SOURCES AND BENEFITS OF SOCIAL CAPITAL FOR TECHNOLOGY BASED FIRMS IN STPs: A CASE OF METU TECHNOPOLIS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

DUYGU ASLAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
SCIENCE AND TECHNOLOGY POLICY STUDIES

AUGUST 2014

Approval of the Graduate School of Social Sciences

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ABSTRACT

SOURCES AND BENEFITS OF SOCIAL CAPITAL
FOR TECHNOLOGY BASED FIRMS IN STPs:
A CASE OF METU TECHNOPOLIS

Aslan, Duygu
M.S., Science and Technology Policy Studies
Supervisor: Prof. Dr. Nazlı Wasti Pamuksuz

September 2014, 111 pages

The main objective of this thesis is to analyze the sources and benefits of social capital for technology based firms located in science and technology parks (STPs). For this aim, the dyadic and network relations of technology based firms within a science and technology park were examined by analyzing firms in METU Technopolis, the first science and technology park established in Turkey. A mixed method approach including both quantitative and qualitative methods was applied, and for the qualitative analysis the approach of grounded theory was used. According to the findings, informal networks among the owners or managers of technology based firms constitute a source for the generation of social capital in STPs. The geographical proximity provided by STPs is not a source or a driver for the formation of social capital between

technology based firms. Furthermore, the match between the goals of the firms and the structure of benefits of social capital strongly affect the perceived value of the benefits. As one of the major goals of the firms is engaging in innovation and R&D activities, firms see strong ties more valuable since joint work seeking R&D and innovation necessitates a more embedded relation that can be formed through these strong ties. In light of the findings of the study, five propositions and a theoretical model were developed to be investigated in further research and some possible policy implications were also drawn to stimulate social capital in STPs.

Keywords: Social Capital, Technology Based Firms, Science and Technology Parks.

ÖZ

Bilim ve Teknoloji Parklarında Yer Alan Teknoloji Firmaları İçin Sosyal Sermayenin Kaynakları ve Katkıları: ODTÜ Teknokent Örneği

Aslan, Duygu
Yüksek Lisans, Bilim ve Teknoloji Politikası Çalışmaları
Tez Yöneticisi: Prof. Dr. Nazlı Wasti Pamuksuz

Eylül 2014, 111 sayfa

Bu tezin temel amacı bilim ve teknoloji parklarında yer alan teknoloji firmaları için sosyal sermayenin kökenlerini ve faydalarını araştırmaktır. Bu amaçla Türkiye'nin ilk bilim ve teknoloji parkı olan ODTÜ Teknokent'teki firmalar incelenerek, bu parklarda yer alan teknoloji firmalarının ikili ve ağ bazlı ilişkileri irdelenmiştir. Yöntem olarak hem nicel hem de nitel araştırma yöntemlerini içeren karma bir yaklaşım uygulanmış ve nitel veriler gömülü kuram kullanılarak analiz edilmiştir. Araştırma sonuçlarına göre bilim ve teknoloji parklarında yer alan teknoloji firmalarının sahipleri ya da genel müdürleri arasındaki gayrı resmi ağlar firmalar arasında sosyal sermayenin gelişimi için bir kaynak oluşturmaktadır. Öte yandan, bilim ve teknoloji parkları tarafından sunulan fiziksel yakınlık buradaki teknoloji firmaları arasında sosyal sermaye oluşumu için herhangi bir kaynak ya da itici güç etkisi oluşturmamaktadır. Bununla birlikte,

firmaların amaçları ile bulundukları ağın sunduğu fayda yapısı arasındaki uyum, sosyal sermayeden alınan faydanın bu firmalar için değerini belirlemektedir. Bu doğrultuda, teknoloji firmalarının temel amaçlarından biri Ar-Ge ve inovasyon faaliyetlerini yürütmek olduğundan, firmalar bu tür faaliyetleri bir arada yürütmeyi mümkün kılan daha bütünleşik ve güçlü bağlantılarını daha değerli görmektedir. Çalışmanın bulguları ışığında, bundan sonraki araştırmalarda incelenmek üzere beş adet önerme ve kuramsal bir model geliştirilmiş olup, bilim ve teknoloji parklarında sosyal sermayenin geliştirilmesi için kullanılabilecek politika çıkarımlarına da yer verilmiştir.

Anahtar Kelimeler: Sosyal Sermaye, Teknoloji Firmaları, Bilim ve Teknoloji Parkları.

To My Family

ACKNOWLEDGMENTS

I would like to thank all the people who contributed in some way to the work described in this thesis. First and foremost, I thank my supervisor, Prof. Dr. Nazlı Wasti Pamuksuz, for her guidance and support throughout the research.

I am grateful to Assist. Prof. Dr. Seven Ağır and Assist. Prof. Dr. İ. Semih Akçomak for serving as my committee members and for meticulously reviewing my thesis manuscripts.

Every result described in this thesis was accomplished with the help of the firms participating in the survey of the study in METU Teknopark. I would like to thank the managers of the firms and the Teknopark Administration for all the information they provided.

I would like to acknowledge the Department of Science and Technology Policy Studies at METU. My graduate experience benefitted greatly from the courses I took from the valuable instructors of the department.

Finally, I would like to thank to my family in particular to my husband Özgür Aslan for their constant love and support.

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ICT	Information and Communications Technologies
MEMS	Micro-Electro-Mechanical Systems
METU	Middle East Technical University
OSTİM	Middle East Industry and Trade Center
R&D	Research and Development
SMEs	Small and Medium Sized Entrepreneurs
STPs	Science and Technology Parks
TDZs	Technology Development Zones

CHAPTER 1

INTRODUCTION

In the global world where competition has become more intensified than ever before, firms are increasingly in need of value-adding processes based on knowledge creation and exploitation (Bettis & Hitt, 1995; Grant, 1996; Nahapiet & Ghoshal, 1998; Nonaka & Takeuchi, 1995). In this environment, the success of firms does not only depend on the control over scarce resources but on the ability to learn and use knowledge effectively (Larsson, Bengtsson, Henriksson, & Sparks, 1998). This is especially valid for technology based firms as high technology sectors necessitates knowledge to be replenished continually (Lane and Lubatkin, 1998).

In order to explore knowledge or exploit existing knowledge, firms generate and create capabilities through "structured and coordinated relationships among individuals, groups, and members to an industrial network" (Kogut and Zander, 1995). The network of relationships forms a valuable resource for firms to have the "collectivity-owned capital" (Bourdieu, 1986). This type of capital constitutes "the sum of actual and potential resources embedded within, available through and derived from the network of relationships" and is characterized as "social capital" (Nahapiet & Ghoshal, 1998).

The concept of social capital has increasingly been an attractive research topic in the social sciences especially during the last decades, although the term is quite old, having been introduced by Hanifan in 1920 in his book called "The Community Center". The questioning of the notion of capital has brought the idea that there are different forms of capital such human, cultural, or social. As Portes (1998) states "economic capital is in people's bank accounts, human capital is inside their heads and social capital inheres in the structure of their relationships". The concept of social capital is defined as "the

aggregate of the actual or potential resources which are linked to possession of a durable network" (Bourdieu, 1986), "friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital" (Burt, 1992) or "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (Putnam, 1993). Although researchers develop different definitions of social capital, they mainly express links, networks, or interactions among agents.

Since the beginning of the use of the term of social capital, it has been the focus of studies from different disciplines ranging from sociology to health. The expanse of the applications of social capital has contributed to the generation a pool of diversified definitions, structures, features and analysis regarding the concept. The investigation of the social capital of firms is one of the applications.

In the current knowledge based economy, intangible assets have become more crucial for firms more than ever before. In almost all countries of the European Union, business investments in intangibles grew faster than those for tangibles between 1995 and 2005 (Jona-Lasinio et al., 2011). As an intangible asset, the social capital of firms has begun to attract the attention of scholars and become the focus of numerous studies. Nevertheless, there is still much to be explored in this research field. The social capital of technology based firms constitutes such an area.

For technology based firms, social capital is vital together with other types of capital as it provides firms with the opportunity to innovate, which is in itself a highly interactive phenomenon (Utterback, 1971). Technology based firms are more dependent on inter-organizational networks since for them knowledge is rapidly changing and broadly distributed, which makes innovation a more difficult matter (Grant and Baden-Fuller, 1995; Liebeskind et al., 1996; Powell, et al., 1996; Powell, 1998).

The intimacy between technology based firms and notion of social capital opens new avenues to study the nature of social capital. Yli-Renko et al. (2002) found that social

capital by facilitating the acquisition and creation of knowledge is an important driver for international growth of technology-based new firms. Fukuyama (1995) underlined the significance of informal information exchanges in high-tech ventures. Some studies focusing on international high-tech SMEs showed the effects of social capital on knowledge acquisition (Autio, Sapienza, & Arenius, 2005; Presutti, Boari, & Fratocchi, 2007). Further support for the concept of social capital was also provided in studies about technology entrepreneurs (Liao and Welsch, 2003) and personal networks of individuals in science- and technology-based small firms (Liebeskind et al., 1996; Partanen, Möller, Westerlund, Rajala, & Rajala, 2008).

In the related literature, few studies deal with the sources through which technology based firms form and develop their social capital and its benefits for them. The social capital of technology based firms in close networks, in particular within the context of science and technology parks (STPs), constitutes an important research area to be explored. STPs are sites established for promoting close social interactions and exchange of knowledge among firms. An STP can be defined as a property based organization having an administrative center concentrating on business acceleration with knowledge agglomeration and resource sharing (Phan et al., 2005). There are minimum standards required for being a knowledge cluster for STPs although there is not an agreed model for them (Link, 2009). For STPs, ensuring interaction among tenant firms is vital to perform well as their role necessitates effective networking to encourage transfer of knowledge, resources and innovation among the firms (Hansson et al., 2005). Therefore, analyzing the interactions between and among technology based firms within STPs gives the opportunity to investigate how and why the interactions among the firms are developed.

Studies on STPs are generally focused on success of STPs, best practices, performance assessment of STPs or justification for STPs' existence, and there is much to be explored in terms of the analysis of social capital in STPs. Furthermore, in the literature of social capital, the number of studies focusing on firms in a bounded geographical area is limited. In addition, studies analyzing the effect of STPs on firm performance have different results. Some of them found a positive effect of STPs on patents

(Squicciarini, 2008; Wright et al., 2008), on productivity (Yang et al., 2009), and on new product development (Siegel et al., 2003). On the other hand, there are also studies showing no significant effect of STPs on patents (Westhead, 1997), profitability (Lofsten and Lindelof, 2005) or growth (Monck et al., 1988, Dettwiler et al., 2006). However, as the studies use traditional economic indicators, they are limited in the sense that they do not take into account the intangible aspects of social relations which is a necessary indicator of success in the network economy (Westlund, 2006). Therefore, studies analyzing the relation between STPs and firms from the social capital point of view are important to understand the effects of territorial based network of relations on firms especially the technology -based ones.

Studies combining social capital and SMEs constitute a new and important area for social capital research since social capital is a critical aspect of business life (Spence et al., 2003). Cooke and Wills (1999) claim that analyzing smaller firms let people develop insights for social capital. Previous studies underline the significance of informal networks, trust and cooperation for small firms (Granovetter, 2000) which is the vast majority of business enterprises. Big firms have more opportunity to access different resources like financial and human resources. On the other hand, small and medium sized companies are more likely to rely on their informal relationships, solidarity or trust to grow. Therefore, understanding the nature of social capital for SMEs is important and so more studies are needed to explore the dynamics of social capital for such entreprises.

This thesis aims to help fill the gaps in the social capital literature by examining the sources of social capital and its benefits. Technology based SMEs are selected as the population as they are more dependent on intangible assets like social capital to increase their capacity to acquire knowledge and information from other agents in order to be more competitive. Specifically, the concept is analyzed within the context of STPs.

1.1 Research Questions

The objective of this thesis is to contribute to the literature by examining the sources and benefits of social capital for technology based firms in STPs.

The first research question seeks out the sources of social capital. Exploring the mechanisms through which the technology based firms within STPs form social capital in their dyadic or network relations and the factors in effect in this process is an important step to understand why some firms generate and develop social capital while some others do not.

In the literature of social capital, factors like trust (Putnam 1993, Leana and Van 1999, Nahapiet and Ghoshal 1998), informal networks (Granovetter, 1985), historical roots (Adler and Kwon, 2002), and industry structure (Lyons 2002, Liao et al., 2005) have been found to be important factors in the creation of social capital. This study aims to capture factors other than these and to highlight the ones distinctive for technology based firms. Therefore, the first research question addressed in this study is the following:

How do technology based firms in STPs create social capital? What helps in this creation? What are the mechanisms of social capital creation?

As a second step, the benefits of social capital for technology based firms are explored. There are studies showing that the creation of information channels (Burt, 1992) or innovation (Burt, 1987; Katz, & Menzel, 1966; Rogers, 1995) are the main benefits of social capital for firms. This study investigates whether the benefits of social capital given in extant literature are valid for technology based firms and whether there are other benefits. Therefore, the second question to be addressed is the following:

What benefits do technology based firms in STPs derive from their social capital? What are the mechanisms to reach such benefits?

1.2 Research Focus

The analysis of social capital can be done at different levels. These can be the individual (Burt, 1997), group (Burt, Hogarth, & Michaud, 2000), organizational (Pennings and Lee, 1999), and inter-organizational (Chung, Singh, &Lee, 2000). In this thesis, a firm level analysis of social capital is applied as the main concern is to explore the sources and benefits of social capital for technology based firms. On the other hand, the social capital of a firm is related to the individual firm members. Especially at the starting phase of the firms, the firms' social capital has very much to do with the social capital of the founders (Hite and Hesterly, 2001) and firm members benefit from their individual social capital to acquire the necessary resources (Larson and Starr, 1993). However, it is still an ambiguous matter how individual level social capital is related to the firm level (Ibarra, Kilduff, and Tsai, 2005). Due to the inseparable nature of the social capital of firms from that of members, applying a dual-level approach is useful (Maurer &Ebers, 2006). Therefore, this study examines both the social capital of firms and their founders to analyze the sources and benefits of social capital for technology based firms.

This study focuses on the social capital of technology based firms. As stated earlier, social capital plays an important role for such firms especially as they are more dependent on inter organizational networks to share knowledge and innovate. The effects of social capital on firms become more obvious when they are located in close proximity which provides them with a more interactive environment. The dyadic and network relations of technology based firms within STPs which are established to promote such an environment among tenant firms are examined in this study. As a case study, the first science and technology park established in Turkey, namely METU Technopolis, was chosen. Being the oldest technology park in Turkey, METU Technopolis provides enough history and time for the generation of social capital among the technology based firms it houses than the other technology parks in Turkey. There are 338 firms and 7098 people working in the firms in METU Technopolis and it represents 12% of firms located in the science and technology parks in Turkey, and

25% people working in the firms. Therefore, METU Technopolis provides a rich pool of cases to study both the dyadic relations between the technology based firms and network of relations within the park as a whole.

As a theoretical framework, the definition of social capital developed by Nahapiet & Ghoshal (1998) is used. Nahapiet and Ghoshal (1998) define social capital as "the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit". They claim that there are three dimensions of social capital contribute to knowledge creation: structural, relational, and cognitive. The structural dimension is defined as the "overall pattern of connections between actors". The relational embeddedness refers to the "kind of personal relationships people have developed with each other through a history of interactions". The cognitive dimension is described as "the resources providing shared representations, interpretations and systems of meaning among parties".

1.3 Research Methods

This research aims to discover the sources and benefits of social capital in technology based firms. For this aim, a mixed approach including both quantitative and qualitative methods is applied. By this way, the results provided by one method can be complemented with the results from the other, especially in sampling and evaluation stages. The benefits of using the mixed method design are triangulation, which seeks convergence of findings, and complementarity in which different study components together with the plausibility of identified threats to validity can be assessed and the interpretability of assessments can be enhanced (Mark and Shotland, 1987).

Within the various techniques in qualitative research, case studies are used to investigate complex social phenomena (Yin, 2003). Therefore, deep analysis of case studies on the chosen context is used for this study. For this aim, a multiple case study

design is used as the evidence from multiple cases is more compelling and the overall study is more robust (Yin, 2003).

The unit of analysis for the research is technology based firms as the main objective is to explore the social capital development and its benefits for them. For this aim, data is collected from the owner or the general manager of 53 firms located in METU Technopolis by means of semi-structured questionnaires. The data are then analyzed following the techniques provided by the grounded theory approach. Quantitative data is collected through questionnaires and analyzed using the statistics program IBM SPSS Statistics 22.

1.4 Organization of the Study

Chapter 2 introduces social capital theory, gives an insight on social capital as a concept, its sources and benefits on firms by analyzing the related literature. Chapter 3 introduces the case research methodology and the research setting. Chapter 4 presents the results of the research and provides answers to the research questions. Chapter 5 gives the conclusions and outlines the theoretical contributions of the findings together with the limitations of the research and recommendations for further research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Over the past decades the concept of social capital has increasingly been an attractive area of research for many scholars. The tendency towards explaining the phenomenon by non-economic forms and structures has made it possible to rethink agents within the social framework and not solely in the one -economic form- brought by economic theory. In this new perspective, the individual is considered as a figure affecting and affected by his social environment, taking decisions in accordance with the norms and values of the environment.

Till the 1960's the main idea was that economic growth is shaped by three assets; namely land, labor and physical capital, but with the introduction of the concept of human capital by sociologists, the importance of other assets for production and growth has been noticed. Since "a lot of economically relevant behavior is socially determined" (Solow, 2000), a new research field called "economic sociology" emerged and the term of "social capital" was introduced. The term was first identified by Jane Jacobs, Pierre Bourdieu and Glenn Loury but was later developed mostly by James Coleman, Ronald Burt and Robert Putnam. Until now, the concept of social capital has been the focus of many studies from different disciplines.

To analyze the concept of social capital, it would be better to start with the term "capital". Capital as a general term refers to assets used in production. These assets can be tangible like machinery and buildings or intangible like human capital. Social capital is one of the forms of capital in addition to physical, human and financial capital. Social capital is productive like other forms of capital as it makes the

achievement of certain aims possible that in its absence would not be possible. Unlike other forms of capital, social capital exists in the structure of relations among and between actors and it is not lodged either in the actors themselves or in physical implements of production (Coleman, 2000).

2.2 Definition of Social Capital

The term "social capital" has been used and applied by different research areas and disciplines in order to explain different structures, relationships or more generally different phenomena. Some scholars use it to explain relations in the labor market (Aguilera, 2002; Drever and Hoffmeister, 2008; Boxman, De Graaf, and Flap, 1991; Lin, 1999). Furthermore, there are some studies explaining the contribution of social capital to health (Kawachi, 2008; Berkman, 2000; Eriksson, 2009), to resource exchange and innovation of units (Gabbay & Zuckerman, 1998; Hansen, 1998; Tsai & Ghoshal, 1998) or its influence on development of regions and nations (Putnam, 1995; Fukuyama, 1995). In this sense, the definitions of social capital are quite varied as an unsurprising outcome of being derived from different social areas. Some of these definitions can be listed as the following:

Sprengers, Tazelaar, and Flap (1988) state that "someone's network and all the resources a person gets access to through this network can be interpreted more specifically as his "social capital". They go on to state that "someone's social capital is a function of the number of people from whom one can expect support, and the resources those people have at their disposal. Here social capital is seen as a means of production that can produce better conditions of life" (1988).

