ASSESSMENT OF TECHNOLOGY DEVELOPMENT ACTIVITIES IN TURKISH TECHNOPARKS

by

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B.S., Systems Engineering, Yeditepe University, 2003

Submitted to the Institute for Graduate Studies in
Science and Engineering in partial fulfillment of
the requiremets for the degree of
Master of Science

Graduate Program in Systems and Control Engineering
Boğaziçi University

2007

Muhteşem Aileme

Ve

Çok Sevdiğim Üniversiteme

ACKNOWLEDGEMENTS

I would like to express my truthful gratitude to Assoc. Prof. Ramazan Yıldırım for his guidance, encouragement and inexhaustible patience. I have learned a great deal from him. Threfore, I wish to thank him for his efforts.

Deepest thanks are owing to all respondnets participating in " Assessment of Technology Development Activities in Turkish Technoparks Questionnaire". By using their answers and comments the Work is done.

I wish to thank to thesis committee members.

Special thanks are due to all my friends at Systems and Control Engineering Department for their support in every way.

I wish to thank to my family for their patience, encouragement and understanding. They believed in me all the time. This thesis would not have been possible without their encouragement and support. This thesis is dedicated to them.

ABSTRACT

ASSESSMENT OF TECHNOLOGY DEVELOPMENT ACTIVITIES IN TURKISH TECHNOPARKS

In this study, a survey was conducted among the firms in Turkish technoparks in order to asses the technology development activities in these technoparks. A questionnaire was prepared and distributed to the firms in five technoparks in three cities in face to face interview. These technoparks are İTÜ ARI Technocity in İstanbul, TÜBİTAK MAM Technocity in Gebze, Kocaeli, GOSB Technopark in Gebze, Kocaeli, Cyberpark (Bilkent University) in Ankara, and ODTÜ Technocity in Ankara. The questionnaire was distributed to 242 corporations in these technoparks, and it was filled by 168 companies. It was found that the majority of the firms are in the software related businesses and originated by the industry (85.7 percent) rather than the university. Apparently most of the firms are developing their own product or service although patent application is not quite common. This is also evident from the relatively high R&D spending (53 percent of budget) and the ratio of the employees working in R&D (73 percent). The university graduates constitute the highest percents in both R&D (46.1 percent) and other fields (17.4 percent). Various reasons from tax privilege to R&D environment and supports were stated as the reasons to operate in a technoparks; and the technology development support mainly come from various institutes such as TÜBİTAK, TİDEB, TTGV and KOSGEB. The majority of the respondents believe that the technopark applications in Turkey are successful with respect to both the firms (73.7 percent of respondents) and the country (65.3 percent) while about 80 percent of the respondents consider the current status of Turkish technoparks in the world as “poor”. The benefits of the technoparks for the companies and the country, and the necessary conditions for the success were also asked and evaluated in terms of their importance and their realization level.

ÖZET

TÜRK TEKNOPARKLARINDA TEKNOLOJİ GELİŞTİRME FAALİYETLERİN DEĞERLENDİRİLMESİ

Bu çalışmada Türkiye'deki teknoparklarda teknoloji geliştirme faaliyetlerinin belirlenmesine yönelik bir anket yapılmıştır. Hazırlanan anket üç farklı şehirdeki beş farklı teknoparktaki şirketlerle yüz yüze görüşülerek doldurulmuştur. Bu teknoparklar İstanbul'da ARI Teknokenti, Gebze Kocaelinde TÜBİTAK MAM Teknokenti, ve GOSB Teknoparkı, Anakarada ise Ankara Cyberpark ve ODTÜ Teknokent'tir. Anketin dağıtıldığı 242 şirketten 168 şirket yanıt vermiştir. Anket sonucunda firmaların çoğunun yazılımla ilgili alanlarda faaliyet gösterdiği ve %85.7'sinin endüstri kökenli olduğu belirlenmiştir. Patent uygulaması yaygın olmamakla birlikte, firmaların çoğu kendi ürünlerini ve servislerini kendilerinin geliştirdiklerini belirtmektedirler. Bu durum Ar-Ge harcamalarının %53 gibi yüksek bir değerde olmasından ve Ar-Ge'de çalışanların toplam çalışanların %73'nü oluşturmasından da anlaşılmaktadır. Üniversite mezunları Ar-Ge'de %46.1 ve diğer alanlarda % 17.4 ile en yüksek orana sahiptir. Firmalar teknoparkta faaliyet gösterme nedenleri olarak vergi avantajı, Ar-Ge ortamı ve desteği gibi sebepleri göstermektedirler. Söz konusu Ar-Ge desteğinin büyük ölçüde TÜBİTAK, TİDEB, TTGV ve KOSGEB gibi kurumlardan geldiği anlaşılmaktadır. Ankete katılanların çoğu teknopark uygulamaların hem firmalar (katılımcıların %73.7'si) hem de ülke için (% 65.3) faydalı olduğuna inanmakta ancak büyük çoğunluk teknopark uygulamalarını dünyadaki diğer örneklerine göre "zayıf" bulmaktadır. Teknoparkların firma ve ülkeye sağladığı yararlar ile başarılı olmanın gerektirdiği koşullar da ankete dahil edilmiş, belirtilen faktörler hem önem dereceleri, hem de bugünkü gerçekleşme seviyelerine göre değerlendirilmiştir.

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LIST OF SYMBOLS / ABBREVIATIONS

n	Number of observation
$\overline{X}$	Mean
X_i	Value of each scale
n_i	Number of Responses for each scale
μ	Mean or Average of the Expectation Factors
σ	Standard Deviation
SD	Standard Deviation
ν	Variance of the Expectation Factors
ATAP	Anatolia Technology Research Park
CRM	Customer Relationship Management
EBN	European Business and Innovation Centre Network
EC	European Community
ECSC	European Coal and Steel Community
EIB	European Investment Bank
ERDF	European Union Economic and Regional Development Fund
ERP	Enterprise Resource Planning
FDI	Foreign Direct Investment
GAO	General Accounting Office
GOSB	Gebze Organizing Industry
GYTE	Gebze High Technology Institute
HEI	Higher Education Institute
HSIP	Hsinchu Science Based Industrial Park
IASP	International Association of Science Parks
ICT	Information and Communications Technology
IT	Information Technology
İTÜ	Istanbul Technical University
İYTE	İzmir Higher Technology Institute
KAP	Kazusa Academia Park
KATU	Blacksea Technical University
KOBİ	Small and Medium Sized Enterprises

KOSGEB	Small and Middle Scale Industry Development and Support Management Chairmanship
MAM	Marmara Research Center
METU	Middle East Technical University
NTBF	New Technology Based Firm
PC	Personal Computer
R&D	Research and Development
R&DO	Research and Development Oriented
SME	Small and Middle Enterprises
TEKGEB	Technology Development Zone
TEKMER	Technology Development Center
TEKSEB	Technology Free Zone
TGB	Technology Development Zone
TEYDEB	Technology and Innovation Founding Programs Directorate
TIT	Tokyo Institute of Technology
TSIP	Tainan Science-Based Industrial Park
TTGV	Turkey Technology Development Foundation
TÜBİTAK	Scientific and Technical Research Council of Turkey
TUSSIDE	Turkish Institute for Industrial Management
U.K.	United Kingdom
U.S.A.	United States of America
UKSPA	The United Kingdom Science Park Association
UNDP	United Nations Development Programme
UNFSTD	United Nations Fund for Science and Technology for Development
UNIDO	The United Nations Industrial Development Organization
WATP	Western Australia Technology Park

1. INTRODUCTION

The technological development is one of the key factor for the welfare and wealth of the nations. Over the last decades, the governments in both developed and developing countries have placed increasing emphasis on supporting technology development efforts, and the small high tech firms using several mechanisms and tools. The technoparks, which is originated in late 1950s is one of those tools to promote technology development, more specifically converting scientific research to technological innovations.

The technoparks are generally established around the universities and research centers to increase the interaction between scientific research and business. The idea is to provide an infrastructure of technical, logistic, administrative support to create new high tech companies or strengthen the current ones to increase the technological capability of the country and, hence its competitive power.

The first technoparks were constructed in USA in 1950s, followed by UK and other developed countries, and the several other countries around the world. The law regulating the technoparks was issued in 2001 in Turkey and the number of technoparks has increased continuously. There are currently more that 19 technoparks in Turkey.

In this study, the current status of Turkish technoparks was investigated using survey method. A questionnaire related to the current technological status, expectation of firms, technology development support in Turkey, benefits, required conditions for success, and problems and deficiencies was developed and conducted on the participants firms of technoparks. The results were analyzed and interpreted to draw conclusions about the patterns of technology development activities in Turkish technoparks.

In chapter 2, technology and related topics of technoparks were presented by the title of "technoparks". Establishment reasons of technopark are discussed in "Rationale behind the technoparks". Advantages of them are explained in "benefit of technoparks" section. Structure of technoparks is shown in "establishment model of technopark" part. Required conditions for success are illustrated in "criteria and conditions for success of technoparks" section. Different examples of technoparks are discussed in following sections which are technopark application in the world and technopark application in Turkey.

The assessment surveys were presented shortly in chapter 3. The questionnaire construction was discussed first followed by the title of "conducting survey". Finally the tools for analysis of the data generated by the survey are discussed briefly.

Chapter 4 contains the steps followed in this work. The preparation of survey questions is described first. Then the details about the survey conducted are presented briefly.

The survey results are presented and discussed in Chapter 5 while the conclusion obtained and the recommendations for the future works are given in chapter 6.

2. TECHNOPARKS

2.1. Technology

Technology is the applied knowledge that is used to change, control or order the physical and social surrounding of human kind. It can be described as a complex process that integrates various interrelated elements such as people, knowledge, methods, rituals, tools, and systems to achieve a specific purpose [1-2].

Technology has become the most crucial factor in industrial societies of today due to the fact that it increases the competitive advantage of corporations as well as the welfare of the nations. The countries which have superiority in science and technology are dominating the international competition, and they are becoming the determinants of the information age of the future. [3]

There has been an ever-growing impact of technological developments on all aspects of human life since the World War II, and its importance was better understood by the western countries after the economic crisis in 1970s. The crisis fuelled the competition between companies and countries to a great extent. Companies and governments set the right policies, and strategies for technological change [4-5].

The technological progression can be interpreted as the rapid change for the recent decades. Technology based manufacturing is the new direction of alteration. There is a direct relation between economical welfare and technology development level.

Technology development is defined as the accumulation of operations which are capability of technology transfer, comprehending and utilizing of transferred technology, progression of new technology, construction of the infrastructure, selling of developed technology, production of new products which are developed by utilizing current technology, coordinating and regulating related processes. [6]

Progression of science and technology policies has caused great alterations in the order of importance in the world. One of the first consequences of that situation is that information society becomes the most valuable subject. Another significant consequence is that all countries have to organize their science and technology policies and attach importance to R&D activities. The technopark is one of the tools that is employed extensively to improve technology development efforts of the countries.

2.2. Technopark

The technoparks are one of the most significant instrument to support the technology development activities. They are usually established to promote industry-university cooperation so that the developments in science can be transferred to the industrial innovation.

The terms used to describe technopark or related concepts vary such as Science Park, technology center, technopark, technocity, industrial cluster, technopole and so on. Although the variation in terms and definitions is partially due to the variation in its stressed function, it also has some national characters. For instance the “science park” in UK is more common while the “research park” in USA and the “technopole” in France are more preferred. [7] The “technopark” term is more common in Turkey although some other terms were also used.

There is no clear distinction among various terms in this area or universally accepted definition for the technopark or related entities because their structures and functions may vary from country to country, even city from city in the same country.

The U.S. General Accounting Office (GAO, 1983) defines university-related Research parks as ‘‘clusters of high technology firms or their research centers located on a site near a university, where industry occupancy is limited to research-intensive organizations.’’ [8]

According to Monck et al: ‘‘There is also no uniformly accepted definition of a Science Park in Britain and there are several terms used to describe broadly similar developments—such as ‘Research Park,’ ‘Technology Park,’ ‘Business Park,’ ‘Innovation Centre,’ etc.’’. [9] The United Kingdom Science Park Association (UKSPA, 1985), on the other hand, uses the following definition: ‘‘A science park is a property-based initiative which, has formal operational links with a university or other higher education or research institution; is designed to encourage the formation and growth of knowledge-based businesses and other organizations normally resident on site; has a management function which is actively engaged in the transfer of technology and business skills to the organizations on site.’’ [8]

Turkish By Law for Implementation of “Technology Development Zones” defines the technoparks as a site where the NTBFs develop new technologies and convert innovations to commercial products or processes by utilizing the capabilities of a university or research center, and hence they support the regional developments. The technoparks are established inside or close to a university or research institute, and integrate the academic, economical and social structures. [43]

Although those differences in description and name, the technoparks and related entities are generally research based, in close relationships with universities and research institutes, they are on campuses or in close proximity to the campus. This is also apparent in the Turkish experience.

On the other hand the terms such as innovation center or incubator usually describe an entity that formed to foster to the new and high technology businesses by supplying space, relations and support of a research institute and managerial services. The relative position of various entities can be summarized in the flabellum in Figure 2.1. [7]

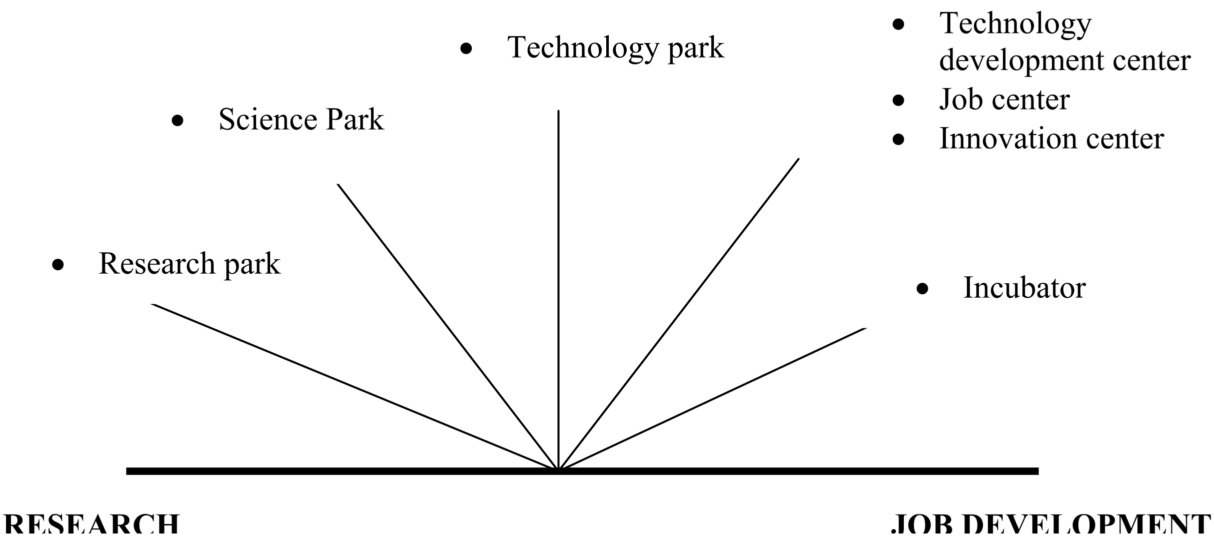

Figure 2.1. Technopark application flabellum [7]

2.2.1. Rationale behind the Technoparks

Together with incubators, technology centres and the other similar entities, the technopark belongs to a group of political instruments that promotes technology development and regional growth. The most profound role of a technopark is to provide an environment to transform basic science at universities into commercially viable innovations. Hence, the major expectation of universities from a technoparks is commercialization of their research generating funds for future studies while the entrepreneurs and smaller high-tech companies want high quality prestigious accommodation, a close association with the university, other similar businesses on site and the managerial services provided by the park staff. Large multinational businesses, on the other hand, see the technoparks as the providers of flexibility for short-term projects and proximity to already established cooperation partners at universities. [10]

The local governments see the technoparks as a tool to support the regional growth while the national governments expect that the technoparks should increase the technological capability of the country and so on.

As results each stakeholder of the technopark concept has its own reason to have a technopark. However one reason is common: to transform the scientific research of university to industrial application. According to Monck et all (1988) the linkage between university and the companies could be formed in many ways such as transfer of people, transfer of knowledge, companies sponsoring the research and access to the university facilities.

The major goals for technopark establisment can be summarized as follows: [7]

- Creation and growth of new technology based enterprises.
- Turning research and development activities to investments,
- Encouraging entrepreneurship,
- Increasing the number and types of economical activities of the region,
- Promoting technology transfer,
- Commercialization of the university's inventions and know-hows,
- Increasing the education capabilities,
- Generating employment opportunities for the university graduates who stay in the region,
- Making profit from the park,
- Creation of employment opportunities which pay higher salaries,
- Developing chances and capabilities for workers.

The rationale behind the technopark application in Turkey can be seen in law 4691 (2001) which regulates the establisment, operation, management and control of Technology Development Zone, and authority and responsibility of the related people. The aim of this law is to create collaboration between research institutes and industry in order to help the country in economy, international competition and export trading, production of technological knowledge, develop innovations in products and procedures, increase the quality or standard of product, increase the efficiency, lower the cost of production, commercialize the information, support the technology dense production and entrepreneurship, adapt small and middle scale enterprises to new and high technology, generate investment capabilities in technology dense areas with the permission of The Scientific and Technical Research Council of Turkey, create employment opportunity to the people who are researchers and scientists, help the transfer of technology, create a technological infrastructure which helps to the entrance of foreign capital.

2.2.2. Benefits of Technoparks

The firms operating in the technoparks and the university or the research center associated with this technoparks are the ones that directly get benefit from the technoparks. In addition, the city, the region and the entire country will benefit from the technoparks in various ways.

2.2.2.1. Benefits to the Entrepreneurs. Entrepreneurs' required supports are listed in the following subheadings

- Technoparks create synergy between firms and academic institutions
- The exchange of knowledge, information and even technology between the partners is stimulated and improved.
- Firms can understand the links established between university and industry much better. [11]
- Universities transfer the scientific knowledge and expertise to companies [11]
- Technoparks provide an important resource network for firms. [12]
- Proximity between firms and universities promote the natural exchange of ideas through both formal and informal networks. According to Deeds et al. (1997), formal methods contain licensing and cooperative alliances, while informal methods contain mobility of scientists and engineers, social meetings, and discussions. [11]
- Tax privilege is supplied to the entrepreneurs with respect to the technoparks law which is numbered 4691.
- The interaction among the firms is promoting.[13]
- Image and prestige are also supplied in technoparks to the entrepreneurs. [14]
- Consulting services are supplied to the firms from technopark and university.
- Technoparks supply some services such as communication, photocopy, and other secretarial services for giving entrepreneurs a chance to use their time more effectively in their major task.
- According to Mian (1996), to accomplish firm's survival and growth objectives technoparks provide shared office services and business assistance including

affordable rent and fostering connections with firms inside the incubator and in the local economy. [15]

- Firms also take help in fields like finance, marketing, and management from the technoparks.
- It reduces consumer research costs.
- Firms can generate new products and processes which are developed more consumer oriented.
- Even if technoparks promote the introduction of radical innovations by firms in the market, this effect is contingent on entrepreneur specific factors such as work experience in the R&D department. [15]

2.2.2.2. Benefits to the University. Benefits of technoparks to the universities are listed in the following subheadings

- Universities can gain extra financial funds at a time when their traditional sponsors, namely governments which are operating under financial difficulties.
- The enlargement and updating of universities' research agenda in areas related to companies' science and technology demands would create positive stimulus for linkages.
- Technoparks are transferring universities' finding in science and technology to the society.
- Technoparks' interaction with universities could positively contribute to their innovative ability and capacity. Thus, improve their competitive performance. [11]
- Technological innovation stems from scientific research and science parks can provide the catalytic incubator environment for the transformation of pure research into production. [12]
- Technoparks give the academic environment a clear opportunity to start a business to commercialize research. It is reasonable to allege that without technoparks, most of the academic owned businesses would not have been established in the first place.

- According to Link and Scott (2003), there exists negative correlation between the distance from the technopark to the university and the probability that the academic curriculum will shift from basic toward applied research. [14]

2.2.2.3. Benefits to Region. Benefits of technoparks to region are listed in the following subheadings

- Governments and other organizations which are dealing with industrial and technical development have introduced regionally targeted measures to provide an appropriate physical environment to encourage economic development in deprived and depressed localities. [12]
- Technoparks cause to an increase of employment opportunities in the region where they are established.
- Technoparks increase the income level of citizens who live around the technopark
- Reindustrialization takes place in regions where the technoparks are established. [13]
- Regional development occurs also in zones where the technoparks are constructed. [13]
- Education level of region is increased

2.2.2.4. Benefits to the Country. Benefits of technoparks to the country are listed in the following subheadings

- Closer interaction between universities and industries may not merely create mutual benefits but also contribute to improving the countries' industrial competitiveness. [11]
- Development of higher institute links is assumed to encourage innovation and production in country.
- Decrease the unemployment rate of the country. [16]
- Increase the image and prestige of the country in the world.
- Science and technology level of the country is gone up also among other countries of the world.

- Specialized labor force also increases as a result of technopark application.
- Country becomes open to international markets.

2.2.3. Establishment Model of Technoparks

The structure and the function of technoparks may vary from country to country, even technoparks to technoparks in the same country. However, the technoparks can be classified using some models based on ownership structure and functions.

2.2.3.1. Model based on Ownership. The technoparks can be classified into five models based on ownership. [7]

State weighted model, governments can directly take the major part of the technopark establishment or becomes the only founder. In this model, the state cooperates with the regional or local government institutions in order to complete the infrastructure such as the water, electricity, and communication networks. The state plays role not only an owner of the infrastructure but also regulates the incentives, tax cuts, privileges, or easy credits. For instance, in Great Britain, state fund comprises the 60 per cent. On the other hand, in Turkey this percentage is nearly 53 per cent.

