companies	3	7	10
		Percentage of companies	30.0%	70.0%	100.0%
	did collaborate	Number of companies	13	24	37
		Percentage of companies	35.1%	64.9%	100.0%
Total		Number of companies	16	31	47
		Percentage of companies	34.0%	66.0%	100.0%

Chi square= 0.092; p=0.538

Table 4.26 Frequency distribution of companies based on marketing innovation and collaboration

			Marketing Innovation		Total
			did not make any marketing innovations	made marketing innovations	
Collaboration	No	Number of companies	8	2	10
		Percentage of companies	80.0%	20.0%	100.0%
	Yes	Number of companies	21	16	37
		Percentage of companies	56.8%	43.2%	100.0%
Total		Number of companies	29	18	47
		Percentage of companies	61.7%	38.3%	100.0%

Chi square= 1.800; p=0.166

Results for process and marketing innovations are expected in a way since none of the companies interviewed mentioned about a collaboration aiming to implement a process or marketing innovation. Thus, software companies in ODTÜ Teknokent do not see collaborations as an opportunity to improve process or marketing innovations.

In addition, considering the frequency distribution of number of new products which is given in Table 4.21 earlier, companies are divided into 3 groups. First group consists of companies which developed 3-5 products, in the second group there are companies which develop 6-10 products and lastly companies in the third group develop more than or equal to 11 products in the last 3 years.

However, the results of Chi-square test based on 3 product groups could not be interpreted because of the inadequate sample size. Test result suggests to increase the

number of observations or to decrease the number of product groups. Therefore, two groups are selected.

4.3. Findings about Effects of Product, Process, Marketing Innovations and Collaboration on Companies' Perceived Innovation Capability

In this section, whether there is any statistically significant difference in the perceived innovation capability of the companies when product, process and marketing innovations and collaboration are considered is investigated. Regarding the effect of collaboration, strategy introduced earlier is implemented: Firstly, companies are divided into two and then if the relationship is proved to be significant, the effects of types of collaborations will be investigated in groups of two.

Firstly, underlying distributions of companies' perceived innovation capability data grouped according to the number of product innovations, process and marketing innovations and collaborations are examined. Results of the normality tests are provided in Appendix D. It is observed that all groups of perceived innovation capability are normally distributed, since normality assumption holds, independent-samples t-test is performed.

Secondly, alternative hypotheses to null hypotheses are set as the following:

1. There is a significant difference between companies grouped acoording to number of products they develop in terms of perceived innovation capability.
2. There is a significant difference between companies which perform process innovations and which do not in terms of perceived innovation capability.
3. There is a significant difference between companies which perform marketing innovations and which do not in terms of perceived innovation capability.

4. There is a significant difference between companies which collaborate and which do not collaborate in terms of perceived innovation capability.

According to the results of the independent-samples t-test provided in Table 4.27, all of the null hypotheses are failed to reject ($p>0.05$). This means that there is no significant difference between means of the companies' perceived innovation capabilities when product, process and marketing innovations and collaboration are considered.

It can be concluded that number of new products companies developed or whether companies implement process, marketing innovations or whether they perform collaborations do not have any significant effect on employees' perception of innovation capability of the company.

In addition, similar to earlier section, companies are again divided into 3 groups. First group consists of companies which developed 3-5 products, in the second group there are companies which develop 6-10 products and lastly companies in the third group develop more than or equal to 11 products in the last 3 years. According to the normality tests, all three data sets are found to be normally distributed. After that, independent-samples t-test is performed for groups of two regarding 1st and 2nd groups, 1st and 3rd groups and lastly 2nd and 3rd groups in order. However, the result comes up still the same: no significant difference between means of the companies' perceived innovation capabilities when product innovations are considered.

Table 4.27 Effects of product, process, marketing innovations and collaboration on perceived innovation capability

| | | Perceived innovation capability | | t | p |
		Mean	Standard Deviation		
Product Innovation	less than 11	3.56	.62	1.196	0.238
	equal or more than 11	3.34	.55		
Process Innovation	did not make any process innovations	3.50	.72	0.174	0.863
	made process innovations	3.47	.53		
Marketing Innovation	did not make any marketing innovations	3.48	.66	0.058	0.954
	made marketing innovations	3.47	.50		
Collaboration	did not collaborate	3.70	.59	1.334	0.189
	did collaborate	3.42	.59		

4.4. Recommendations

In this study, organizational climate which includes support for innovation is found to be positively effective with the perceived innovation capability. Based upon descriptive statistics of Q1.20 and Q1.22 (mean values are 2.79 and 2.60 respectively), it can be concluded that most of the employees are not satisfied with the reward systems in their companies. A clear and fair reward system which provides adequate support for innovation will improve the perceived innovation capability. Another suggestion regarding the organizational climate will be about financial resources for creative ideas. Respondents think that there is no adequate financial resources to investigate and develop innovative ideas (mean value is 2.94). At this point, companies should reconsider their allocation strategy for available financial resources, and maybe they should check whether they exploit governmental financial supports to the bitter end.