Lin (2001) believes that social capital is the "...investment in social relations by individuals through which they gain access to embedded resources to enhance expected returns of instrumental and expressive actions".

Dasgupta (2005) notes that "...I take social capital to mean interpersonal networks. The advantage of such a lean notion is that it does not prejudge the asset's quality. Just as a building can remain unused and a wetland can be misused, so can a network remain inactive or be put to use in socially destructive ways. There is nothing good or bad about interpersonal networks; other things being equal, it is the use to which a network is put by members, that determines its quality."

Fukuyama (1997) defines social capital as "the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them".

Many theoretical studies have enriched the research area of social capital by bringing different perspectives and definitions but the major ones might be considered those of Burt, Bourdieu, Coleman and Putnam. Burt (2000) sees social capital as a metaphor about advantage. According to him, the society is a market where people are exchanging things for their interests and the people who are better connected do better. For this, the location of individual within the structure of the network is important and it can be seen as an asset which is called social capital. According to Bourdieu (1986), social capital is a resource gained from social structure. He defines social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition – or in other words, to membership in a group which provides each of its members with the backing of the collectivity-owned capital, a 'credential' which entitles them to credit, in the various senses of the word". According to him, the volume of social capital is related to the size of the network mobilized. According to Coleman (1990), another noted scholar in the research area of social capital, "social capital is defined by its function. It is not a single entity but a variety of different entities having two characteristics in common: They all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that would not be attainable in its absence." The emphasis on social structure and facilitation of actions is also seen in the definition of social

capital developed by Putnam. He sees social capital as the features of social organization like trust or norm which facilitate coordinated action.

2.2.1 Social Capital – External or Internal

Studies in social capital theory may also be categorized in accordance with their focus of analysis as relations within group, between groups, or both types of linkages (Adler and Kwon, 2002). Some studies deal with internal links within a group or community- this is named as 'bonding' as a form of social capital. On the other hand other studies focus on relations between groups namely the 'bridging' form of social capital.

In bonding or internal social capital, the important feature is the ties among the individuals within a group and features of the group facilitating having a collective action. The definitions of social capital in the studies of Coleman (1990), Fukuyama (1995), and Putnam (1995) can be considered to focus on internal social capital. In the bridging or external form, social capital has to do with the factors tying an actor with other actors in social networks. In that sense, it is the social capital that determines the differences in actors' success or failure. Bourdieu (1985) or Burt (1992)'s analysis may be given as example for bridging or external social capital. There is also a third group standing in the middle of these definitions of social capital. This neutral standpoint is based on the thought of non - excludability of internal and external forms of social capital to each other. Definitions of social capital developed by Nahapiet & Ghoshal (1998), Woolcock (1998) and Loury (1992) have this neutral approach. The definitions of social capital according to their standpoint as external, internal, and neutral can be seen in Table 1.

Table 1: Definitions of Social Capital

Author	Definition	Internal Social Capital	External Social Capital	Internal& External Social Capital
Bourdieu	“the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (1985).			
Burt	“friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital" (1992).			
Coleman	"Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics' in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure" (1990).			
Fukuyama	"the ability of people to work together for common purposes in groups and organizations" (1995).			
Nahapiet & Ghoshal	"the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network" (1998).			
Portes	"the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (1998).			
Portes & Sensenbrenner	"those expectations for action within a collectivity that affect the economic goals and goal seeking behavior of its members, even if these expectations are not oriented toward the economic sphere" (1993).			
Putnam	"features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (1995).			
Thomas	"those voluntary means and processes developed within civil society which promote development for the collective whole" (1996).			
Woolcock	"the information, trust, and norms of reciprocity inhering in one's social networks" (1998).			

(Source: Adler and Kwon, 2002)

2.2.2 Social Capital – Individual or Collective

Despite the fact that studies in social capital use and develop different definitions, it may be possible to divide them into two main groups in terms of their level of analysis. One group takes social capital into consideration at an individual level while the other sees it in collective level. At the individual level, accessing and gaining return from the social relations formed by individuals are important. The works of Bourdieu (1986), Coleman (1990), Lin & Bian (1991) or Burt (1997, 1998) can be considered to have this perspective in their analysis of social capital. The other perspective takes the group as its level of analysis and considers social capital as a collective asset. Characteristics of the group or the structure of the network is taken into consideration as a determinant to produce this asset. Coleman (1990) and Putnam (2000)'s work use this perspective of analysis in their discussions. In the distinction of perspectives of analysis, the question is whether social capital is a collective or a personal good but for most scholars these are not mutually exclusive to each other (Lin, 2001). This thesis also depends on both levels of analysis and applies a more comprehensive understanding of social capital as individual and collective.

2.2.3 Social Capital – Capital or Not

As a general term, capital means a stock of factors of production and it connotates generally tangible and durable things like machinery. However, it has become obvious that there are factors other than tangible capital influencing production. Scholars came up with the idea of human capital and from then the question whether the other forms of capital like human or cultural are really capital has been asked and discussed among scholars. The same is true for the case of social capital. As the term was used and developed within the discipline of sociology, the use of an economic term in a social context has been questioned by scholars from different disciplines.

Stiglitz (2000) used the concept of social capital and stated that social capital functions as a "complement or substitute for market based exchange and allocation". Becker (1996) also used the term in his analysis. On the other hand, Solow (2000) approached the term more doubtfully and questioned whether "social capital" is the right term to use. At this point the question to be asked is what factors need to be in place to call a phenomenon "social capital" and what features are not in common with other forms of "capital".

The disputes on whether the concept of social capital is treated as traditional concept of capital are still alive although social capital has become an established concept and been a widely used topic of many studies and analyses. Scholars approach the concept differently as their definition of traditional capital varies in scope. Westlund and Bolton (2003) talked about the commonalities and differences between social capital and other forms of traditional capital. The characteristics of social capital as being the result of an investment, being a sunk cost, and obsolete are stated by the authors as some of the similarities. However, dissimilarities also exist between social capital and other forms of traditional capital. The features of being a product of both intentional and unintentional investment behavior, not being individually possessed, and not requiring a deliberate sacrifice for being accumulated can be counted as important dissimilarities.

Adler and Kwon (2002) also discussed the shared characteristics of social capital and traditional capital. Firstly, it is possible to invest other resources in social capital with expected future benefits like other forms of traditional capital. People can invest in social capital by building their network of relations and in return they can get access to the information flow within the network and, benefit from solidarity and cooperation. Therefore actors build this form of capital with deliberate action although some scholars treat it as a given asset. Secondly, social capital is convertible and appropriable like other kinds of capital. A network constructed for one purpose can be used for another aim in social capital and it displays its appropriateness. Furthermore, individuals can convert the advantages in a social network into economic benefits. Thirdly, social capital can substitute or complement another resource by providing

benefits that can not be achieved through other forms of capital or by improving efficiency by means of reducing transaction costs. Furthermore, there are some features of social capital that are less shared with other forms of capital. For example, for social capital it is not possible to talk about depreciation while using it. On the contrary, social capital grows and develops with use. Secondly, social capital cannot be individual property like a traditional form of capital as it is more a public or a collective good. Although it is non-rival meaning its use does not diminish the use of other actors, it can be considered as excludable, especially in the case of internal social capital. In internal social capital, members of a network can exclude others from benefits of being in the network. Thirdly, social capital has to do with the relations not the actors; meaning that if the actor in one side of the relation quits the connection, then for the other side the relation and its social capital is turned off automatically. In that sense, there is no an ownership right exclusive to one actor (Burt, 1992).

2.3 Sources in Formation of Social Capital

Like in the definitions of social capital, there is much disagreement among researchers in this field on the factors in effect in the formation of social capital. Although, studies give different answers to the question that how do organizations or units build their social capital, sources like trust, informal networks, time, and geographical proximity are the ones mostly mentioned. The sources should not be seen as substitute to each other as organizations may rely on one or several sources in their social capital formation. Furthermore, one source can be conveyed to another one as relationships between actors develop through time.

- ***Trust***

Trust brings the feelings that one party believes in the honesty and reliability of the other. According to Fukuyama (1995), "trust is the expectation that arises within a community of regular, honest, and cooperative behavior, based on commonly shared norms, on the part of other members of that community".

Trust can be considered a factor affecting the formation of social capital as well as an outcome. It is an important source of social capital giving way to economic dynamism and governmental performance (Putnam, 1993). As stated by Coleman (1988), the system of mutual trust between actors is important for social capital on which future obligations and expectations may be based. This factor, defined as the willingness of members of a group to share their knowledge with each other by Nahapiet and Ghoshal (1998), facilitates the exchange of information between actors as they begin to need less protective behavior against abuses and opportunistic behaviors of others within the trust relationship.

- ***Informal Networks***

In analysis of the role of networks in formation of social capital, focusing only the formal networks and ignoring other types will bring a limited perspective on the social capital of actors as interactions can be generated through informal networks in addition to the formal ones. Therefore, taking into account the informal or unstructured networks that actors are engaged in is essential to have a more complete picture of an actors' social capital.

Informal networks are important factors in formation of trust and social capital between actors. These networks create an environment where opportunities can be exchanged accidentally, resulting in actors forming networks and collaborations (Darr et al., 2005). With the help of informal networks, unplanned informal relationships first turn into planned relationships and then into structured networks (Lechner et al., 2006).

Studies especially in the field of technology and knowledge show the importance of informal networks in interaction between and among units. Rothschild and Darr (2005) in their field study on a technological incubator in Israel show that informal ties constituted the majority of ties existing in the incubator. Their findings suggest that the informal exchange of knowledge and know-how is a part of a wider barter economy in the incubator.

Allen et al (1983), in their analysis of industries from eight different countries, show that informal networks are mainly based on personal ties and they flourish through social interactions. They argue through such networks, emergent technology finds its best way to flow between actors. Similarly, von-Hipple (1988) shows that engineers from different firms share information for their R&D activities by using their informal networks. In addition, Kreiner and Schultz (1993) use the word of "informal barter economy" for the exchange of information and knowledge in the high-tech industry. According to the authors, informal networks are important in knowledge exchange between university and industry as the networks are more flexible than the formal ones.

Historical roots create an important basis for the formation of informal networks among actors. Previous personal relations constitute the main ground of embedded relations (Uzzi, 1996). These ties form expectations for trust between the newly introduced actors and also equip the new economic exchange with re-sources from preexisting links. The previous ties can result from social circles like coworkers, schoolmates, friends, or kin. The resources and expectations generated through these informal links provide the basis for creating new relationships or extending the dimensions of existing ones. Adler and Kwon (2002) also see historical roots as endowment for social capital. On the other hand, there are opinions which suggest that historical roots have no impact on the formation of social capital. For example, Burt (1997) claims that prior networks are ineffective in the formation of social capital since it would only be a by-product of actors seeking each other for maximization of interest from exchanging.

- ***Time***

Time is important element in the formation of social capital as it necessitates an effort or investment extended over a period of time. Building social capital is not a short term activity for a firm (Lyons, 2002). Social capital has a dynamic nature where its components evolve on spatial and temporal scales. Social capital can depreciate over time when parties do not feed it by maintaining relationships with each other. Furthermore, existing social capital should be updated in order to adapt the changing

features of social or economic structure with time. For social capital, being adaptive to changes is important as these changes can affect the emergence or persistence of forms of social capital and also the value of the given forms (Sandefur and Laumann, 1998). Coleman (1988) states that network closure is the facilitating factor to have trust among actors within the network. However, it may not be the case if the structure of environment changes. This is due to the fact that the closure of the network may prevent actors from adapting to new conditions and produce conflicts among them (Gargiulo and Benassi, 2000).

- ***Geographical Proximity***

Actors which are geographically close to each other will have more opportunity to know each other better. It will be more likely for them to be engaged in informal relations and to develop a trust relation with each other. Actors located in same area have more formal and informal channels to get access to information flows and benefit from the trust relations fostered by face to face interactions. Agents can minimize the risks from networking with less known actors in remote locations and decrease the costs of monitoring and communicating by taking advantage of geographical proximity.

A number of studies focus on the role of physical proximity on knowledge exchange through interaction. Stuart and Sorenson (2003) state that sharing the same physical space facilitates the emergence of informal social and professional networks and through the networks knowledge and information disseminate. Similarly, Uzzi (1997) points out that geographically localized networks ease face to face interaction among actors. According to Lazerson and Lorenzoni (1999) proximity facilitates interactions taking place between actors and so promotes knowledge dissemination.

The importance of physical closeness is underlined especially for the tacit and complex knowledge and information by researchers (Dyer and Singh 1998, Hill 1995, Uzzi 1997) as repeated interaction favors the emergence of trust between actors (Granovetter 1985, Gulati 1995, Tsai and Ghoshal 1998). Gulati (1995) states that

there are two factors in effect for the formation of trust in repeated interactions. The first one is about the shared norms of fairness. When firms interact, they get to know each other more and the shared norms developed. The other factor is about the reputation of trustworthy for firms. It is more costly for a firm to be perceived as untrustworthy by other firms within a geographically bounded area as the reputation of the firm spreads easily in such environments.

2.4 Benefits and Drawbacks of Social Capital

Studies on social capital have concentrated mostly on its positive outcomes but they are criticized on the grounds that they take the issue from one side and ignore the dark side of social capital. Therefore, for a more thorough analysis, it would be better to have more a comprehensive approach (or integrated view) on social capital.

- ***Benefits of Social Capital***

The benefits of social capital can be analyzed at two levels: benefits for the focal actor and benefits for the broader aggregate of the actor.

Social capital provides the focal actor access to a broader flow of information. Interactions among actors bring the opportunity to share knowledge and skills with each other. This reduces the transaction costs for economic agents or the risks of market failures related to inadequate or incorrect information. Furthermoe, social capital strengthens solidarity, shared norms, mutual trust relationship among actors. Krackhard and Hanson (1993) states that in a trust network, richer information can be obtained due to its solidarity. In networks with strong shared values, there is higher commitment and this lowers the monitoring costs for agents.

The number of studies trying to show the link between social capital and innovation has been increasing over the last decade. Akcomak and Weel (2009), in their empirical investigation of 102 European regions in the period of 1990-2002, show that social capital affects per capita income growth indirectly by fostering innovation. For Rutten

and Boekema (1997), innovation is increasingly becoming a network phenomenon. In networks where there is trust, commitment and shared values, it is more likely to see learning, knowledge transfer and diffusion of information which are crucial assets for innovation. According to Uzzi (1997), trust eases information transfer and joint problem solving among actors. By means of facilitating resource exchange among actors, social capital creates a convenient environment for product innovation (Tsai and Ghoshal, 1998).

Nahapiet and Ghoshal (1998), Tsai and Ghoshal (1997), Tötterman et al. (2005), and Batjargal (2003) argue that social capital increases the potential of firms to innovate by means of facilitation resource and information exchange. Nahapiet and Ghoshal (1998) define social capital as "the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit". They claim that three dimensions of social capital contribute to knowledge creation which is one of the main drivers of innovation. In their model, there are three dimensions of social capital: structural, relational, and cognitive. The structural dimension is defined as "overall pattern of connections between actors". The relational dimension refers to "kind of personal relationships people have developed with each other through a history of interactions". The cognitive dimension is described as "the resources providing shared representations, interpretations and systems of meaning among parties". The authors also mention about four conditions for knowledge creation emerging as a result of social capital. These conditions are opportunity, which is "determined by accessibility to the objectifies and collective forms of social knowledge", value expectancy, which is "the anticipation of or receptivity to learning and new knowledge creation", motivation, which is "the feeling that engagement in the knowledge exchange and combination will be worth" and combination capability which is "the ability to recognize the value of new knowledge and information but also to assimilate and use it". This model can be seen in Figure - 1.

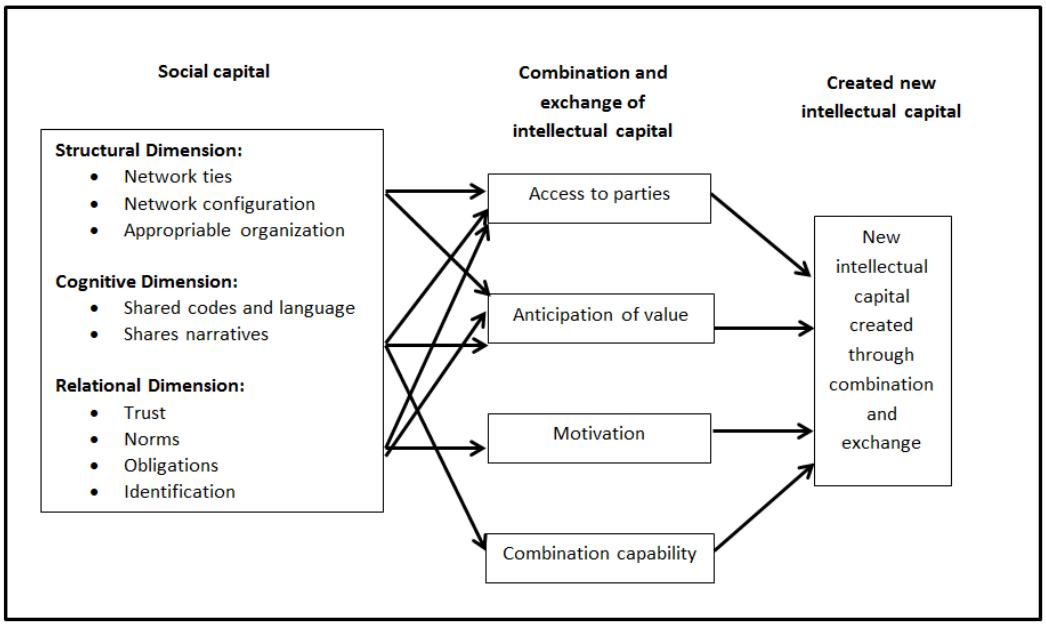

Figure 1: Social Capital in the Creation of Intellectual Capital
Source: Nahapiet & Ghoshal, 1998.

- ***Drawbacks of Social Capital***

Social capital may bring about risks (dark side) together with its positive outcomes. One of the negative effects of social capital is the free riding problem. In networks with solidarity, some members may abuse the relations for the sake of their own interests and can enforce the successful members perform their demands backed by the same normative structure that makes the existence of trust possible. The problem is frequently seen in cozy intergroup relationships found in solidary communities (Portes and Sensenbrenner, 1998).