University weighted model, the universities create major sources for technopark which is established inside of the university or near to it in this model. For instance, in England, universities like Cambridge, Surrey, and Heriot Watt have their own technoparks. This is also the common model in Turkey as in the case of İTU, ODTÜ, Hacettepe and Bilkent technoparks.

Private enterprise model, in this model, universities generate partnerships with the strong financial institutions in order to construct the buildings of technoparks. These kinds of parks are established in the areas that have high rents and high land prices. The major aim of these kinds of technoparks is profit. Ankara Cyberpark is the best instance of application this model in Turkey.

Local government weighted model, in recent years, the local governments start to establish technoparks as a way of regional development or generating the new employment opportunities especially in growing and developing cities. Some parks in England established their infrastructures and financial capabilities with the help of the European Union Economic and Regional Development Fund (ERDF), European Coal and Steel Community (ECSC) and European Investment Bank (EIB). In Turkey, Mersin technopark and Ulutek TGB are the instances of this kind of technoparks.

Mixed model, universities, local governments, banks or associations collectively establish technoparks. In these types of technoparks capital ratios can be found in different percentages. In Turkey, most of the technoparks belong to this model such as Göller Bölgesi Technocity, Kocaeli University TGB, and Konya Technocity. [17]

2.2.3.2. Model based on Function. The first and major aim of the technopark is nurturing the small and middle enterprises or new start-ups, as well as for firms to conduct research and development or technology transfers, and produce or assemble advanced technology products. The orientation of technoparks can simply be categorized into three types with respect to the goals and functions. [18]

Innovation/incubation oriented technoparks, this kind of technoparks tries to stimulate the industrial innovation and technology development, hence generate an environment to attract R&D personnel from universities and research institutes. Innovation/incubation oriented technoparks are usually seen around the universities and research institutes.

Research and development oriented technoparks, for this type of technopark, the main goal is to develop and innovate the technologies mostly related to industry, or to promote industrial upgrading. Attraction of firms which operate in a region and evaluation of measures are the major key elements in order to encourage firms to participate in research and development. The best place for this kind of technoparks is near to universities or research institutes.

Production oriented technoparks, the major targets of this kind of technoparks are to increase the speed of economic growth and establishment of new regional industries. When items are produced in production oriented technoparks, these items share some special characteristics like large market potential wide use, high value addition and technology intense. [18]

2.2.4. Criteria and Conditions for Success of Technoparks

The assessment of the impact and effectiveness of technoparks is a very difficult task due to the diversity in stakeholders' objectives and expectations from a technopark, and hence due to the difficulties in measuring the relevant performance criteria. One method of assessing the impact of technoparks is to compare the performance of technology-based firms located within and outside the park [19]. Using this methodology, Westhead conducted two surveys in 1988 and 1992/93 and found no statistically significant difference between the two types of firms in terms of R&D intensity, R&D spending and the research capability to introduce new products and patents. Survey's major consequence was that "there are similarities between independent science park and comparable off-park firms which are striking, rather than the contrasts" [20]

A recent EC study suggests that the different political instruments used to stimulate growth through high-tech and knowledge-intensive start-ups and business development can be differentiated in a two-dimensional frame, where the level of technology occupies one-dimension and management support to tenants the other. [10]

Another study done by Monck et al. implies the fact that off-park firms achieve a higher level of employment than comparable on-park firms when taking the different age of the firms into account, this situation illustrates the fact that technoparks even obstruct the development of high-tech firms. [21]

The conditions for the success for the technoparks can be summarize as follows:

- Greater private sector participation to technoparks
- Making formal linkages with other successful technoparks [22]

- Low cost of office space
- Offered management services
- Low cost of utility services
- Provided administration and financial services
- Leadership of the incubator
- Support from the local university and research institutes
- Support from government and public sector organizations
- Financial support including angel, venture, and other sources of capital
- Market conditions and marketing capability
- Entrepreneurial atmosphere
- Networks with local business and support services
- Global networks for information sharing
- Quality of business plans
- Management capacity
- Location of incubator
- Availability and quality of technical experts
- Strong entrepreneurship and leadership
- Marketing capability [23]
- Clusters of universities which affect the performance of technoparks
- Growth
- Successful transfer of university researches to industry
- Placement of university graduates [8]
- Macro-economic and political conditions
- Demand of technology in the region
- Number of patents and other rights which are developed in the technopark
- Products commercialized and started to be produced
- Technology transfers in the technopark
- Research publications produced by activities in technoparks
- New products and technologies sold in local and international markets
- Added value which is generated in technoparks
- Generation of beautiful work space with the help of the staff, and supply the cultural works and communication possibilities

- Partnerships which are done with foreign firms
- Number of joint projects which are done with universities and research institutions
- Number of scientific studies which are commercialized due to activities which take place in technoparks
- Interactions between technopark firms and firms which are in different technoparks [24]
- Shared vision
- Necessity of collborative process
- Complementary roles of industries and universities
- Need for presence of leading companies, preferably both large companies and "niche market" companies
- Effective commercialization strategies [25]
- Prestige and image
- Closeness to the airport and communication possibilities

2.3. Technopark Application in the World

The first examples of technoparks established in the U.S.A. are Stanford Research Park established in 1951 and Cornell Business & Technology Park established in 1952, A few new technoparks had been founded until 1972. After that year, number of technoparks started to increase with a boom in mid 1980s. There are nearly 200 technoparks in the U.S.A. Then the technopark idea was spreaded to Asian countries. The international supports played an important place in the technopark applications in developing countries. For instance, many countries such as China, Korea, Taiwan, Singapore, Australia, Russia, Hungary, and Turkey have opened technoparks by the help of United Nations Development Programme (UNDP). In order to better understand the technopark movement which has spreaded nearly all of the countries of the five continents, the technopark experience of some countries which have different physical, legal and societal situations will be summarized [8]

Silicon Valley is the world's center for producing advanced information technologies: semiconductors, microcomputers, computer peripherals, and lasers. Its economy is among the fastest-growing and wealthiest in the United States. The total number of high tech firms in Silicon Valley was about 8000 in 1983. Some factors were profound in the rise of Silicon Valley such as availability of technical expertise, infrastructure, venture capital, job mobility, and information-exchange networks. Sixty per cent of the Nobel prizes were taken in Silicon Valley. Moreover, all innovations in electronic industry were made in this technopark. The establishment of Route 128 started in 1933 and continued up to 1951 in Massachusetts. In 1970s, more than 800 companies placed in the park. The lowest unemployment rate in U.S.A. can be seen in Massachusetts region in 1988. This technopolis is as close to a free market economy as possible. It has abandoned the three Rs: no regulations, no rules, no restrictions. The major function area is electronics in Route 128. [26] The last example is Research Triangle Park. It started to its functions at the end of the 1950s. North Carolina's Research Triangle Park is still pretty small compared to the size of Silicon Valley and Route 128. Thus, the cooperation with universities produced a beneficial result of Research Triangle Park. [8]

After United States first examples of European technopark started to be seen in England, which has the highest number of technoparks in Europe. In 1972, the first U.K. technoparks were established in Cambridge and Heriot-watt. The policies that stress the importance of cooperation between the universities and the industry had a great role in the establishment of these technoparks. After the success of these technoparks, establishment of other technoparks continued until the end of 1980s. In 1983 the number of technoparks was 8, this number reached to 38 in 1989. By 1992, there were 32 parks in operation, as most of the older U.K. universities had adopted this organizational innovation. Over the time, more "polytechnics" or "new" universities also established such a facility, so that by 1999, there were 46 fully operational university technoparks in the U.K. The UKSPA also reports that 80 per cent of the technopark firms have fewer than 15 employees and that over half of the firms located on these facilities are engaged in R&D and new product development. [27] It is possible to compare this employment level with other European countries to see the placement of England with respect to employment opportunity. In Greek technoparks, the average employment level is 5 employees, while the average employment level in Spain is 26.7 and 26.6 in Ireland. [28]

In France, the first technopark of Sophia-Antipolis was founded in a nonurbanized area in Southern France near Nice in 1969 by a private nonprofit company. French technopark movement’s real and major aim was to increase the speed of the regional economic development. Thus, technology transfer activities had been realized among the Research and Development (R&D) offices of the corporations which are found mostly in the same region. An average size of the French technoparks is much bigger than English ones. Three key factors have sustained the development of Sophia-Antipolis: the cross fertilization of ideas, individuals, and organizations. However, in England the situation is completely different. The major goal of technopark in England is to create competition, finding solution to the unemployment and recession in economy. [26]

After the United States and Europe technoparks started to appear in East Asia especially in Japan, Korea, and Taiwan. In Japan, the main aims of the institution are to escape from the difficulties associated with the cities and promote the growth of the less developed regions by creating an attractive area for the industry and academy. The real development strategy depends on the natural resources of the regions [29]. An increasing number of technoparks began operation in the latter half of the 1989s. Technoparks in regional innovation systems act as catalysts that facilitate localized knowledge flow. Tokyo Institute of Technology (TIT) identified 158 technoparks in Japan in 1997. [14]

Tsukuba is the first example of technopark movement in Japan. For this center, first decision was taken in 1963 and Tsukuba technopark was established in 1970. The research oriented dynamic structure of Tsukuba University gave an advantage of developing relationship between the researchers. The research agencies in Tsukuba compose 30 per cent of all Japanese national research agencies and 40 per cent of all personnel. They expend 50 per cent of the total R&D budget. The rest of the Tsukuba technopark area is suburban or development district, where there are three major research parks for private industries: Northern Research Park, Western Research Park, and Toukoudai Research Park [26]. Kazusa Academia Park (KAP) was established by learning from the failures of Tsukuba technopark. KAP in Chiba prefecture is designed to aggregate bio-industries from Tokyo and ignores local ones including the world-top soy-sauce industries [29]. Another enterprise is Higashi Hiroshima Technology Park. The basis of project is Hiroshima University which is founded in the center of Hiroshima. [7]

After Japan, technopark application started in Korea owing to the fact that Korea is the closest neighbor of Japan. The main objective of Korean technoparks is often to promote the application of science by bridging the gap between research and development, and commercialization. Korea's unprecedented economic growth, from 1960 to 1995, is largely attributed to chabol (groups of large companies) with the assistance of favorable policy of the central government. As a consequence, Taedok technopark is established in Pusan to generate solutions to two major issues which are centralization of the enterprises and protection of independence against Japanese firms [23]

In Taiwan different strategies were followed in regional development and reindustrialization. As of 2001, Taiwan had four technoparks, namely Hsinchu (1980), Tainan (1995), Chunan (1998), and Taichung (2001). Taiwanese technoparks such as the Hsinchu Science based Industrial Park (HSIP), established in 1980, only 2% of the total number of patents in Taiwan were owned by HSIP companies in 1994, this number grew to 10% by 1999. [30] The Tainan Science-based Industrial Park (TSIP), established in 1995, has become closely integrated with regional industries and local development. Thus, high-tech and innovative firms generally remain concentrated in specific locations, use shared facilities, and enjoy common economic benefits. These specific characteristics can be transformed into regional development. From this perspective, technopark can be an effective tool for integrating industry and regional development. Comparing the development of Hsinchu Science City in Taiwan with the planned development of Tsukuba Science City in Japan and Taedok Science Town in Korea reveals some unique experiences in Taiwan in that the government-led projects have successfully stimulated the regional, and even national, emergence of innovation systems and economic development [31- 32].

After the European and the East Asian examples, there are also developed technoparks in the Australian continent. One of the most famous technoparks of Australia is that the Western Australia Technology Park (WATP) which was established in 1985 in the capital city of Western Australia. WATP is different from other technoparks owing to the fact that it is a state governed rather than a university initiative. Moreover, this place is not a suitable place for sustainable technology park due to small population, low population densities and distance from major markets [13]. The major aim of this technopark is the promotion of R&D, transfer of technology and development. 58 companies are established in WATP.

There is also great development in technopark applications in Israel, Ireland, China, and Russia. Today, a total of 18 technoparks are established in Israel. [33] The first technopark of Israel is Institute of Weisman, second one is Carmiel which was established in 1984 by the Israel government and it is very close to Haifa city. Third technopark is Etziona International Scientific Park established by the Herodian Association in 1991. The first technopark became the pioneer of the pushing force for the industrial development of Israel. In 1980s, more than 3000 people were employed and more than 30 corporations were placed in the Rehovot Science Park. By the end of the 1990s Israel had the world's second most profound technopark after Silicon Valley in USA., Israel had formed one of he world's most successful high-technology clusters which generated $15 billion in export revenues in 2000. [34] Today, Private high-tech businesses are focused in four small and different clusters: Har Hotzfim and Malkah Technology Park in Jerusalem, the Rechovot/Rishon LeZion area (which includes the famous Weizmann Institute), Haifa Technology Park, Herztiliyah Pituach area. [35]

Ireland has been termed the "Celtic Tiger" due to its similarity to East Asian economic successes in the late 1990s. Ireland has one of the highest concentrations of information and communications technology (ICT) activity and employment among the OECD countries. It is the fifth largest exporter of computers in the world, they account for more than a third of all Irish exports and one third of PC is sold in Europe are made in Ireland. Plassey Technology Park is established near to the Limerick city and this park is the oldest park and technopole of the country. It has been operating nearly for 30 years. The major aim of the technopark is to increase the cooperation and collaboration between university and industry. The technoparks drive the industry in Ireland and they are located in Dublin with the smaller regional clusters in Corck, Limerick/Shannon and Galway, the latter including Nortel and over 50 small and medium-sized companies. The new key opportunity sectors being targeted by Ireland are informatics, digital media, e-business and health sciences[34]. Moreover, especially business application products are the component of this activity. It has largely been driven by foreign direct investment (FDI), though recent evidence suggests that the indigenous software industry is now growing at a much faster rate than the multinational sector. It is also a major factor in high skill, high wage job creation since the early 1990s and comprises a key element of Ireland's national innovation system. [25, 36]

After the Celtic Tiger, Chinese Dragon takes its own place in the world. Japan and U.S.A. are the pioneers of the technology production race. On the other hand, European countries have become the "One Europe", and China is the world's most crowded country. Thus, China has wanted to become the super force of the world.

In the middle of the 1980s the government of China decided to apply three major policies which were increasing the scientific researches, development of high technologies, and growth of the national economy. Shenzhen Science and Technology Park was established in 1985. Then, in 1988, the Torch program was started to commercialize the findings of high technology researches. Proceeding of this program placed an important role in the establishment of the high technology industrial areas from that time to today, 40 technoparks have been established in China. 27 of them are accepted as parks. Chinese government supports the cooperation with foreign countries. Today, more than 1700 corporation are established in Shenzhen Science and Technology Park and they have employed more than 130.000 staff. [37]

In Eastern Europe, developments have not been as fast as Western Europe. At the same time the scope of this development also has been limited due to the fact that the economic, political, organizational, and cultural level obstacles have prohibited the entrepreneurship activities. Russia also understood the significance of science parks after China. The concept of science park was introduced in 1988 following the publication of an article in a Russian scientific journal. The first science park was constructed in Tomsk in 1990 jointly by universities, scientific institutions and industrial enterprises. The number of Russian science parks was fifty-two in 1996 and the number of small firms based in these structures more than 1000. By the beginning of 1998 the number of university technology parks had risen to sixty-two. Seven are considered to be the technology park leaders, comparable to western science parks; fifteen are in the process of catching up while the others remain at a more elementary level. St. Petersburg technopark is the most famous one among Russian technoparks. According to Shukshunov and Variukha (1997), there are three major characteristics of Russian technology parks. Firstly, the number of founders ranges from three to twenty one. Fifty per cent have more than ten founders, mainly large enterprises, universities. Secondly, 93% are individual companies, while the remaining 7% are subdivisions of universities. Thirdly, the average number of firms accommodated is 20. [38]

2.4. Technopark Applications in Turkey

2.4.1. Legal Background of Technology Development Zones Law

Technopark law which is numbered as 4691 was accepted on 26th of June in 2001 while the practical applications were started in 2003 by the decision of the Turkish government.

2.4.1.1. Aim. The major aim of this law is to create collaboration between research institutes and industry in order to help the country in economy, international competition and export trading, production of technological knowledge, develop innovations in products and procedures, increase the quality or standard of product, increase the efficiency, lower the cost of production, commercialize the information, support the technology dense production and entrepreneurship, adaptation of small and middle scale enterprises to new and high technology, generate investment capabilities in technology dense areas with the permission of the Scientific and Technical Research Council of Turkey (TÜBİTAK), create employment opportunity to the people who are researchers and scientists, help the transfer of technology, create a technological infrastructure which helps the entrance of foreign capital.

2.4.1.2. Scope. This law contains technology development zones institution, process, management and control and related people and institution's duties and responsibilities.

2.4.1.3. Technopark Management. At least one university or higher research institute in the same region or city with the technopark must be a member of the technopark management Corporation. These institution or establishments can join the technopark management corporation.

Other institutions can also join the technopark management corporation. For instance, chamber of commerce, local governments, banks, finance institutions, native and foreign corporations, R&D firms, associations, related state institutions, export unions can be member of the technopark management corporation.

Foreign corporations have to take necessary permissions which are described in law 6224. This law is related to the incentives for foreign capital.

2.4.1.4. Supervision. Activities and applications of both technopark management corporation and entrepreneurs are controlled by Ministry of Industry and Commerce.

2.4.1.5. Supports and Exemptions. Expenditures which are necessary for the establishment of the technopark are supplied by the ministry budget in a situation which expenditures can’t be financed by technopark management corporation.

Technopark management corporation exempts the taxes, tariffs, and expenses in transactions which are related with the application of this law. Firms which are in technopark have the advantage of income tax and institutions tax. These firms are exempt from income and institutions taxes for incomes which come from software products and production activities depending on R&D research, for five years from their starting date in the technopark. However, the council of ministers can increase the period of this time up to 10 years for special regions and products.

Salaries of personnel who are researchers, software developers, and R&D personnel are exempt from the tax up to ten years starting from the establishment of the technopark.

2.4.1.6. Temporary Decisions. Technoparks which were established before this technoparks law, are accepted as Technology Development Zone and they can also get benefit from the all exemptions, incentives, and supports which are supplied by this law. [39]

2.4.2. Turkish Technoparks

The concept of technopark was first cited in 1986 – 1987 by the Tınaz Titiz who was the minister of the state and Fikret Üçcan who was the counselor of the ministry of the state. The first examples were established in Ankara and Gebze, Kocaeli in 2001, Izmir in 2002, Istanbul and eskişehir in 2003. Currently there are 19 technoparks in Turkey [40]. 14 of these 19 technoparks are in function. 5 of these 19 technoparks are the members of the international technopark institutions. These technoparks are Ankara Cyberpark, Konya Technocity, Mersin Technopark (Technoscope), ODTÜ Technocity, Gazi Mağusa TGB.

Table 2.1. Establishment years of Technoparks in chronological order

Establishment Year	**Name of Technopark**
2001	ODTÜ Technocity TÜBİTAK MAM Technocity
2002	Ankara Cyberpark TGB GOSB Technopark İzmir TGB
2003	ARI Technocity Eskişehir TGB Hacettepe Technocity Kocaeli University TGB Konya Technocity
2004	Antalya Technocity Çukurova TGB Erciyes Technopark Gazi Mağusa TGB Trabzon TGB
2005	ATA Technocity Göller Bölgesi Technocity Mersin Technopark (Technoscope) Ulutek TGB

2.4.2.1. ODTÜ Technocity. ODTÜ Technopark is established in 2001 in the campus of METU (Middle East Technical University) in Ankara. There are six distinct buildings in the technopark. These are ODTÜ – KOSGEB Technology Development Center which has 26 NTBFs , Sem -2 building which has 15 NTBFs in 814 square meters closed area, İkizler building which has 30 NTBFs in 7000 square meters closed area, Halıcı Software House building which has 11 NTBFs in 4840 square meters closed area, Silver Blocks which have 33 NTBFs in 8650 square meters closed area, Silicon Blocks which have 35 NTBFs. There are also 5 different buildings which belong to Milsoft, Aselsan, Havelsan and TAI firms. The expected number of firms in technopark in 2007 is about 215. On the other hand, total number of NTBFs was 167 and more than 3000 personnel were employed by these firms in 2006. 46.1 per cent of the firms function in software industry, 8.9 per cent of the firms is in electronics, 8.6 per cent of the firms are in defense, 7.8 per cent of the firms are in medical – biomedical industry and 2.4 per cent of the firms are in telecommunication. There are also firms that are operating in advance material, medicine, environment, and so on. The total of export is 1.900.000 $ in 2002, 7.200.000 $ in 2003, 15.600.000 $ in 2004, and 33.000.000 $ in 2005.

2.4.2.2. TÜBİTAK MAM Technocity. TÜBİTAK MAM (Marmara Research Center) Technopark is established in TÜBİTAK Gebze Settlement in 2001. This technopark has two different parts, which are TEKGEB (Technology Development Zone) and TEKSEB (Technology Free Zone). The technopark occupies 380.000 square meters of the total 8.000.000 square meters settlement. The technopark has many advantages due to the fact that many institutes of TUBİTAK such as Software Technologies Research, Energy, Food Science, Material, Earth and Marine Sciences Research, Chemistry and Environment institutes are in the same campus. Moreover, both the technopark management and NTBFs have chance to cooperate with other institutes like TUSSIDE (Turkish Institute for Industrial Management), TÜBİTAK Genetic Engineering and Biotechnology Research Institute, and TÜBİTAK National Electronic and Encoding Research Institutes in the same area. These institutes which have more than 1.000 personnel are directly connected to TÜBİTAK. There are 55 firms in technopark. Total amount of export which is done in technopark is around 3.000.000 $.

2.4.2.3. Ankara Cyberpark TGB. Ankara Cyberpark was established by Bilkent University in 2002 in Ankara. This technopark has the highest number of firms among the Turkish technoparks. 160 firms, 1200 R&D personnel, and 2000 total personnel are working in Cyberpark. Cyberpark which is established in 37.2 hectares of land on the campus of Bilkent University has nine buildings which have more than 50.000 square meters closed area. 159 R&D firms and 5 support firms are operating in industries such as software information technologies, electricity, electronics, electro mechanic, telecommunication, defense, space, medical – biomedical, biotechnologies and nanotechnology, Total endorsement done in Cyberpark is more than 300.000.000 $. Total amount of exportation is more than 52.000.000 $.