The importance of shared vision on the perceived innovation capability is also observed in this study. Mean value for shared vision is high enough, which is 3.42 indicating an overall satisfaction. However, according to the descriptive statistic of Q1.26, most of the respondents do not view themselves as partners in charting the direction of the organization (mean value is 2.95). It should be beneficial to adopt new company policies which will ensure the most participation on the part of the employees. It is important to ask for the opinions of employees and hear their recommendations on certain subjects about the direction of the company in order to make them feel essential for the organization.

According to the results of the study, 3 out of 4 factors of transformational leadership are found to be positively related with perceived innovation capability. Thus, it can be concluded that behaviors of leaders are important determinants of innovation capability. In this study, employees' satisfaction about their leaders' visionary behaviors are at a moderate level, which has mean value of 3.418. They think their leaders are clear and understandable with the goals of the organization. However,

based upon descriptive statistic of Q2.18 (mean value is 2.99), leaders lack to make their employees believe in their dream of the future. In order to improve this competency, leaders should try harder to know their employees and also should build mutual trust in the organization.

Factor 2 of transformational leadership called "fostering the acceptance of group goals" is found to be positively related with perceived innovation. According to the results, leaders in this cluster have the capability to build a motivated working environment. However, there is still room for improvement since mean values of questions about high performance expectations; Q2.17 and Q2.21 are moderate; 3.07 and 3.13 respectively. For this purpose, leaders should clearly express their expectations for excellence, quality and high performance together with providing adequate support for the employees to achieve.

Leaders' behaviors about providing an appropriate model are found to be effective on perceived innovation capability. In this study, results regarding this are at moderate level. For this purpose, leaders should realize that every action they performed has effect on employees' perception and they should ensure the consistency between their actions and values they advocate.

Lastly, result indicating that majority of the companies develop products on customer request while fewer companies develop regarding the market needs may reduce companies' chance to pioneer innovative ideas since there is a lot dependency to customers. In order to become leaders in software technology, companies in ODTÜ Teknokent should develop more ideas and products on their own in order to fulfill the market needs.

CHAPTER 5

CONCLUSION

5.1. Summary and Main Outcomes of the Study

In this study, the aim is to investigate the effects of some behavioral properties of companies on innovation capability at the company level. Research is conducted in one of the most prestigious techno parks of the country, ODTÜ Teknokent. Micro and small sized software companies form the subjects of the research.

For the sake of the research, two approaches are developed. In the subjective approach, a questionnaire is developed and is distributed to 322 employees from 47 different companies. This questionnaire is a combination of five different questionnaires from the literature which are developed to measure organizational climate, shared vision, innovation capability, transformational leadership and knowledge sharing.

First, a factor analysis is performed for all 5 sub-questionnaires: organizational climate, shared vision, innovation capability, transformational leadership and knowledge sharing. According to the results of factor analysis, 11 different variables are determined. "Support for innovation", "tolerance for difference" and "resource supply" are determined to be the factors of organizational climate. "Articulating a vision", "fostering the acceptance of group goals", "providing an appropriate model" and "individualized support" are to be the factors of transformational leadership. "Knowledge collecting" and "knowledge donating" are the factors of knowledge sharing. Shared vision and innovation capability have no factor structures.

Results for descriptive statistics of 11 variables show that employees' perceptions of their companies are above average for all variables; knowledge collecting being the highest and resource supply being the lowest, which are 4.446 and 3.12 respectively.

Secondly, the probable relationships between perceived innovation capability and factors obtained from organizational climate, shared vision, transformational leadership and knowledge sharing are searched and types of the relationships, if there is any, are examined. According to the results, positive relationships between perceived innovation capability and support for innovation, resource supply, shared vision, articulating a vision, fostering the acceptance of group goals, providing an appropriate model, knowledge collecting, knowledge donating are proved.

In the objective approach of the research, interviews are held with the owners or R&D managers of the companies. Information about product, process and marketing innovations and collaborations the company engaged in the last three years are obtained through the interviews. According to the interview results, majority of the companies develop products on customer request while fewer companies develop regarding the market needs. Regarding process and marketing innovations, it is revealed that 66% of the companies have implemented at least one process innovation in the last three years while only 38% of the companies have implemented marketing innovations. Results of collaboration show that micro sized companies are more dependent to government's financial supports than small sized companies. On the other hand, small sized companies develop more collaboration with universities, and other firms compared to micro sized firms.

In addition, the effects of collaboration on product, process and marketing innovations are analyzed. The results indicate no significant difference in the proportions of companies grouped according to product, process and marketing innovations if companies developed collaborations or not.