The problem of isolation may also occur as a result of social capital. Woolcock (1998) in his analysis uses a two by two matrix with dimensions of internal to external social capital and high to low linkages. In this research, he shows that actors having high internal and also low external linkages are more likely to be isolated. Social capital brings actors constraints on their freedom which is called "an old aged dilemma between community solidarity and individual freedom" (Simmel, 1902). Especially internal social capital can prevent actors from linking with the outside world with its limited area of norms, rules or movement.

Social capital can also increase inequality between actors. The actor that is more powerful within the network frequently captures the benefits of cooperation (Dasgupta, 2005). The actor with the ability to use the resources exchanged within the network in a more rational way than the other will benefit more from the relation and this widens the relative gap between actors.

In networks, downward pressures may also exist between actors. There can be a fear that a solidarity born out of common adversity would be undermined by the departure of the more successful member within the network (Woolcock, 1998). In this situation, solidarity generated through a common adversity discourages individuals from seeking or pursuing outside opportunities.

Another negative effect of social capital is placed in its excludable nature. On the one side, social capital is inclusive for the members within the network. However on the other side, it is exclusive for outsiders. This may result in a situation that an economic transaction, information transfer or an exchange of an asset takes place as a result of a social relation in itself but not of a rational decision making or analysis. In market relations, the important thing may become the fact that whether the other actor is within the network or not irrespective of his other features. Hence, resources are not rationally allocated in the general picture.

2.5 Social Capital within the Context of Science and Technology Parks (STPs)

In recent years, studies focusing on firm performance and success have increasingly begun to take social capital as an explanatory factor (Adler and Kwon 2002). The relation of a firm with its environment opens up new avenues for social capital analysis in clusters or in industrial agglomeration of firms.

Industrial districts are defined as "a socioeconomic entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area" (Becattini, 1990). Firms benefit from the

positive externalities of being together in a physical area. Marshall (1925, p.271) defines the externalities as:

> *The mysteries of the trade becomes no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated; inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas.*

Therefore, firms in industrial districts benefit from the pool of resources like human resources, suppliers, technological spillovers (Krugman 1991) or intangible externalities like mutual knowledge, repeated and long-term relationships that build trust and cooperative attitude (Paniccia, 1998).

Like industrial districts, science and technology parks provide a territorial based network of relationships. An STP can be defined as a property-based organization having an administrative center and which concentrates on business acceleration with knowledge agglomeration and resource sharing (Phan et al., 2005). There are minimum standards required for being a knowledge cluster for STPs although there is not an agreed model for them (Link, 2009). STPs are established to provide an environment to allow firms to access easily key factors and the resources like research and development, human capital, innovation infrastructure, financers, venture capitalists, technological capital and social capital (European Commission, 2008). In this environment, ensuring interaction among tenant firms is vital to perform well for STPs as their role necessitates an effective networking to encourage transfer of knowledge, resources and innovation among the firms (Hansson et al., 2005).

Studies analyzing the effect of STPs on firm performance have different results. Some of them find a positive effect of STPs on patents (Squicciarini, 2008; Wright et al., 2008), productivity (Yang et al., 2009), or new product development (Siegel et al., 2003). On the other hand, there are also studies showing no significant effect of STPs on patents (Westhead, 1997), profitability (Lofsten and Lindelof, 2005) and growth (Monck et al., 1988, Dettwiler et al., 2006). However as the studies use traditional

economic indicators, they are limited in the sense that they do not take into account the intangible aspects of social relations which is a necessary indicator of success in the network economy (Westlund, 2006). Therefore, studies analyzing the relation between STPs and firms from the social capital point of view are important to understand the effects of territorial based network of relations on firms especially the technology -based ones.

Analyzing social capital within the context of STPs brings the question of whether the focus should be on a focal actor's relations with other actors or on the structure of relations among actors within a collectivity. It is rooted in the distinction in social capital as external or internal (bridging and bonding). Putnam (2000) defines "bridging social capital" as bonds of connectedness formed across diverse social groups, whereas "bonding social capital" takes place only in homogenous groups. According to Coleman (1990), in cohesive and dense networks of relationships, trust and cooperative behaviour are seen through forming of social norms and sanctions. Therefore, the main argument of strong tie is that such ties facilitate the exchange of high quality information and tacit knowledge and ensure social control to work in the interdependencies in partnerships (Uzzi 1996). On the other hand, in his structural holes approach Burt (1992), proposes that being a broker in relations between disconnected groups provides information and control advantages. Similarly, Granovetter (1973) believes in strength of weak ties as such ties give the opportunity to get different information from various different sources. Adler and Kwon (2002) state that within the external – internal views of social capital, what matters is the unit of analysis and the advantages of one type differ according to the chosen unit. Therefore, apart from the advantages of external or internal social capital, as a unit of analysis both views can be used to analyze social capital of a single actor and/or group of actors within a collectivity. In that sense within STPs, both external ties of technology based firms with other networks and internal ties among the firms within STPs become important.

STPs are generally delimited geographical places and so analyzing social capital within STPs concerns the debate on the relation between geographical proximity and

social capital. A number of studies shows that physical closeness of firms enables knowledge and information to be exchanged more (Jaffe, Trajtenberg, and Henderson 1993; Utterback, 1974). Proximity facilitates interactions taking place between actors and so promotes knowledge dissemination (Lazerson and Lorenzoni, 1999). Also as exchanging tacit knowledge necessitates a dense relation (Dyer and Nobeoka, 2000), being close to other actor permits obtaining such knowledge although technological developments has made communication easier among actors in remote places (Uzzi, 1996). Furthermore, there are studies showing other types of proximities like social, cognitive, or institutional proximities are important factors in knowledge dissemination (Breschi and Lissoni, 2009; Nooteboom, 1999; Rallet and Torre, 2005). Moreover, there are studies showing that rather than physical proximity, the content of the knowledge exchanged is important in relations between firms. For Becattini (2005), knowledge shared within a district can gain value within a specific activity of a firm, but on the other hand, it loses value with alternative uses. Likewise Adler and Kwon (2002) mention the importance of task contingencies which refer to the fit between network features contributing social capital and the organization's objectives to determine the value of benefits of social capital.

Studies on STPs are generally focused on success of STPs, best practices, performance assessment of STPs or justification for STPs existence and there is much area to be explored more for analysis of social capital in STPs. Furthermore, in the literature of social capital, number of studies focusing on firms in a bounded geographical area is limited. Therefore, this thesis concentrates on social capital between and among technology based firms in STPs and aims to contribute the literature by means of analyzing social capital on firm level together with a geographic concentration and also examining social capital within the context of STPs.

2.6 Social Capital for Small and Medium Sized Enterprises (SMEs)

Studies combining social capital and SMEs constitute a new and important area for social capital research since social capital is a critical aspect of business life (Spence et al., 2003). Cooke and Wills (1999) claim that analyzing smaller firms let people develop insights for social capital. Previous works underline the significance of informal networks, trust and cooperation for small firms (Granovetter, 2000) which is the vast majority of business enterprises. Big firms have more opportunity to access different resources like financial and human resources. On the other hand, small and medium sized companies are more likely to rely on their informal relationships, solidarity or trust to grow.

Studies on social capital of SMEs generally highlight the concept of entrepreneurship. There is a general consensus among the studies that social capital helps entrepreneurs to reach venture capitalists, key information, and potential customers (Liao and Welsch, 2003). For young and small firms, social capital facilitates exchange and diffusion of critical information (Davidsson and Honig, 2003) and constitutes a main component of assets necessary for forming a successful firm (Aldrich and Martinez, 2001).

The research area focusing on social capital of SMEs needs to be explored more to understand the dynamics of social capital for SMEs especially for those that are technology based. This thesis concentrates on technology based SMEs and seeks out the sources and benefits of social capital for them. In that sense, findings of the study allow us to understand more the nature of social capital for technology based SMEs.

CHAPTER 3

METHODOLOGY

3.1 Methodological Approaches and Research Focus

The main objective of this thesis is to analyze the sources and benefits of social capital among technology based firms in science and technology parks. As a theoretical framework, the definition of social capital developed by Nahapiet and Ghoshal (1998) is used in this study. Nahapiet and Ghoshal (1998) take social capital as "the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit". Therefore not only the network but also the resources that are mobilized through the network constitute social capital. Furthermore, the definition consists of both external and internal relations of actors and has a neutral standpoint unlike being focused solely interal or external social capital.

First of all, this study focuses on the social capital of technology based firms. As stated earlier, social capital plays an important role especially for these firms as they are more dependent on interorganizational networks to share knowledge and innovate. Firms which develop technology with the purpose of exploiting an invention or a technological innovation are taken as technology based firms. The general definition also constitutes the main characteristics set out by legal regulations and/or official rules of technology park administrations to take part in science and technology parks. Therefore, if a firm is located in a science and technology park, it is assumed that it is engaged in technology development activities and can be referred to as technology based firm.

SMEs constitute the vast majority of business enterprises. Although big firms have more opportunity to access different resources like financial and human, small and medium sized companies are more likely to rely on informal relationships, solidarity or trust to grow. Therefore, the study focuses on small and medium sized (SME) technology based firms. For this, the SME definition adopted by the Regulation on Definition, Qualification and Classification of SMEs in Turkey (04.11.2012/ 790) was used. According to this definition, firms which have the number of employees less than 250 and annual turnover or annual balance sheet less than 40 million Turkish Liras are classified as SMEs.

In order to find answers to the research questions, a mixed approach including both quantitative and qualitative methods was applied. With this way, the results taken from one method are able to contribute to the other method especially in the sampling and evaluation stages. The benefits of using a mixed method design are triangulation, which seeks convergence of findings and complementarity in which different study components together with the plausibility of identified threats to validity can be assessed and the interpretability of assessments can be enhanced (Mark and Shotland,1987).

Using mixed methods is helpful in contextualizing causal relationships between social concepts. This type of analysis requires an approach including generality and particularity, objectivity and subjectivity, patterned regularities and idiosyncratic stories (Greene et al., 2001). In this study, both qualitative and quantitative method tools were used but the former type was applied more to explore the concept of social capital as it is more helpful to explain causal links in social phenomena which remains too complex for a survey of experimental strategies.

Qualitative research methods give opportunity to analyze social phenomena in a more detailed and profound manner (Vedovello, 1997). In order to explore the concept of social capital which constitutes the main research area of this work, the use of qualitative research methods is suitable as it is more helpful to explain causal links in social phenomena. Within the various techniques in qualitative research, case studies

are used to investigate complex social phenomena (Yin, 2003). Therefore, deep analysis of case studies on the chosen context was used for this study. For this aim, a multiple case study design is used as the evidence from multiple cases is more compelling and the overall study is more robust (Yin, 2003).

In this research, an interview guide was also designed and applied to the technology based firms. The use of qualitative method in such analysis is especially important as people in sample may not able to link their own social network with the outcomes provided by the network in an accurate way as their perception of social capital may imply something which is beyond the desired framework of this study. Through interviews, people were forced to think of their social links which cannot be explained by direct questions. Face to face interaction with people gave the opportunity to explain abstract terms such as social capital, social links or network structure and made them more understandable for participants. For the research study, a grounded theory approach was used as a qualitative method.

Two sociologists Glaser and Strauss introduced the approach of grounded theory in 1967 and developed its methodology. It is a flexible approach to explore theory by means of in depth analysis of social phenomenon (Miller & Salkind, 2002). The objective of using this type of approach is to have a new understanding on a familiar condition and determine whether it is applied to practical problems. In grounded theory, the researcher seeks out the process going on within the social scene. Data collected from the scene leads to the generation of theory. Therefore the theory is constructed based on the collected data rather than through the process of forcing data to fit the pre-determined assumptions. This approach seeks to uncover the theory behind the experience. The understanding behind it is to generate hypotheses rather than testing them within the desired context. The facts sought lie in the meaning of the context so the method necessitates sensitive interviewing, observing and analyzing of the data.

3.2 Methods of Data Collection

3.2.1 Unit of analysis

Analysis of social capital can be done at different levels. These can be the individual (Burt, 1997), group (Burt, Hogarth, and Michaud, 2000), organizational (Pennings and Lee, 1999), and inter-organizational (Chung, Singh, and Lee, 2000) levels. In this study, a firm level analysis of social capital is applied as the main concern is to explore the sources and effects of social capital for technology based firms. On the other hand, the social capital of a firm is related to the individual firm members. Especially at the starting phase of the firms, the firms' social capital has a great deal to do with the social capital of the founders (Hite and Hesterly, 2001) and firm members benefit from their individual social capital to acquire the necessary resources (Larson and Starr, 1993). However, it is still an ambiguous matter how individual level social capital is related to firm level social capital (Ibarra, Kilduff, and Tsai, 2005). Due to the inseparable nature of social capital of firms from the one of members, applying a dual-level approach is useful (Maurer &Ebers, 2006). Therefore, in this study this approach is used to analyze the sources and benefits of social capital among technology based firms located in same technology park by collecting data from the owner or the general manager of the firms.

3.2.2 Geographic Location

In order to analyze the sources and benefits of social capital among technology based firms in science and technology parks, METU Technopolis (known also as METUTECH) located in Ankara, was selected as a case. It is the oldest science and technology park in Turkey. The history of the park is rooted in the foundation of incubation centers in the METU SMIDO Technology Development Centre in 1992. This experience turned later into establishing a technology park in METU with the advantages of its location (7 km from Ankara city center), collaboration potential and

research capacity. With the Law of Technology Development Zones (Law No. 4691) in 2001, the park was established officially.

In Turkey, Law No. 4691 (revised by Law No. 6170 02/03/2011) provides the legal basis for establishment of technology parks referred by "Technology Development Zones (TDZs)". The law sets technology parks as means to develop new technologies and software by using the resources and facilities of universities, research centers and high tech institutes. The law encourages firms to invest more in R&D and software development through tax exemptions and incentives on social security costs for R&D personnel. According to the statistics of the Turkish Ministry of Science, Industry and Technology, there are 55 TDZs approved as of the end of June 2014. 40 of them are active and there are 2778 firms located in the zones.

Figure 2 shows the general sectoral distribution of the firms which are active in the Turkish TDZs. As can be seen, 40% of them are in the software sector, and the ICT and electronics sectors are in the second and third place with shares of 18% and 7%, respectively.

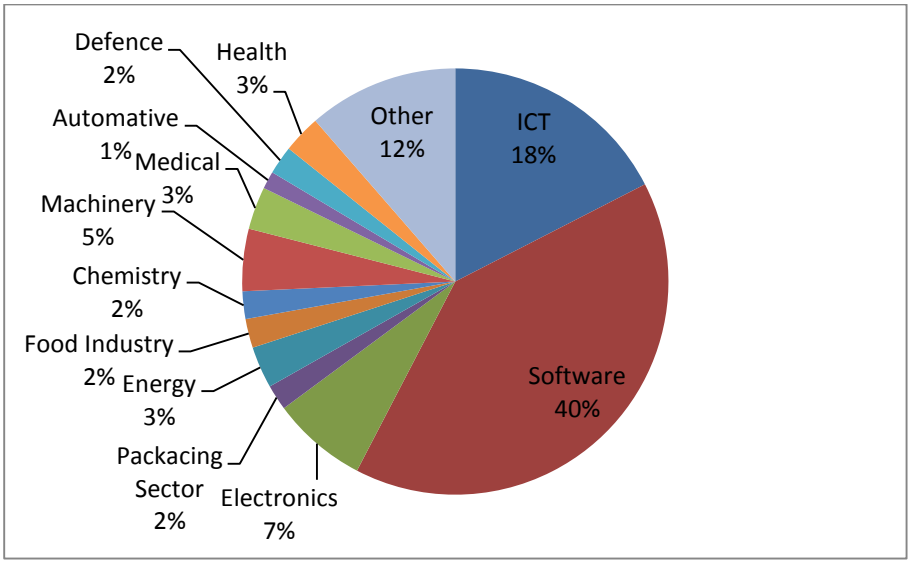

Figure 2: Sectoral Distribution of the Firms Located in TDZs in Turkey (Source: Turkish Ministry of Science, Industry and Technology, 2014)

In the Technology Development Zones (TDZ) Performance Index 2011 and 2012 which were conducted by the Ministry of Science, Industry and Technology, TDZs in

Turkey are ranked on the base of six dimensions: government subsidies and the expenses of the management company, R&D competence, import and company compositions, intellectual property rights, incubation services and collaboration and interaction. University-industry collaboration, inter-company co-operations and international collaborations are included in the dimension of collaboration and interaction. In the indices of 2011 and 2012, METU Technopolis ranked first among other TDZs in Turkey. METU Technopolis also has the highest number of tenant firms and employees within the top three TDZs of the 2011 Index, as showed in Table 2.

Table 2: Firms and Employee Numbers of the Top Three TDZs of the 2011 Index.

Rank	**Name of TDZ**	**Number of firms**	**Number of employees**
1	METU Technology Development Zone	338	7098
2	ITU Arı Technology Development Zone	160	4824
3	West Mediterranean Technology Development Zone	82	311

(Source: Administration Offices of the Listed TDZs, 2014)

METU Technopolis was chosen as a case to study social capital among technology-based firms for a number of reasons. First of all, as it is the first science and technology park in Turkey, it provides enough history and time for the generation of social capital among the technology based firms it houses compared to the other technology parks in Turkey. There are 338 firms and 7098 people working in the firms in METU Technopolis. It represents 12% of the firms located in the science and technology parks in Turkey and 25% of the people working in the firms. Therefore, being a large technology park, in terms of number of firms and their employees, METU Technopolis provides a rich pool of cases to study both the dyadic relations between the technology based firms and network of relations within the park as a whole.

METU Technopolis has a closed area of about 105.000 m2 with Silver Blocks, Silicone Block, SATGEB Buildings, OSTİM Center, Milsoft R&D Building, Gallium Block, Titanium Block and METU MET. Apart from the METU MET and OSTİM Center, all of them are located in the same area.

The official objectives of METU Technopolis are set as the following:

- To participate R&D potential and technology production ability of Turkey,
- To contribute to the supply of high value-added goods and services to the world market,
- To play an important role in directing Turkey's technological production and accumulation with sectoral priorities,
- To provide an effective and sustainable university-industry collaboration,
- To assist in transforming the university's research infrastructure and knowledge into economic value,
- To encourage and support entrepreneurship and innovation,
- To prioritize the companies in selected sectors that can compete on a global scale,
- To promote the production of high-tech products and services for global markets,
- To create a suitable environment for the technology transfer,
- To be one of the regional aspects of sustainable development,
- To create employment for qualified human resources,
- To strengthen international co-operation, particularly in the countries of the European Union

As stated in the objectives of METU Technopolis, the main emphasis is on R&D and technology and the technopolis uses specific criteria to accept firms in order to reach the objectives. In order to take part in the park, firms have to possess sufficient qualifications and potential to produce value added technological products and an active investment in R&D and software development activities. Therefore, the filtering

mechanism used by METU Technopolis provides us a reliable population consisting of technology based firms.