2.4.2.4. GOSB Technopark. This technopark was established in 2002 in Gebze Industrial Zone. Technopark has 35939 square meters open and 17844 square meters closed area. Major industrial areas of this technopark are automotive, robotics and automation, ERP – CRM solutions, electronics, medical, logistics, software, aviation, finance, web applications, hospital software, cad software, and insurance software. There are 134 projects in GOSB Technopark. 20 per cent of these projects are done with the partnership of universities. GYTE (Gebze High Technology Institute) is the major supporter of this technopark.

2.4.2.5. İzmir TGB. This technopark is established in 2002 in İYTE (İzmir High Technology Institute) in İzmir. This technopark has an area of 218.4 hectares. Total office areas have reached 3345 square meters. Total number of R&D and software development personnel is 225. There are 46 firms in this technopark. The central offices of 27 firms are found in technopark while other 19 firms are the branch offices. 29 companies are operating in software and the others are in the industries such as electricity – electronics, design, advanced material, medical – biomedical and so on Total import is 165.280 $ and total export is 1.279.300 $.

2.4.2.6. ARI Technocity. ARI Technocity was established in 2003 in İTÜ (Istanbul Technical University). There are two different building blocks in ARI Technocity which are placed in Maslak Campus of İTU. ARI-1 building has 3800 square meters while ARI-2 building has 18.500 square meters closed area. Activity areas of this technopark are information technologies, software, electricity – electronics, defense industry, design, advanced material and environment. The technopark has total of 1009 personnel in all 56 NTBFs. Moreover, total importation for six months is 487.417 $ whereas the total exportation for six months is 1.880.519 $.

2.4.2.7. Eskişehir TGB. This land in Eskişehir was accepted as Technology Development Zone in 2003 by the decision of the council of ministers due to the fact that the technological areas which were established before the technoparks law are also accepted as Technology Development Zone. To increase the university-industry cooperation Anatolia Technology Research Park (ATAP) was established in 1990 with help of United Nations Development Organization (UNIDO) and United Nations Fund for Science and Technology Development (UNFSTD). The major industries of this technopark are computer technologies, software, hardware, communication, electricity – electronic, plastic, ceramic and composite material industries. The total personnel of Eskişehir TGB is 75. There are 15 projects in this technoparks. Total exportation value is 470.662 $ in 2005.

2.4.2.8. Hacettepe Technocity. This technopark was established in 2003 in Beytepe Campus of Hacettepe University. This technopark has two parts in Beytepe campus. One of the parts is found in South Education – Research Complex. This part has an area of 1.045.344 square meters. The other part is found in West – Northwest area which has 1.077.448 square meters land. 25 firms are found in Hacettepe Technocity. The activity areas are software technologies, electricity – electronics, machine – automotive and electro mechanic, mine, food, environment industries. There are 63 projects in technopark. Total import of firms was 329.338 $ and total export of these firms was 83.000 $ in 2005. However, total import has become 1.005.048 $ and total export has become 6.000$ in the first six months of 2006.

2.4.2.9. Kocaeli University TGB. This technopark was established in Yeniköy settlement of Kocaeli University in 2003. Technopark has one building which has 7.500 square meters closed area. Total land of technopark is 200.000 square meters. 16 computer software, 1 environment technologies, 1 counselor services, 1 motor technologies, 5 defense technologies firms are operating in technoparks. There is not export potential of NTBFs owing to the fact that these firms are small . The technopark management has planned to open the services such as incubation center, risk capital counselor service, financial counselor service, EU center, and life long education center, entrepreneurs club, and science and technology museum, exhibition rooms.

2.4.2.10. Konya Technocity. Konya Technopark is established in Selçuk University in Konya in 2003. Around 50 R&D firms are found in technopark. It is one of the technoparks which have the highest development speed. It is one of the members of International Association of Science Parks (IASP). It has the full capacity which is 100 per cent from the time of its establishment. This technopark continues its function in a building which belongs to university. The real buildings of it will be constructed in an area which has 520.000 square meters land. Activity areas are software – electricity – electronics technologies, machine design technologies, food technologies, chemistry and process technologies, agricultural technologies, biotechnologies, construction technologies, energy and environment technologies, advanced material. 101 R&D personnel are employed in the technopark. There are 72 projects in technopark. The major purpose of technopark is production of regional development projects by using the university – industry cooperation.

2.4.2.11. Antalya Technocity. Antalya Technocity was established in 2004 in Akdeniz University. This technopark has three different parts which are TGB-1, TGB-2, and TGB-3. TGB-1 which has 380 acres and TGB-2 which has 120 acres are in the campus of Akdeniz University. However, TGB-3 which has 1290 acres is in Aksu town which is found in Antalya. The companies in technopark operate in software, agriculture, advance material and renewable energy industries.

2.4.2.12. Çukurova TGB. Çukurova TGB was established in 2004 in Çukurova University campus in Adana. The technopark has 859 hectares land in university campus. This technopark is not completely in function yet due to the construction of technopark buildings.

2.4.2.13. Erciyes Technopark. This technopark was established in Erciyes University campus in 2004. Total area of technopark is 270.000 square meters. The major aim of this technopark is to stop the brain drain. This technopark is not in function; however, construction of two buildings is about to finish in the university campus.

2.4.2.14. Gazi Mağusa TGB. This technopark was established with the helps of both Eastern Mediterranean and Lefke European Universities in 2004. This technopark was established in an area of 27 acreas and 4600 square meter closed area is found in it. 50 offices, conference halls, meeting rooms, multimedia presentation systems, and management offices are found in the technopark. Major industries of technopark are software technologies, gsm technologies, wireless communication systems, traffic signalization systems, renewable energies technologies.

2.4.2.15. Trabzon TGB. This technopark was established in campus of Karadeniz Technical University in 2004. Total area of technopark is 18.396 square meters. The construction of management building, incubation center, social facilities have stated in 2006. The technopark is planned to operate in the following industries: Biotechnology, health, software, communication, energy, electronic, automotive, chemistry, marine sciences and advanced technology areas.

2.4.2.16. ATA Technocity. ATA Technocity was established in Atatürk University in Erzurum in 60144 square meters land. 24000 square meters of this land is closed area in 2005. Incubation center is also found in the park. Major activity areas are micro-nano chip technologies, medical systems, bio technology, materials, energy, and software industries.

2.4.2.17. Göller Bölgesi Technocity. This technopark was established in Süleyman Demirel University which is in Isparta, in 2005. There are merely two building in the technopark. Technopark is composed of TGB – 1 which has 29.530 square meters land and TGB – 2 which has 82.860 square meters closed areas. One of the buildings of technopark is TEKMER (Technology Development Center) building. Technopark management is going to construct a TGB – 2 building in 2007. The technopark is planned to operate in the industries like software, automation, information technologies, advance material technologies, machine industry, electronics, telecommunication, energy and environment technologies, textile, genetic, food technologies, agriculture technologies, nano technologies, biomedical. However, there are merely 6 firms in function in this technopark at present and 14 firms desired to enter.

2.4.2.18. Mersin Technopark (Technoscope). Mersin Technology Development Zone which is called Technoscope was establisehd in 2005. This technopark is established on two locations, one is Mersin University campus and the other one is Mersin Tarsus Industrial Zone. Three different buildings which have 24 offices, 14 laboratories, and the conference hall of technopark were constructed in the industrial area. Total area of technopark is projected in 152.000 square meters. The technopark is planned to function in the following fields: Agriculture and agriculture machines, food quality and safety technologies, chemistry and new material technologies, software, logistics, energy production, environment technologies and electronics. However, there are currently 4 firms only operating in software and chemistry industries.

2.4.2.19. Ulutek TGB. Ulutek TGB was established in Uludag University is Bursa in 2005. The total area of technopark is 471.230 square meters. There are merely 7 NTBFs in technopark in only one building with 1374 square meters closed area. The major activities of technopark are computer aided engineering, design, automotive, and fields. The technopark is planned to operate in other industries such as electronics – communication, textile, machine, biotechnology, chemistry, advanced material, nanotechnology, food, agriculture, environment, and energy in future. [17]

3. ASSESMENT SURVEY

A survey is a method of collecting information from people about their ideas, feelings, plans, beliefs, and social, educational, and financial background. It usually takes the form of questionnaires and interviews. The surveys are used to help the policy makers, program planners, evaluators, and researchers if information should come directly from people. Other information collection methods, such as observations, record reviews, and achievement and performance tests, may be more efficient for getting data from other sources.

The questionnaires and interviews share many of the same features. Both rely on directly asking the people questions to get information. In order to be successful, the information asked should be clear, the people who will answer the questions (sampling) should be chosen appropriately, and the entire process of conducting survey and analysis of results should be designed clearly. [41]

In order to choose the best way to conduct the survey, various factors such as reliability, validity, time and resources required should be considered. Mailed, self-administrated questionnaires are probably the cheapest, followed by telephone interviews. Self-administered questionnaires can also guarantee anonymity, but if you need in-depth information and to be able to clarify the issues that may not be clear to the respondent, the interviews are better.

The most commonly used surveys are questionnaires and interviews. Questionnaires are sometimes designed to be self-explanatory, so that they can be filled out in privacy. Questionnaires have the following features. [41]

1. Questions: Information from questionnaires and interviews is obtained by asking questions. The questions may have fixed or forced response choices.
2. Instructions which make sense only in the context. For clarity, questionnaires and interviews contain general directions.

3. Sampling and design: Questionnaires are data collection techniques that are used to obtain information from people. The “sample” is the number of people in the survey.
4. Data processing and analysis: Data processing and analysis are the most important part of the survey owing to the fact that understanding and evaluation of results are merely possible after that step.
5. Pilot Testing: A pilot test is a tryout, and its purpose is to help produce a survey from that is usable and that will provide researchers with the information which is necessary.
6. Response rate: The surveyor wants everyone who is chosen to respond to all questions. Pilot testing helps improve the response rate because it can eliminate several potential sources of difficulty.
7. Reliability and validity: This refers to the precision and accuracy of the information offered by the questionnaire.
8. Usefulness or credibility of results: The results will be useful if they are reliable and valid and if the survey device is one that users accept as the correct one.
9. Cost: This refers to the financial burden of using the instrument. In general, questionnaires are less costly because they usually are mailed or handed out to people.
10. Anonymity: questionnaires can preserve anonymity so that no one can trace the respondent. At best, questionnaires preserve confidentiality if the interviewer is unaware of the person’s name.
11. Convenience: Questionnaires let people work at their own speed and when and where they want to.
12. Complexity of Information: Information which is in the context of questionnaire must be simple to be understood easily by everyone. If researchers wanted to increase the response rate, they woud prepare the questionnaire simple. The most crucial factor is complexity of information in researches.

There are some basic steps of the survey which are shown below. [42]

- Statement of study objectives
- Sampling

- Preparation of the questionnaire
- Conducting surveys
- Analysis of data and interpretation of results.

3.1. Statement of Study Objectives

Any research study must begin with a statement of its objectives. What does the researcher want to study? On what subject is information desired? If the goal is to test a certain proposition, the statement of objectives should state the proposition clearly and should also state how an appropriate test of the proposition could be constructed. This statement of objectives will guide the selection of respondents (the persons who are interviewed) and the writing of questions so as to guarantee that the survey design matches with the study's objectives. The more complete the statement of objectives, the more ensurance that the survey design can be shaped to satisfy them. [42]

3.2. Sampling

Should researchers survey everyone or just a sample? This depends on how quickly data are needed, what type of survey they are conducting, their resources, the required credibility, and their familiarity with survey sampling methods. [42]

Two basic methods of sampling are the probability and nonprobability sampling. A probability sample is one in which each person in the population has an equal chance of being selected. The resulting sample is said to be "representative". In simple random sampling, researchers select people at random (using a table or random numbers, for example). It is fairly simple, but if the sample has certain subgroups that might influence the results, researchers have to use stratified random sampling. Cluster sampling is like random sampling except that groups, such as classroom or school, are selected at random rather than individuals. Researchers use it when sampling individuals is unethical or administratively difficult. Unfortunately, cluster sampling produces a small number of units to study. Systematic sampling lets you choose every second, tenth, or nth number from a list, and the number can be randomly chosen. If the list has a pattern, then researchers introduce bias because all names do not have an equal chance of being selected.

Nonprobability samples include those acquired by accident, such as when the first fifty people to leave a clinic are surveyed. [41]

3.3. Questionnaire Construction

Survey questions should be directly related to the theory and concepts which are investigated by the researchers. Great care must be exercised in writing questions to get the desired information. As a consequence, the first step in writing questions is to spell out precisely what it is the researcher wants to learn from each question or set of questions. Once this is done, the researcher can construct the questionnaire. When constructing a questionnaire, the first decision to make is what form of question will be used to measure each variable. Various forms of the questions as well as the preparation of these questions are summarized below. [41]

3.3.1. Open-ended and Closed-ended Questions

Closed-ended questions offer a series of alternative answers among which the respondent must choose, like a multiple-choice examination question. Open-ended questions allow people to answer in their own words, like an essay examination question.

Open-ended questions have the advantage of allowing respondents to express their thoughts and feelings in their own words instead of in words chosen by the researcher. Thus, these questions permit the analyst to study how the people think rather than just what their opinions are.

Another advantage of open-ended questions is that different analysts with different research interests can find information of value to them from the answers to these same questions. The accompanying disadvantage, however, is that different respondents may approach the same question from different perspectives, so their answers are not fully comparable.

Open-ended questions are more difficult to analyze than closed-ended questions. This is so due to the fact that researchers must code respondents' answers to open-ended questions into categories before analysis can begin. Closed-ended questions are easier to analyze because the respondents code themselves into categories.

A common format for closed-ended questions is to read a statement and ask the respondent to agree or disagree. Simple agreement or disagreement with a statement, however, gives no clue as to the intensity of the person's views. Moreover, it is also possible to say that closed-ended questions can be analyzed as forced choices.

3.3.2. Yes and No Questions

The responses in a survey with forced-choice questions can take several forms. "Yes" and "no" responses are simple to use and score. But slight misinterpretation means that the answer will be exactly opposite from what the respondent really means. Also, in some cases, asking for absolutely negative or positive views may results in the participant's refusal to answer. [41]

3.3.3. The Rating Scale

With rating scales, the respondent places the item being rated at some point along a continuum or in any one of an ordered series of categories; a numerical value is assigned to the point or category. There are ten types of rating or measurement scales. [42]

1. Nominal: These are sometimes called categorical responses and refer to answers given by people about the groups to which they belong: sex, religious, affiliation, school, or college last attended.
2. Ordinal: These responses require that respondents place answers in rank order. A person's economic status would provide an ordinal measurement.
3. Interval: With these measurement choices, distances between numbers have a real meaning.
4. Ratio: Height and weight are ratio measures. A ratio scale, like an interval scale, is one in which adjoining units on the scale are always equidistant from each other, no

matter where they are on the scale. The surveys rarely have ratio measures. Usually only ordinal or interval scales are used.

5. Graphic scales: Graphic scales are a kind of rating scale in which the continuum of responses is visual owing to the fact that researchers do not have to name all the points on the scale. Graphic scales are relatively easy to use.
6. Comparative Rating Scales: Comparative rating scales rely on relative judgments. The most common is the rank order, which is a type of ordinal scale. Another type of comparative scale enables you to contrast a single specific object in terms of a general situation.
7. Category Scales: When raters utilize category scales, they select one of a limited number of categories that are previously ordered with respect to their position on some scale.
8. Additive Scales: Surveyors use the terms “scales” in at least two ways. One of these means is that the first refers to the way the responses are organized for an individual question and the second mean is that a score which represents a person’s views on many items.
9. Differential Scales: Differential scales distinguish the people in terms of whether they agree or disagree with experts. In order to generate a differential scale for an idea such as equality of opportunity experts should rate each statement according to whether it was favorable to the idea. There are some disadvantages of differential scales. The most obvious disadvantage is the amount of work needed to construct them. In addition to this, researchers must take into account the attitudes and values of the scale and interpret the responses.
10. Summated Scales: A summated scale aligns people according to how their responses to controversial or debatable statements add up. As can be understood from its name, in summated scales each item takes a value which can be –1, 0, +1 and these values are added up after that, thus it can be possible to generate a concluding result which is called summated scales.

3.3.4. Branching Questions

These kinds of questions are utilized in situation that researchers are concerned with getting answers to questions that they know are merely appropriate for part of a group. [41]

3.3.5. Wording Questions

Once the investigator has decided which question forms to utilize in measuring each variable, the specific wording of each question must be worked out. When wording a survey question, a number of general rules should kept in mind. [42]

1. Ambiguous Wording: The meaning of words in survey questions must be clear to all respondents.
2. Bias in Questions: Survey designers must be careful to avoid writing biased questions which are those that make one response more likely than another one.
3. Double-Barreled Questions: It is important to avoid double-barreled questions which ask two questions at once.
4. Double Negative: Another question-wording problem is the use of double negatives. Such question wording can be confusing to respondents who do not know which answer represents their view.
5. No-Opinion Options: Another decision once must make in designing questions is whether to include a “no opinion” response option.
6. Hypothetical Situations: Another problem involves asking about how the respondent would behave in a hypothetical situation.
7. Importance of Question Wording: There is no way to word a question perfectly. The same question can be asked in different ways, and the different wording may yield different results.
8. Using Standard Questions: A useful shortcut to wording your own questions is to use standards questions which are developed by major survey organizations.
9. Batteries of Questions: It is often impossible to measure a complex concept with merely a single question, so several questions may be needed to measure the various aspects of the concept.
10. Tailoring Questions to Respondents: Questions should be written specifically for the group being interviewed.

3.3.6. Evaluating Questions

Once, a survey question has been written, the investigator must evaluate how well it does what it is intended to do. That requires assessing the reliability and the validity of each question. [41]

1. Reliability: For a survey question to be useful, it must be reliable, which means that people should answer it the same way each time they are asked.
2. Validity: Good survey questions must also be valid, meaning that they should measure the concepts they are intended to measure.

3.3.7. Structure of the Questionnaire

After deciding on the wording of each question, the questionnaire must be assembled. This involves deciding on the order of topics to be discussed and the order of questions on each topic. [42]

1. Topic Order: The organization of questions in the questionnaire is extremely significant, partly owing to the fact that the interview may be terminated at the beginning if it starts with questions that anger or embarrass the respondent.
2. Question Order: Each question in the questionnaire should flow naturally from the previous one. Questions on the same topic should be grouped together.
3. Response Choices: It is useful to have some consistency in scales used in a study.
4. Number of Questions: Researchers invariably want to ask more question than possible in a single survey. If too many questions are asked in face-to-face or telephone interviews, many respondents will terminate their interviews early.
5. Questionnaire Layout: After the questions and their order are determined, it is necessary to lay out the questionnaire thus, it can be read simply. Confusing layout produces negative results.
6. Pretesting the Questionnaire: Researchers rarely utilize a questionnaire in a survey without first pretesting it. They interview some people who will not be in the final sample to try out the questions.

3.4. Conducting Survey

The next step in a survey is to collect data from the respondents. The three primary methods for survey data collection are mailed questionnaires, self-administrated questionnaires, and face-to-face interviewing.

3.5. Data Analysis

It is possible to analyze and organize the survey results by utilizing statistics that contains organizing and interpreting numerical information. There are many tools and methods which can be used in the analysis of the survey. [42]

3.5.1. Frequency Distributions

The simplest display of results is a list showing the number of people giving each answer to the variable.

3.5.2. Percentage Distributions

It is usually more effective to present the frequency distributions in percentage form. As a matter of fact, percentage distribution is not different than the frequency distribution. In frequency distribution number of respondents is presented by implying their choices. In percentage distribution, on the other hand, all of these results are divided with the total number of respondents and multiplying with 100.

3.5.3. Graphic Displays

Another way of presenting frequency distributions is graphical displays. The graphic presentations are usually the most effective mode of presentation. People who read the findings of the research find frequency tables hard to comprehend, on the other hand they generally can understand graphs easily.

3.5.4. Measures of Central Tendency

The reader can examine the full set of percentages, but it would be useful to summarize the results in more compact form. When the responses tallied and frequency distribution produced, responses may be summarized statistically-for instance, to report the average response or to give some idea of how unified the public is in its attitudes.

The easiest sort of summary measure is the central tendency, which indicates how the typical person behaves or what the typical value of a variable is. The most familiar measure of central tendency is the arithmetic average, known technically as the mean. To compute the mean, add up the values of the variable for each case and divide that by the number of cases. $\overline{X}$ is used for sample mean while **μ** represents the mean of entire population. [42]

$$\overline{X} = \frac{X_1 + X_2 + \dots\dots\dots + X_n}{n} = \frac{\sum_{i=1}^{n} Xi}{n} = \text{Mean} \qquad (3.1)$$

3.5.5. Measures of Dispersion

The scientists often seek to account for differences among the respondents. The variation is a measure of how dispersed the cases are from the mean. The smaller the variance, the closer the cases to the mean; the larger the variance, the more widely they are scattered.

It is also possible to imagine measuring the dispersion around the mean by subtracting it from each value and summing those differences. It is clear that the sum would always be zero owing to the fact that the sum of the differences for the cases above the mean is the same as the sum of the differences for the cases below the mean (with the opposite sign). [41]

This problem can be handled in at least two ways. One is to take the absolute value of the differences; the other is to square them. Staticians prefer working with the squared values when they generalize the variance concept to more than one variable. The variance

v is customarily defined as the average squared deviation from the mean while the standard deviation σ is just a square root of variance.

$$\mathbf{v} = \frac{\sum_{i=1}^{n}(X_i - \overline{X})^2}{n-1} \tag{3.2}$$

$$\text{SD} = \sqrt{\frac{\sum_{i=1}^{n}(Xi - \overline{X})^2}{n-1}} \tag{3.3}$$

4. SURVEY ON ASSESSMENT OF TECHNOLOGY DEVELOPMENT ACTIVITIES IN TURKISH TECHNOPARKS

Assessment of Technology development activities on Turkish Technoparks was analyzed using survey method in the following steps.