Lastly, the existence of a statistically significant difference in the perceived innovation capability of the companies when product, process and marketing innovations and collaboration are examined. However, no significant difference is detected.

5.2. Limitations and Future Studies

In this study, only information about product innovations gathered is the number of them. As mentioned earlier, this method may have a drawback since it gives no indication of the importance of each product innovations. In another future study, financial importance of product innovations could be utilized in the analysis. Similarly, process and marketing innovations are measured only by yes/no questions. Oslo Manual suggests utilization of financial importance of process and marketing innovations to measure them which is more difficult to perform in real cases. Measuring product innovations based on their financial importance is much easier to apply.

In addition, because of the limited time allowed by the managers/owners for the interview, no detailed information about collaborations could be gathered. For instance, there are types of EU projects in which only financial support is given and no obligations are insisted to develop relationships with second parties. However, in this study, all collaborations involving EU projects are considered as the types in which companies are also required to develop relationships with second parties.

Furthermore, this study could be used in the comparison of software companies which reside other than ODTÜ Teknokent.

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APPENDIX A

QUESTIONNAIRE

(IN ENGLISH)

I. Please indicate whether you agree or disagree with the following statements which are related with the company you work.

5 = Strongly Agree

4 = Agree

3 = Undecided

2 = Disagree

1 = Strongly Disagree

		5	4	3	2	1
1	Creativity is encouraged here.					
2	Our ability to function creatively is respected by the leadership.					
3	Around here, people are allowed to try to solve the same problems in different ways.					
4	The main function of members in this organization is to follow orders which come down through channels.					
5	Around here, a person can get in a lot of trouble by being different.					
6	This organization can be described as flexible and continually adapting to change.					
7	A person can't do things that are too different around here without provoking anger.					
8	The best way to get along in this organization is to think the way the rest of the group does.					
9	People around here are expected to deal with problems in the same way.					

		5	4	3	2	1
10	This organization is open and responsive to change.					
11	The people in charge around here usually get credit for others' ideas.					
12	In this organization, we tend to stick to tried and true ways.					
13	This place seems to be more concerned with the status quo than with change.					
14	Assistance in developing new ideas is readily available.					
15	There are adequate resources devoted to innovation in this organization.					
16	There is adequate time available to pursue creative ideas here.					
17	Lack of funding to investigate creative ideas is a problem in this organization.					
18	Personnel shortages inhibit innovation in this organization.					
19	This organization gives me free time to pursue creative ideas during the workday.					
20	The reward system here encourages innovation.					
21	This organization publicly recognizes those who are innovative.					
22	The reward system here benefits mainly those who don't rock the boat.					
23	There is a commonality of purpose in my organization.					
24	There is total agreement on our organizational vision across all levels, functions, and divisions.					
25	All employees are committed to the goals of this organization.					
26	Employees view themselves as partners in charting the direction of the organization.					
27	Our company tries out new ideas.					
28	Our company seeks out new ways to do things.					
29	Our company is creative in its methods of operation.					
30	Our company is the first to market with new products and services.					
31	Innovation in our company is perceived as too risky and is resisted.					
32	Our new product introduction has increased over the last 3 years.					

II. *Please indicate whether you agree or disagree with the following statements*
which are related with your leader.

5 = Strongly Agree

4 = Agree

3 = Undecided

2 = Disagree

1 = Strongly Disagree

		5	4	3	2	1
1	Has provided me with new ways of looking at things which used to be a puzzle for me.					
2	Is always seeking new opportunities for the unit/department/organization.					
3	Has ideas that have forced me to rethink some of my own ideas I have never questioned before.					
4	Paints an interesting picture of the future for our group.					
5	Shows us that he/she expects a lot from us.					
6	Fosters collaboration among work groups.					
7	Acts without considering my feelings.					
8	Encourages employees to be "team players."					
9	Leads by "doing" rather than simply by "telling."					
10	Gets the group to work together for the same goal.					
11	Has a clear understanding of where we are going.					
12	Shows respect for my personal feelings.					
13	Has stimulated me to think about old problems in new ways.					
14	Behaves in a manner that is thoughtful of my personal needs.					
15	Treats me without considering my personal feelings.					
16	Inspires others with his/her plans for the future.					
17	Insists on only the best performance.					
18	Is able to get others committed to his/her dream of the future.					

		5	4	3	2	1
19	Provides a good model to follow.					
20	Develops a team attitude and spirit among his/her employees.					
21	Will not settle for second best.					
22	Leads by example.					

III. *Please indicate whether you agree or disagree with the following statements which are related with the knowledge sharing in your company.*

5 = Strongly Agree

4 = Agree

3 = Undecided

2 = Disagree

1 = Strongly Disagree

		5	4	3	2	1
1	When I have learned something new, I tell my colleagues about it.					
2	When they have learned something new, my colleagues tell me about it.					
3	Knowledge sharing among colleagues is considered normal in my company.					
4	I share information I have with colleagues when they ask for it.					
5	I share my skills with colleagues when they ask for it.					
6	Colleagues in my company share knowledge with me when I ask them to.					
7	Colleagues in my company share their skills with me when I ask them to.					