Table 3 indicates the sectoral distribution of technology based firms in METU Technopolis. As it can be seen, nearly 30% of them are in the software sector, ICT and electronics have the second and third place with a share of 13.61% and 12.13%, respectively. The ranking is parallel to that of the Turkish TDZs which is important for the generalizability of the conclusions of this research.

Table 3: Sectoral Distribution of Firms in METU Technopolis.

Sector	**Number of Firms**	**Percentage**
Software	99	29.29%
ICT	46	13.61%
Electronics	41	12.13%
Defense	22	6.51%
Iron & Other Metals	21	6.21%
Energy	14	4.14%
Machinery	14	4.14%
Medical	13	3.85%
Chemistry	8	2.37%
Packaging	5	1.48%
Construction	4	1.18%
Glass	3	0.89%
Maritime	3	0.89%
Aviation	3	0.89%
Health	3	0.89%
Durable Consumption Products	2	0.59%
Furniture	1	0.30%
Automotive	1	0.30%
Logistics	1	0.30%
Other	30	8.88%
TOTAL	**338**	**100.00%**

(Source: Administration Office of METU Technopolis, 2014)

Table 4 shows that 330 firms out of a total of 338 located in the METU Technopolis firms can be grouped as having been in operation for 0-5 years, 5-10 years, 10-15 years and more than 15 years. 45.5% of the firms in METU Technopolis are in 0-5 years of operation. 25.1 % of them have 5-10 years of operation, 16.4 % of them have 10-15

years of operation and the share of firms older than 15 years is 13%. Therefore, we can say that nearly half of the firms located in the park have 0-5 years of operation.

Table 4: Firms According to their Years of Operation in METU Technopolis

Years of Operation	Number of Firms	Percent	Cumulative Percent
0-5 years	150	45.5	45.5
5-10 years	83	25.1	70.6
10-15 years	54	16.4	87.0
15+	43	13	100.0
Total	330*	100.0	

(Data for 330 firms out of a total 338)

As can be seen from the Table 5, about 84% of the firms located in METU Technopolis have 0-25 employees. 8.8% of them have 25-50 employees, whereas 7.1% of them have more than 50 employees. Therefore, we can say that most of the firms have less than 25 employees.

Table 5: Firms According to their Number of Employees in METU Technopolis

	Frequency	**Percent**	**Cumulative Percent**
0-25 employees	284	84.1	84.1
25-50 employees	30	8.8	92.9
50+ employees	24	7.1	100.0
Total	338	100.0	

3.2.3 Selection of cases

In the qualitative research method, participants are purposely selected (Creswell, 2002) with the purpose of reaching out to the different and important information which would not be received with other research choices. Our aim is to maximize what we can get from the sample. As stated by Stake (1995) "Case study research is not sampling research. We do not study a particular case to understand other cases. Our first obligation is to understand this one case". By means of analyzing cases which are similar and contrasting, the aim is to generalize from one case to the next in the light of existing theory. According to Miles & Huberman (1994), cases are chosen based on conceptual, not on representative, grounds.

For the study, selected cases had to meet two criteria: being a technology based firm and being a small-medium sized firm. The first criterion was met by means of application criteria set out by the Administration Office of METU Technopolis for firms to be located in the park. Therefore, it was assumed that if the company was in METU Technopolis, then it is a technology-based firm. To analyze the effects of geographical proximity on social capital, firms located in the main area of METU Technopolis were selected. For the size of firms, firms which have less than 250 employees and annual turnover or annual balance sheet less than 40 million Turkish Liras were selected according to the information given by the METU Technopolis Administration.

In order to maximize the information that can be obtained from cases, 9 firms having different features in terms of their year of operation and sector were selected. As most of the firms are in the sectors of software, ICT or electronics in the METU Technopolis, it was difficult to form a heterogeneous sample. Therefore, rather than general sector differentiation, sub-sectors as a more specific field of operation were taken into consideration.

Table 6: The Sectoral Distribution and Years of Operation of Case Firms

Firm	Sector	Year of Foundation
Firm 1	ICT & Electronics / Security Systems	2006
Firm 2	Automotive & Defense Industry	2005
Firm 3	Software	1999
Firm 4	Electronics & Software / Traffic Systems	2009
Firm 5	Electronics & Medical Devices	2004
Firm 6	Software & ICT	2003
Firm 7	Software & Education	2013
Firm 8	Game Technologies	2010
Firm 9	Electronics & Transportation Technologies	2009

3.2.4 Data Collection

- ***Quantitative Data***

Quantitative data was collected by means of questionnaires. The questionnaires were sent to the e-mail addresses of the owners of 100 firms located in METU Technopolis whose contact information were able to be reached out of a total of 182 firms which are in the main campus and also characterized as SMEs. 53 of the firms sent back their responses. The sectoral distribution of the 53 firm is shown in Table 7. About half of them are in the software sector. 34% of them are in electronics. The share of firms in consulting & education, ICT and nanotechnology is 7.5%, 5.7% and 3.8%, respectively.

Table 7: Sectoral Distribution of the Respondent Firms

	Number	Percent	Cumulative Percent
Electronics	18	34.0	34.0
Software	26	49.1	83.0
Consulting	4	7.5	90.6
Nanotechnology	2	3.8	94.3
ICT	3	5.7	100.0
Total	53	100.0	

Year of operation of the 53 firms differ from each other but nearly half of them are in the group of 0-5 years. The share of other groups is closer to each other. 18.9 % of the 53 firms have 5-10 years of operation, 20.8% of them have 10-15 years of operation and the share of firms older than 15 years is 15.1%. The proportion of firms in the 0-5 year of operation range is nearly same with the proportion for the whole firms located in METU Technopolis.

Table 8: Firms According to their Years of Operation

	Number	Percent	Cumulative Percent
0-5 years	24	45.3	45.3
5-10 years	10	18.9	64.2
10-15 years	11	20.8	84.9
15+	8	15.1	100.0
Total	53	100.0	

The firms in the sample are roughly equally distributed according to their sector and year of business, as seen the cross-tabulation Table 9.

Table 9: Cross-tabulation of Firms According to their Years of Operation and Sector

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year of Business * Sector	53	100.0%	0	0.0%	53	100.0%

	Sector					Total
	Electronics	Software	Consulting	Nanotechnology	ICT	
0-5 years	9	12	1	2	0	24
5-10 years	3	5	0	0	2	10
10-15 years	4	5	2	0	0	11
15+	2	4	1	0	1	8
Total	18	26	4	2	3	53

As it is illustrated in the Table 10, about 80% of the sample firms have 0-25 employees. This number is 84.1% for all the firms located in METU Technopolis. 17% of the sample firms have 25-50 employees whereas only 3.8% of them have more than 50 employees. The percentage of firms having 0-25 employees is seen in all sectors.

Table 10: Firms According to their Number of Employees

	Number	Percent	Cumulative Percent
0-25 employees	42	79.2	79.2
25-50 employees	9	17.0	96.2
50+ employees	2	3.8	100.0
Total	53	100.0	

Table 11: Cross-tabulation of Firms According to Number of Employees and Sector

	Sector					Total
	Electronics	Software	Consulting	Nanotechnology	ICT	
0-25 employees	13	21	4	2	2	42
25-50 employees	5	3	0	0	1	9
50+ employees	0	2	0	0	0	2
Total	18	26	4	2	3	53

- ***Qualitative Data***

In grounded theory, there are certain procedures to collect and analyze data. Unlike other qualitative methods, data is generated from the experiences of participants (Taylor & Bogdan, 1998). The points repeated are classified and used to develop theory and so the process is one of discovery and one that grounds theory in reality (Glaser & Strauss, 1967).

In the process of data collection, the principles and steps developed by grounded theory were used in this research. In grounded theory, steps to collect and evaluate data and reach a theory occur simultaneously. According to Glaser and Strauss (1967), selection of the sample group is related to the possibility to develop emerging categories. Any group with the highest chance to come up with as many features of categories as

possible can be selected. As data is collected, their categories or features begin to appear, relationships between them begin to be discovered and theory begins to be generated. Data collected in one step is used to direct and develop the next stage of data collection. Therefore, developing theory is an ongoing process in the grounded theory approach.

In data collection, the underlying idea behind grounded theory is that every participant has information regarding the categories forming the phenomenon sought and so can affect the data collection process. The data collected from one participant constitutes a valuable asset to enrich the process for the next step. According to Strauss and Corbin (1998), giving a pause between interviews helps the researcher understand the phenomena studied. In this approach, the principal of theoretical sampling which refers to "the process in which the researcher jointly collects codes and analyzes data and decides what data to collect next and where to find them to develop theory as it emerges" is applied (Glaser et al., 1967). The researcher begins with doing open ended interviews with key participants or observations on important activities. Then, he/she looks at the similarities and differences in the data and tries to figure out the categories within the phenomenon studied. The sources of data include experiences of others together with personal ones, perspectives gained from existing theory and other sources consisting systematic information from which features, categories, and hypotheses can be extracted.

In this study, qualitative data was collected through the following phases:

1. ***Pilot interview***

   In the first phase, a pilot interview was done with a firm owner selected in sampling step. The aim of conducting this phase is to check the interview instrument, to eliminate the questions which do not work and to decide on the question hierarchy. After doing the pilot interview, the necessary modifications were made to the interview protocol that can be seen in the Appendix A.

2. Interviews

In the second phase, an interview guideline was prepared in accordance with the literature and taking into account the results of the pilot interview. Next, semi-structured interviews were conducted with the owner of firms selected through purposeful sampling over the period from June to July 2014. The interviews were recorded by means of voice recorders. Notes were taken when recording was not accepted by the interviewee or the environment was not amenable to recording. Attention was paid to ensure that the sequence of questions was same for all the participants. Table 12 shows the duration of the interviews for each firm.

Table 12: Duration of Interviews

Interviewee	**Sector**	**Interview Duration (minute)**
Firm 1	ICT & Electronics / Security Systems	30
Firm 2	Automotive & Defense Industry	70
Firm 3	Software	30
Firm 4	Electronics & Software / Traffic Systems	42
Firm 5	Electronics & Medical Devices	45
Firm 6	Software & ICT	30
Firm 7	Software & Education	50
Firm 8	Game Technologies	63
Firm 9	Electronics & Transportation Technologies	48

3.3 Analysis of Data

The data collected with interviews was analyzed by means of using the technique provided by grounded theory approach. This technique consists of procedures called open coding, axial coding, selective coding and development of the theory. In the process of *open coding*, data is conceptualized and divided into categories. Similarities and differences are tried to be captured. Similar points, events, dimensions or properties are grouped to form categories in open coding. In the second stage called *axial coding*, subcategories are formed by searching for the connections between categories. In the *selective coding* process, a clear story line is generated with the inputs from open and axial coding processes. A main category is formed and subcategories are made to be linked to it in this process. Conceptual relationships are tried to be validated against data by means of selective coding. The processes are not always distinct (Strauss and Corbin, 1990). They can be handled in a simultaneous process.

In this research, firstly open coding of data was done. The transcribed interviews were coded line by line and commonalities and differences between codes and concepts were detected. After that, as described by grounded theory, the coding process continued with axial and selective coding. Categories and subcategories were formed and relations between them were identified. Codes, category and subcategories were examined repeatedly to highlight patterns in social linkages between firms. Eventually, propositions regarding the sources and benefits of social capital on technology based firms were reached.

According to Strauss and Corbin (1990), during the coding stages, it is important to have a "theoretical sensitivity". This concept refers to having the ability and capacity to conceptualize and understand data and to differentiate relevant ones from others. Such sensitivity can be gained through familiarity with existing literature related to the issues under study, professional experience, personal experience which might be helpful in making comparisons and the analytical process itself which refers the interaction with data. According to Strauss and Corbin (1990), by asking questions,

doing cross checks, generating hypotheses, forming small frameworks about concepts, the researcher can develop his/her theoretical sensitivity with analytical process. In this research, theoretical sensitivity was tried to be gained and developed by means of the methods introduced by Strauss and Corbin in their approach of grounded theory. Quantitative data collected was used to support the results reached with the grounded theory approach. The data was analyzed by using the statistics program called IBM SPSS Statistics 22.

3.4 Methodological Limitations, Validity and Reliability of the Research

The first limitation of this research study is time. Social relations and conditions are subject to change over time. In this study, a snapshot of the firms in data sample regarding their social links was reached instead of a series of pictures spreading over time. Moreover, in the social context, subject and time specific inputs matter. Therefore, the information given by the participants and their experiences may be limited in the sense that they lack representing the entire population of technology based firms as well as all other firms.

For the validity and reliability of the methods used, all steps including conceptualization, collection and analyzing data were carefully conducted. Research validity and reliability are related with to what extent the findings reflect the real world. To do that, methods like triangulation, observations spread over time, participatory research were used. The validity and reliability of this study mainly depend on the trustworthiness of data collected which is related with the accuracy of the data taken from questionnaires and interviews, careful transcription and analysis of data. To maximize the validity and reliability, all the factors were taken into consideration.

Researcher bias is another factor affecting the reliability and validity of the research. To handle this problem, pre -written questions were used in interviews.

CHAPTER 4

ANALYSIS AND RESULTS

4.1 Social Capital Formation for Technology Based Firms

- Informal networks

Informal networks are important factors in the formation of social capital between actors. The informal relationships between individuals create a basis for interactions among organizations to which they belong (Kilduff & Tsai, 2003).

Rothschild and Darr (2005) in their study at a technological incubator mention "informal networks" and find that such networks play a central role in the development of emergent technology by providing access to knowledge and know-how. At the firm level, it is the entrepreneur or the owner(s) of the company forming social capital through his or her networking activities. Therefore, their interpersonal ties act as antecedents for the formation of inter-firm relationships. The informal ties which can be formed through the historical roots or the previous personal relations are important mechanisms for the formation of social capital among technology based firms in STPs, as the following quotes illustrate:

> *There are seven firms that we are in touch with in the technopark. At first, all their owners were our friends, and then we started to do something for our firms. We have known the owners of two of them from our previous work environment. (Firm 1)*

> *Our firm is in relation with five different firms in the technopark. We knew the owners of most of them from our university years. (Firm 2)*

Our firm has ties with five firms in the technology park. The relations started through the friendship with their owners. (Firm 5)

The social capital in a relationship may create a basis for creating future capital. By analyzing the New York apparel industry, Uzzi (1997) found that the stock of social capital existent in a relationship was often used in a new relationship by applying the expectations and norms from the existing one. Similarly, Burt (1992) mentions the referral mechanism in which your name is mentioned at the right time in the right place. For technology based firms the ties within the informal network provide a resource for creating new relationships, as the following quotes illustrate:

We met the firms we are in relationships with in the technopark through our friends. (Firm 4)

We work together with a firm in the technopark. We got to know the firm with the reference of our friend. They had a business relationship earlier. (Firm 3)

The results of the qualitative analysis are in parallel with the above quotes. Ties or connections among firms were taken as an indicator of social capital and the firms were asked to evaluate their ties with the other firms in the technopark according to the source of the relation with a five-point Likert Scale. As Table 13 shows, more than 50% of the firms frequently use their personal ties to form social capital with other technology based firms whereas less than 20% of them use their personal ties never or rarely.

Table 13: Frequency of Using Personal Ties to Form Social Capital

N	53
Mean	3.25
Median	4.00
Mode	4

	Number	Percent	Cumulative Percent
Never	5	9.4	9.4
Rarely	5	9.4	18.9
Sometimes	16	30.2	49.1
Often	26	49.1	98.1
Always	1	1.9	100.0
Total	53	100.0	

According to Larson & Starr (1993), at the early stages of a firm, the firm's network is based on the personal network of the entrepreneur and he/she generally uses ties with family members or friends to obtain resources such as financing for his/her firm. Similarly, Hite & Hesterly (2001) suggest that networks of firms change in accordance with the life cycle of the firm. In the early years, owners/managers use personal, embedded ties rather than the arms' length relations as the former provide more access to resources. However, later, firms want to switch to the arm's length ties and shift from personal networks to the wider networks that bridge structural holes.

In order to see whether there is such a difference between young firms and the older ones, the sample of firms is divided according to their year of operation as 0-5 year and more than 5 years. The results show that there is no statistically significant difference in their attitude towards personal ties as the source of social capital formation. As it is shown in Table 14, Sig. (p) value that was less than our alpha of .05 ($p < .05$), we reject the null hypothesis in support of the alternative hypothesis,

and conclude that young firms (0-5 years) and mature firms (> 5 years) are not differed significantly on their view on personal ties. This may be because of the fact that increased year of operation may not be the only a variable to show the maturity of the technology based firms in our sample.

Table 14: Using Personal Ties to Form Social Capital for Young and Mature Firms

Year of business	N	Mean	Std. Deviation	Std. Error Mean
0-5 year	24	3.33	1.129	.231
> 5 year	29	3.17	.889	.165

Proposition-1: Informal networks are positively related with the formation of social capital among the technology based firms in STPs.

Table 14: Using Personal Ties to Form Social Capital for Young and Mature Firms (continued)

Independent Samples Test									
	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.032	.160	.580	51	.564	.161	.277	-.396	.717
Equal variances not assumed			.568	43.294	.573	.161	.284	-.411	.733

- **Geographical proximity**

A number of studies shows that physical closeness of firms enables knowledge and information to be exchanged more (Jaffe, Trajtenberg, and Henderson 1993; Utterback, 1974). Proximity facilitates interactions taking place between actors and so promotes knowledge dissemination (Lazerson and Lorenzoni, 1999). Also as exchanging tacit knowledge necessitates a dense relation (Dyer and Nobeoka, 2000), being close to other actor permits obtaining such knowledge although technological developments have made communication easier among actors in remote places (Uzzi, 1996).

Actors which are geographically close to each other will have more opportunity to know each other better. Hence, it will be more likely for them to be engaged in informal relations and to develop a trust relation with each other. Actors located in the same area have more formal and informal channels to get access to information flows and benefit from the trust relations fostered by face to face interactions. Parties can minimize the risks from networking with less known actors in remote locations and decrease the costs of monitoring and communicating by taking advantage of geographical proximity. However, geographical proximity is a relative term and the necessary or optimum distance easing the formation of social capital may differ according to firm, industry and market structure.

For the technology based firms located in the same technology park, being geographically close to each other was not found to be an effective factor to form social capital among them. The firms interviewed reveal the situation by saying:

> *All the firms in the technopark are busy with their own business. To know other firms, you need to make an effort and this necessitates spending time for it. This is making an investment. But here firms do not make such an investment. There are some workshops arranged by the Technopark Administration. But we do not find the firms that we work with this way. According to our needs, we investigate firms. [….] So what I need is important. If I do not need anything, I do not feel the need to know other firms in the technopark. (Firm 4)*

It is not known which firm does what in the technopark. I know my friends'firms. However, I do not know what the firm next to me does specifically. We say hello to each other but when we talk, we do not talk about our work. (Firm 3)

There are seven firms that we are in touch within the technopark. We met the owners of five of them in a workshop in the USA. Although we work in same area, are located in same technopark, we did not know each other before then."(Firm 1)

Our firm works together with a firm in the technopark. We did not know the firm before. A firm in OSTİM [an organized industrial area in Ankara] that we work with suggested the firm to us. [……] It is like going the longer way. (Firm 9)

Therefore, our qualitative analysis shows that being in the same location; i.e., the METU Technopark, is not enough to know other firms and develop social capital for technology based firms. In order to look at the issue from the quantitative point of view, an index developed by Krackhardt and Stern (1988) is used. It is called the *E–I index* used to measure group embeddedness.