1. Defining the objective
2. Developing framework
3. Preparing the survey questions
4. Conducting survey
5. Analysis and evaluation

4.1. Objective

The purpose of the study is to assess the current status of the Turkish technoparks using a survey among the companies in various technoparks in Turkey, and analyze the results with the guidelines of similar applications in other countries.

4.2. Framework

After the purpose of the study was defined, a framework was developed. The following steps were taken to make a complete assessment.

- All factors were identified using the data obtained from the resources in the literature varying from the Annual Technopark Meetings [17], to reports on Turkish and foreign technoparks [24] and scientific papers.
- Those factors were evaluated and the most important were selected using the criteria below:

  - Whether it is significant or not
  - Whether the respondent can comment on or not

- Whether the data related with those factors can be found in another source or not.

➢ The remaining factors were clustered in the following topics.

- General Information about the New Technology Based Firm (NTBF)
- Current Technological Situation of the New Technology Based Firm
- Technology Development Support in Turkey
- Benefits of Technoparks
- Success Conditions of Technoparks
- Problems and Deficiencies of Technoparks
- Results

Survey questions were prepared under these headlines.

4.3. Preparing Survey Questions

The questionnaire developed in a way that all questions related to a certain topic listed above were placed in the same section with a title resulting in seven different sections in the questionnaire. The questionnaire started asking some general information about the company in section one, and followed by section two containing questions related to the current technological status of the company such as activity areas, number of technologies developed or patent granted and personnel profile of the company. The reasons for the company to have been established in a technopark was also searched in this section asking the respondent to choose the appropriate factors from a given list, and rate the significance of these factors. The rate of fulfillment of the selected factors was also asked as a second dimension in the same questions.

In section 3, the incitement and supports for technology development was searched considering that the technoparks are closely related to the governmental supports for technology development through various projects and tax benefits. Then the benefits of tehnoparks were searched in section 4 in two subtitles: benefits for the company, and benefits for the country. The questionnaire continued with section 5 asking the respondents to choose the appropriate success factors, to rate their importance and current fulfillment level. Finally the questionnaire was concluded with asking problems and difficulties encountered in section 6 and conclusion remarks (if there are any) in section 7.

4.4. Conducting the Survey

The face-to-face interview with the managers of the New Technology Based Firms (NTBF) was chosen as a way of making the questionnaire to be filled by the appropriate people properly. The largest technoparks of Turkey were determined. These are Istanbul Technical University's ARI Technocity, TUBITAK MAM Technocity, GOSB Technopark, METU Tecnocity, Ankara Cyberpark. 168 companies that have participated in the survey are given in Table 4.1., Table 4.2., Table 4.3., Table 4.4., and Table 4.5.

Table 4.1. Names of Respondents in ARI Technocity

1. Atos	2. İO çevre
3. Exim	4. Eastern Net.
5. Vestel	6. Nevotek
7. Planet	8. Eteration
9. Verikon	10. Sobee
11. Mikro yazılım	12. Risk yazılım
13. Kartek(smartsoft)	14. YOĞURT
15. Rayonet	16. Febau
17. ATP	18. Nuks
19. Treda Bilişim	20. GVZ
21. Angela Techn.	22. Bizitek
23. Solvoyo Yazılım	24. Servus
25. Artı Teknoloji	26. İst.Bilgi iletişim
27. C-Bilişim	28. ITD
29. INVENOA	30. Vadofone
31. AMVG	32. FONOKLİK
33. KaleData	34. SESTEK
35. IMS Yazılım	36. E-çözüm
37. Delta	38. Data Display
39. İNNOVA	40. Netsis
41. SFS	42. Airties
43. DT	44. Mobilera

Table 4.2. Names of Respondents in TÜBİTAK MAM Technocity

1. ASSAN Teknoloji ve Bilişim	2. Bilişim Bilgisayar Hiz.
3. Metus Teknoloji	4. Destim Müh.
5. Eliar Elektronik	6. Mirensi Yazılım Danışmanlık
7. Mobil Teknolojileri	8. Armada Bilişim
9. Momentum Bilgisayar Yazılım	10. 4T Sağlık ve Bilgi işlem Hiz.
11. Porini International	12. NEKSUS Bilişim
13. BMT Teknoloji ve Proses Geliştirme	14. ZİVAK TEKNOLOJİ
15. ETCBASE Yazılım ve Bilişim Tek.	16. Ekom Dış Tic.
17. Tekno Tasarım	18. Artı 90 hızlı imalat Tekn.
19. 5M Bilişm Yazılım Eğitim Yön.Dan.	20. Sualtı Sistemleri Tek.Geliştirme
21. Epsilon Elektronik	22. BİS ÇÖZÜM
23. cTech Bilişm Teknoloji	24. Navtürk Bilgi Sistemleri
25. cTech Bilişm Teknoloji	26. Çözüm Bilgisayar
27. Gordion Bilgi Hizmet	28. Benko Bilgisayar Yazılım
29. Mobiarts GSM & Yazılım	30. Teknoset
31. Mekatro Ar-Ge	32. Return Bilişim
33. Temsa Ar-Ge ve Teknoloji	34. EMC Elektronik
35. Pavo Elektronik	36. Devnet
37. Kavrakoğlu e-Technologies	38. AQVİLA Software Yazılım
39. VESTEL Savunma Sanai	

Table 4.3. Names of Respondents in GOSB Technopark

1. SİM Sistem Bilişim Hizmetleri	2. Bosal- Mımaysan
3. Matriks Bilgi Dağ. Hiz.	4. INOVENT
5. Ekip Mapics Bilgisayar Yaz. Plan	6. Teknodrom Robotik ve Otomasyon
7. Çözüm Yazılım ve Bilgisayar	8. Astone Arge Bilgi Bilişim Sistemleri
9. Kuşman Teknoloji	10. Tetaq Yazılım ve Danışmanlık
11. Teknolojist	12. Teknoloji Yatırımları ve Danışmanlık
13. Ditaş	14. Sis Bilişim Sistemleri
15. Mavisis Teknoloji	16. Futurecom Bilişim Hizmetleri
17. ABİGEM Teknopark	18. WHITE CAD Teknolojileri
19. ARGE Bilişim	20. ALTAR Bilişim Ar-Ge Hizmetleri
21. Persona İletişim Hizmetleri	22. Ketsoft Bilgisayar Yazılım Danışmanlık
23. Mikromask Arge	24. Piworks LLC. (Eksperkom)
25. Ankanet Yazılım	26. Far Dezayn
27. Artesis Teknoloji Sistemleri	28. Erk Yazılım
29. Vtek Bilişim ve İletişim Teknolojileri	30. Sempa Bilgi İşlem
31. I-Base	32. Entek
33. Eklips Bilişim Teknolojileri	34. Mira Ar-Ge
35. Sonar Ar-Ge yazılım ve Elektronik	

Table 4.4. Names of Respondents in ODTÜ Technocity

1. Meteksan Sistem	2. Bimsa Bilgi ve Yönetim Sistemleri
3. TEG Elektronik	4. Halıcı Bilgi İşlem
5. Data Ofis	6. Fiğes Ankara
7. Remedium	8. Bilgi Grubu
9. Turkray	10. SATEK Savunma Teknoloji
11. Onmaz Bilgi Sistemleri	12. Stratek
13. Vega Yazılım	14. Enocta
15. BTT Bilgi Teknoloji Tasarım	16. Siemens (SIS Bölümü)
17. Bias Mühendislik	18. Gate Elektronik
19. Tümer Mühendislik	20. Havelsab Ehsim
21. Aydın Yazılım	22. Cito Eğitim Araştırma Danışmanlık
23. TAREL	24. Refgen Bioteknoloji
25. Hemosoft Bilişim ve Eğitim Hizmetleri	26. İnterak
27. Çözüm Bilgisayar	28. Kaletron Yazılım Teknolojileri
29. Bilgi GIS	30. ESDAŞ
31. LOGO Yazılım	32. Labris Teknoloji Bilişim Çözümleri
33. MNG Bilgisayar	34. BOTT Bilgi Sistemleri

Table 4.5. Names of Respondents in ANKARA Cyberpark

1. Meddata
2. Özel Güven Bilgi Teknolojileri
3. Bilişim Sanayi ve Ticaret
4. Bmbsoft Bilgisayar Yazılım İletişim Sistemleri
5. KAREL Ar-Ge
6. İnfopark Bilgi Teknolojileri
7. İnta Uzay Sistemleri ve İletişim
8. Mobiliz Bilgi ve İletişim Teknolojileri
9. Göksan Bilişim Teknolojileri
10. DuSoft
11. Nanomanyetik Bilimsel Cihazlar
12. SYS
13. Ars Arthro Biyoteknoloji
14. DMT Dijital Multimedya Teknolojileri
15. Mht Elektonik tasarım
16. Avaian Yazılım

4.5. Analysis

The evaluation of the survey results and statistical analysis is given in "Results and Discussion" section. The answers of the respondents are summarized in Appendix D.

5. RESULTS AND DISCUSSION

In this survey, questionnaire forms were distributed among 242 New Technology Based Firms (NTBF) in five technoparks. 168 companies, which makes the 69.4 per cent of companies that received the questionnaire, had responded to the survey. The respondents varied from the owner of the firm to the general manager or people in various departments mostly from R&D and engineering. This can be considered as a good response rate for this type of studies. For instance a similar study was done in Sweden in 2005. 134 forms were answered by the technoparks firms out of 265 corresponding to a response rate of 50.6 [12]. The distribution of respondents in these five technoparks is given in Figure 5.1. The results of the survey is summarized and discussed below while the detailed results are given in Appendix D.

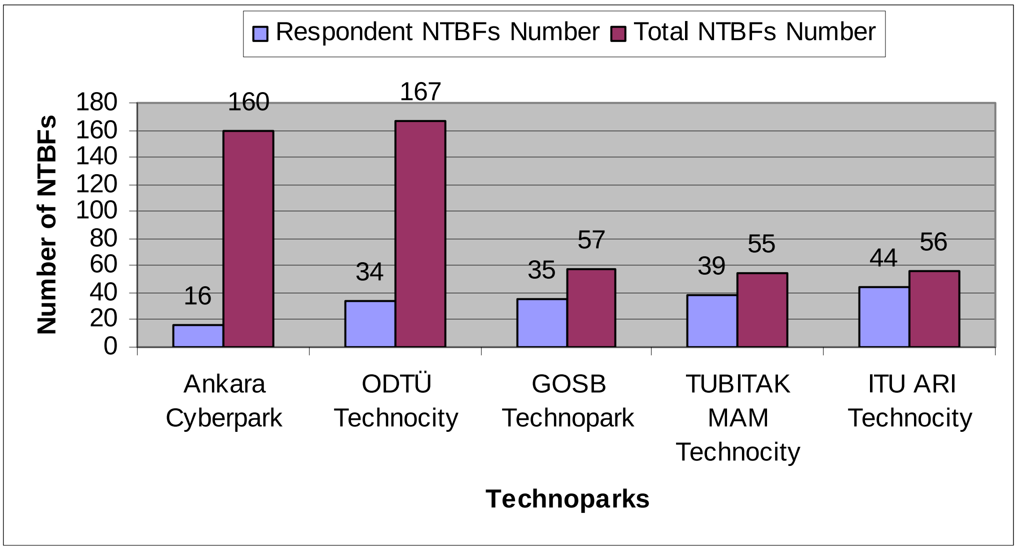

Figure 5.1. General view of number of respondents' technopark

5.1. General Information about the New Technology Based Firms

In this part of the questionnaire, general information about the New Technology Based Firms (NTBF) was asked. The first question was about the industry that the firm operates in. Figure 5.2 shows the distribution of companies among the industries which are quite diverse. However, nearly half of those companies (45.6 per cent) are working in the software and business solutions. It should be also noted that the entries such as e-commerce, education service sector, insurance and other may also involve some sort of software development activity indicating the significance of this industry for the Turkish technoparks. This could be understood easily considering that the capital investment needs for the software development are relatively lower than the hardware, and the human resources required for this industry are available especially among the young people who are the main group establishing the firms in technoparks.

This is also true for some foreign technoparks. For instance a survey indicates that 33.9 per cent of the firms in Sweden technoparks operate in software and IT industries. [12] Similarly 35 per cent of Korean technopark firms are in software and telecommunication industry. [23]

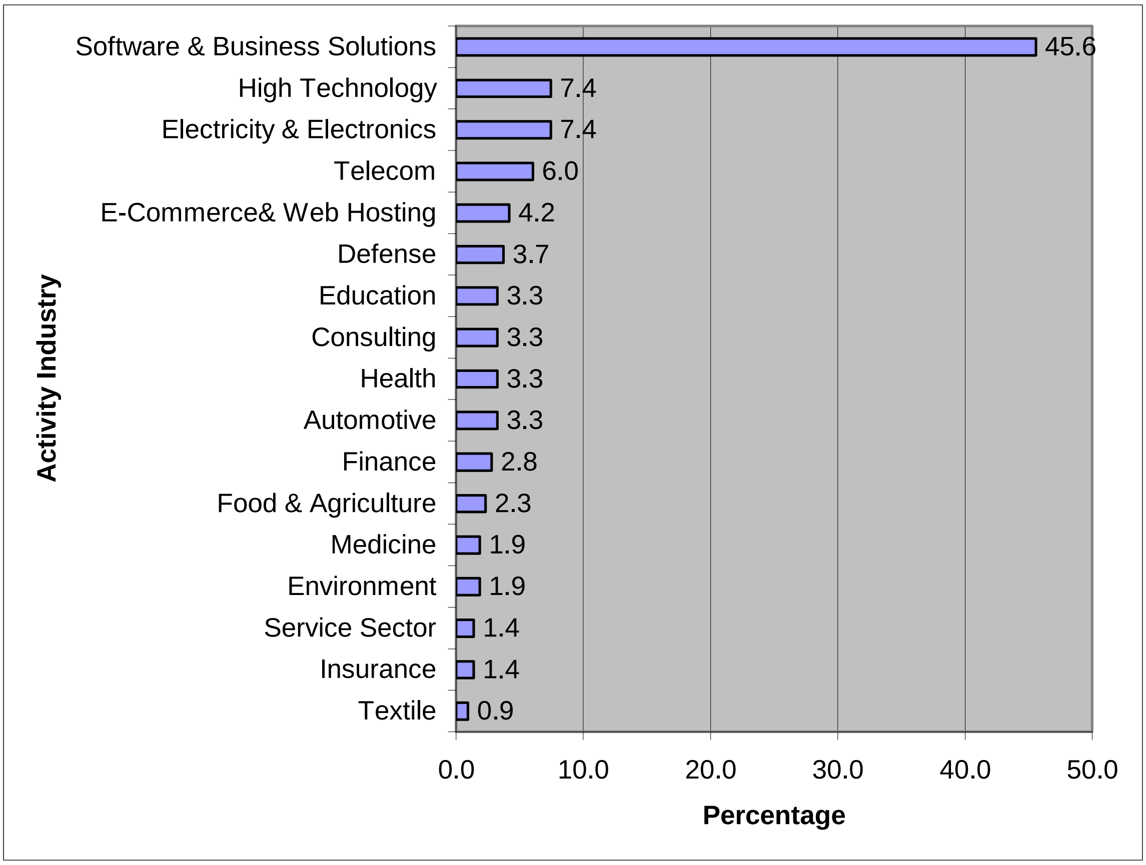

Figure 5.2. Activity industries of the NTBFs

Next, the establishment years of the NTBFs were probed, and the results are shown in Figure 5.3. The eight firms, which did not give answer to that question, are not shown in the figure. Two firms that responded 2007 as the establishment year were also excluded from the graph since the survey conducted in the first months of 2007, hence the inclusion of these two firms will not represent the actual situation. As the figure show, the most of the companies are quite young. For example almost half of the companies were established after 2001, which is also the date the technopark law was issued. It is also clear that the number of companies increases generally every year suggesting that the technopark phenomena has not reached the steady state yet. This is understandable considering that most of the technoparks in Turkey are very young and some are still in the establishment stage.

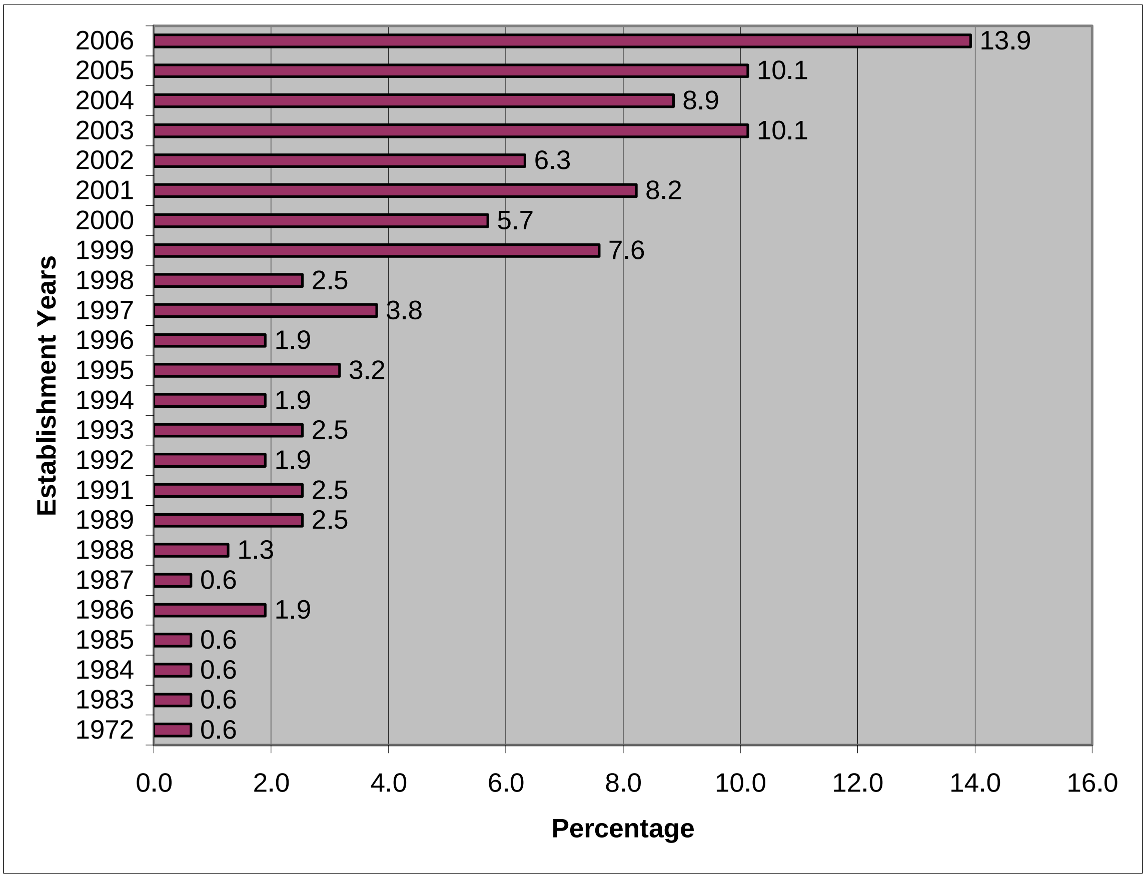

Figure 5.3. Establishment years of NTBFs in a sample of technoparks

The next question was about the origin of the firms. Three distinct categories were available for the respondents to choose from: "university", "industry" and "both". The "university" option indicates that the corporation was established in the university or by the academicians, hence it can be called university spin-off (USO) while" industry" option represents the establishments originated by the corporate spin-off (CSO). The survey showed that the majority of companies (85.7 per cent) are established by people or firms outside the university (Figure 5.4). Apparently establishing a technology firm in the technoparks is not common among the academicians although most of the technoparks in Turkey have been established by a university. This may partially due to the lack of experience of academicians since establishing or working in a private company was not permitted to the them (as a matter of fact to all state officials) until recent years and those restrictions still hold outside the technoparks.

The number of firms originated by universities is higher in other countries. For example, 24 of 78 companies in Cambridgeshire technoparks in UK. Similarly 11 firms out of 37 are also originated by the university in Hertfordshire. This situation is also true for Cambridge. USOs were 27.5 per cent of total in Cambridge Science Park in 1980. According to Lindholm and Wikström (1998), USOs are 53.8 per cent while CSOs forms 46.2 per cent of the firms in Sweeden Science Parks . However this is not always the case. For instance, according to Cooper (1971), only 8 firms out of 243 Silicon Valley in the 1960s came directly from Standford University. [12]

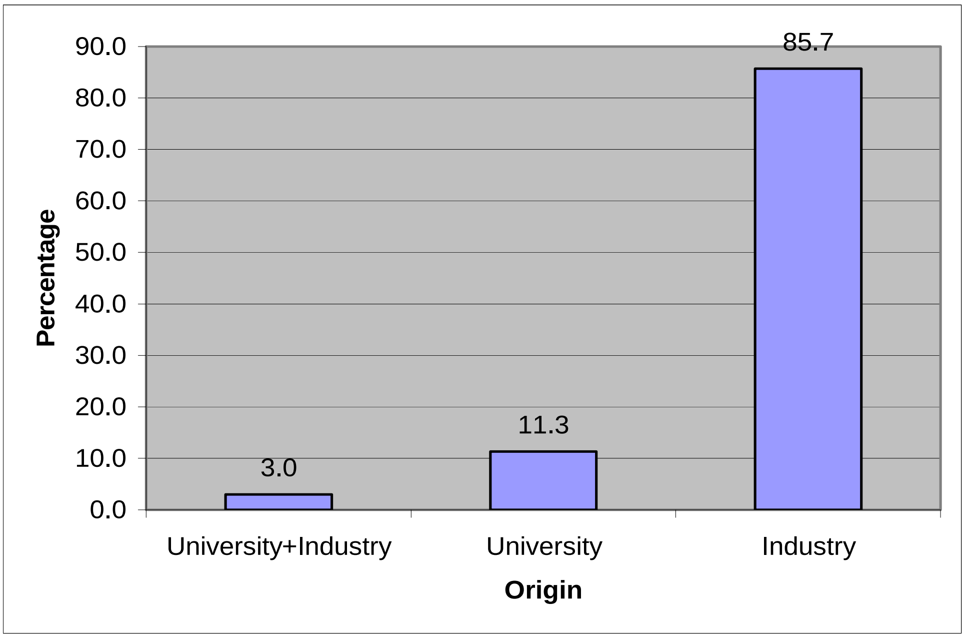

Figure 5.4. Origin of NTBFs in technoparks

5.2. Current Technological Status of NTBFs

The second set of questions were about the products, services, technologies, patents and know-hows, and R&D activities so that the current technological status of the firms could be understood. The expectations of NTBFs from the technoparks were also searched.