I. Çalıştığınız kurumla ilgili verilen aşağıdaki ifadelere katılım derecenizi belirtiniz.

5 = Tamamen katılıyorum

4 = Katılıyorum

3 = Kararsızım

2 = Katılmıyorum

1 = Kesinlikle katılmıyorum

		5	4	3	2	1
1	Şirketimizde yaratıcılık teşvik edilir.					
2	Yaratıcı yetenek sergileyen çalışanlara yönetim değer verir.					
3	Şirketimizde çalışanların benzer problemleri farklı yollardan çözmesine izin verilir.					
4	Şirketimizdeki çalışanların asli işi amirleri tarafından verilen görevleri yerine getirmektir.					
5	Şirketimizde çalışanın çoğunluktan farklı olması onu zora sokar.					
6	Şirketimiz esnek ve sürekli olarak değişime ayak uyduran bir şirket olarak tanımlanabilir.					
7	Şirketimizdeki bir çalışan çok farklı şeyler yaptığında öfke oklarını üzerine çeker.					
8	Şirketimizde rahatsızlık yaşamamanın en iyi yolu çoğunluğun düşündüğü gibi düşünmektir.					
9	Şirketimizde çalışanların sorunlarla benzer şekillerde başa çıkmaları beklenir.					
10	Şirketimiz dışa dönük ve değişime açık bir şirkettir.					
11	Şirketimizdeki amirler çalışanlarının fikirleri üzerinden kredi alırlar.					
12	Şirketimizde denenmiş ve doğrulanmış yöntemlerden vazgeçilmemesi eğilimi vardır.					
13	Şirketimiz değişimle ilgilenmekten çok mevcut durumu korumaya çalışır.					

		5	4	3	2	1
14	Şirketimizde yeni fikirleri geliştirmek için gerekli destek mevcuttur.					
15	Şirketimizde inovasyon için ayrılmış yeterli kaynak bulunmaktadır.					
16	Şirketimizde yaratıcı fikirleri geliştirmek için yeterli zaman mevcuttur.					
17	Yaratıcı fikirleri araştırmak için yeterli mali kaynağın bulunmaması şirketimizdeki problemlerden birisi olarak değerlendirilebilir.					
18	Şirketimizdeki personel açığı inovasyonun oluşumunu engeller.					
19	Şirketimizde iş saatlerinde yaratıcı fikirleri geliştirmek için zaman yaratmama olanak sağlanır.					
20	Şirketimizdeki ödüllendirme sistemi inovasyonun oluşumunu destekler.					
21	Yaratıcı yetenek sergileyen personel alenen takdir edilir.					
22	Şirketimizdeki ödüllendirme sistemi daha çok aykırı davranmayanların yararına işler.					
23	Şirketimizde ortak bir amaç vardır.					
24	Organizasyonel vizyonumuz konusunda tüm seviye ve bölümlerdeki çalışanlar hemfikirdir.					
25	Tüm çalışanlar şirketin hedeflerini benimsemektedirler.					
26	Şirketimizdeki çalışanlar kendilerini şirketin yönünün belirlenmesi sürecinin ortağı olarak görmektedirler.					
27	Şirketimiz yeni fikirler dener.					
28	Şirketimiz işleri yapmanın yeni yollarını arar.					
29	Şirketimiz çalışma yöntemlerinde yaratıcılık gösterir.					
30	Şirketimiz yeni ürün ve hizmetleri pazara sunmada ilk olma özelliği gösterir.					
31	Şirketimizde inovasyonun riskli olduğuna inanılır ve inovasyona karşı direnç gösterilir.					
32	Şirketimizin piyasaya sunduğu yeni ürün sayısı son üç yıl içerisinde artmıştır.					