The index is defined as:

$$\boldsymbol{E-I\ Index = \frac{E-I}{E+I}}$$

where; *E* is the number of external ties,

I is the number of internal ties.

The measure varies between +1 (all ties are external) and −1 (all ties are internal), where larger values indicate that the group is outward looking and negative values show that there are closed group relations.

The index is used to analyze the role of physical proximity for the formation of social capital among the technology based firms. In the questionnaire, firms were asked to state the location and the number of their ties, which add up to 2187. Accordingly, the number of ties and the geographical characteristics of the ties were analyzed. As Figure

3 shows within the total of 2187 ties, only 10% of the ties take place within the technopark where they are located.

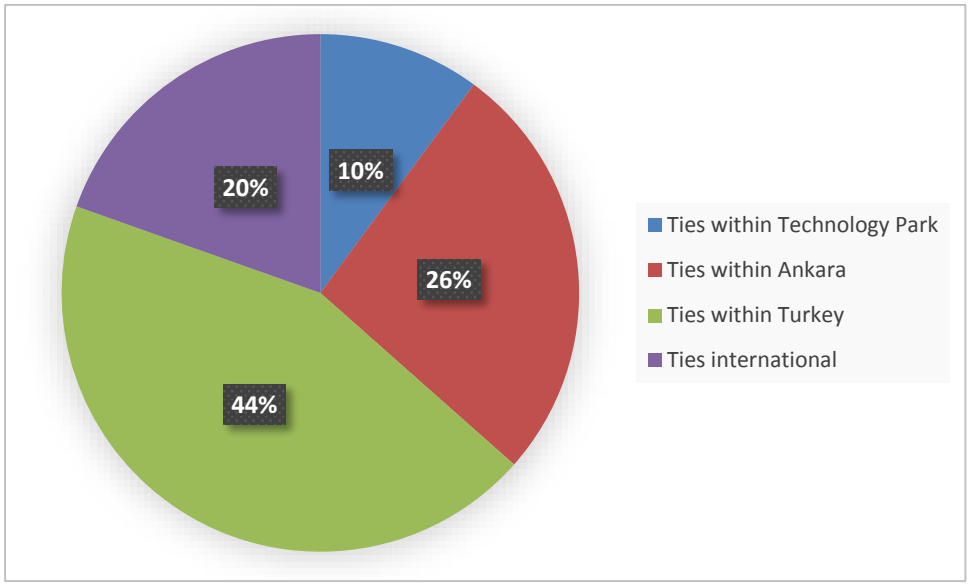

Figure 3: Geographical Distribution of Ties.

The ties taking place within the technopark are taken as internal to see whether or not the technology based firms are outward looking. The frequency of the values of the E-I Index for the ties within the technology park can be seen in Figure 4. It shows that majority of the values are between 0 and 1.

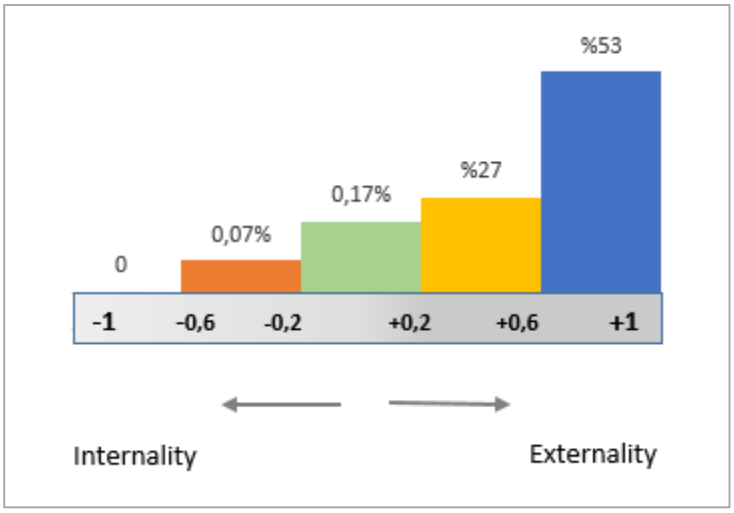

Figure 4: The Frequency of E-I Index Values Within the Technopark

The E-I index score for the ties within the Technopark is 0.52, meaning that the density of ties within the geographical boundary of the park is less than the density of ties outside the park for the technology based firms. The firms prefer to form social capital with firms outside the technopark and so the quantitative results are in parallel with the qualitative ones.

Table 15: The E-I Index Score for the Ties within the Technopark

	N	Range	Minimum	Maximum	Mean
E-I Index for Technopark	53	1.50	-.50	1.00	.5223
N	53				

Firms	E-I Index Value For Ties in Technopark	Firms	E-I Index Value For Ties in Technopark
1	0.67	27	0.78
2	-0.20	28	0.00
3	0.82	29	0.50
4	0.50	30	0.00
5	0.94	31	0.08
6	0.50	32	1.00
7	0.80	33	-0.20
8	0.20	34	0.73
9	1.00	35	0.33
10	0.75	36	0.45
11	0.00	37	-0.25
12	0.29	38	1.00
13	0.25	39	1.00
14	0.88	40	0.43
15	1.00	41	0.90
16	0.00	42	0.88
17	0.80	43	0.00
18	0.83	44	0.00
19	0.44	45	-0.50
20	0.40	46	0.67
21	0.80	47	0.98
22	0.80	48	0.75
23	0.60	49	0.95
24	0.75	50	0.68
25	1.00	51	0.84
26	-0.14	52	0.00
		53	1.00
TOTAL			**27.68**

When we compute the E-I index for the ties within the boundary of the city, namely Ankara, we see the predominance of ties within the city over the firms' external ties. The score is - 0.14 which shows that relations of technology based firms within the city is substantial within their total ties.

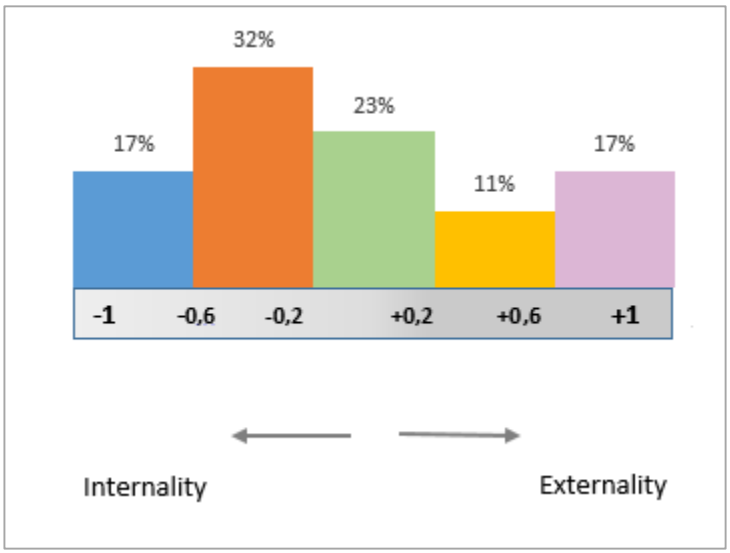

Figure 5: The Frequency of E-I Index Values Within Ankara

Table 16: The E-I Index Score for the Ties Within Ankara

	N	Range	Minimum	Maximum	Mean
E-I Index for the City	53	2.00	-1.00	1.00	-.1487
N	53				

Table 16: The E-I Index Score for the Ties Within Ankara (continued)

Firms	E-I Index Value For Ties in Ankara	Firms	E-I Index Value For Ties in Ankara
1	-0.17	27	0.11
2	-1.00	28	-1.00
3	-0.09	29	-0.50
4	-1.00	30	-0.40
5	0.80	31	-0.23
6	-0.50	32	0.82
7	-0.40	33	-0.60
8	-0.60	34	0.33
9	-0.50	35	0.33
10	-0.25	36	0.09
11	-1.00	37	-0.75
12	-0.14	38	1.00
13	-0.50	39	-0.33
14	0.65	40	-0.43
15	0.75	41	0.80
16	-0.40	42	0.68
17	-0.20	43	0.00
18	-0.67	44	0.00
19	-0.11	45	-1.00
20	-0.60	46	-0.33
21	-0.20	47	0.60
22	-0.20	48	-0.42
23	0.20	49	0.55
24	-0.25	50	0.52
25	-1.00	51	0.20
26	-0.14	52	-1.00
TOTAL			**-7.88**

Proposition-2: Locational proximity provided by the technopark is neither a source nor a driver for the formation of social capital for technology based firms.

- **Cognitive Factors**

Cognitive factors refer to resources providing shared interpretations and system of meaning for parties (Cicourel, 1973). Nahapiet and Ghoshal (1998) state that while

exchanging and combining different knowledge to innovate, it is necessary to have at least a shared of context and define shared language, codes, and narratives as the cognitive dimension of social capital. As Tsai and Ghoshal (1998) suggest, the shared code or paradigm permits the emergence of a common understanding within a collectivity. According to the authors, the common understanding helps cognitive social capital develop and hence facilitates the actions of individuals or groups which is a valuable benefit. The authors found that common values or shared vision as cognitive social capital may ease the generation of trust relations. However, according to their findings there is no significant relation between social interactions and shared vision.

For the technology based firms who are members of the same technology park, there are some cognitive items perceived common for the firms located in the technopark as a whole, as the following quotations show:

> *Firms here are more or less similar; most of them are R&D firms or based on engineering systems. As most of the people have an engineering background; people here are more inclined to production and technical thinking, more focused on problem solving. (Firm 4)*

> *In Turkey, lots of firms do not do R&D when it is not needed, so the R&D activities are not continuous. But in the technopark, firms do R&D. (Firm 2)*

> *Being from METU may provide a common culture as most of the people in the Technopark are METU graduates. (Firm 7)*

On the other hand, for the firms, the existence of cognitive factors is not a source of social capital but can be a facilitating factor to form relationships or improve existing ones.

> *We do not only share a common space but also a common culture in the technopark. If the firm is in the Technopark, then it means that we can understand each other easily. Forming a relationship with the firms in the technopark is not a problem if we need it. [….]For example, if you form a partnership with another firm, it has nothing to do with that the other firm being in the Technopark.”(Firm 1)*

In the Technopark, most of the firms are engaged in R&D. So we have a common thing. However, firms do not need to interact with each other. [….]Most of the firms here think that if you are not the buyer of my firm, telling you about something is a waste of time. People here focus on their own business. (Firm 2)

Most of the people in the technopark are METU graduates. We trust METU graduates more. It is because we have experienced the same things, passed through the same ways. We can understand each other more [….] but it is not enough to form a relationship with a firm in the technology park. (*Firm 2)*

Proposition-3: The existence of cognitive features is not a sufficient condition for the generation of social capital among technology based firms in STPs.

4.2 Benefits of Social Capital for Technology Based Firms

Social capital is an important source of information for firms. Through their network of relationships, firms can reach different types of information. This decreases their search costs (Granovetter, 1985; Burt, 1992). According to Burt (1992), information benefits of social capital can be in three forms: access, timing, and referral. Access means that social capital provides the opportunity to obtain a valuable piece of information and timing refers to get this information early.

In the interviews, technology based firms were asked the source of information they use irrespective of the importance of the information they needed. All of them referred to the same source: i.e., the internet, as the following quotations show:

We get most of the information we need from the internet. (Firm 3)

From the internet we get the information we need. (Firm 5)

From the internet, we look for the firms that we need. […] For academic information, we use academic journals. All of them can be accessed through the internet. (Firm 1)

I use the internet to learn what is going on in the sector. In our market, most of the firms are in the USA. So I look at the internet to see what type of products and services are provided by the big firms. (Firm 8)

Therefore, the primary source of information for the technology based firms is the internet. With this resource, they can access codified technical information, follow technology and obtain information about the market and check the credibility of a future business partner. By providing limitless and varied information in a fast way, the internet can surpass the range of information that can be obtained solely through network of relations. The information that the technology based firms get from their networks within the Technopark is seen mostly as "limited" or "not of good quality" such as information about a workshop, seminar, or financial support given by public institutions. In that sense the access and timing form of information benefits are not obtained by the firms from their social capital within the Technopark.

In Burt's discussions on the information benefits of social capital, referral is one of the forms of benefits. It means having your name mentioned at the right time in the right place which alleviates the problem of being in only a limited number of places within a limited amount of time. Technology based firms get this benefit of social capital from their networks within the Technopark, as the quotations below indicate:

In our ties within the Technopark, we pass on jobs to each other. (Firm 2)

When someone asks me whether I know a firm doing a specific thing, I suggest the firm that I know here in the Technopark. (Firm 5)

Sometimes a customer demands something that is irrelevant to what we do, and then I direct him to the firm that I have a tie with in the Technopark. (Firm 9)

Proposition-4: The internet is an important factor limiting the information benefits of social capital for technology based firms. In other words, the internet has a restrictive effect on the information benefits of social capital for technology based firms.

According to Krackhardt and Hanson (1993), in social capital "what matters is the fit, whether networks are in synch with company goals". Adler and Kwon (2002) mention "task contingency" to refer to the fit between network features contributing social capital and the organization's objectives. The match between the actual and potential resources embedded within, available through, and derived from the network of relationships and the objectives of the organization determines the value of the network. Therefore, task contingencies determine whether a strong tie or a weak one is more valuable (Adler and Kwon, 2002).

Hansen (1998) shows that weak ties provide a benefit of a cost effective search for codified information; on the other hand, strong ties are helpful to have a cost effective transfer of complex information and tacit knowledge. Similarly, Uzzi (1997) points out that the embedded ties in which frequent exchanges take place between parties in small numbers are more preferable if the task necessitates trust and cooperative activities. However, for market relations ties with more numerous actors are more effective.

For technology based firms, information or skill acquired through interactions plays an important role in the tradeoff between their weak and strong ties. With some ties, firms can benefit from exchanging information at a limited level, whereas with other ties, they can get important information that cannot be acquired from elsewhere.

The technology based firms interviewed make this separation according to two types of relationship: a relationship in which firms work together for a project, innovation or R&D, and a relationship in which firms just exchange limited and simple information with each other.

> *Our ties with other firms in the Technopark have a different nature. If I work together with another firm, like working on the same project, it is different […] It means our relationship is deeper. (Firm 1)*

> *There are different firms with whom we interact here. With one of them we work together in a project, so the type of interaction is a bit different than the others. (Firm 4)*

The distinction is somewhat similar to the distinction of Granovetter (1973) discussing the quality of ties as strong and weak ones. If there is time and energy invested in a relationship where parties interact frequently, then it is a strong tie. On the other hand, weak ties are seen as just acquaintances. For example, working together with another firm for an R&D or innovation project necessitates a deeper interaction where parties get to know each other and, their competencies and believe that mutual expectations are to be met. An increased strength of relation refers to enhanced interaction and trust and hence such a relation is perceived as "strong" by the technology based firms as stated by following quotations:

> *Our relationship with the firm that we do R&D with has developed step by step. First we worked on a small part of a project together and analyzed the information that we got from the other firm, his approach to your firm etc. Then we cooperated more for a bigger project. We let our relationship develop deeper step by step. First "Hi", then "What do you think about this?", then it turns into a real project. (Firm 4)*

> *We are developing a product together with a firm in the Technopark. I have known the firm for one year. During this year, we began to know each personally and trust has developed between us. (Firm 8)*

In accordance with the type of the relations as a strong or weak, the type and the value of the received from the relation differ. For the technology based firms, the internet is a valuable source to get various codified information on a range of topics. Taking into consideration the role of weak ties which mainly facilitate the cost-effective search for codifiable information (Hansen, 1998), the internet has a substitution effect over weak ties of technology based firms. Therefore for the firms, the more valuable benefits are those received from their strong ties, as the following quotations express:

> *From firms with which we have a close relationship, we get information about which way we should go in our business, whom we can trust, which firms we can work together. The information is not very detailed and is ordinary but important for choosing our business path. […] Through the relationship with other firms, I just monitor the sector and technology. (Firm 4)*

> *We can get to-the-point information from the firms we are close to, like material we can use for our product. (Firm 2)*

> *If the relationship with other firms is strong, like working together, it helps you see the needs of your firm, your capacity areas to be developed. Otherwise our relationship cannot go further from passing on to the other firm a business demand irrelevant to you. (Firm 2)*

Proposition 5: Technology based firms perceive their weak ties as substitutable with the internet to a large extent, and hence, less valuable than their strong ties. Therefore, firms are more willing to increase their social capital through strong ties.

In this section, five propositions developed in light of the findings of the research for the sources and benefits of social capital for technology based firms in science and technology parks were mentioned.

CHAPTER 5

DISCUSSION and CONCLUSIONS

In the final chapter of this thesis, a model of social capital for technology based firms located in STPs is developed in light of the propositions generated from the research results. The sources and benefits of social capital within the dyadic and network level of relationships of technology based firms located in METU Technopolis are discussed. Also, the managerial and research implications of the study are evaluated and the related policy implications are assessed. Lastly, the limitations of the work and recommendations for future studies are mentioned.

5.1 Discussion

The main objective of the thesis was to analyze the social capital development among technology based firms located in STPs and the benefits of social capital for them. To this end, the dyadic relations of the technology based firms within the internal structure of the technology park and the external relations of the firms are examined. Results reached provide information about the channels of social capital generation between and among the technology based firms located in the same technopark and also the benefits of social capital and the related network configuration formed by them. Figure 6 demonstrates the model generated in accordance with the results. According to this model, informal networks between the owners or managers of technology based firms constitutes a source for the generation of social capital between technology based firms located in the same technopark. The ties between the firms can be weak or strong. If there is trust and frequent interactions between the parties, this refers to a strong tie. Both weak ties and strong ties provide value for the technology based firms. However, the value of the weak ties is affected negatively by the internet which is also used as a source of information. The match between the goals of the firm and benefit

configuration of the network, i.e., the task contingency plays an important role in the determination of the value of the benefit from social capital. As one of the major goals of the technology based firms are engaging in innovation and R&D activities, they see their strong ties as more valuable as a joint work seeking R&D and innovation necessitates a more embedded relation between the partners.