The first question in this section was about the product and services they produce, and the results are summarized in Figure 5.5. The software related products and services have the highest share as expected considering that almost half of the companies indicated their industry as software and business solutions. The second largest group of responses is about the business solution products (which is also software) with 12.6 per cent. This group contains solutions software from ERP, CRM packets to specialized software products. Consulting services has the same 12.6 per cent. Then the remaining parts of the products produced in the technoparks varies in a wide range. However, there seem to be some software dimensions in most of the product groups.

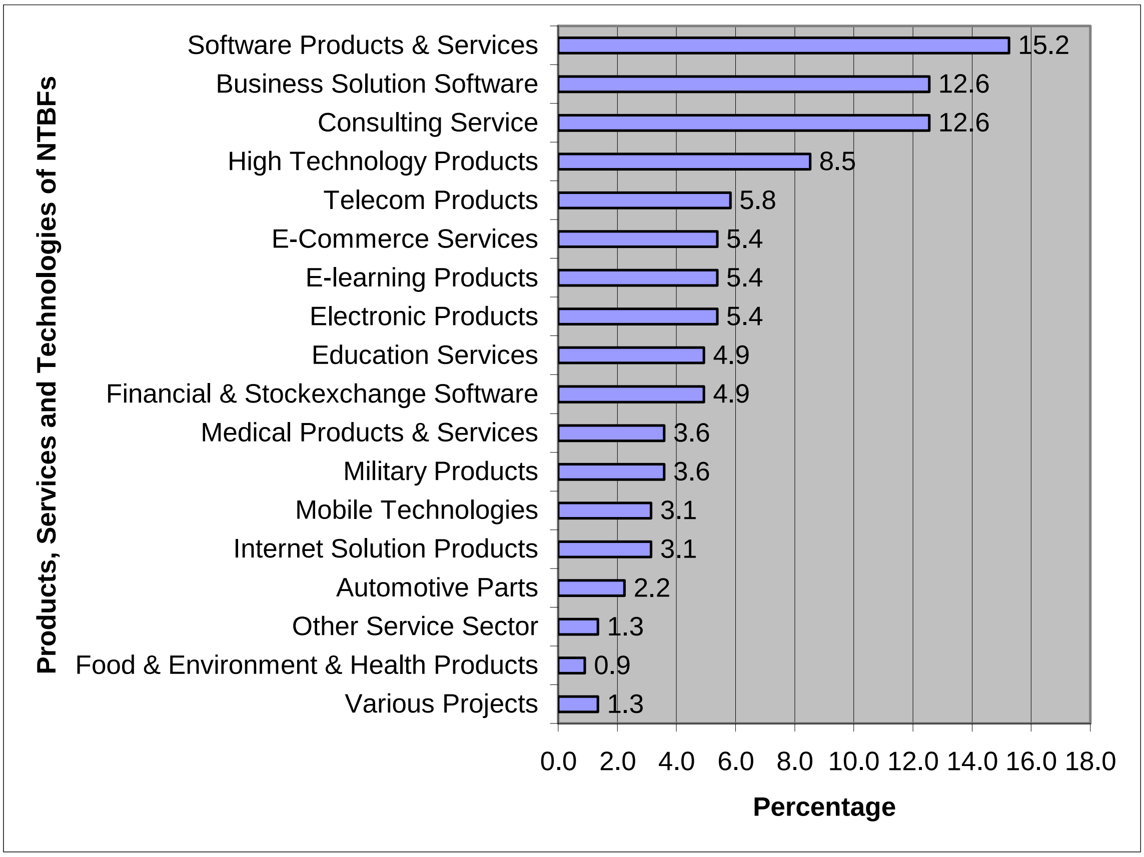

Figure 5.5. Products and services of new technology based firms

Then the fraction of these products, services and technologies, which was developed by the firm, was asked, and the summary of the answers is presented in Figure 5.6. 59.3 per cent of the respondents stated that they develop all of their products, services, and technologies themselves. Considering that 26.9 per cent of the firms also responded to this question as “more than half”, it can be concluded that most of the companies are developing new product, services or technologies as expected. However these developments do not seem to have resulted in a “patent”, since only 38 out of 168 companies responded to the question asking “the number of patents they have”. 12 firms stated that they have one patent while 8 company responded as “two”. The number of firms that have three patents was also 8, and the rest of the companies have the number of patents ranging from four to eight.

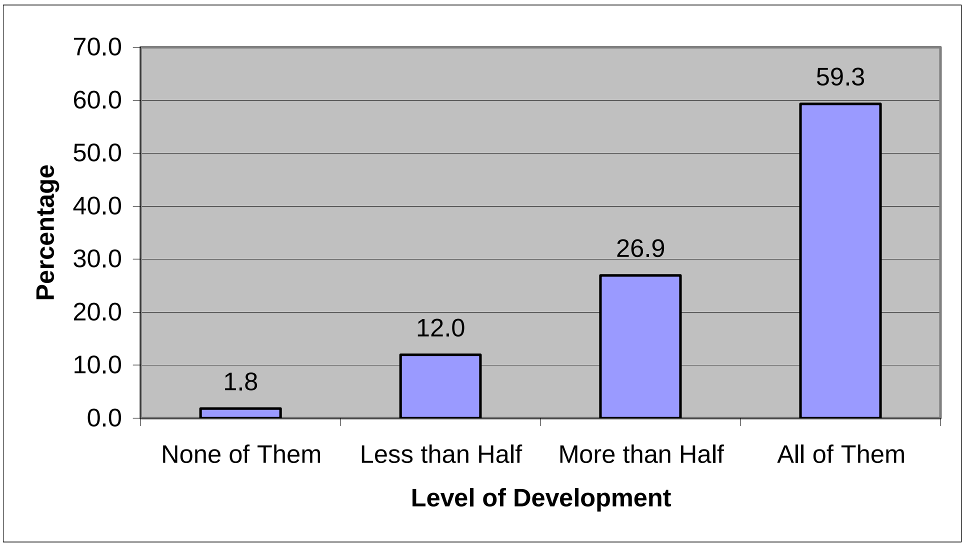

Figure 5.6. Developing or developed products, service or technology

However, it should be noted that not all new innovations have resulted in a patent due to the secrecy, cost of patent or some other reasons. Hence, the next two questions, which are about the commercialized innovation, included the “know-how” in addition to patents. Again only 62 firms answered to these questions. The first question was about the type of the products and services that were commercialized by these firms. The software and business solution is taking the lead again with the 37.1 per cent as expected (Figure 5.7). This is followed by consulting services and Electronic products with the same percentage of 11.3. The remaining product and services are ranging from telecommunication to automotive, education to defense in various ratios.

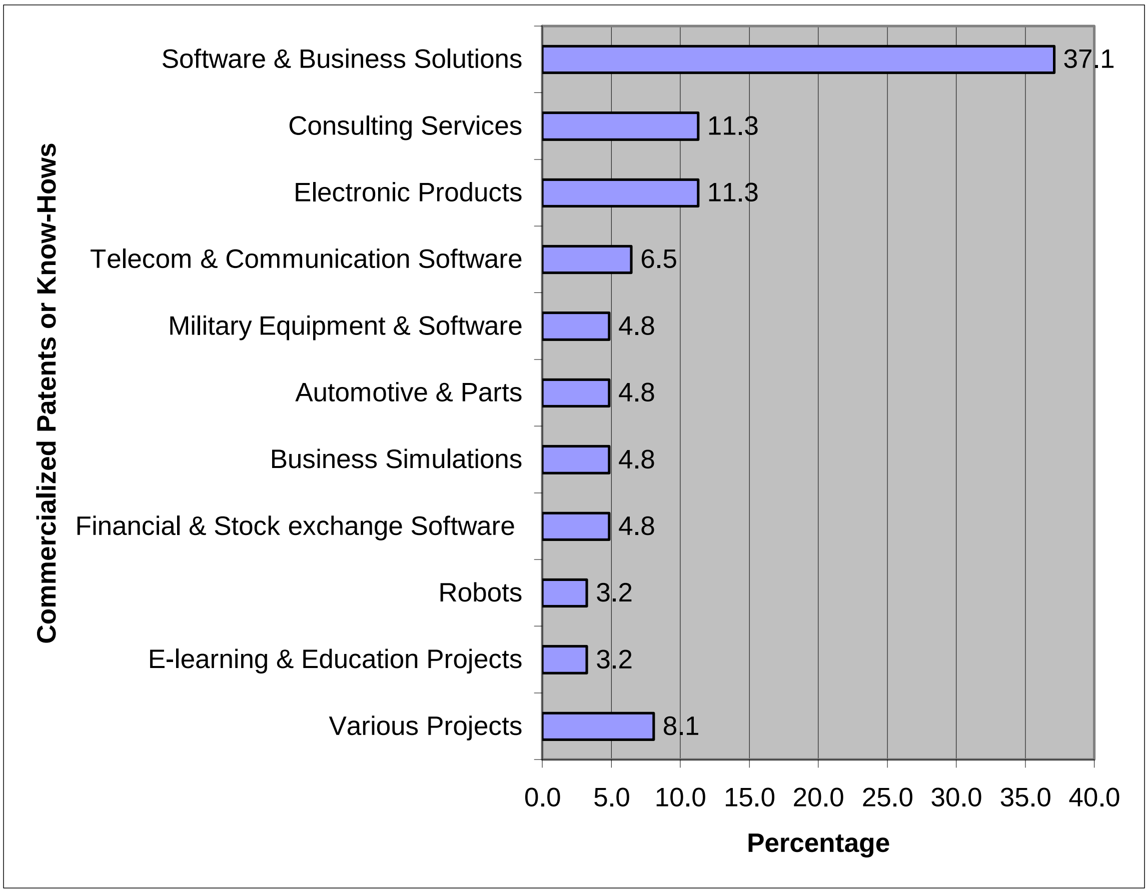

Figure 5.7. Explanation of commercialized patents or know-hows

The time that takes to commercialize a patent or know how was also asked to the respondents who answered the previous question, and the distribution of the answer given in Figure 5.8. It appears that most of the responding firms' commercialization process takes 12 to 24 months with the average of 21.

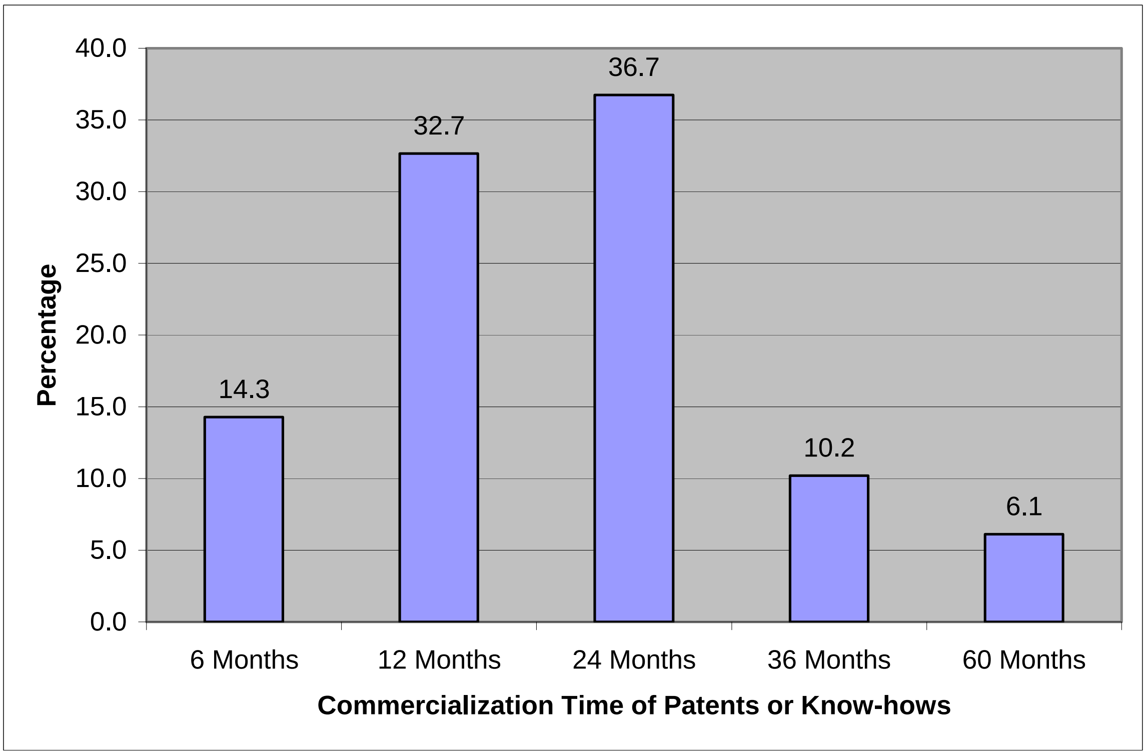

Figure 5.8. Commercialization time of patents or know-hows

The next question was R&D expenditure as a per cent in the budget in a scale of 10 per cent intervals from 0 to 100 per cent. 148 of 160 firms responded to the question with the results given in Figure 5.9. 16.9 per cent answered that their R&D spending are in 90 to 100 per cent interval. The other answers distributed in all the interval without any significant trend, which is an expected results considering that the firms are operating in quite divers industries that may require different levels of R&D spending. The average spending however is still quite high (about 53 per cent) as expected from the companies operating in technoparks.

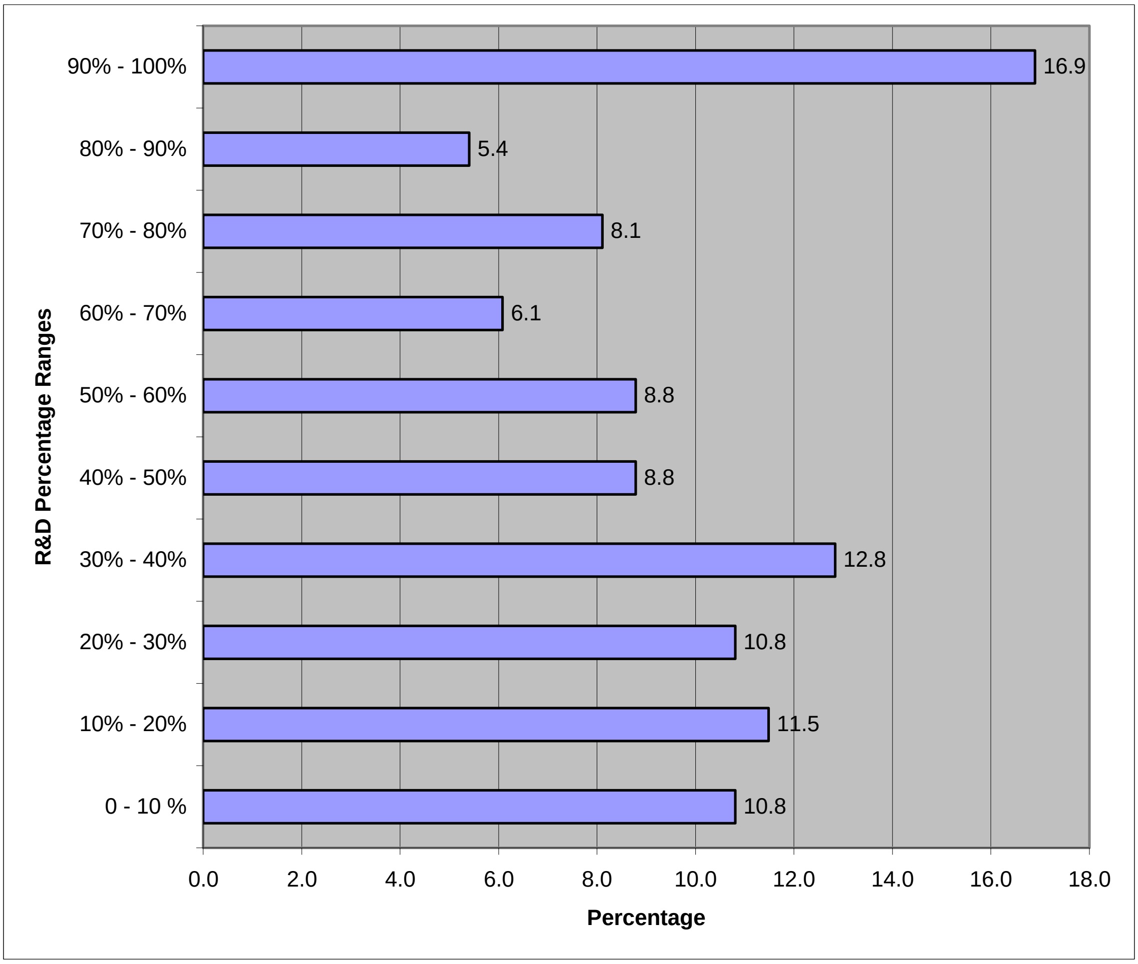

Figure 5.9. R&D percentages in total budget

The current status of the human profile was also asked, and total number of employees in 168 firms responded was found to be 2973 which corresponds to 17.7 people per firm on the average. This result is very close to the report of United Kingdom Science Parks Association, which reported that 80% of science park firms have fewer than 15 employees in 1999. [27]

The education levels of those employees are given in Figure 5.10 in two groups as R&D and others. It should be noted that some respondents stated only the number of employee without any details about the education level. Hence, the plot in Figure 5.10 is based on 2501 employees. 1819 people who form about the 73 per cent of total are working in R&D function while the remaining 27 per cents are in the other departments.

The university graduates constitutes the highest per cents in both R&D (46.1 per cent) and other fields (17.4 per cent) .The per cent of people who have a master's degree in R&D can also be considered as significant (14.0 per cent) while this ratio is quite low (2.6 per cent) in other fields. Furthermore, 4.6 per cent of the whole R&D personnel have doctorate degree while this per cent is only 0.1 (3 people) in other fields. The per cent level of employees with an education lower than four years university degree is about 15.2. Although the per cent of people working in R&D department is still high in two year university graduate, the majority of high school graduate are working in other departments as expected considering that the most of the firms are trying to develop new technologies with strong R&D departments and the other departments mostly for supporting activities.

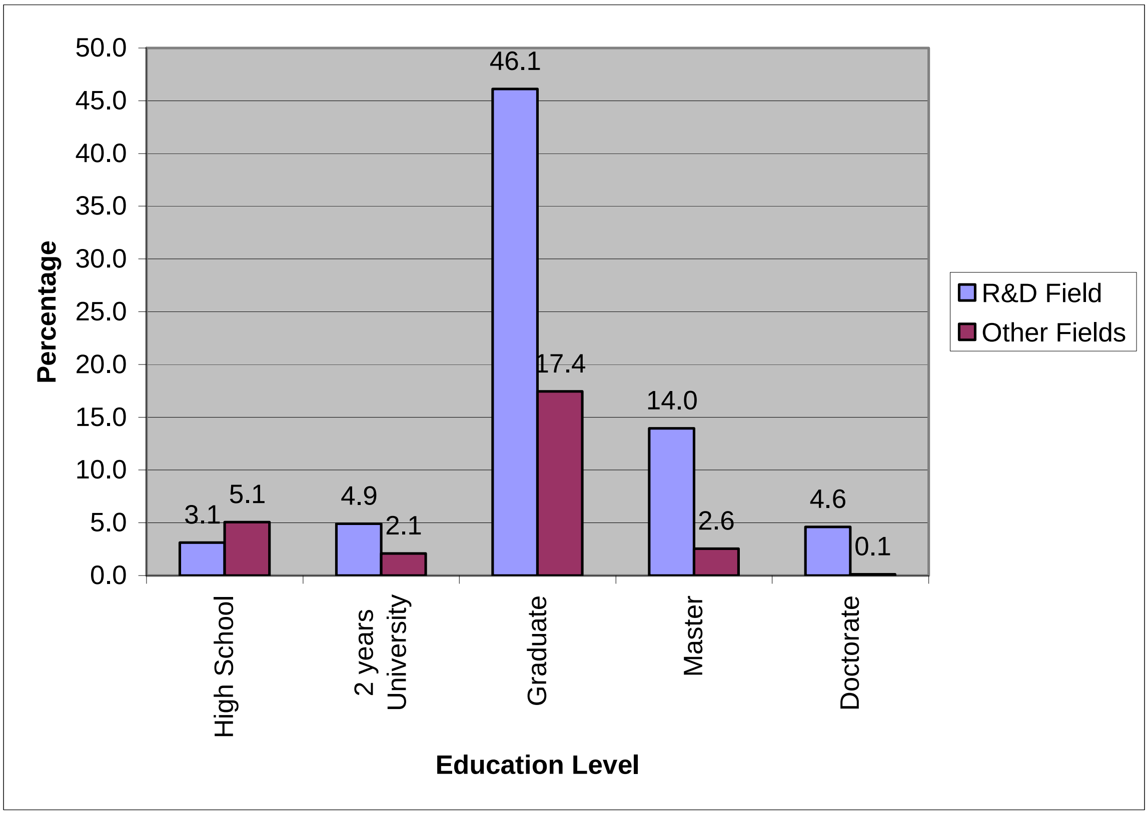

Figure 5.10. Education profile of new technology based firms in Turkish technoparks

The last question in this part of the survey was about the expectations from the technoparks in two dimensions: What they wanted to find (level of importance) and what they found (level of realization). The respondent were asked to rate each factor in a given list and score them from 1 to 5 (1:"Very Poor"; 2: "Poor"; 3: "Fair"; 4: "Good"; and 5: "Excellent"). The data in Figure 5.11 is sorted in descending order with respect to level of importance, which is expressed as average. The standard deviation in both level of importance and level of realization can be found in Appendix A.