II. Amir / yöneticinizle ilgili verilen aşağıdaki ifadelere katılım derecenizi belirtiniz.

5 = Tamamen katılıyorum

4 = Katılıyorum

3 = Kararsızım

2 = Katılmıyorum

1 = Kesinlikle katılmıyorum

		5	4	3	2	1
1	Karmaşık bulduğum konulara farklı bir bakış açısı ile yaklaşmamı sağlar.					
2	Birimimiz / şirketimiz için yeni fırsatlar arayışı içindedir.					
3	Sahip olduğu bazı fikirler daha önce sorgulama ihtiyacı duymadığım bazı görüşlerimi yeniden değerlendirmemi sağlar.					
4	Birimimiz / şirketimiz için ilgi çekici bir gelecek resmeder.					
5	Bizden çok şey beklediğini gösterir.					
6	Çalışma grupları arasında yardımlaşmayı teşvik eder.					
7	Hislerimi önemsemeden hareket eder.					
8	Çalışanları takım oyuncusu olmaları konusunda cesaretlendirir.					
9	Sözlerinden ziyade davranışları ile örnek olur.					
10	Ekibinin aynı amaç için beraberce çalışmasını sağlar.					
11	Hedeflerimizle ilgili net bir fikri vardır.					
12	Duygularıma saygı gösterir.					
13	Eski sorunları yeni bakış açılarıyla değerlendirmem konusunda beni teşvik eder.					
14	Kişisel ihtiyaçlarıma duyarlı bir tutum sergiler.					
15	Bana karşı hislerime aldırış etmeden davranır.					
16	Gelecek planları ile çalışanlara ilham kaynağı olur.					
17	Çalışanların sadece en iyi performansı göstermeleri konusunda ısrarcıdır.					
18	Kendi gelecek plan ve hayallerini çalışanlarına kabul ettirme yeteneğine sahiptir.					

		5	4	3	2	1
19	Çalışanları için iyi bir rol modeldir.					
20	Çalışanları arasında takım ruhu ve davranışlarının gelişmesini sağlar.					
21	En iyiden aşağısı ile yetinmez.					
22	Davranışları ile örnek olan bir yöneticidir.					

III. Şirketinizdeki bilgi paylaşımı ile ilgili verilen aşağıdaki ifadelere katılım derecenizi belirtiniz.

5 = Tamamen katılıyorum

4 = Katılıyorum

3 = Kararsızım

2 = Katılmıyorum

1 = Kesinlikle katılmıyorum

		5	4	3	2	1
1	Yeni bir bilgi edindiğimde bunu iş arkadaşlarımla paylaşırım.					
2	İş arkadaşlarım yeni bir bilgi edindiğinde bunu benimle paylaşırlar.					
3	Çalışanlar arasında bilgi paylaşımı şirketimizde olağan karşılanır.					
4	Sahip olduğum bilgileri istedikleri taktirde iş arkadaşlarımla paylaşırım.					
5	Sahip olduğum yetenekleri istedikleri takdirde iş arkadaşlarımla paylaşırım.					
6	İş arkadaşlarım sahip oldukları bilgileri istediğim takdirde benimle paylaşırlar.					
7	İş arkadaşlarım sahip oldukları yetenekleri istediğim takdirde benimle paylaşırlar.					

APPENDIX B

RESULTS OF FACTOR ANALYSIS
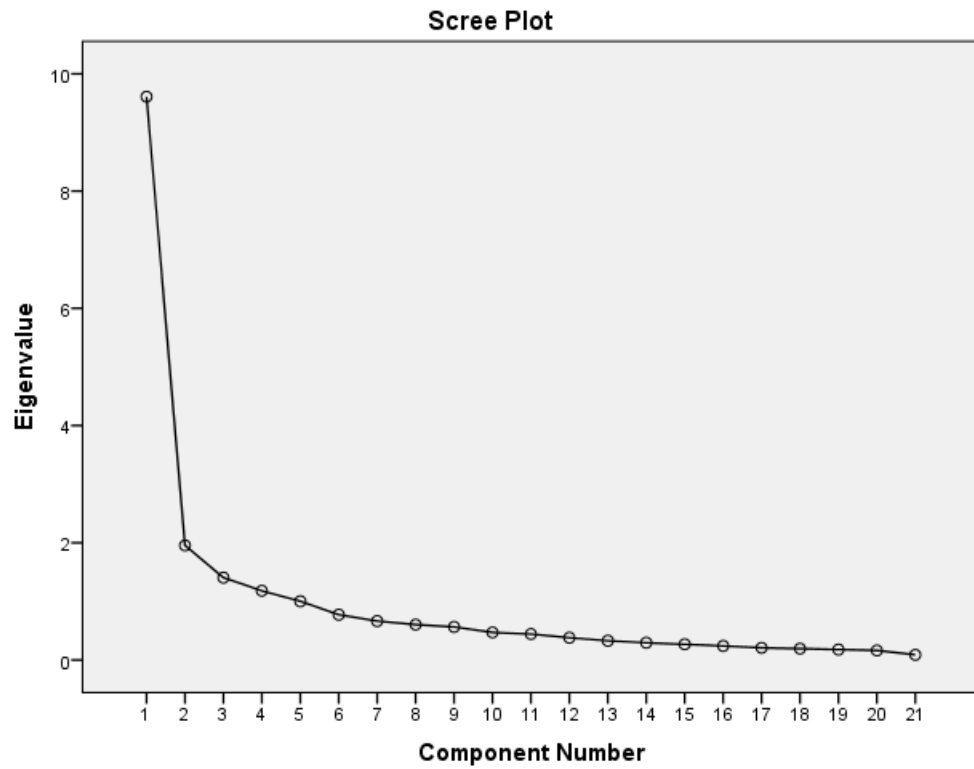
Figure B.1 Scree plot for organizational climate