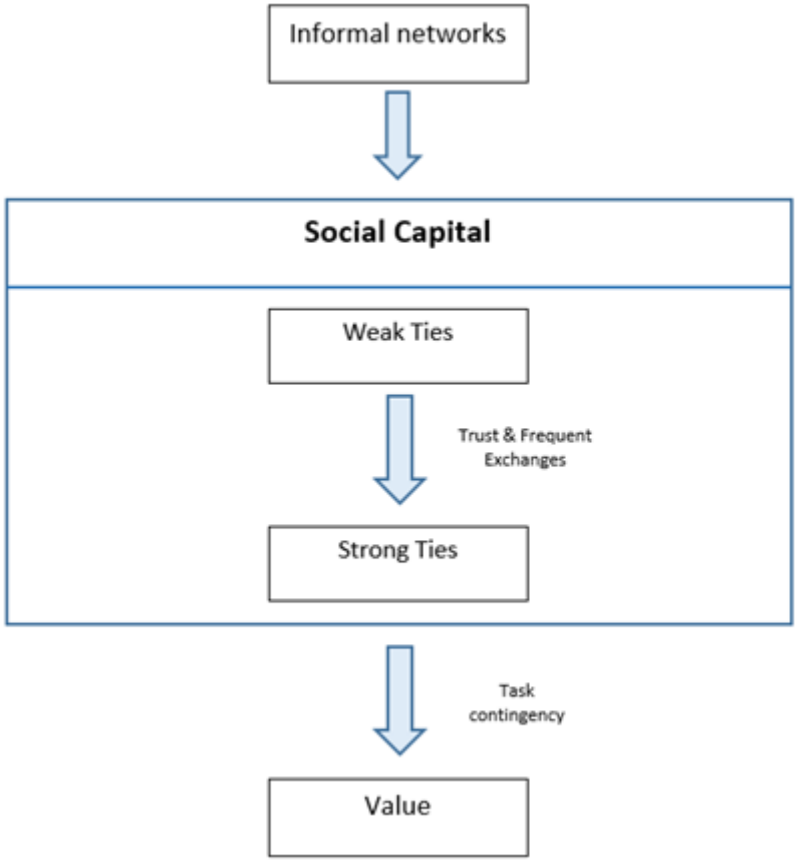

Figure 6: A Proposed Model of Social Capital Development for Technology Based Firms in STPs

The first research question of the thesis was "How do technology based firms create social capital? What helps in this creation? What are the mechanisms?" The informal relationships between individuals create a base for interactions among the organizations to which they belong (Kilduff & Tsai, 2003). At the firm level, it is the entrepreneur or the owner(s) of the company forming social capital through his or her networking activities. The results of the study show that informal networks which are formed through the historical roots or the previous personal relations are important

mechanisms for the formation of social capital among technology based firms located in the same technopark. Furthermore, the role of informal networks on the generation of social capital does not change in accordance with the year of operation of the firms.

Actors which are geographically close to each other will have more opportunity to know each other better. It will be more likely for them to be engaged in informal relations and to develop a trust relationship with each other. Actors located in same area have more formal and informal channels to get access to information flows and benefit from the trust relations fostered by face to face interactions. However, the results of this research indicate that for the technology based firms located in the same technopark, being geographically close to each other is not an effective factor to form social capital among them. Analyzing the ties of 53 technology based firms within the same technology park with the E-I Index, it is shown that the density of external ties is higher than the ties internal to the technopark. The technology based firms do not see the social structure of the technopark as a source of social capital. Therefore, the locational proximity provided by the technopark does not constitute a source for the formation of social capital for technology based firms.

Cognitive factors refer to resources providing shared interpretations and a system of meaning for parties (Cicourel, 1973). Nahapiet and Ghoshal (1998) state that while exchanging and combining different knowledge to innovate, it is necessary to have at least a shared of context and define a shared language; i.e., codes and narratives as cognitive dimension of social capital. In the technopark studied, most of the firms are R&D firms, people working in the firms are mostly engineers and graduates of the same university and the common characteristics defined for the firms are perceived as the cognitive features of the social structure of the technopark. However, the technology based firms do not see the factors as effective drivers to form dyadic relationships with other firms and hence to generate social capital. Therefore, the existence of cognitive features is not a sufficient condition for the generation of social capital for technology based firms.

The second research question of the thesis was "What benefits do technology based firms derive from their social capital?" Social capital is an important source of information for firms. Through their network of relations, they can reach different types of information which decreases their search costs (Granovetter 1985; Burt, 1992). However, the technology based firms mainly use the internet to get the information they seek. The internet provides them with a limitless pool of information in a fast manner. Furthermore, they have the ability to use and exploit the information they get from the internet as people in the firms have at least an undergraduate degree. With this rich resource, they can obtain the codified technical information they need, monitor development in technology and market and also check the credibility of a future business partner. A technology based firm can get codified information from the internet instead of obtaining it through the network of relations. Therefore, the internet is an important factor limiting the information benefits of social capital for technology based firms.

According to Krackhardt and Hanson (1993), in social capital "what matters is the fit, whether networks are in synch with company goals". Similarly, Adler and Kwon (2002) mention "task contingency" to refer the fit between network features contributing social capital and the organization's objectives. Therefore, task contingencies determine whether a strong tie or a weak one is more valuable. Hansen (1998) shows that weak ties provide a benefit of a cost effective search for codified information; on the other hand, strong ties are helpful to have a cost effective transfer of complex information and tacit knowledge. Also, Uzzi (1997) indicates that the embedded ties in which frequent exchanges take place between parties in small numbers are more preferable if the task necessitates trust and cooperative activities. In that sense, in accordance with the type of the relation as a strong or weak, the type and the value of the benefits taken from the relation differ. For the technology based firms, the internet is a valuable source to get various codified information in a range of topics. Taking into consideration the role of weak ties which mainly facilitate the cost-effective search for codifiable information (Hansen, 1998), the internet has a substitution effect over weak ties of the firm. On the other hand, if there is time and energy invested in a relationship where parties interact frequently then it is a strong tie

and this type of ties provides them more value as the tacit knowledge taken from such ties directs them to make innovation or R&D activities. Therefore, technology based firms perceive their weak ties as substitutable with the internet to a large extent and hence, less valuable than their strong ties. Therefore, they are more willing to increase their social capital through the strong ties.

5.2 Managerial Implications

Coleman (1990) argues that there are a few cases in which social capital is well understood as a resource and can be created as a direct result of investment by actors who have the aim of receiving a return on their investments. Nonetheless, social capital should not be understood as fortuitous by products of firms' other activities. Therefore, managers of technology based firms should have an awareness of the importance of social capital as it provides them with the opportunity to innovate, which is in itself a highly interactive phenomenon (Utterback, 1971).

Within the social structure of the METU Technopolis, social capital creation takes place mainly through the informal networks of managers or the owners of the technology based firms. In that sense, the dependence on the informal networks restricts the creation of social capital to a limited number of firms. Therefore, firms should use other sources through which they build social capital for their firms and not be content with their current ties but try to enhance them continually.

5.3 Policy Implications

STPs need to increase the interaction among the firms they host to fully perform their technology transfer and economic development functions. Ensuring interaction among tenant firms should be the key objective of STPs' administrations. In order to do this, the generation of social capital among the firms within STPs is vital. However, some administrations do not take into account facilitating interaction or development of

social capital among tenant firms as an objective while setting out their goals. This is also valid for the case of METU Technopolis.

If the personal ties of the owners or managers of technology based firms are an important source for social capital generation like it is seen in the case of the thesis, the physical structure of STPs should facilitate the interactions among them and more social platforms that make people together should be created.

In general, STPs in Turkey are located in single delimited places with one or more buildings. The physical proximity provided by the STPs can facilitate the face to face interactions among people working in the firms and enable them know each other. However, the physical layout provided by STPs does not constitute a source of social capital among technology based firms even though it can facilitate the generation of social relations among them. In addition, STPs consist of similar firms. Mainly they are small and medium sized companies doing technology/engineering based jobs and run their business in software and related sectors. However, the similarities together with the cognitive factors are not enough to generate social capital among them. To do that, other conditions need to be satisfied.

First of all, if we consider a technology based firm, then innovation or R&D activities are at the core of its business. In that sense, such firms need tacit knowledge more than the codified knowledge as they have the enough capacity to use the technology, computer and the internet which provide an easy and limitless access for getting this type of information. Therefore, weak ties which provide a benefit of a cost effective search for codified information (Hansen, 1998) are not attractive for technology based firms. Instead, they need more to form strong ties characterized by trust and frequent exchanges and through which they can get more solid value for their firms. Therefore, mechanisms should be sought to transform the weak ties to the strong ones to stimulate social capital within STPs.

Task contingency is an important factor for the technology based firms in forming ties with other firms. It means that “whether networks are in synch with company goals”

(Krackhardt and Hanson, 1993) is vital for them. In that sense, the range of the firms located in STPs should ensure to meet the business strategies of the firms. Firms should band together for specific goals like doing a big project together in which all firms put their efforts and capacities complementary fashion to each other. Similarly cluster based small groups can be created which are not sectoral but rather horizontal or vertical manner.

5.4 Limitations and Directions for Future Research

This study has some limitations although efforts to minimize them were made. The first limitation resulted from the use of the case study method which means its results cannot directly be generalized to other populations. By using existing literature and a cross- case analysis, some theoretical propositions were reached but they do not represent a generalization on statistical grounds.

The other limitation is about the focus of the case. The results can be valid for the chosen STP due to the configuration of firms located in it. Some common features of the firms located in the chosen case area may have specific and unpredicted effects on the findings. The selection criteria specific to the chosen STP to accept firms to host may create a filtering mechanism which can affect their attitude towards social capital.

Literature on social capital research has begun to underline the existence of the dark side of the concept. However, this research focuses only the benefits of social capital. For the case firms analyzed, data could not be reached for the drawbacks of social capital. This may be due to the fact that the content and number of ties of the case firms are limited and could not provide any example for the dark side of social capital.

The findings of our research also open up new paths for further research. For instance, firms in an STP and in an industrial district can be compared to see whether there is a difference in the sources of social capital and the benefits obtained and factors in effect for any differences. In addition, social capital of two or more STPs can be compared

to analyze which specific factors play a role in the generation of social capital within the general social structure of the STPs.

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APPENDICES

A. PROTOCOL OF THE INTERVIEW WITH THE TENANT FIRM OWNERS/MANAGERS

I. Information about the Firm

1. General information about the firm: Your position in the company, the work domain of the company, the sector it operates in, number of employees, etc.
2. Could you please give some information about the history of the company?
3. General information about the owner(s) of the company: age, education, etc.

II. Sources of Social Capital

1. Is there any company that you have a connection-tie in the science and technology park? How many?
2. How often you communicate with these companies, with which purposes?
3. How did you come together with these companies?
4. Do you have any criteria to establish connections with other companies? Do you have any pre-conditions? When searching for a company to work with, what criteria do you pay attention to?
5. When you work with a firm do you use a written contract? Why is that?
6. Among the companies in the technology park, is there any group identity or perception from being together? Does this perception create a motivation to come together to work?
7. Dou you think companies in the technology park have a common language or understanding? If yes, does it offer any advantages to contact with other companies in the park?
8. In the foundation stage of your company, was there any company that you had a connection that may be important for your firm? How did you come

together with this company? How your relationship with this company has evolved over time, or changed?

9. In what situations do you need to get in contact with other companies in the technology park?

III. Benefits of Social Capital

1. What benefits have you got by coming together with other companies in the technology park?
2. What are the information channels that you use for your company? Do you use your connections with other firms as an information channel?
3. What kind of information do you seek to obtain with your connections with other companies? Have you succeeded in getting that from your existing connections?
4. Do the links with other companies enable your firm access the information you need more quickly?
5. Do the firms connected to your firm operate in different areas? Does working with firms operating in different areas provides any advantages?
6. 6. At what level you exchange information with the companies that you have a connection? What kind of information do you get through the connections? In what areas do you use this information?
7. Have the connections with other companies in the technology park provided you any knowledge or skill which brings an innovation to your firm?
8. Have you acquired new skills with the connections?
9. Have you obtained more opportunity to have a say in your sector with the connections you have within the park?
10. Have your connections in the park provided you with any information that you could not find otherwise?

IV. Being in a Science and Technology Park

1. What advantages have you experienced from operating in the technology park? Is there any disadvantage?
2. Is there any disadvantage from being together with firms operating in similar fields with you? What are the advantages?

V. Policy Recommendations

1. What should be done to increase communication/connection among companies in the technology park?

B. PROTOCOL OF THE INTERVIEW WITH THE TENANT FIRM OWNERS / MANAGERS (TURKISH)

I. Firma Hakkında Genel Bilgi

1. Şirketle ilgili genel bilgi: Şirketteki konumunuz, şirketin iş tanımı ve yer aldığı sektör nedir, çalışan sayısı, vb.
2. Şirketin tarihinden kısaca bahseder misiniz? (kuruluş tarihi, ortakları, kaç yıldır teknoparkta olduğu vb.)
3. Firma sahibi/sahiplerinin yaş ve eğitim durumları hakkında bilgi verebilir misiniz?

II. Sosyal Sermayenin Kökenleri

1. Teknopark içinde bağlantıda olduğunuz firmalar var mı? Kaç farklı firma ile bağlantıdasınız?
2. Bu firmalarla hangi sıklıkla ve hangi amaçlarla iletişime geçiyorsunuz?
3. Bu firmalarla nasıl bir araya geldiniz?
4. Başka firmalarla bağlantı kurarken herhangi bir kriteriniz, ön koşulunuz var mı? Beraber çalışacak bir firma ararken ne gibi kriterlere dikkat ediyorsunuz?
5. Bir firma ile çalışırken yazılı bir sözleşme kullanıyor musunuz? Neden?
6. Teknoparktaki firmalar arasında bir arada olmaktan kaynaklı bir grup kimliği-algısı var mı? Bu algı birlikte çalışma konusunda bir motivasyon oluşturuyor mu?
7. Sizce teknoparkta yer alan firmaların ortak bir dili - anlayışı var mıdır? Varsa bu sizin teknopark içindeki firmalarla bağlantı kurmada ne gibi avantajlar sağlıyor?
8. Şirketinizin kuruluş aşamasında şirketiniz için önemli olabilecek bağlantıda olduğunuz Teknopark firmaları var mıydı? Bu firmalarla nasıl bir araya geldiniz? Zaman içinde bu firmalarla ilişkileriniz nasıl gelişti veya değişti?

9. Hangi durumlarda teknoparktaki diğer firmalarla bağlantıya geçme ihtiyacı duyuyorsunuz?

III. Sosyal Sermayenin Yararları

1. Teknoparkta bulunan firmalarla bir araya gelmenin ne gibi faydasını gördünüz?
2. Firma çalışmalarınızda bilgiye erişim kanallarınız neler? Bu kanallar içinde varolan firma bağlantılarınızı kullanıyor musunuz?
3. Bağlantıda olduğunuz firmalarla ne tür bilgiye erişim sağlamayı amaçlıyorsunuz? Bu konuda başarıya ulaştınız mı?
4. Firma bağlantılarınız ihtiyacınız olan bilgiye daha çabuk erişimizi sağlıyor mu?
5. Bağlantıda olduğunuz firmalar farklı alanlarda mı faaliyet gösteriyor? Farklı alanlarda faaliyet gösteren firmalarla çalışmanın ne gibi avantajlarını yaşadınız?
6. Bağlantıda olduğunuz firmalarla bilgi alış-verişiniz hangi düzeyde? Firma bağlantılarıyla ne tür bilgiler elde ediyorsunuz? Bu bilgileri hangi alanlarda kullanıyorsunuz?
7. Teknopark içindeki firma bağlantılıları size yenilik kazandıracak bilgi ya da beceri sağladı mı?
8. Teknopark içindeki firma bağlantılılarıyla elde ettiğiniz yeni beceriler oldu mu?
9. Teknopark içindeki firma bağlantılılarıyla sektörde daha çok söz sahibi olma imkanı yakaladınız mı?
10. Teknoparktaki başka bir firma ile bir araya gelerek başka yollarla elde edemeyeceğiniz nitelikte bir bilgi elde ettiniz mi?

IV. Teknoparkta Bulunma

1. Teknoparkta faaliyet göstermenin ne gibi avantajlarını yaşadınız? Dezavantajları oldu mu?
2. Teknoparkta benzer alanda faaliyet gösteren firmaların bir arada olmasının avantajları ve dezavanatjları nelerdir?

V. Politika Önerileri

1. Teknoparkta firmalar arası iletişimin artırılması için neler yapılmalı?

C. QUESTIONNAIRE FOR TENANT FIRMS

* Required Fields

1. Please indicate the date of establishment of your company.*
2. Which sector does your company focus on?*
    - Software
    - Electronics
    - Information and Communication Technology
    - Nanotechnology
    - Education-Consulting
    - Other

3. Specify the number of employees in your company, including partners.*

4. Specify the number of firms that your company is in connection with.* (the links can be in different forms like exchange of information, common work, input supply or service-product sales, etc.)

5. How many firms you are in connection with are located in the technology park?*

6. How many firms you are in connection with are located in Ankara (outside the METU Technopolis)?*

7. How many of them are located in a science and technology park other than the METU Technopolis?*

8. How many firms that you are in connection with are located in other cities of Turkey?*

9. How many firms that you are in connection with are located abroad? *

10. How would you rate your company in terms of its innovation capacity (Product-process or organizational innovation? *

1: Insufficient 5: Very good

- 1
- 2
- 3
- 4
- 5

11. How did you come together with the companies that you have a connection in the technology park? * (Connection may be in different forms like simple exchange of information, sharing business news, joint working, joint project development, product sales, input supply and so on.)

	Always	Often	Sometimes	Rarely	Never
Know previously the owner(s) of the other company (friends, relatives)					

12. What is the sectoral proximity of the companies that you have a connection with to your business in the technology park? * 1: The most distant 5: The nearest

- 1
- 2
- 3
- 4
- 5

13. Please rate the benefits that you have gotten or expect to get from the connections with other companies in the technology park. * From 1 to 8; 1 is the least relevant.

- To get a technical information that could not be obtained with my own efforts
- To get information that I could obtain with other sources more quickly
- To get information on existing support mechanisms
- To benefit from the connection of the company with other companies in the technology park
- To benefit from the connection of the company with other companies outside the technology park
- To do joint R & D projects / develop joint products
- To supply inputs - product sales
- I do not get any benefits, I do not think it is possible.

14. Please rate the benefits that you have gotten or expect to get from the connections with other companies outside the technology park. * From 1 to 6; 1 is the least relevant.

- To get a technical information that could not be obtained with my own efforts.
- To get information that I could obtain with other sources more quickly

- To get information on existing support mechanisms
- To benefit from the connection of the company with other companies.
- To do joint R & D projects / develop joint products
- To supply inputs - product sales

15. Please indicate your assessment for the statements given below. *

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
I first look it up on the internet when I need a business-related information.					
I do not think that other companies in the technology park can give me an information I cannot reach.					
We do not need to be connected with other companies in the technology park for the growth of my company.					
I do not think that taking part in the technology park has an effect in monitoring technology.					
Even if it is more economical to do a project / product by working together with another company, I would prefer to do it with my own means.					
If we do not take into account taxes and other financial advantages of being in technology park, we would be at the same technology level as if we did not take part in the technopark.					