Apparently the tax privilege and the project supports are the most important expectation factor with 4.4 average out of 5. The level of realization of tax privilege is also the highest (4.1). This is an expected result since the tax privilege is regulated by law and it is easier to fulfill. However the fulfillment level of project support is low (average 3.1) implying that the firms are not satisfied with the supports as much as with the tax privilege. Creating R&D environment is in the third order in level of importance with 4.3 average. The realization level of this factor is also low (3.3).

There seem to be two general trends in the responses to this question: First the level of importance is always higher than realization which indicates some unhappiness. The second trend is that if the level of importance is rated high, the level of realization seem to be also rated high indicating that the expectation of the companies were considered when the technoparks and related support mechanisms were structured.

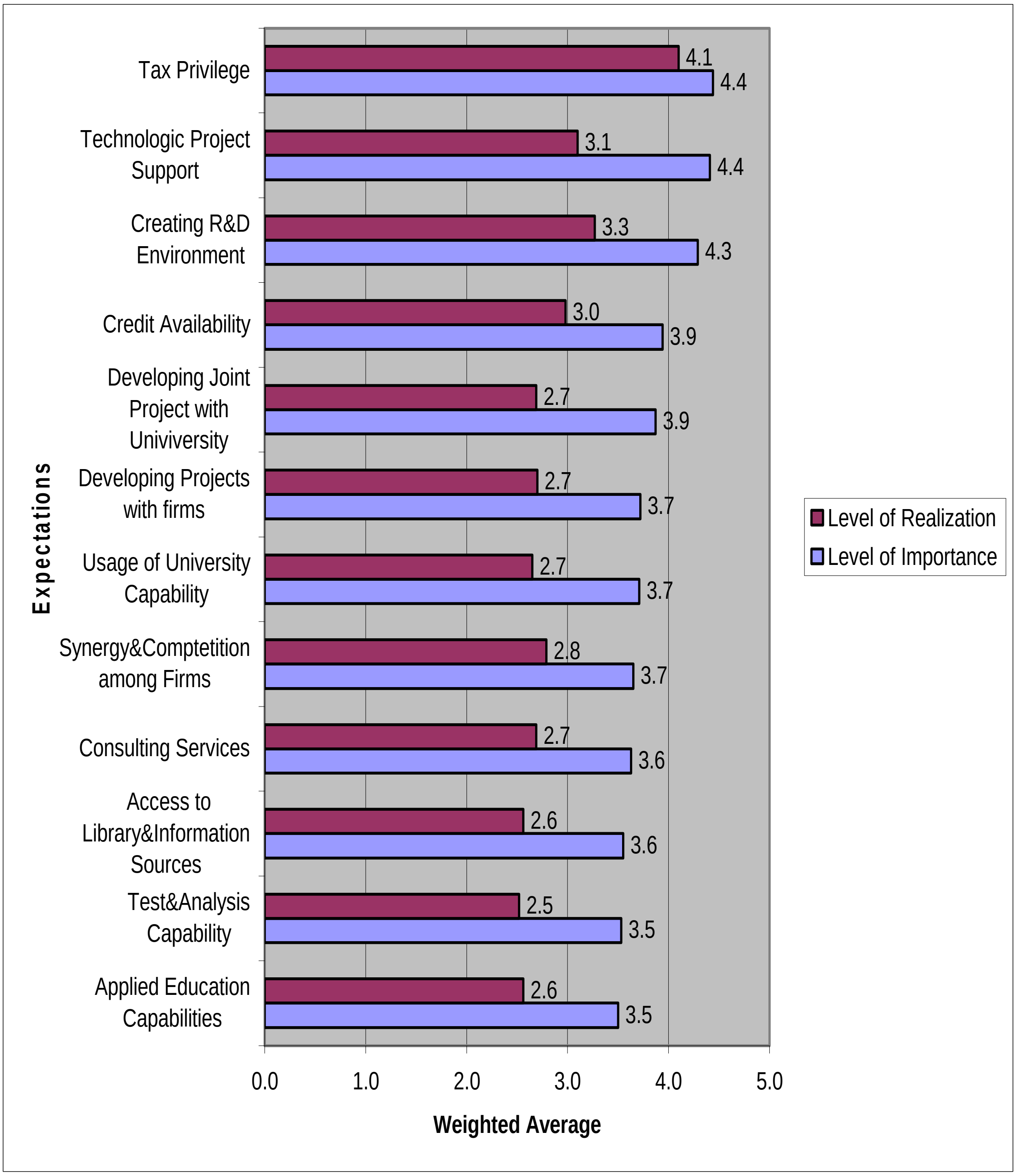

Figure 5.11. Expectations of NTBFs from technopark in realization and importance scales

5.3. Support for Technology Development in Turkey

The third part of the questionnaire was about the technology development support in Turkey. In order to investigate this topic the name of the supporting institutions and type of the supports were asked to the respondents first. This part of the questionnaire was not filled by 107 of the 168 respondent firms claiming the secrecy of this information.

However the results should still give the general picture since the list of supporting institute and support mechanisms are limited.

As can be seen in the Figure 5.12. the highest percentage belongs to the TÜBİTAK (Scientific and Technical Research Council of Turkey) which is 45.1 per cent. In the second place, TEYDEB (Technology and Innovation Founding Programs Directorate) which is also a TUBİTAK institute has given 18.7 per cent of full support to the responding firms. This followed by TTGV (Turkey Technology Development Foundation) with 12.1 per cent and KOSGEB (Small and Middle Scale Industry Development and Support Management Chairmanship**)** with 11 per cent. The remaining 13.2 per cent support is given by various institutes such as World Bank, EU (as FP6 project), and other institutions and private companies.

The characteristics of supports also are varying from R&D projects to rents, from credit to donations.

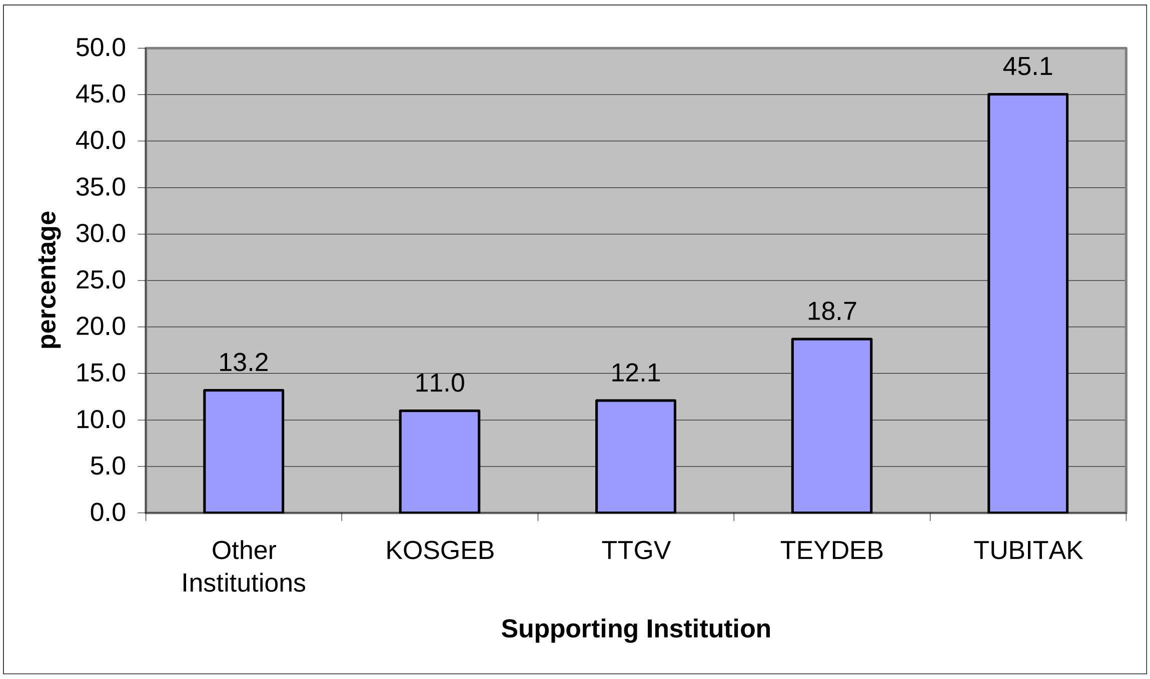

Figure 5.12. Percentage of supporting institution

Then the respondent were asked whether they found the level of support for technology development sufficient or not. The results obtained were given in Figure 5.13

using a scale 1 to five 5 (1:"Very Poor"; 2: "Poor"; 3: "Fair"; 4: "Good"; and 5: "Excellent"). The highest percentage of the answers was "fair" with 42.3 per cent. In the second order, 25.0 per cent of the respondents claimed that the level of support to NTBFs in Turkey is good while 21.4 per cent of the respondents asserted that the level of support is poor. The per cent of the respondents that found the support "excellent" or "very poor" was relatively small.

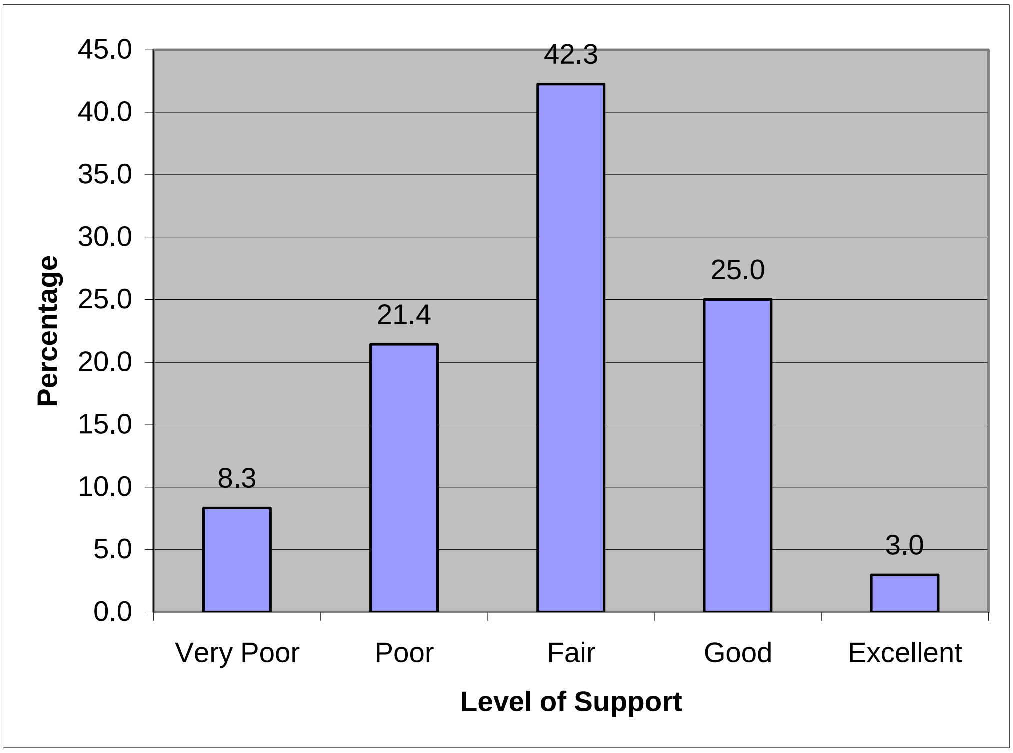

Figure 5.13. Supplying support to the NTBFs in Turkey

Next, the question of whether the technoparks were successful or not in Turkey was asked in YES or NO form. The respondents were asked to answer the question both for the company and for the country. The answers of 167 respondents out of 168 are summarized in Figure 5.14. 73.7 per cent of the respondent firms claimed that technopark applications are successful with respect to company while this per cent dropped to 65.3 per cent for the country.

Although the majority of the respondents asserted that technopark applications are successful in Turkey with respect to both company and country, the per cent of NO answer in both cases are still significant considering that those firms are in technoparks. It is also interesting that that there are almost 10 point differences between the per cent of respondents that found the technoparks successful for the companies than for the country. This may be partially attributed to the fact that the companies get benefits of the technoparks directly although the benefit for the country will come indirectly in the long run.

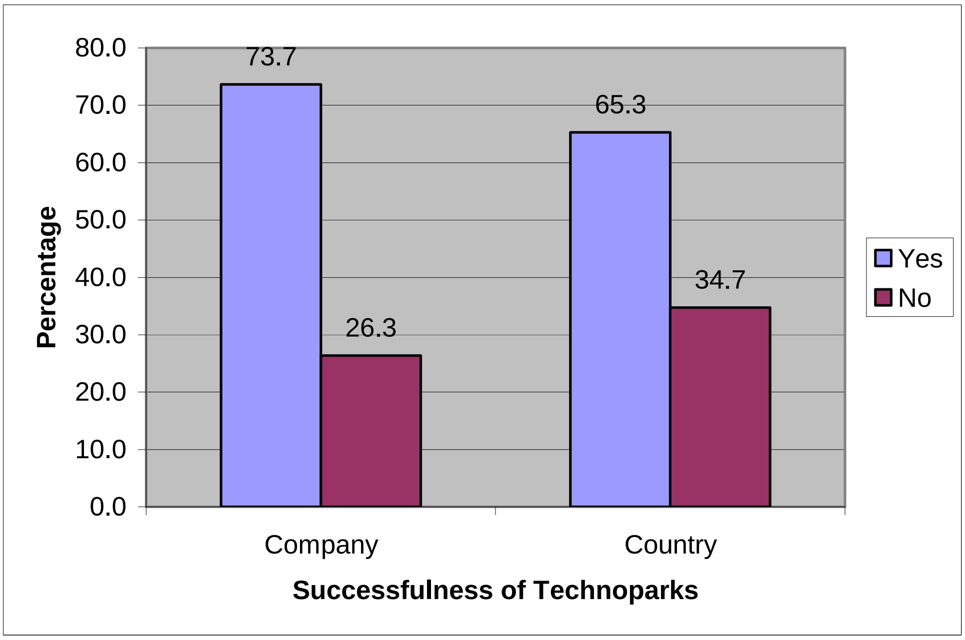

Figure 5.14. Evaluation of technoparks' successfulness with respect to company and country

Finally the opinion of the respondents about the place of Turkey in the world with respect to technopark applications was also asked. All of the respondents filled this part of the questionnaire form. The results are illustrated in Figure 5.15. It is interesting that 70.8 per cent of the respondent think that the place of Turkey in the world is "poor" when technoparks are considered. It is clear that there is a strong dissatisfaction or negative perception about the Turkish technopark applications compared to the foreign technoparks. The remaining answer is distributed among the other options as given in the figure.

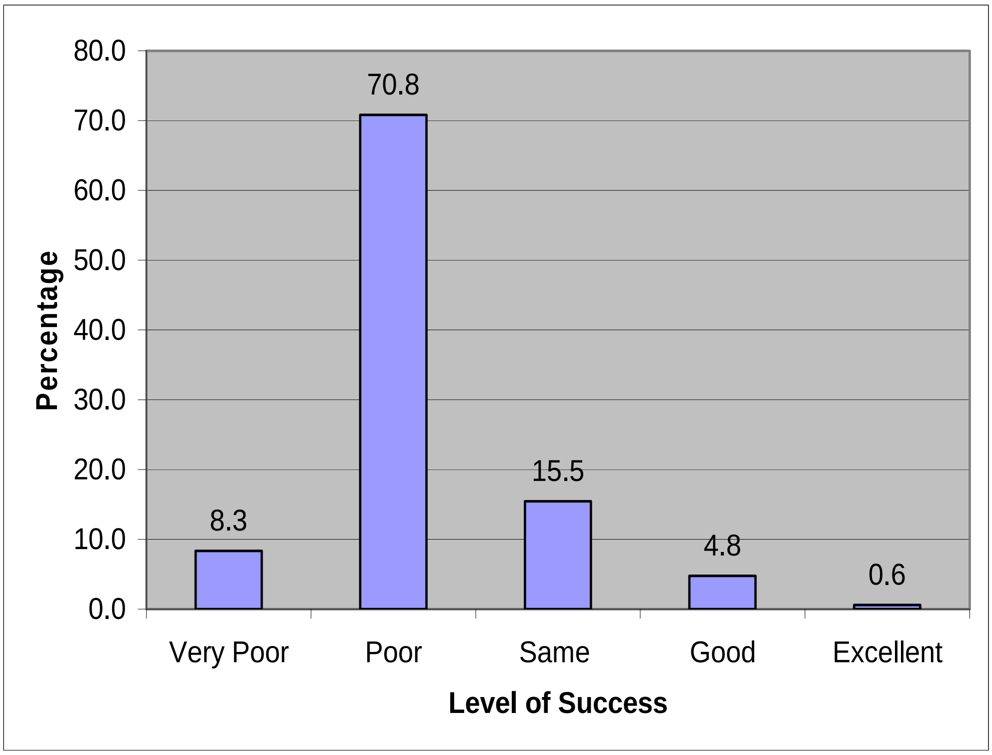

Figure 5.15. Place of Turkish technoparks in the world

5.4. Benefits of Technoparks to Entrepreneurs and Country

This part of the survey is done in order to comprehend the benefits of the technoparks to both entrepreneurs and country. A list of possible benefits were given to the respondents and asked them to rate these in two dimensions as" level importance" and "level of realization".

Figure 5.16 illustrates the results for the firms. The respondents state that the most important factor is financial incentive and support with the score of 4.6 which is a very high. Unfortunately, the level of realization for these factors with respect to entrepreneur is merely 3.5. The cooperation with university and research institutes is in the second order with the score of 4.3 in the level of importance. However, the score for the realization is 2.9 which is again very low. Similarly benefiting from the technoparks services (such as analysis and testing, library, technical education, and infrastructure) which is in the third place in importance with the score of 4.2, was rated very low again (2.6) in terms of realization.

Although no direct correlation between the level of importance and the level of realization of various factors with respect to the entrepreneur, it is quite clear that the realization level is much lower than the importance.

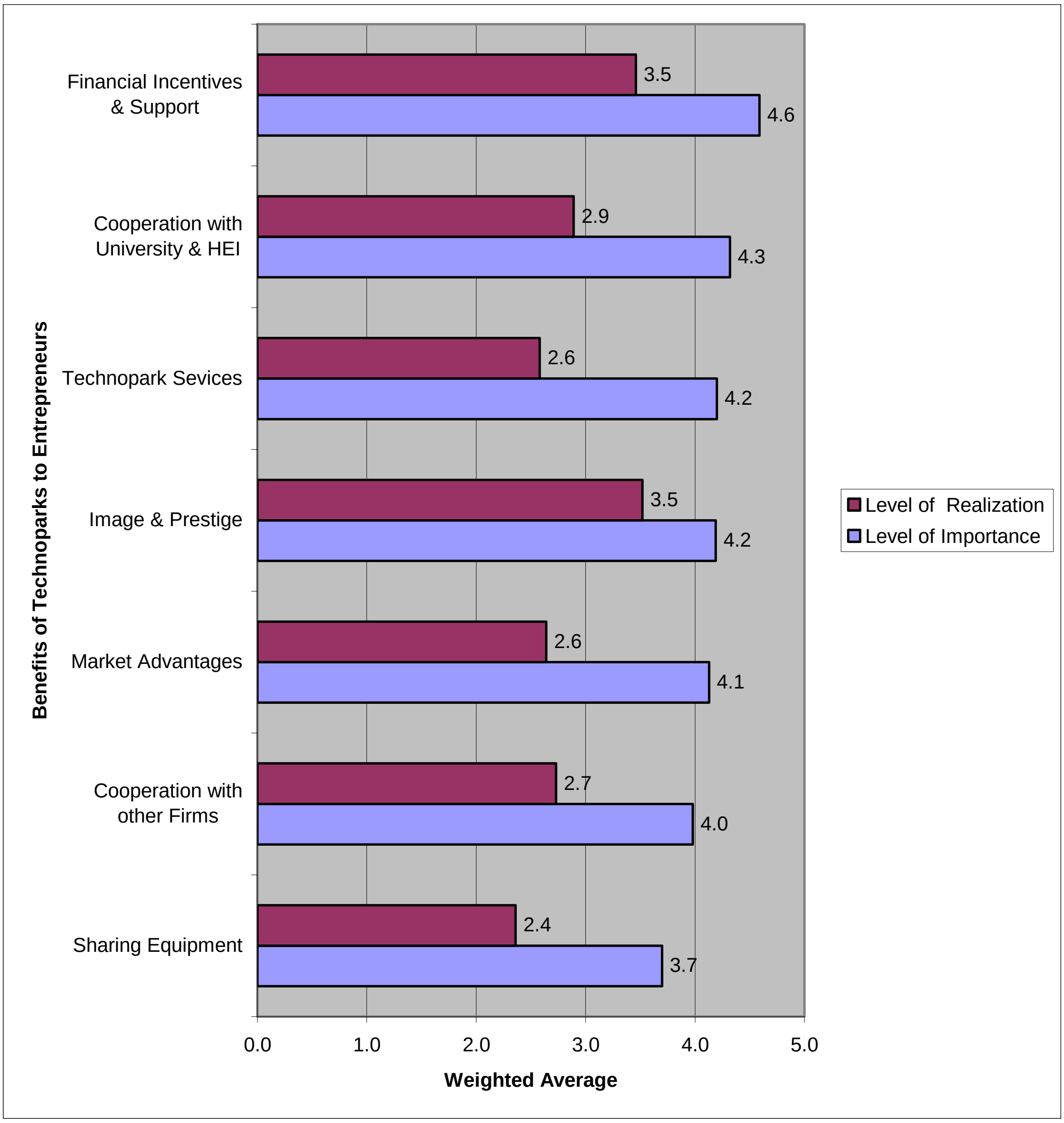

Figure 5.16. Benefits of technoparks to entrepreneurs

The benefits of the technoparks to the country is given in Figure 5.17. The creation of technology and therefore added value to the country and contribution to innovative environments are taking the lead in terms of importance with the rating of 4.7 out of 5. However the level of realization is 3.3 and 3.4 for creation of technology and added value, and contribution to the innovative environment respectively. It followed by the factors such as creation of employment opportunities, contribution to university- industry corporation, contribution to regional development, attraction of foreign technology and capital and financial support to universities with the descending order in terms of importance. The realization level for all factors are rated lower than the importance as the previous importance.