Table B.1 Total variance explained for organizational climate

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.612	61.765	61.765	9.612	61.765	61.765
2	6.954	5.621	67.386	6.954	5.621	67.386
3	1.405	4.77	72.156	1.405	4.77	72.156
4	0.983	0.168	72.324			
5	0.863	2.788	75.112			
6	0.772	0.721	75.833			
7	0.663	3.157	78.99			
8	0.602	2.868	81.858			
9	0.564	2.685	84.543			
10	0.469	2.234	86.777			
11	0.442	2.103	88.88			
12	0.379	1.806	90.686			
13	0.329	1.564	92.25			
14	0.293	1.398	93.648			
15	0.267	1.272	94.92			
16	0.239	1.139	96.059			
17	0.207	0.986	97.045			
18	0.193	0.919	97.964			
19	0.177	0.846	98.81			
20	0.162	0.77	99.58			
21	0.088	0.42	100			
Extraction Method: Principal Component Analysis.						
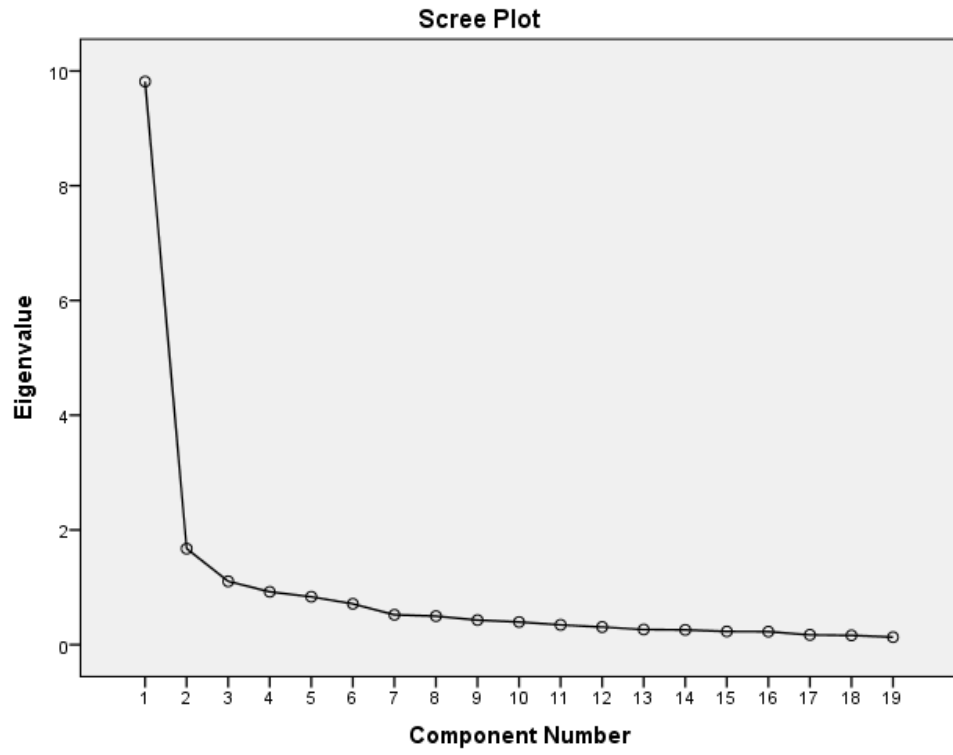
Figure B.2 Scree plot for transformational leadership

Table B.2 Total variance explained for transformational leadership

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.956	49.801	49.801	10.956	49.801	49.801
2	2.109	9.587	59.388	2.109	9.587	59.388
3	1.167	5.306	64.694	1.167	5.306	64.694
4	1.032	4.235	68.929	1.032	4.235	68.929
5	0.904	3.11	72.039			
6	0.743	3.078	75.117			
7	0.634	2.881	77.998			
8	0.593	2.75	80.748			
9	0.508	2.505	83.253			
10	0.463	2.402	85.655			
11	0.398	2.307	87.962			
12	0.372	2.190	90.152			
13	0.329	2.094	92.246			
14	0.279	1.771	94.017			
15	0.274	1.557	95.574			
16	0.253	1.359	96.933			
17	0.241	1.197	98.13			
18	0.219	0.966	99.096			
19	0.2	0.904	100.00			
Extraction Method: Principal Component Analysis.						