16. Please specify the sources you use to search for a firm you need?*

- o Internet
- o Technopark company catalog

- Company that was previously connected to us
- Personal links
- Other

17. For the growth of your company, what is the area needed to be mostly improved?*

- New Product Development
- Improvement of Existing Products
- New Sales Channels
- New Supply Channels
- Other

18. Through which ways can undesirable information leakage from your company take place? *

- The departure of a person working in the company
- Informal contacts of employees
- The customers served
- Informal information sharing among firms
- Other

19. What can be done to increase the inter-connection/communication among the companies within the technology park?

D. QUESTIONNAIRE FOR TENANT FIRMS (IN TURKISH)

* Zorunlu Alanlar

1. Firmanızın kuruluş tarihini belirtiniz.*
2. Firmanız büyük ölçüde hangi sektörde faaliyet gösteriyor? *
   - o Yazılım
   - o Elektronik
   - o Bilgi ve İletişim Teknolojileri
   - o Nanoteknoloji
   - o Eğitim-Danışmanlık
   - o Diğer

3. Firmanızda ortaklar dahil çalışan sayısını belirtiniz. *

4. Firmanızın bağlantıda olduğu firma sayısını belirtiniz.*

(Bağlantı bilgi alışverişi, iş paslama, ortak çalışma, girdi tedariği veya hizmet-ürün satışı vs. şeklinde olabilir.)

5. Bağlantıda olduğunuz firmaların kaç tanesi ODTÜ Teknopark'ta yer alıyor? *

6. Bağlantıda olduğunuz firmaların kaç tanesi Ankara'da yer alıyor?*

7. Ankara'da bağlantıda olduğunuz firmalar içinde kaç tanesi ODTÜ Teknopark dışında bir teknoloji geliştirme bölgesinde yer alıyor? *

8. Bağlantıda olduğunuz firmaların kaç tanesi Türkiye'nin diğer şehirlerinde yer alıyor? *

9. Bağlantıda olduğunuz firmaların kaç tanesi yurt dışında yer alıyor? *

10. Ürün-süreç ya da organizasyonel inovasyon (yenilik) yapma anlamında firmanızı nasıl değerlendirirsiniz?*

1:Yetersiz 5: Çok iyi

- o 1
- o 2
- o 3
- o 4
- o 5

11. ODTÜ Teknopark içinde firmanızın herhangi bir şekilde bağlantıda olduğu firmalarla nasıl tanışmıştınız? * (Bağlantı basit bilgi alışverişi, iş paslama, teşviklerle ilgili bir haberi paylaşma, ortak çalışma, ortak proje geliştirme, ürün satışı, girdi tedariği vb. şeklinde olabilir.)

	Daima	Çoğunlukla	Bazen	Nadiren	Hiçbir Zaman
Firma sahipleriyle zaten önceden tanışıyorduk (arkadaş, akraba ilişkisi,vs.)					

12. Teknopark içinde firmanızın bağlantıda olduğu diğer firmaların sektör olarak size yakınlığı nedir? *

1: en uzak 5:en yakın

- o 1
- o 2
- o 3
- o 4
- o 5

13. ODTÜ Teknopark'ta yer alan firmalarla olan bağlantılarınızdan firmanız için elde ettiğiniz ya da elde etmeyi umduğunuz imkanları sıralayınız. *

1'den 8'e kadar: 1 en geçersiz

- Kendi çabamla elde edemeyeceğim teknik bir bilgi elde etmek
- Başka araçlarla ulaşabildiğim bilgiye daha çabuk erişmek
- Varolan destek mekanizmaları ile ilgili bilgi almak
- Firmanın Teknopark içindeki diğer firmalarla olan bağlantısından yararlanmak
- Firmanın Teknopark dışındaki diğer firmalarla olan bağlantısından yararlanmak
- Ortak Ar-Ge projesi yapmak/Ortak ürün geliştirmek
- Girdi tedariği-ürün satışı
- Herhangi bir somut fayda elde etmiyorum, edileceğini düşünmüyorum

14. ODTÜ Teknopark dışında yer alan firma bağlantılarınızdan elde ettiğiniz /etmeyi umduğunuz imkanları sıralayınız. * 1'den 8'e kadar: 1 en geçersiz

- Kendi çabamla elde edemeyeceğim teknik bir bilgi elde etmek
- Başka araçlarla ulaşabildiğim bilgiye daha çabuk erişmek
- Varolan destek mekanizmaları ile ilgili bilgi almak
- Firmanın diğer firmalarla olan bağlantısından yararlanmak
- Girdi tedariği-ürün satışı
- Ortak Ar-Ge projesi yapmak/Ortak ürün geliştirmek

15. Lütfen verilen ifadeler için değerlendirmelerinizi belirtiniz.*

	Kesinlikle katılıyorum	Katılıyorum	Kararsızım	Katılmıyorum	Kesinlikle katılmıyorum
İşle ilgili bir bilgiye ihtiyacım olduğu zaman ilk internete bakıyorum.					
ODTÜ Teknopark içindeki bir firmanın bana ulaşamayacağım bir bilgiyi vereceğini düşünmüyorum.					
Firmamın büyümesi için ODTÜ Teknopark'ta bulunan diğer firmalar ile bağlantıda olmamıza ihtiyacımız yok.					
Teknopark'ta yer almamın teknolojiyi takip edebilmem konusunda bir etkisinin olduğunu düşünmüyorum.					
Daha ekonomik olmasa bile bir projeyi/ürünü başka bir firma ile beraber çalışarak yapmaktansa kendi imkanlarımızla yapmayı tercih ederim.					
Vergi ve diğer finansal avantajları dikkate almazsak, Teknopark'da yer almasaydık da firmamız aynı teknoloji düzeyinde olurdu.					

16. İhtiyaç duyduğunuz bir konu ile ilgili bir firma ararken kullandığınız kaynakları belirtiniz.*

- o İnternet
- o Teknoparkın firma kataloğu
- o Şirketin daha önce bağlantıda olduğu firmalar
- o Kişisel bağlantılar
- o Diğer

17. Firmanızın büyümesi için en çok ihtiyaç duyduğunuz gelişme alanı nedir?*

- o Yeni ürün geliştirme
- o Mevcut ürünü iyileştirme
- o Yeni satış kanalları
- o Yeni tedarik kanalları
- o Diğer

18. Firmanız ile ilgili istemediğiniz bir şekilde bilgi sızması hangi yollarla olabilir?*

- o Firmada çalışan bir kişinin ayrılması
- o Çalışanların sosyal ortamlardaki informal görüşmeleri
- o Hizmet verilen müşteriler
- o Firmalar arası informal bilgi paylaşımı
- o Diğer

19. Teknopark içinde yer alan firmalar arası bağlantıların/iletişimin artırılması için neler yapılabilir?

E. TURKISH SUMMARY

Rekabetin hiç olmadığı kadar arttığı günümüz küresel ekonomisinde, firmaların yeni bilginin üretilmesi ve işlenmesine dayalı olarak ortaya çıkan katma değer üretim süreçlerine olan ihtiyacı giderek artmaktadır (Bettis & Hitt, 1995; Grant, 1996; Nahapiet & Ghoshal, 1998; Nonaka & Takeuchi, 1995). Böyle bir ortamda, firmaların başarısı kıt kaynaklar üzerinde kontrol sahibi olmanın yanında bilgiyi etkili bir biçimde öğrenme ve kullanma yetkinliği ile de yakından ilişkilidir (Larsson, Bengtsson, Henriksson, & Sparks, 1998). Bu durum özellikle bilginin sürekli değiştiği ve yenilendiği ileri teknoloji sektörlerinde faaliyet gösteren firmalar için geçerlidir. Diğer sektörlerdeki firmalar üretim kapasitesi, dağıtım kanalları gibi daha statik kaynaklara bağlı olarak çalışmakta iken, teknoloji firmalarının büyüme olanakları bilgi birikimi ve yeni bilginin elde edilmesine daha çok bağlıdır.

Yeni bilginin üretimi ve işlenmesi amacıyla firmalar, endüstriyel ağlar içindeki bireyler ya da gruplar arası ilişkileri yoluyla yetkinlik kazanmakta ya da varolan yetkinliklerini artırmaktadır (Kogut and Zander, 1995). Bu ilişki ağları firmaların Bourdieu'nün (1986) tanımıyla "toplumsal sermaye"ye erişimini sağlamaktadır. Bu tür bir sermaye, Nahapiet ve Ghoshal (1998) tarafından ilişki ağlarında gömülü, kullanılabilir ve bu ilişkilerden türetilen gerçek ve potansiyel kaynakların toplamı olarak tanımlanmakta ve genel olarak "sosyal sermaye" olarak adlandırılmaktadır.

Özellikle son yıllarda sosyal bilimler alanında popüler bir araştırma konusu haline gelen sosyal sermaye kavramı, ilk kez Hanifan'ın 1920 tarihli "Toplum Merkezi" adlı kitabında kullanılmıştır. Bu kavram, ortaya çıkışından bu yana sosyolojiden sağlığa farklı disiplinden gelen birçok çalışmanın odak noktası olmuştur. Bu da, sosyal sermaye kavramı ile ilişkili olarak birçok tanımın, yapının ve özelliğin ortaya çıkarıldığı zengin bir analiz havuzunun oluşmasına katkıda bulunmuştur.

Sosyal sermaye kavramı ilgili yazında,"kalıcı bir ağa sahip olmayla ilişkili gerçek veya potansiyel kaynakların toplamı" (Bourdieu, 1986), "finansal sermaye ile beşeri sermayeye yönelik fırsatların elde edilebileceği arkadaşlar, iş arkadaşları ve daha genel bağlantılar" (Burt, 1992) ya da "karşılıklı fayda sağlamak üzere eşgüdüm ve işbirliğini kolaylaştıran ağlar, normlar ya da sosyal güven gibi sosyal örgütlenme özellikleri" (Putnam, 1993) olarak tanımlanmaktadır. Bu çerçevede, sosyal sermayenin çeşitli tanımları geliştirilmiş olsa da, bu tanımlar genel anlamda sosyal birimler arasındaki bağlantıları, ağları, ya da etkileşimleri vurgulamaktadır.

Günümüz bilgi ekonomisinin yarattığı koşullar içinde, maddi olmayan varlıklar firmalar için her zamankinden daha önemli hale gelmiştir. Avrupa Birliği ülkelerinde, 1995 ve 2005 yılları arasında maddi olmayan varlıklara yapılan yatırımlar maddi varlıklara yapılan yatırımlardan daha hızlı büyüme göstermiştir (Jona-Lasinio ve diğerleri, 2011). Bu açıdan, maddi olmayan varlıklar içinde sayılan firmaların sosyal sermayesi çalışma alanı olarak birçok araştırmacının dikkatini çekmiştir. Ancak bu alanda keşfedilmeyi bekleyen birçok konu varlığını korumaya devam etmektedir. Bu konulardan biri de teknoloji firmalarının sosyal sermayesidir.

İnovasyonun etkileşimden beslenen bir fenomen olması dolayısıyla, sosyal sermaye teknoloji firmaları için diğer sermaye türlerinin yanı sıra önemli bir rol oynamaktadır (Utterback, 1971). Bilginin hızla değiştiği bir ortamda inovasyonun daha zor bir faaliyet haline gelmesi, teknoloji şirketlerinin firmalar arası ağlara daha fazla bağımlı olmasına yol açmıştır (Liebeskind vd., 1996; Powell vd., 1996).

Teknoloji firmaları ve sosyal sermaye kavramı arasındaki ilişkiyi konu alan çalışmalar, sosyal sermayenin bilgiyi elde etme ve yeniden yaratmayı kolaylaştırarak, teknoloji tabanlı yeni firmaların uluslararası arenada büyümeleri için önemli bir etken olduğunu bulmuş (Yli-Renko vd., 2002) veya gayrı resmi bilgi alışverişinin yüksek teknoloji alanındaki yeni firmalar için önemini vurgulamıştır Fukuyama (1995). Ancak, bu alanda yapılan araştırmalar incelendiğinde, az sayıda çalışmanın teknoloji firmaları için sosyal sermayenin kökenleri ile faydalarına odaklandığı görülmektedir. Bu nedenle teknoloji firmalarının özellikle belli bir coğrafi alan dahilindeki sosyal

sermaye gelişimini anlamak adına daha fazla araştırmaya ihtiyaç duyulmaktadır. Sosyal sermayenin bilim ve teknoloji parklarında bulunan teknoloji firmaları için kökenlerini ve katkılarını araştıran bu tez çalışması, ilgili yazındaki söz konusu ihtiyacı karşılamaya katkıda bulunmayı amaçlamaktadır.

Bilim ve teknoloji parkları (BTP) firmalar arasında yakın sosyal etkileşimi ve bilgi alışverişini teşvik etmek için kurulmuş alanlardır. BTP, belli bir yönetim merkezi olan ve bilgi birikimi ile kaynak paylaşımı yoluyla büyümeyi hedef alan mülkiyet tabanlı bir örgüt olarak tanımlanabilmektedir (Phan vd, 2005). BTP, bilgi kümesi olarak sahip olması gereken asgari standartlar doğrultusunda, bünyesinde bulundurduğu firmalar arasında bilgi ve kaynak aktarımını ve inovasyonu teşvik etmek üzere firmalar arasında etkileşimi sağlamayı hedef alma durumundadır (Hansson vd., 2005).

BTP üzerine yapılan çalışmalar genel olarak BTP için başarı koşulları, iyi uygulamalar, performans değerlendirmeleri gibi konulara odaklanmakta olup BTP'nin firma performansı üzerindeki etkilerini araştıran çalışmalar da farklı sonuçları ortaya koymaktadır. Bazı çalışmalar BTP'nin patent sayısı (Squicciarini 2008; Wright vd, 2008), verimlilik (Yang vd., 2009), yeni ürün geliştirme (Siegel vd, 2003) üzerinde olumlu etkisini vurgularken, BTP'nin patent (Westhead, 1997), karlılık (Lofsten ve Lindelof, 2005) ve büyüme (Monck vd., 1988; Dettwiler vd., 2006) üzerinde önemli bir etkisi olmadığını gösteren çalışmalar da mevcuttur. Ancak yapılan bu çalışmalar, yalnızca geleneksel ekonomik göstergelere odaklanıp ağ ekonomisi içindeki sosyal ilişkilerin getirdiği maddi olmayan varlıkları dikkate almadıkları için eleştirilmektedir (Westlund, 2006). Bu nedenle belli bir fiziksel alan kapsamında firmalar arası ağ ilişkilerini daha iyi anlamak adına BTP ve firmalar arasındaki ilişkiyi sosyal sermaye kavramı üzerinden araştıran çalışmalar önem kazanmaktadır. Ayrıca bu araştırmaların içinde KOBİ'lere odaklanan çalışmalar öne çıkmaktadır. Cooke ve Willis'e (1999) göre küçük firmaların sosyal sermaye yönünden analiz edilmesi sosyal sermaye kavramı için yeni bir anlayış geliştirilmesine katkıda bulunmuştur. Bugüne kadar yapılan çalışmalar, küçük ölçekteki işletmeler için gayrı resmi ağların, güven ve işbirliğinin önemini vurgulamaktadır. Büyük firmalar finansal veya insan kaynakları gibi farklı kaynaklara erişim için daha fazla olanağa sahipken, küçük ve orta ölçekteki

firmaların büyümek için gayrı resmi ağlara, güven ve işbirliğine bağımlılığı daha fazladır. Bu nedenle, KOBİ'lerin sosyal sermayesi daha fazla sayıda araştırma gerektiren bir alan olarak karşımıza çıkmaktadır.

Bu tez çalışması, bilim ve teknoloji parklarında bulunan KOBİ'ler için sosyal sermayenin kaynak ve faydalarını inceleyerek, sosyal sermaye yazınında yukarıda değinilen boşlukları doldurmaya katkıda bulunmayı amaçlamaktadır. Bu amaç doğrultusunda iki temel araştırma konusu geliştirilmiştir. İlk araştırma konusu sosyal sermayenin kaynaklarıyla ilgili olup, BTP'de bulunan teknoloji firmalarının ikili ve ağ tabanlı ilişkileri içinde hangi mekanizmalar aracılığıyla sosyal sermayenin oluştuğunu ve hangi etmenlerin bu süreçte etkili olduğunu ortaya koymaya yöneliktir. İkinci araştırma konusu ise teknoloji tabanlı firmaları için sosyal sermayenin yararlarına ilişkindir. Yapılan çalışmalar, bilgi kanallarına erişim veya inovasyonu firmalar için sosyal sermayenin temel faydası olarak göstermiştir. Bu tez çalışması ise ilgili yazındaki bahsi geçen etmenlerin BTP'de yer alan teknoloji firmaları için de geçerli olup olmadığını ve varsa başka hangi faydaların oluştuğunu araştırmayı amaçlamaktadır. Bu tez çalışmasında belirlenen amaçlar doğrultusunda güvenilir sonuçlara ulaşmak için hem nicel hem de nitel yöntemleri kullanarak karma bir yaklaşım uygulanmıştır. Böylece, tek bir yöntem ile elde edilen sonuçlar, özellikle örneklem belirleme ve değerlendirme aşamalarında kullanılmak üzere, diğer yöntemden gelen sonuçlar ile tamamlanabilmektedir. Nitel araştırmalarda kullanılan teknikler içinde, vaka analiz yöntemleri, karmaşık sosyal olguları araştırmak için kullanılmaktadır (Yin, 2003). Bu nedenle, bu çalışmada da çoklu vaka analiz tekniğine başvurulmuştur.

BTP'de yer alan teknoloji firmaları için sosyal sermayenin kaynak ve faydalarını incelemek üzere ODTÜ Teknokent örnek araştırma alanı olarak seçilmiştir. ODTÜ Teknokent Ankara'da bulunmakta olup, Türkiye'nin ilk teknoparkıdır.

Türkiye'de teknopark konusunda yapılan politika ve resmi çalışmalar 2001 yılında yürürlüğe giren "Teknoloji Geliştirme Bölgeleri Yasası" ile başlamıştır. Bu yasa, Türkiye'de "Teknoloji Geliştirme Bölgeleri" (TGB) olarak tanımlanan teknoparkların

kurulması için yasal zemini oluşturmuştur. Bu yasa, TGB ile üniversiteler, araştırma kurum ve kuruluşları ile özel sektör arasında işbirliği sağlayarak, teknolojik bilgi üretilmesini, üründe ve üretim yöntemlerinde yenilik geliştirilmesini, verimliliğin artırılmasını, teknolojik bilginin ticarileştirilmesini, teknoloji yoğun üretim ve girişimciliğin desteklenmesini ve teknoloji yoğun alanlarda yatırım olanaklarının artırılmasını amaçlamaktadır.