It is important to note that the factors related to the university are not seen as the most important factors although the major driving forces behind the technoparks in Turkey are the universities.

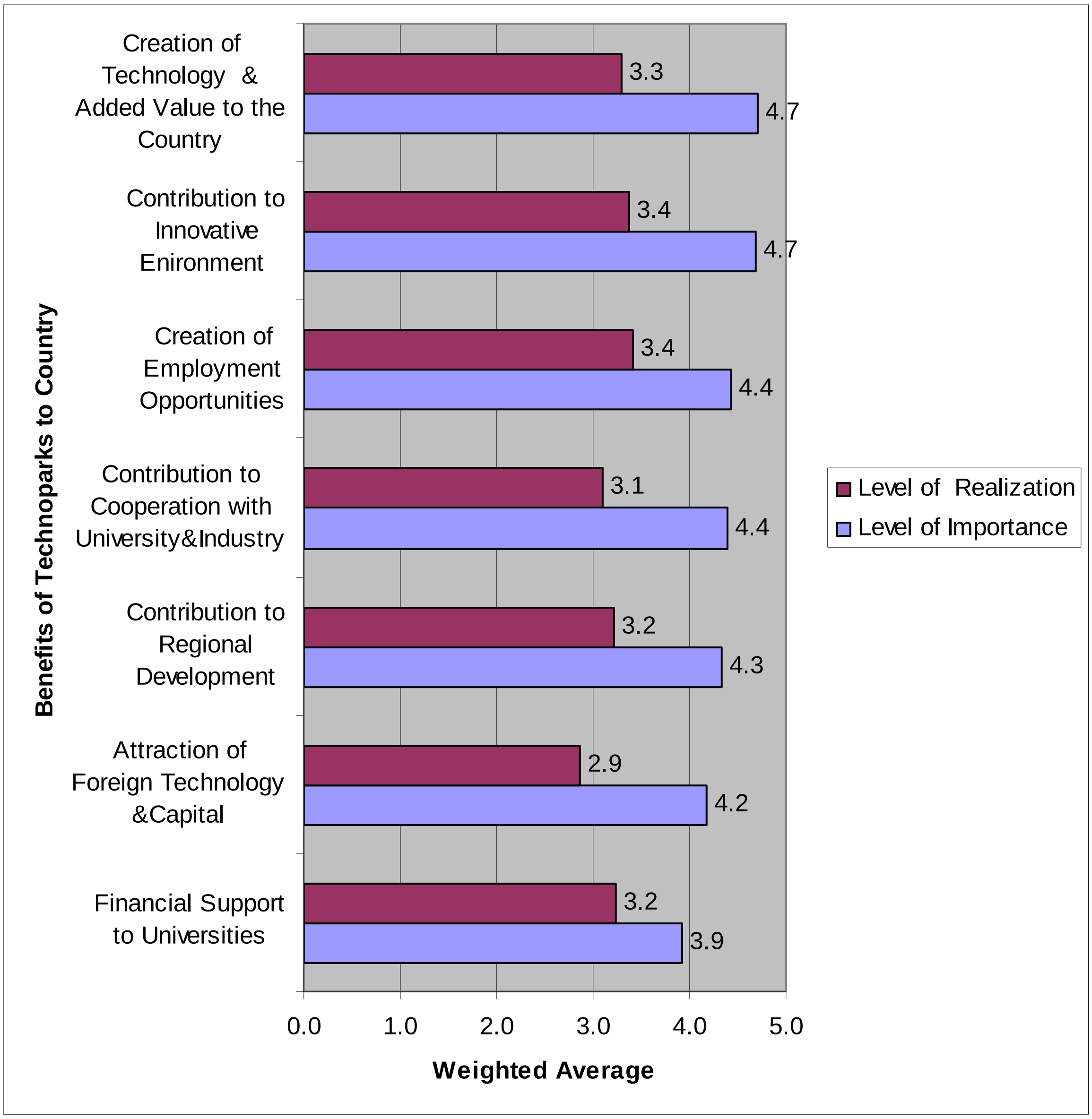

Figure 5.17. Benefits of technoparks to country

5.5. Necessary Conditions for Success

The eighteen success criteria are listed in this part of the questionnaire and asked the respondents rate these criteria in two dimensions again as “importance” and “realization” level.

The results are listed in the Figure 5.18. in descending order with respect to level of importance. The telecommunication capabilities have the highest mean value of 4.7 while the realization value of this success criterion is 3.7 indicating that there is some dissatisfaction. The supply of financial funds, incentives, and support criterion has the second highest mean value which is 4.6 in level of importance. Realization value of this success criterion is 3.3 which is again much lower than the importance level. This followed by the strong research capacity with 4.5 level of importance and 2.9 for realization. The other factors are rents, infrastructure, professional and effective management, strong R&D core and scientific alignment and so on. As in all other questions, the level or realization levels are lower that the importance for all factors.

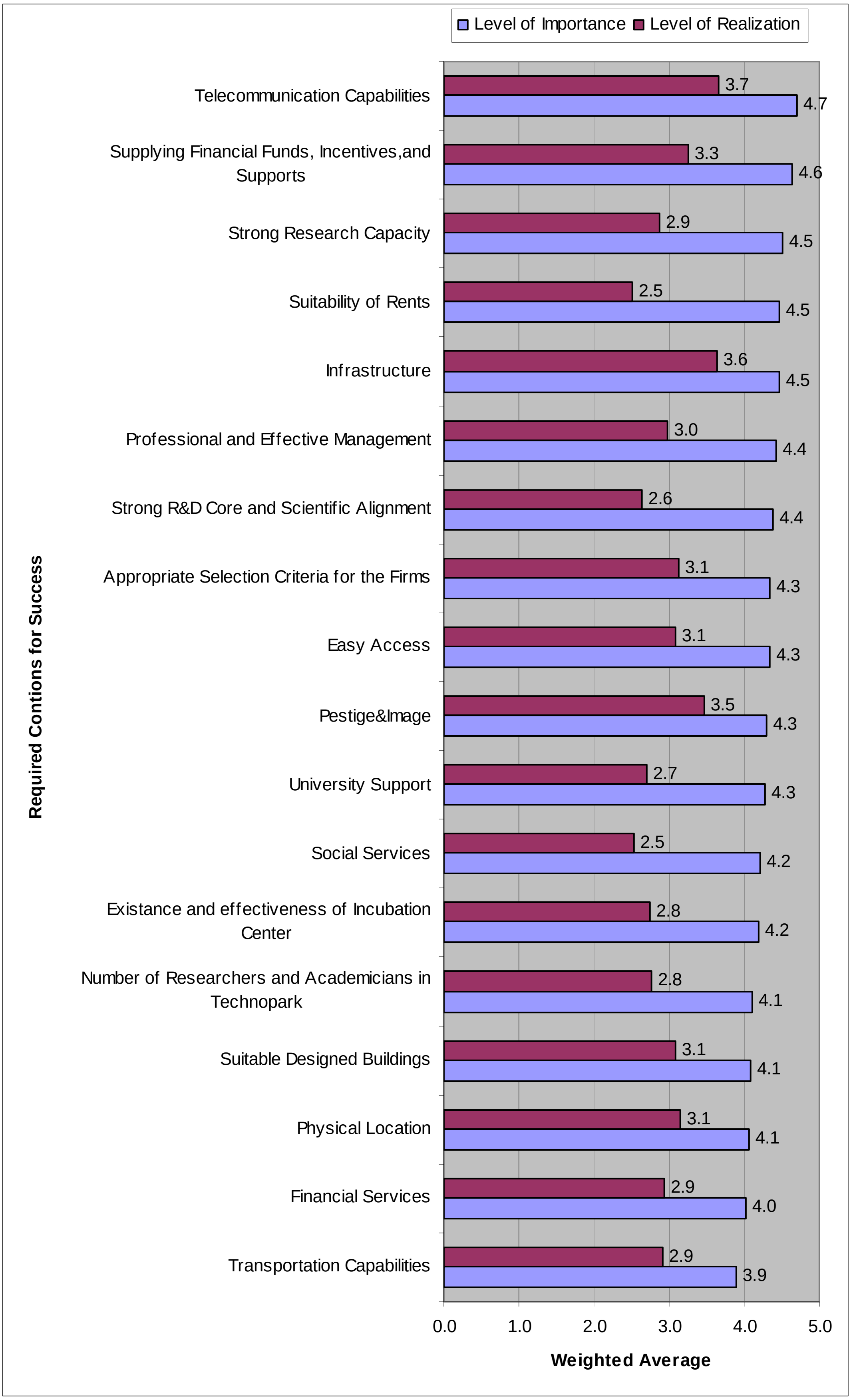

Figure 5.18. Necessary conditions for success of technoparks

5.6. Problems and Deficiencies

In this part of the questionnaire, problems and deficiencies of the technoparks are tried to investigate. The five major issues of technoparks were listed in the questionnaire form. The respondents rate these factor or add new one if they want. The results are presented in Figure 5.19.

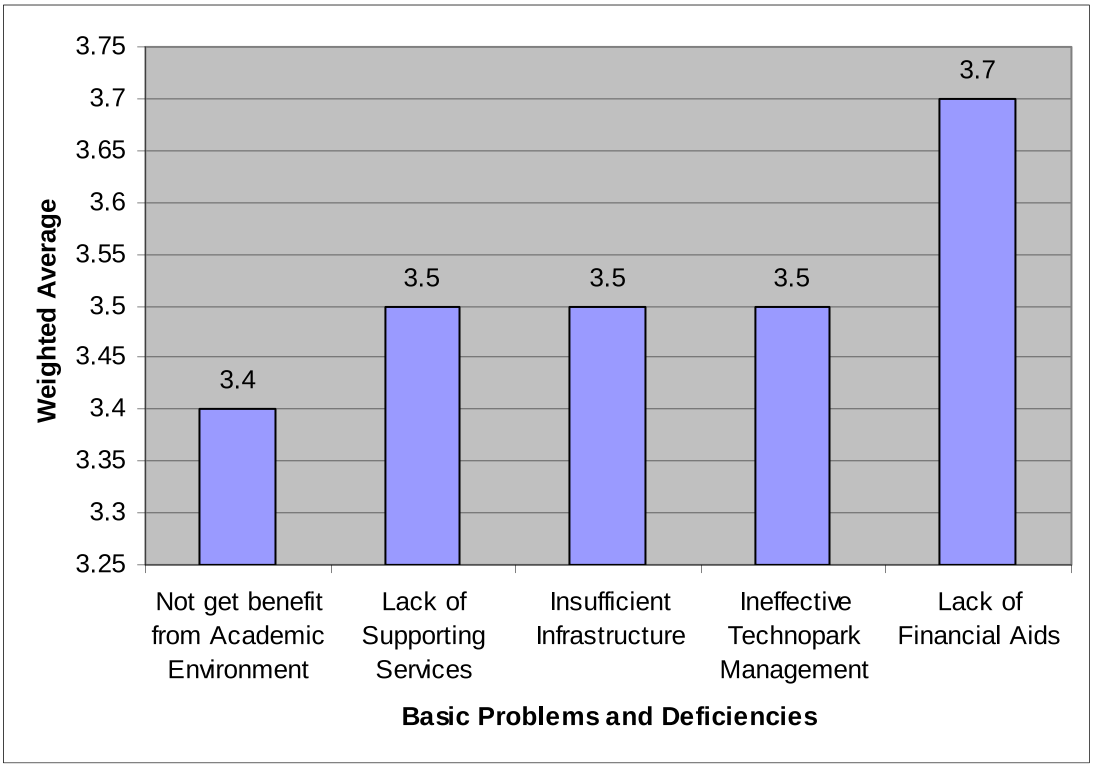

Figure 5.19. Basic issues of technoparks

All these issues are sorted in ascending order with respect to their mean values. Lack of Financial Aids issue has the highest mean value which is 3.7 out of five. Ineffective technopark management, insufficient infrastructure issue, and lack of support services received the same score (3.5) followed by the lack of benefit from the academic environment (3.4).

Respondents were also added the following problems and deficiencies: Lack of information sharing, lack of R&D studies, lack of seminars & educations, many firms or department which are not dealing with R&D, control of technopark, bureaucracy, insufficient social capabilities, firm selection, high rents, and monopole of the university.

Although the results in this section have the same level of variance with the other sections, some respondents said that they had difficulty when they are filling the questionnaire, because the meaning was not so clear. Hence the conclusion in this section should be treated accordingly.

5.7. Final Comments

Finally, the respondents were asked whether there is anything they wanted to add or not, and the following comments were added:

- Rents, common expenditures, internet, and electricity bills are very high in Turkish technoparks. Thus, earnings of firms are in low level.
- Although many firms applied for the participation in the techno parks, there is not enough place.
- Legal background of technopark concept should be defined better than the current situation of Turkish technopark today.
- The function of technopark is very important to integrate the enterprises in one area because the R&D firms come together due to the incentive of technopark.
- Technopark managements should organize educations and seminars for participant firms.
- Although participants of technoparks are not pleased with the general situation of Turkish technoparks, they can not leave these institutions owing to the fact that there is not enough number of technopark in Turkey. The behaviors of these technopark managements are completely commercial.
- Technopark managements are unsuccessful in Turkish technoparks due to the fact that there is not cooperation between technoparks and universities.
- Finding a place in technoparks is really difficult. Moreover, evaluation time takes from 1 year to 5 years which is a very long time period for enterprises.
- Renting conditions are very difficult in technopark applications in Turkey.
- There are not enough social and financial services in centers of technoparks. This situation generates bad image for technoparks. Moreover, there is not also enough synergy and cooperation.

- Technopark and universities are far away from each others. In technoparks, merely technology is bought from the abroad in order to develop and sell. This is done for making money. On the other hand, technoparks should be the places which turn theories into applications.
- Projects which are developed in technoparks have to be reported to the technopark management. This situation prevents the technologic competition among NTBFs.
- Transportation capabilities and social life which contains cafes, sport complexes, other activities are not in sufficient level.
- There must be lower bureaucracy in technopark.
- Generally, the rents of technoparks are stabilized as the same level as tax privilege. The rents are regulated by technoparks management without taking the opinions of the participant firms.
- Generally, the transportation capabilities are weak in Turkish technoparks. This is true for both internal and external capabilities of technoparks.
- Technoparks are placed not only to university campuses, but they also establish in TÜBİTAK Gebze Settlement and Gebze Industrial Zone. Thus, the technoparks which are established in outside of universities can not take academic support from universities and higher research institutes.
- There is a little connection between technopark firms and management.
- The supports and incentives should be also given the state institutions other than TÜBİTAK, TIDEB, and TTGV. These institutions should be politically neutral.
- Receiving the R&D supports and incentives takes too much time.
- The management personnel of technopark are less educated and experienced.
- The technoparks should be established in places which are close to universities.
- There should be more social services of technoparks in order to increase the motivation of the technopark staff.
- The technoparks should give educational supports related to the advanced products. Furthermore, the absenteeism right should be increased.
- The application period should be decreased. Moreover, applications could be done by the firms directly.
- There is no socialization in technoparks due to the mentality and attitude of people.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The following conclusion about the characteristics of the firms in the technoparks can be drawn from this study:

- Most of the firms are operating in software and business solutions industry.
- Most of the NTBFs were established after the acceptance of technoparks law in 2001.
- The majority of the firms (nearly 86 per cent) originated from the industry, rather than universities.

Those are the conclusions about the current technological status of the firms in Turkish technoparks.

- Most of the products and services of NTBFs are about the software and business solution as the operating industry of the companies.
- Nearly 60 per cent of NTBFs stated that they produce all of their products, services, or technologies themselves.
- 38 firms stated that they have patents. Most of firms have one patent while the remaining firms have 2-8 patents.
- The commercialization time for most of the firms is stated as 24 Months (37 per cent) and 12 Months (33 per cent).
- The average R&D spending of the firms in Turkish technoparks is around 53 per cent
- There are average 18 employees per firm in Turkish technoparks and 73 per cent of them are working in R&D area.

The conclusions about the expectations of the firms from the technoparks and degree of fulfillments are:

- The most important expectation factors are tax privilege and technologic project supports. However, companies are not completely satisfied with these expectation.

The conclusions about technology development support in Turkey:

- There are many distinct types of supports in technopark application in Turkey. The majority of types of supports are R&D support.
- 4 major institutions give support to most of the firms in Turkish technoparks. These are TÜBİTAK, TEYDEP, TTGV, KOSGEB. Nearly half of the supported companies are supported by TÜBİTAK.
- Nearly 43 per cent of firms claimed that support to NTBFs in Turkish technoparks is “average”.
- It is possible to say that technopark applications in Turkey are successful with respect to both firms and country. However, these applications much more successful for company than country.
- The respondents rate the place of Turkey in the world with respect to technopark applications as “poor”.

The conclusions about benefits of technoparks to entrepreneurs are listed below:

- Financial incentives and support is the most important benefit factor. The most of the firms seem to be satisfied with the realization of this factor at certain extend.
- Cooperation with university or higher education institute is the second most important benefit factor. However, firms aren’t satisfied the realization of this factor.
- Although importance of most of other terms is significant, they are not realized in necessary level.

The conclusions about benefits of technoparks to country are as following:

- Creation of technology and added value to the country are believed to be the most important benefits for the country. Contribution to innovative environment benefit factor is also very substantial for country. The firms are satisfied with the realization of these factor at a certain level.

The conclusions about the necessary conditions for the success of technoparks are listed below:

- Telecommunication capabilities criterion which has the highest value of importance followed the financial funds, incentives and supports criterion with a certain level of fulfillments.
- Although the other success conditions' level of importance values are significant, their realizations show great differences.

The conclusions about the problems and deficiencies of technoparks are listed in the following part:

- Major problem of technoparks seem to be lack (or insufficiency of) financial aids.
- Ineffective technopark management, insufficient structure, lack of supporting services and Not benefiting from the academic environment were also stated.

6.2. Recommendations

There can be two groups of recommendation for future studies.

- Recommendation to improve the assessment
- Recommendation for the success of technoparks.

Recommendations to improve the assessment are:

- This survey should be done with more NTBFs.

- This assessment should be extended to other technoparks which are established in 19 different parts of the Turkey.
- The questionnaire form could be improved.
- The survey should be supported by the other methods

Recommendation for the success of technoparks:

- The number of patent application is small in Turkish technoparks, and it should be encouraged.
- Percentage of R&D personnel who have doctorate, associated professor, professor degree should be increased higher levels.
- Most of the respondents consider the support as “fair”, hence the level of support should increase.
- The capabilities of technoparks in telecommunication, research capability, suitability of the rents, university supports, social services, incubation services and so on should be increased since they were stated as success conditions for the technoparks.
- Financial supports should be increased since it is considered the most important problems.