APPENDIX C

DESCRIPTIVE STATISTICS FOR QUESTIONNAIRE ITEMS

Table C.1 Descriptive statistics of items in the questionnaire

Item	Mean	Std. Deviation
Q1.1. Şirketimizde yaratıcılık teşvik edilir.	3.96	1.073
Q1.2. Yaratıcı yetenek sergileyen çalışanlara yönetim değer verir.	3.94	1.031
Q1.3. Şirketimizde çalışanların benzer problemleri farklı yollardan çözmesine izin verilir.	3.84	0.948
Q1.4. Şirketimizdeki çalışanların asli işi amirleri tarafından verilen görevleri yerine getirmektir.	2.03	1.024
Q1.5. Şirketimizde çalışanın çoğunluktan farklı olması onu zora sokar.	3.53	1.056
Q1.6. Şirketimiz esnek ve sürekli olarak değişime ayak uyduran bir şirket olarak tanımlanabilir.	3.72	1.070
Q1.7. Şirketimizdeki bir çalışan çok farklı şeyler yaptığında öfke oklarını üzerine çeker.	3.66	1.035
Q1.8. Şirketimizde rahatsızlık yaşamamanın en iyi yolu çoğunluğun düşündüğü gibi düşünmektir.	3.50	1.229
Q1.9. Şirketimizde çalışanların sorunlarla benzer şekillerde başa çıkmaları beklenir.	2.93	1.139
Q1.10. Şirketimiz dışa dönük ve değişime açık bir şirkettir.	3.77	1.070
Q1.11. Şirketimizdeki amirler çalışanlarının fikirleri üzerinden kredi alırlar.	3.19	1.177
Q1.12. Şirketimizde denenmiş ve doğrulanmış yöntemlerden vazgeçilmemesi eğilimi vardır.	2.84	1.326

Table C.1 Descriptive Statistics of Items in the Questionnaire (continued)

Item	Mean	Std. Deviation
Q1.13. Şirketimiz değişimle ilgilenmekten çok mevcut durumu korumaya çalışır.	3.09	1.192
Q1.14. Şirketimizde yeni fikirleri geliştirmek için gerekli destek mevcuttur.	3.64	1.097
Q1.15. Şirketimizde inovasyon için ayrılmış yeterli kaynak bulunmaktadır.	3.31	1.276
Q1.16. Şirketimizde yaratıcı fikirleri geliştirmek için yeterli zaman mevcuttur.	3.11	1.306
Q1.17. Yaratıcı fikirleri araştırmak için yeterli mali kaynağın bulunmaması şirketimizdeki problemlerden birisi olarak değerlendirilebilir.	2.94	1.263
Q1.18. Şirketimizdeki personel açığı inovasyonun oluşumunu engeller.	3.20	1.142
Q1.19. Şirketimizde iş saatlerinde yaratıcı fikirleri geliştirmek için zaman yaratmama olanak sağlanır.	3.05	1.258
Q1.20. Şirketimizdeki ödüllendirme sistemi inovasyonun oluşumunu destekler.	2.79	1.182
Q1.21. Yaratıcı yetenek sergileyen personel alenen takdir edilir.	3.37	1.121
Q1.22. Şirketimizdeki ödüllendirme sistemi daha çok aykırı davranmayanların yararına işler.	2.60	0.993
Q1.23. Şirketimizde ortak bir amaç vardır.	3.98	0.846
Q1.24. Organizasyonel vizyonumuz konusunda tüm seviye ve bölümlerdeki çalışanlar hemfikirdir.	3.32	1.051
Q1.25. Tüm çalışanlar şirketin hedeflerini benimsemektedirler.	3.37	1.121
Q1.26. Şirketimizdeki çalışanlar kendilerini şirketin yönünün belirlenmesi sürecinin ortağı olarak görmektedirler.	2.95	1.274
Q1.27. Şirketimiz yeni fikirler dener.	3.80	0.900

Table C.1 Descriptive Statistics of Items in the Questionnaire (continued)

Item	Mean	Std. Deviation
Q1.28. Şirketimiz işleri yapmanın yeni yollarını arar.	3.43	1.087
Q1.29. Şirketimiz çalışma yöntemlerinde yaratıcılık gösterir.	3.23	1.131
Q1.30. Şirketimiz yeni ürün ve hizmetleri pazara sunmada ilk olma özelliği gösterir.	3.03	1.120
Q1.31. Şirketimizde inovasyonun riskli olduğuna inanılır ve inovasyona karşı direnç gösterilir.	3.66	1.002
Q1.32. Şirketimizin piyasaya sunduğu yeni ürün sayısı son üç yıl içerisinde artmıştır.	3.36	1.053
Q2.1. Karmaşık bulduğum konulara farklı bir bakış açısı ile yaklaşmamı sağlar.	3.91	0.953
Q2.2. Birimimiz / şirketimiz için yeni fırsatlar arayışı içindedir.	3.85	0.976
Q2.3. Sahip olduğu bazı fikirler daha önce sorgulama ihtiyacı duymadığım bazı görüşlerimi yeniden değerlendirmemi sağlar.	3.59	1.029
Q2.4. Birimimiz / şirketimiz için ilgi çekici bir gelecek resmeder.	3.41	1.056
Q2.5. Bizden çok şey beklediğini gösterir.	3.77	0.865
Q2.6. Çalışma grupları arasında yardımlaşmayı teşvik eder.	3.87	0.951
Q2.7. Hislerimi önemsemeden hareket eder.	3.47	1.041
Q2.8. Çalışanları takım oyuncusu olmaları konusunda cesaretlendirir.	3.60	1.025
Q2.9. Sözlerinden ziyade davranışları ile örnek olur.	3.30	1.093
Q2.10. Ekibinin aynı amaç için beraberce çalışmasını sağlar.	3.68	0.948