Bilim, Sanayi ve Teknoloji Bakanlığı (BSTB) verilerine göre, Türkiye'de Haziran 2014 itibariyle 40 tanesi aktif olmak üzere toplam 55 kayıtlı TGB bulunmakta olup, bu bölgelerde 2778 firma yer almaktadır. Bu firmaların yaklaşık %40'ı yazılım sektöründe faaliyet göstermektedir ve bilişim ve elektronik sektörleri sırasıyla %18 ve %7'lik paya sahiptir. BSTB 2011 ve 2012 yılları için Türkiye'deki TGB'nin performanslarını ölçmek amacıyla bir endeks hazırlamıştır. Her iki endekste ODTÜ Teknokent ilk sırada yer almaktadır.

ODTÜ Teknokent Türkiye'nin ilk teknoparkı olması dolayısıyla Türkiye'deki diğer teknoparklardan daha köklü bir geçmişe sahip olması nedeniyle, sosyal sermaye araştırması için daha uygun bir ortam sağlamaktadır. ODTÜ Teknokent Yönetici Şirketi'nden alınan verilere göre, mevcut durumda ODTÜ Teknokent'de 338 firma ve 7098 çalışan bulunmaktadır. Bu rakamlar Türkiye'nin tüm teknoparklarında yer alan firma ve çalışan sayısının sırasıyla %12 ve %25'ini temsil etmektedir. Bu bakımdan ODTÜ Teknokent, teknoloji firmaları arasında sosyal sermayeyi araştırma açısından zengin bir örneklem sunmaktadır.

ODTÜ Teknokent Yönetici Şirketi tarafından teknopark için şu hedefler belirlenmiştir:

- Türkiye'nin Ar-Ge potansiyeline ve teknoloji üretebilme yeteneğine katkı sağlamak,
- Katma değeri yüksek hizmet ve ürünlerin Dünya pazarına sunulmasına katkı sağlamak,
- Sektör öncelikleriyle Türkiye'nin teknoloji üretiminin ve birikiminin yönlendirilmesinde rol oynamak,

- Üniversite - sanayi işbirliğini etkin ve sürekli kılmak,
- Üniversitedeki araştırma altyapısının ve bilgi birikiminin ekonomik değere dönüşmesine katkı sağlamak,
- Girişimciliği ve yenilikçiliği teşvik etmek ve desteklemek,
- Seçilmiş sektörlerde küresel ölçekte rekabet edebilir nitelikteki şirketlere öncelik vermek,
- Dünya pazarlarına yönelik ileri teknoloji ürün ve hizmet üretimini desteklemek,
- Teknoloji transferi için uygun ortam yaratmak,
- Bölgesel sürdürülebilir kalkınmanın unsurlarından birisi olmak,
- Nitelikli işgücüne istihdam yaratmak,
- Başta Avrupa Birliği ülkeleri olmak üzere uluslararası işbirliğini güçlendirmek.

ODTÜ Teknokent'te yer almak isteyen firmalar için ODTÜ Teknokent Yönetim A.Ş. tarafından başvuru ve kabul süreci oluşturulmuş ve birtakım katılım koşulları belirlenmiştir. Genel olarak teknoparkta yer almak isteyen firmaların katma değeri yüksek teknolojik ürünleri üretecek düzeyde yeterli kabiliyete sahip olması ve yazılım geliştirme ve Ar-Ge çalışmalarını fiilen yapıyor ya da yapabilecek kapasitede olması gerekmektedir. Dolayısıyla teknoparka katılım koşulları, bu tez çalışmasının odak grubunu oluşturan teknoloji firmalarını seçmek için güvenilir bir örneklem oluşturmaya zemin hazırlayıcı niteliktedir. Bu nedenle bu tez çalışmasında ODTÜ Teknokent'de yer alan firmalar teknoloji firması olarak kabul edilmiştir.

ODTÜ Teknokent'te yer alan firmaların sektörel dağılımına bakıldığında en büyük paya sahip ilk üç sektörün yazılım, bilişim ve elektronik olduğu görülmektedir. Bu firmaların yaklaşık %46'sı 0-5 yıllık faaliyet geçmişine sahip firmalardır. Firmaların yaklaşık %84'ü 25'ten az çalışan sayısına sahiptir.

Bu tez çalışmasında nitel veri elde etmek amacıyla ODTÜ Teknokent'te bulunan 9 farklı firma sahibi ya da genel müdür ile yarı yapılandırılmış görüşme yapılmıştır. Bunun için öncelikle bir görüşme protokolü hazırlanmış, daha sonra pilot bir görüşme

çalışması yapılarak hazırlanan protokolde soru sayısı, sıralanışı ve kullanılan ifadelerde gerekli görülen değişiklikler yapılmış ve protokole son hali verilmiştir. Görüşmeler Haziran – Temmuz 2014'te gerçekleştirilmiştir. Bu görüşmelerden elde edilen veriler, gömülü kuram kullanılarak analiz edilmiştir. Glaser ve Strauss (1967) tarafından geliştirilen bu yöntemde veriler sistematik olarak toplanıp analiz edilmekte ve tümdengelim bir anlayıştan ziyade verilerin içinde gömülü olan kuramların ortaya çıkarılması hedeflenmektedir. Gömülü kuramda veriler dört temel basamak izlenerek analiz edilmektedir. İlk basamak olan açık kodlamada veriler analiz edilerek kategoriler çıkarılırken, ikinci basamak olan eksenel kodlamada kategoriler arasında ilişki oluşturulmaya çalışılmaktadır. Daha sonra seçici kodlamaya geçilir ve ana kategori oluşturularak alt kategoriler ana kategori ile ilişkilendirilir. Son aşamada ise ulaşılan neden sonuç ilişkileri doğrultusunda kurama ulaşılmaktadır. Bu tez çalışmasında da gömülü kuramın belirtilen aşamaları izlenerek nitel veriler analiz edilmiş ve beş adet önerme geliştirilmiştir.

Tez çalışması için kullanılan nicel veriyi elde etmek için ise ODTÜ Teknokent'te bulunan ve iletişim bilgisine ulaşılabilen 100 firmaya anket gönderilmiş, bunlardan 53 firma ankete geri dönüş yapmıştır. Geri dönüş yapan 53 firmanın yaklaşık %50'si yazılım, %34'ü elektronik, %7,5'i eğitim ve danışmanlık, %5,7'si bilişim ve %3,8'i nanoteknoloji alanında faaliyet göstermektedir. Ayrıca söz konusu 53 firmanın yaklaşık olarak %50'si 0-5 yıllık faaliyet geçmişine ve yaklaşık %80'ninin ise 25'ten az çalışan sayısına sahip olduğu tespit edilmiştir. Bu oranlar ODTÜ Teknokent'te bulunan tüm firmalar için ulaşılan oranlarla benzerlik göstermektedir. Toplanan nicel veri IBM SPSS Statistics 22 programı kullanılarak analiz edilmiştir.

Toplanan verilerin analiz edilmesiyle ulaşılan sonuçlara göre şu önermeler geliştirilmiştir:

1. Bilim ve teknoloji parklarında bulunan teknoloji firmaları için gayrı resmi ağlar ile sosyal sermaye oluşumu olumlu yönde ilişkilidir.
2. Bilim ve teknoloji parkları tarafından sağlanan mekansal yakınlık bu parklarda bulunan teknoloji firmaları arasında sosyal sermaye oluşumu için bir kaynak ya da itici güç oluşturmamaktadır.

3. Bilişsel özelliklerin varlığı bilim ve teknoloji parklarında bulunan teknoloji firmaları arasında sosyal sermaye oluşumu için tek başına yeterli bir koşul teşkil etmemektedir.
4. İnternet teknoloji firmaları için sosyal sermayenin bilgiye yönelik yararlarını sınırlayıcı niteliktedir.
5. Teknoloji firmaları interneti aynı bilim ve teknoloji parkında yer alan diğer firmalarla olan zayıf bağlarıyla büyük ölçüde ikame edilebilir olarak algılamakta ve bu bağlarını güçlü bağlarından daha az değerli görmektedir. Dolayısıyla bu firmalar, teknoparktaki diğer firmalarla olan sosyal sermayelerini güçlü bağlar yoluyla artırmayı tercih etmektedir.

Tez kapsamında ulaşılan sonuçlar çerçevesinde geliştirilen modele göre, bilim ve teknoloji parklarında yer alan teknoloji firmaları arasında sosyal sermaye oluşumu için bu firmaların sahipleri ya da genel müdürleri arasındaki gayrı resmi ağlar önemli bir kaynak teşkil etmektedir. Firmalar arasındaki bağlar zayıf ya da güçlü olabilmektedir.

Her iki tür bağ da firmalar için değerlidir ancak bilgi kaynağı olarak kullanılan internet zayıf bağların bu firmalar için değerini azaltmaktadır. Ayrıca, firmaların ilişki ağlarının sunduğu yararın değeri, firmaların amaçları ile bu ağların sunduğu fayda arasındaki uyuma bağlıdır. Teknoloji firmalarının temel amaçlarından biri de Ar-Ge ve inovasyon faaliyetlerini gerçekleştirmek olduğundan, iş ortakları arasında daha yakın bir iletişimi gerektiren ve bu tür faaliyetlerin hayata geçirilmesini mümkün kılabilen güçlü bağlar, teknoloji firmaları tarafından daha önemli görmektedir.

Bu tez çalışmasıyla bilim ve teknoloji parklarında bulunan firmalar için sosyal sermayenin kaynakları konusunda önemli bulgular elde edilmiştir. Yapılan araştırmalara göre, bireyler arasındaki gayrı resmi ilişkiler, bu kişilerin yer aldığı kuruluşlar arasındaki etkileşim için temel oluşturmaktadır. Bu tez çalışmasıyla da benzer bir sonuç elde edilmiştir. Buna göre, bilim ve teknoloji parklarında yer alan teknoloji şirketlerinin sahipleri ya da genel müdürleri arasındaki gayrı resmi ağlar firmalar arası sosyal sermaye oluşumu için de önemli bir kaynak oluşturmaktadır.

Ayrıca, gayrı resmi ağların sosyal sermaye oluşumunda gözlenen etki firmaların yeni ya da daha köklü olmasına göre değişiklik göstermemektedir.

Fiziki olarak yakın olan aktörler birbirlerini yakından tanıma bakımından daha fazla olanağa sahiptirler. Bu doğrultuda, yüz yüze görüşme imkanı sağlayan coğrafi yakınlık sayesinde firmalar, resmi ve gayrı resmi ilişkilerini geliştirip, güven ortamı oluşturma konusunda daha fazla imkana sahiptirler. Ancak bu tez çalışmasıyla, aynı bilim ve teknoloji parkında yer alan firmalar arasında sosyal sermaye oluşumu için aynı fiziksel alanda olmanın bir etkisine ulaşılamamıştır. Buna göre, teknoloji firmaları teknoparkın sosyal yapısını sosyal sermaye oluşturma için bir kaynak olarak görmemektedir. Bu nedenle teknoparkların sunduğu fiziksel yakınlığın bu parklarda bulunan teknoloji firmaları arasında sosyal sermaye gelişimi için bir kaynak ya da itici güç niteliğinde olmadığı sonucuna ulaşılmıştır.

Bilişsel faktörler bireyler arasında ortak anlayış ya da anlamlandırma sistemi sunan kaynakları ifade etmektedir (Cicourel, 1973). İnovasyon yapma amacıyla farklı bilgileri kullanma ve bir araya getirme sürecinde taraflar arasında en azından ortak bir dilin olması gerektiğini gösteren çalışmalar mevcuttur. Örnek durum olarak seçilen ODTÜ Teknokent'te yer alan firmalar için yapılan görüşmelerde saptanan bilişsel faktörler Ar-Ge firması olma, çalışanların çoğunun mühendis olması ve benzer ya da aynı üniversitelerden gelen mezunlardan oluşması şeklindedir. Ancak firmalar tarafından tanımlanan bu bilişsel özellikler, diğer firmalarla bir araya gelme, etkileşim içine girme ya da sosyal sermaye geliştirme anlamında yeterli bir koşul olarak görülmemektedir. Bu nedenle bilişsel özelliklerin varlığı bilim ve teknoloji parklarında bulunan teknoloji firmaları arasında sosyal sermaye gelişimi için yeterli bir koşul oluşturamamaktadır.

Sosyal sermaye firmalar için önemli bir bilgi kaynağıdır. Yapılan çalışmalar, ilişki ağları aracılığıyla firmaların farklı alanlarda birçok bilgiye erişebildiklerini ve bu yolla bilgiyi arama maliyetlerinin düştüğünü söylemektedir. Ancak bu tez çalışmasında teknoloji firmalarının aradıkları birçok bilgiye internet aracılığıyla ulaşabildiği saptanmıştır. İnternet bu anlamda firmalara bilgiye sınırsız ve hızlı erişim imkanı

sağlamaktadır. Ayrıca teknoloji firmaları çalıştıkları alan ve sahip oldukları kalifiye insan kaynakları gereği interneti kullanma ve elde edilen bilgileri işleme bakımından yeterli yeteneğe sahiptirler. Bu açıdan internet aracılığıyla firmalar, ihtiyaç duydukları yazılı bilgiyi elde etmekte, teknolojideki yenilikleri takip etmekte veya iş ortağı bulabilmektedir. Bu nedenle ilişki ağlarından elde edilebilecek yazılı ya da kodlanmış bilgiler internet yoluyla erişilebilmektedir. Bu da bizi internetin sosyal sermayenin bilgi bazlı faydalarını kısıtlayıcı nitelikte bir etki yaptığı sonucuna ulaştırmaktadır.

Krackhardt ve Hanson'a (1993) göre asıl önemli olan firmanın amaçları ile ağlar arasındaki uyumdur. Bu uyuma göre firmalar ilişki ağlarının ya da bu ağlardan elde ettikleri faydaların değerini belirlemektedir. Yapılan araştırmalar zayıf bağların kodlanmış ya da açık bilgiyi elde etmede etkili olduğunu söylerken, güçlü bağların daha karmaşık ve örtük bilgilerin elde edilmesi ve paylaşımı noktasında önemli olduğunu belirtmektedir. Bu tez çalışmasında ulaşılan sonuçlar, internetin açık ya da kodlanmış bilgiyi elde etme adına önemli bir kaynak oluşturduğunu ve zayıf bağların da daha çok bu tür bilgiyi elde etmede faydalı olmasından dolayı, internetin teknoloji firmalarının zayıf bağları üstünde ikame etkisi yarattığını göstermektedir. Bu ikame etkisi aynı zamanda firmalar için zayıf bağların değerini azaltıcı etki yapmaktadır. Öte yandan, inovasyon ya da Ar-Ge faaliyetlerinde kullanılan örtük bilgi, daha fazla enerji ve zaman harcanmasıyla oluşan güçlü bağlar yoluyla elde edilebilmektedir. Bu tez çalışması ile büyüme ve başarı için bu tür faaliyetlerin yürütülmesinin önem arz ettiği teknoloji firmaları için bulundukları teknopark içindeki diğer firmalarla geliştirdikleri ya da geliştirmeyi umdukları güçlü bağların daha değerli olduğu tespit edilmiştir. Bu nedenle bu firmaların teknopark içindeki diğer firmalarla olan sosyal sermayelerini güçlü bağlar üzerinden geliştirmeyi tercih ettikleri önermesi geliştirilmiştir.

Tez çalışmasıyla elde edilen sonuçlar ışığında birtakım yönetimsel ve politika çıkarımlarında bulunmak mümkündür. Öncelikli olarak teknoloji firmaları sosyal sermayenin bilgi elde edinimi, inovasyon, büyüme gibi göstergelere olan pozitif etkisinin farkındalığına sahip olmalıdırlar. Örnek vakamızda olduğu gibi teknoloji firmaları sosyal sermaye gelişimi için büyük ölçüde gayrı resmi ağlara bağlı

kalmayarak, farklı kaynaklar üstünden sosyal sermayelerini artırma yoluna gitmelidirler.

Bilim ve teknoloji parkları teknoloji üretimi ya da ekonomik büyüme gibi hedeflere ulaşabilmeleri için öncelikli olarak, bünyesinde bulundurdukları firmalar arasındaki iletişim ve etkileşimi artırmalıdırlar. Ancak bu konuda Türkiye'deki teknoparklar tarafından yapılan çalışmaların yetersiz olduğu savunulabilir. Örnek vakamız olan ODTÜ Teknokent için belirlenen hedefler yakından incelendiğinde, teknoparkta bulunan firmalar arası iletişim ve etkileşimin artırılması gibi açık ve somut bir hedefin olmaması dikkat çekmektedir.

Bu tez çalışmasında ortaya konduğu gibi teknoloji firmaları arasındaki sosyal sermayenin oluşumunda firma sahipleri arasındaki gayrı resmi ilişkilerin etkili olması, teknoparkların fiziksel yapısının insanlar arasındaki etkileşimi kolaylaştıracak ve artıracak şekilde tasarlanması gerekliliğini ortaya çıkarmaktadır.
Türkiye'deki teknoparklar genel olarak belli ve sınırlı bir alanda bulunan bir ya da daha fazla binadan oluşan bölgeler şeklindedir. Teknoparkların firmalara sunmuş olduğu bu fiziksel yakınlık, firmalar için yüz yüze görüşme ya da birbirlerini daha yakından tanıma imkanı yaratsa da, firmalar arasında sosyal sermayenin oluşturulması için bir kaynak teşkil etmemektedir. Bu nedenle teknopark içindeki fiziksel yakınlığın firmalar arasında otomatik olarak iletişim ve etkileşimi doğuracağı sonucuna ulaşmak yanıltıcı olacaktır. Bu doğrultuda, gerek teknopark yönetici şirketleri gerekse de politika yapıcıları teknoparklarda bulunan firmalar arası sosyal sermayenin gelişimi için ilave bir çabanın gerektiği kabulüyle hareket etmelidir.

Türkiye'deki teknoparklarda bulunan firma profilleri incelendiğinde bunların birbirlerine çok benzer nitelikte firmalar olduğu görülmektedir. Genel olarak bu firmalar KOBİ statüsünde, mühendislik ağırlıklı iş yapan ve yazılım ya da buna yakın sektörlerde faaliyet gösteren firmalardır. Ancak firmaların bu ve buna benzer ortak özellikleri sosyal sermayenin oluşumu için yeterli bir zemin oluşturmamaktadır. Firmalar arasındaki bu benzerlikler firmaların birbirlerine rakip olma durumu ortaya çıkarmakta ve bir arada iş yapma olanaklarını kısıtlayıcı etki gösterebilmektedir. Bu

nedenle, teknopark yönetici şirketleri, firmaların farklı stratejilerine ve ihtiyaçlarına cevap verecek şekilde firma komposizyonlarını çeşitlendirmelidir. Teknoparkta yer alan firmalar belli amaçlar çerçevesinde küçük gruplar halinde bir araya getirilmeli ancak bu gruplar oluşturulurken firma kabiliyetlerinin çakıştığı küme bazlı temalardan çok, bu yeteneklerin birbirini tamamladığı daha kapsayıcı alan ya da amaçlar oluşturulmalıdır.

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