Table C.1 Descriptive Statistics of Items in the Questionnaire (continued)

Item	Mean	Std. Deviation
Q2.11. Hedeflerimizle ilgili net bir fikri vardır.	3.37	1.055
Q2.12. Duygularıma saygı gösterir.	3.71	1.044
Q2.13. Eski sorunları yeni bakış açılarıyla değerlendirmem konusunda beni teşvik eder.	3.37	1.057
Q2.14. Kişisel ihtiyaçlarıma duyarlı bir tutum segiler.	3.86	0.935
Q2.15. Bana karşı hislerime aldırış etmeden davranır.	3.73	0.989
Q2.16. Gelecek planları ile çalışanlara ilham kaynağı olur.	3.30	1.076
Q2.17. Çalışanların sadece en iyi performansı göstermeleri konusunda ısrarcıdır.	3.07	0.897
Q2.18. Kendi gelecek plan ve hayallerini çalışanlarına kabul ettirme yeteneğine sahiptir.	2.99	1.038
Q2.19. Çalışanları için iyi bir rol modeldir.	3.38	1.070
Q2.20. Çalışanları arasında takım ruhu ve davranışlarının gelişmesini sağlar.	3.61	1.051
Q2.21. En iyiden aşağısı ile yetinmez.	3.13	0.948
Q2.22. Davranışları ile örnek olan bir yöneticidir.	3.37	1.172
Q3.1. Yeni bir bilgi edindiğimde bunu iş arkadaşlarımla paylaşırım.	4.34	0.754
Q3.2. İş arkadaşlarım yeni bir bilgi edindiğinde bunu benimle paylaşırlar.	3.66	0.873
Q3.3. Çalışanlar arasında bilgi paylaşımı şirketimizde olağan karşılanır.	4.21	0.791
Q3.4. Sahip olduğum bilgileri istedikleri taktirde iş arkadaşlarımla paylaşırım.	4.53	0.622

Table C.1 Descriptive Statistics of Items in the Questionnaire (continued)

Item	Mean	Std. Deviation
Q3.5. Sahip olduğum yetenekleri istedikleri takdirde iş arkadaşlarımla paylaşırım.	4.53	0.651
Q3.6. İş arkadaşlarım sahip oldukları bilgileri istediğim takdirde benimle paylaşırlar.	4.35	0.699
Q3.7. İş arkadaşlarım sahip oldukları yetenekleri istediğim takdirde benimle paylaşırlar.	4.34	0.712

APPENDIX D

NORMALITY TESTS

Table D.1 Tests of normality for 11 variables obtained after factor analysis

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
support for innovation	.108	303	.000	.954	303	.000
tolerance for difference	.072	303	.001	.984	303	.002
resource supply	.086	303	.000	.978	303	.000
shared vision	.315	303	.000	.830	303	.000
innovation capability	.323	303	.000	.814	303	.000
articulating a vision	.128	303	.000	.969	303	.000
fostering the acceptance of group goals	.094	303	.000	.968	303	.000
providing an appropriate model	.120	303	.000	.953	303	.000
individualized support	.115	303	.000	.953	303	.000
knowledge collecting	.264	303	.000	.829	303	.000
knowledge donating	.140	303	.000	.927	303	.000
a. Lilliefors Significance Correction						

Table D.2 Tests of normality for perceived innovation capability in "product innovation" groups

	Product Innovation	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
perceived innovation capability	less than 11	.161	30	.045	.942	30	.102
	equal or more than 11	.143	17	.200*	.940	17	.318
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Table D.3 Tests of normality for perceived innovation capability in "process innovation" groups

	Process Innovation	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
perceived innovation capability	did not make any process innovations	.161	16	.200*	.918	16	.159
	made process innovations	.146	31	.090	.966	31	.408
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Table D.4 Tests of normality for perceived innovation capability in "marketing innovation" groups

	Marketing Innovation	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
perceived innovation capability	did not make any marketing innovations	.147	29	.113	.929	29	.051
	made marketing innovations	.189	18	.089	.954	18	.493
a. Lilliefors Significance Correction							

Table D.5 Tests of normality for perceived innovation capability in "collaboration" groups

	Collaboration	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
perceived innovation capability	did not collaborate	.200	10	.200[*]	.932	10	.471
	did collaborate	.149	37	.037	.956	37	.150
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							