APPENDIX A: MEAN AND STANDARD DEVIATION TABLES

Table A.1. Means and standard deviations of expectations for level of importance

Level of Importance		
Expectation Factors	**µ**	**б**
Technologic Project Support	4.4	0.9
Credit Availability	3.9	1
Tax Privilege	4.4	0.8
Developing Joint Project with University	3.9	1
Usage of University Capability	3.7	1.1
Consulting Services	3.6	1.1
Access to Library&Information Sources	3.5	1.2
Test&Analysis Capability	3.5	1.3
Applied Education Capabilities	3.5	1.2
Developing Projects with firms	3.7	1.1
Synergy&Comptetition among Firms	3.7	1.1
Generated R&D Environment	4.3	0.9

Table A.2. Means and standard deviations of expectations for level of realization

Level of Realization		
Expectation Factors	**µ**	**б**
Technologic Project Support	3.1	1.1
Credit Availability	3	1.1
Tax Privilege	4.1	0.9
Developing Joint Project with University	2.7	1.2
Usage of University Capability	2.6	1.2
Consulting Services	2.7	1.1
Access to Library&Information Sources	2.6	1.3
Test&Analysis Capability	2.5	1.2
Applied Education Capabilities	2.6	1.2
Developing Projects with firms	2.7	1.2
Synergy&Comptetition among Firms	2.8	1.1
Generated R&D Environment	3.3	1.2

Table A.3. Means and standard deviations of benefits of technoparks to entrepreneurs for level of importance

Level of Importance		
Benefit of Technoparks	**μ**	**б**
Financial Incentives & Support	4.6	0.6
Cooperation with Univ. & HEI	4.3	0.8
Technopark Sevices	4.2	0.9
Cooperation with other Firms	4	1
Market Advantages	4.1	1
Sharing Equipment	3.7	1
Image & Prestige	4.2	0.9

Table A.4. Means and standard deviations of benefits of technoparks to entrepreneurs for level of realization

Level of Realization		
Benefit of Technoparks	**μ**	**б**
Financial Incentives & Support	3.5	1
Cooperation with University & HEI	2.9	1.1
Technopark Sevices	2.6	1.1
Cooperation with other Firms	2.7	1.1
Market Advantages	2.6	1.1
Sharing Equipment	2.4	1.1
Image & Prestige	3.5	1.1

Table A.5. Means and standard deviations of benefits of technoparks to country for level of importance

Level of Importance		
Benefit of Technoparks	**µ**	**б**
Creation of Technology & Added Value	4.7	0.6
Contribution to Innovative Enironment	4.7	0.6
Creation of Employment Opportunities	4.4	0.7
Contribution to Regional Development	4.3	0.7
Contribution to Cooperation with University&Industry	4.4	0.8
Financial Support to Universities	3.9	1.0
Attraction of Foreign Technology &Capital	4.2	0.9

Table A.6. Calculation of Means and Standard Deviations of benefits of technoparks to country for level of realization

Level of Realization		
Benefit of Technoparks	**µ**	**б**
Creation of Technology & Added Value	3.3	1.0
Contribution to Innovative Enironment	3.4	0.9
Creation of Employment Opportunities	3.4	1.0
Contribution to Regional Development	3.2	1.1
Contribution to Cooperation with University&Industry	3.1	1.1
Financial Support to Universities	3.2	1.2
Attraction of Foreign Technology &Capital	2.9	1.1

Table A.7. Means and standard deviations of success criteria for level of importance

Level of Importance		
Success Conditions	**µ**	**б**
Supplying Financial Funds, Incentives, Supports	4.6	0.6
Prestige & Image	4.3	0.8
Strong Research Capacity	4.5	0.6
Professional and Effective Management	4.4	0.7
Well Chosen Firms	4.3	0.8
Suitable Designed Buildings	4.1	0.9
Easy Access	4.3	0.7
Transportation Capabilities	3.9	1
Telecommunication Capabilities	4.7	0.6
Infrastructure	4.5	0.7
Financial Services	4	0.8
Social Services	4.2	0.8
Existence and effectiveness of Incubation Center	4.2	0.7
Suitability of Rents	4.5	0.7
Strong R&D Core and scientific alignment	4.4	0.8
University Support	4.3	0.7
Number of Researchers and Academicians in technopark	4.1	0.9
Physical Location	4.1	0.8

Table A.8. Means and standard deviations of success criteria for level of realization

Level of Realization		
Success Conditions	**µ**	**б**
Supplying Financial Funds, Incentives, Supports	3.3	1
Prestige&Image	3.5	1
Strong Research Capacity	2.9	1
Professional and Effective Management	3	1.1
Good Chosen Firms	3.1	1
Suitable Designed Buildings	3.1	1.1
Easy Access	3.1	1.2
Transportation Capabilities	2.9	1
Telecommunication Capabilities	3.7	1.2
Infrastructure	3.6	1
Financial Services	2.9	1.1
Social Services	2.5	1.2
Existence and effectiveness of Incubation Center	2.8	1
Suitability of Rents	2.5	1
Strong R&D Core and scientific alignment	2.6	1
University Support	2.7	1
Number of Researchers and Academicians in technopark	2.8	1
Physical Location	3.1	0.9

Table A.9. Means and standard deviations for problems and deficiencies

Major Problems	**µ**	**б**
Lack of Financial Aids	3.7	1.1
Not get benefit from Academic Environment	3.4	1
Lack of Supporting Services	3.5	1.1
Insufficient Infrastructure	3.5	1.1
Ineffective Technopark Management	3.5	1.1

APPENDIX B: ASSESSMENT OF TECHNOLGY DEVELOPMENT ACTIVITIES IN TURKISH TECHNOPARKS QUESTIONNAIRE

Boğaziçi University

1. General Information About Firm

1. Name of Company:

2. Activity Industry:

3. Establishment Year:

4. Address:

5. Origin (University or Industry):

6. Name, Surname, and Task of Respondent:

2. Current Technological Situation of Firm

1. What are the products and services of your company?

…………………………………………………………………………………………

……...……………………………………………………………………………………

…………………………………………………………………………………………

……...……………………………………………………………………………………

2. Your company produced how much of the developed or developing products, services, or technologies?

a. Nothing
b. Less than half
c. More than half
d. All of them

3. What is the number of patents which belong to your firm?

……………………………………………………………………………………………

4. Is there any commercialized patent or know-how? If there was, please explain?

……………………………………………………………………………………………

……………………………………………………………………………………………

5. If your answer is yes to the 4th question, how much does commercialization take?

□ 6 Months □ 12 Months □ 24 Months □ Other...........

6. What is the R&D percentage in total budget? %..........

7. What is the education profile of staffs in your firm? (Filled with numbers.)

	High School	2 years University	Graduate	Master	Doctorate	Ass.Prof & Professor
R&D						
Other Fields						
TOTAL						

8. What are your expectations when your firm is coming to the technopark? How much of it realized?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important?					How Much Realized?				
	1	2	3	4	5	1	2	3	4	5
Technologic Project Support										
Credit Availability										
Tax Privilege										
Developing Joint Project with University										
Usage of University Capability										
Counselor Services										
Access to Library&Information Sources										
Test&Analysis Capability										
Applied Education Capabilities										
Developing Projects with firms										
Synergy&Comptetition among Firms										
Generated R&D Environment										
Other:										

3. Technology Development Support in Turkey

1. Is there any other support or incentive other than staying in technopark? If there was, please explain.

Quality of Support	**Supporting Institution**

2. How is the giving support to the firms which aim to develop technology in Turkey?

1-Very Poor 2-Poor 3-Fair 4-Good 5- Very Good

3. Are technopark applications successful?

Firm's side.................

Country's side ....

4. What is the place of Turkey in the world with respect to technopark applications?

1-Very Poor 2-Poor 3- Same Level 4- Good 5-Excellent

4. Benefits of Technoparks

1. What are the technoparks' benefits which are supplied or need to be suppied?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important?					How Much Realized?				
	1	2	3	4	5	1	2	3	4	5
To Entrepreneur										
Financial Incentives & Support										
Cooperation with University & HRI										
Technopark Services (Analysis, test, library, technique education, infrastructure services)										
Cooperation with other Firms										
Market Advantages										
Sharing Equipment										
Image & Prestige										
Other:										
To Country										
Creation of Technology & generation of Value added										
Contribution to Innovative Environment										
Creation of Employment Opportunities										
Contribution to Regional Development										
Contribution to Cooperation with University&Industry										
Financial Support to Universities										
Attraction of Foreign Technology &Capital										
Other:										

5. Success Conditions

1. What are the necessary conditions for the success of technopark?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important?					How Much Realized?				
	1	2	3	4	5	1	2	3	4	5
Supplying Financial Funds, Incentives, Supports										
Prestige&Image										
Strong Research Capacity										
Professional and Effective Management										
Good Chosen Firms										
Suitable Designed Buildings										
Easy Access (easy arrival of customers and staffs, closeness to the airport)										
Transportation Capabilities (placement of docks, motor way situation, placement of rail ways.)										
Telecommunication Capabilities (Internet, telephone,…)										
Infrastructure (Energy, water, sewage)										
Financial Services (Banks, Insurance offices,…)										
Social Services (Restaurants, Shopping Mall, sport Centers, Culture Center,..)										
Existence and effectiveness of Incubation Center										
Suitable Rents										
Strong R&D Core and scientific alignment										
University Support										
Number of Researchers and Academicians work in technopark										
Physical location										
Other:										

6. Problems & Deficiencies

1. What are the effects of the factors which are shown below in unsuccessfulness of technopark?

(1-Very Poor 2-poor 3-Fair 4-Good 5-Excellent)

	1	2	3	4	5
Lack of Financial Aids (Support, Incentive, Credit, Tax discount, etc…..)					
Not get benefit from Academic Environment					
Lack of Supporting Services (technique support, management support, education support)					
Insufficient Infrastructure					
Ineffective Technopark Management					
Other:					

7. Conclusion

1. In conclusion, your final comments about Turkish technoparks?

APPENDIX C: TÜRK TEKNOPARKLARINDA TEKNOLOJİ GELİŞTİRME FAALİYETLERİN DEĞERLENDİRMESİ ANKETİ

Boğaziçi Üniversitesi

1. Firmayla İlgili Genel Bilgiler

1. İşyerinin Adı:

2. Faaliyette Bulunduğu Endüstri:

3. İşyerinin Kuruluş Yılı:

4. Adresi:

5. Kökeni (üniversite veya endüstri):

6. Cevaplayanın Adı, Soyadı ve Görevi:

2. Firmanın Mevcut Teknolojik durumu

1. Şirketinizin müşterisine sunduğu ürün ve hizmetler nelerdir?

…………………………………………………………………………………………

………………………………………………………………………………….

……………………………………………………………………………………

2. Üretimini yaptığınız ürün, hizmet veya teknolojinin ne kadarını kendiniz geliştirdiniz veya geliştiriyorsunuz?

a. Hiçbirini
b. Yarıdan azını
c. Yarıdan fazlasını
d. Tümünü

3. Şirketinize ait patent sayısı nedir?

…………………………………………………………………………………………………

4. Ticarileştirdiğiniz patent veya know-how var mıdır? Varsa açıklayınız?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

5. 4. soruya yanıtınız evetse ticarileştirme ne kadar sürdü veya sürmesini bekliyorsunuz?

□ 6 ay □ 12 ay □ 24 ay □ Diğer...........

6. Toplam bütçe içinde Ar-Ge'ye ayırdığınız pay nedir? %………..

7. Şirketinizde çalışanların eğitim profili nedir? (sayı ile belirtiniz.)

	Lise	Ön lisans	Lisans	Yük.lisans	Doktora	Doç.&Prof.
Ar-Ge						
Diğer alanlar						
TOPLAM						

8. Teknoparka gelirken beklentileriniz neydi? Ne kadarı karşılanabiliyor?

(1-çok az 2-az 3-orta 4-iyi 5-çok iyi)

	Ne kadar önemli?					Ne kadar karşılanıyor?				
	1	2	3	4	5	1	2	3	4	5
Teknolojik araştırma projelerine verilen destek										
Kredi (teşvik&risk sermayesi) sağlanabilirliği										
Vergi muafiyeti										
Üniversite/araştırma kurumu ile ortak projeler geliştirme										
Üniversite olanaklarından yararlanma										
Teknoloji ve diğer alanlarda danışmanlık olanakları										
Kütüphane ve diğer bilgi kaynaklarına kolay erişim										
Test ve analiz olanakları										
Uygulamalı eğitim olanakları										
Diğer şirketlerle proje geliştirme olanağı										
Şirketler arasındaki sinerji/rekabet										
Yarattığı Ar-Ge ortamı										
Diğer:										

3. Türkiyede Teknoloji Geliştirme Desteği

1. Teknoparkta yer alma dışında kullandığınız bir destek veya teşvik var mıdır? Varsa açıklayınız.

Desteğin Niteliği	Destekleyen kuruluş

2. Türkiye'de teknoloji geliştirmeyi amaçlayan firmalara verilen desteği nasıl buluyorsunuz?

1-çok az 2-az 3-orta 4-iyi 5- çok iyi

3. Teknopark uygulamalarını başarılı buluyor musunuz?

Şirketiniz açısından ....

Ülke açısından ....

4. Sizce Teknopark uygulamaları açısından Türkiye'nin dünyadaki konumu nedir?

1-çok geri 2-geri 3- aynı seviyede 4- ileri 5-çok ileri

4. Teknoparkın Faydaları

1. Sizce teknoparkların sağlaması gereken/sağladığı yararlar nelerdir?

(1-çok az 2-az 3-orta 4-iyi 5-çok iyi)

	Ne kadar önemli?					Ne kadar sağlanıyor?				
	1	2	3	4	5	1	2	3	4	5
Girişimciye										
Maddi teşvik ve destekler (vergi dahil)										
Universite ve araştırma kurumlarıyla işbirliği olanağı										
Teknoparkın sunduğu hizmetler (analiz, test, kütüphane gibi, teknik eğitim, altyapı hizmetleri)										
Başka şirketlerle işbirliği yapma olanağı (Ar-Ge veya diğer alanlarda)										
Pazara çıkma kolaylığı										
Ekipman paylaşımı										
İmaj & Prestij										
Diğer:										
Ülkeye										
Teknoloji üretme, ülke çapında katma değer yaratma										
Ülkedeki yenilikçi ortama katkısı										
İstihdam olanakları yaratabilme										
Bölgesel gelişmeye katkısı										
Üniversite – Endüstri işbirliğine katkı										
Üniversitelere maddi destek										
Yabancı teknoloji ve sermayeyi çekmesi										
Diğer:										

5. Başarı koşulları

1. Sizce bir teknoparkın başarılı olabilmesi için gerekli koşullar nelerdir?

(1-çok az 2-az 3-orta 4-iyi 5-çok iyi)

	Ne kadar önemli?					Mevcut durum nedir?				
	1	2	3	4	5	1	2	3	4	5
Sağlanan finansman, teşvikler ve destekler										
Prestij & imaj										
Güçlü araştırma kapasitesi										
Profesyonel ve etkili yönetim										
Firmaların iyi seçilmesi										
Binaların uygun tasarımı										
Ulaşım olankları (çalışanların ve müşterilerin kolay ulaşımı, havaalanına yakınlık, toplu taşıma olanakları)										
Taşınım olanakları (limanlara havaalanına yakınlık, karayoul durumu, demir yoluna yakınlık gibi)										
Haberleşme olanakları (internet, telefon ....)										
Altyapı (enerji, su kanalizasyon....)										
Finansal hizmetler (banka, sigorta.....)										
Sosyal hizmetler (restoran, alışveriş merkazi, spor merkezleri, kültür merkezleri....)										
Kuluçka merkezinin varlığı ve etkin çalışması										
Kiraların uygun olması										
Güçlü bir bilimsel yönlendirme ve Ar-Ge çekirdeğinin bulunması										
Üniversite desteği										
Teknoparkta çalışan araştırmacı & Akademisyen sayısı										
Fiziki konumu										
Diğer:										

6. Sorunlar & Eksiklikler

1. Teknoparkın başarısız olmasında aşağıdaki faktörlerin ne ölçüde etkisi vardır?

(1-çok az 2-az 3-orta 4-fazla 5-çok fazla)

	1	2	3	4	5
Teknoparktaki firmalara sağlanan finansal kolaylıkların yetersizliği (destek, teşvik, kredi, vergi indirimi vs.)					
Akademik ortamdan yararlanamama					
Teknoparkta verilen destek hizmetlerinin zayıflığı (teknik destek, idari destek, eğitim desteği vs.)					
Teknoparkın altyapısının yetersizliği					
Teknopark yönetiminin etkin olmaması					
Diğer:					

7. Sonuç

1. Eklemek istediğiniz başka bir şey var mı?

APPENDIX D: EVALUATION OF ASSESSMENT OF TECHNOLOGY DEVELOPMENT ACTIVITIES IN TURKISH TECHNOPARK QUESTIONNAIRE

Boğaziçi University

1. General Information About Firm

1. Name of Company:

2. Activity Industry:

Activity Industry	Number
Textile	2
Insurance	3
Service Sector	3
Environment	4
Medicine	4
Food & Agriculture	5
Finance	6
Automotive	7
Health	7
Consulting	7
Education	7
Defense	8
E-Commerce& Web Hosting	9
Telecom	13
Electricity & Electronics	16
High Technology	16
Software & Business Solutions	98

3. Establishment Year:

Establishment Year Numbers	**Number of firm**
1972	1
1983	1
1984	1
1985	1
1987	1
1988	2
1986	3
1992	3
1994	3
1996	3
1989	4
1991	4
1993	4
1998	4
1995	5
1997	6
2000	9
2002	10
1999	12
2001	13
2004	14
2003	16
2005	16
2006	22

4. Address:

Technopark	**Buillding**	**Number**	**Percentage**
	Arı-1	21	12.5
ITU ARI Technocity	Arı-2	23	13.7
TUBITAK MAM	TEKGEB	15	8.9
Technocity	TEKSEB	24	14.3
	High-Tech Building	31	18.5
	Production 1	2	1.2
GOSB Technopark	Production 4	2	1.2
	Silver Blocks	9	5.4
	Halıcı Software House	3	1.8
METU Technocity	Silicon Blocks	22	13.1
	Cyber Plaza A Block	7	4.2
ANKARA Cyberpark	Cyber Plaza B Block	9	5.4

5. Origin (University or Industry):

Origin of Companies	**Number**	**Percentage**
University	19	11.3
Industry	144	85.7
University+Industry	5	3.0

6. Name, Surname, and Task of Respondent:

Department	Task	Number	Percentage
Engineering Department	Software Engineer & Engineer	32	19.4
	R&D Responsible	6	3.6
	Software Expert	19	11.5
	Domestic Communication Staff	1	0.6
	Clinic Research Follower & Researcher	2	1.2
	Civil Aviation Analyst	1	0.6
	Industrial Designer	2	1.2
	Environment Engineer	1	0.6
	Technician	2	1.2
Management Department	R & D Director & Manager	8	4.8
	Software Development Director	5	3.0
	Sales Manager	2	1.2
	Project Manager	14	8.5
	Coordinator	7	4.2
	Vice General Manager	4	2.4
	General Manager	11	6.7
	Company Manager	18	10.9
	Firm Owner & Shareholders	5	3.0
	Team Captain	4	2.4
	Management Represantative	2	1.2
	Counselor	1	0.6
	Production Manager	1	0.6
Public Relations Department	Public Relations Specialist	2	1.2
	Customer Represantative	1	0.6
	Abroab Represantative	1	0.6
	Institutional Relations	1	0.6
Finance Department	Accounting Manager	3	1.8
	Accounting Adviser	1	0.6
	Accountant	3	1.8

Sales Department	International Marketing	1	0.6
	Sales and Marketing Manager	2	1.2
	Sales and Aftersales Support Director	1	0.6
	Sales Assistant	1	0.6

2. Current Technological Situation of Firm

1. What are the products and services of your company?

Products & Services	Number	Percentage
Software Products & Services	34	15.2
Financial & Stockexchange Software	11	4.9
Electronic Products	12	5.4
Business Solution Software	28	12.6
Military Products	8	3.6
Telecom Products	13	5.8
Internet Solution Products	7	3.1
Consulting	28	12.6
E-learning	12	5.4
E-Commerce	12	5.4
Various Projects	3	1.3
Education	11	4.9
Mobile Technologies	7	3.1
Food & Environment & Health Products	2	0.9
High Technology Products	19	8.5
Medical Products & Services	8	3.6
Automotive	5	2.2
Service Sector	3	1.3

2. Your company produced how much of the developed or developing products, services, or technologies?

Develeping&Developed Technology	**Number**	**Percentage**
None of Them	3	1.8
Less than Half	20	12.0
More than Half	45	26.9
All of Them	99	59.3

3. What is the number of patents which belong to your firm?

Patent Number	**Number**	**Percentage**
1 Patent	12	32
2 Patent	8	21
3 Patent	8	21
4 Patent	4	11
5 Patent	3	8
8 Patent	1	3
10 Patent	1	3
18 Patent	1	3

The average number of patent is calculated below:

$$\text{Average number of patents} = \frac{(8*3+10*3+18*3+5*8+11*4+21*2+21*3+32*1)}{100}$$

$$= 3.29 \sim 3.3$$

4. Is there any commercialized patent or know-how? If there was, please explain?

Commercialized	Number	Perecent
E-learning & Education		
Projects	2	3.2
Robots	2	3.2
Financial & Stockexchange		
Software	3	4.8
Business Simulations	3	4.8
Automotive & Parts	3	4.8
Military Equipment &		
Software	3	4.8
Telecom & Communication		
Software	4	6.5
Various Projects	5	8.1
Electronic Products	7	11.3
Consulting & Supervising		
Services	7	11.3
Software & Business Solutions	23	37.1

5. If your answer is yes to the 4th question, how much does commercialization take?

Commercialization Time	Number	Percentage
12 Months	16	32.7
24 Months	18	36.7
36 Months	5	10.2
60 Months	3	6.1
6 Months	7	14.3

$$\text{Average commercialization time} = \frac{(6.160 + 10.2 * 36 + 14.3 * 6 + 32.7 * 12 + 36.7 * 24)}{100}$$

$$= 20.92 \sim 21 \text{ Months}$$

6. What is the R&D percentage in total budget? %……….

R&D Percentage Range	Number	Percentage(%)
0 - 10 %	16	10.8
10% - 20%	17	11.5
20% - 30%	16	10.8
30% - 40%	19	12.8
40% - 50%	13	8.8
50% - 60%	13	8.8
60% - 70%	9	6.1
70% - 80%	12	8.1
80% - 90%	8	5.4
90% - 100%	25	16.9

The average R&D percentage in total budget is calculated below:

R & D Ratio	Percantage (%)	Multiplication
0.0	0.7	0.0
4.0	1.4	5.4
5.0	2.7	13.5
10.0	6.1	60.8
12.0	1.4	16.2
15.0	2.7	40.5
20.0	7.4	148.6
25.0	2.7	67.6
30.0	8.1	243.2
35.0	4.1	141.9
40.0	8.8	351.4
45.0	2.0	91.2
50.0	6.8	337.8
60.0	8.8	527.0
68.0	0.7	45.9

70.0	5.4	378.4
75.0	2.0	152.0
80.0	6.1	486.5
85.0	0.7	57.4
90.0	4.7	425.7
95.0	2.7	256.8
100.0	14.2	1418.9
	Total	5266.9
	Average R&D	
	% of NTBFs	52.7 ~ 53%

7. What is the education profile of staffs in your firm? (Filled with numbers.)

	High School	2 years University	Graduate	Master	Doctorate	Ass.Prof & Professor
R&D						
Other Fields						
TOTAL						

	Number		**Percentage (%)**	
	R&D Field	Other Fields	R&D Field	Other Fields
High School	78	127	2.6	4.3
2 years University	123	52	4.1	1.7
Graduate	1153	436	38.8	14.7
Master	349	64	11.7	2.2
Doctorate	88	3	3.0	0.1
Ass.Prof.&Prof.	28	0	0.9	0.0

Average number of staff = 2973 / 168 = 17.69 ~ 18 people

8. What are your expectations when your firm is coming to the technopark? How much of it realized?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important? Number					How Much Realized? Number				
	1	2	3	4	5	1	2	3	4	5
Technologic Project Support	1	8	10	49	100	13	33	64	41	17
Credit Availability	7	7	31	66	56	20	30	67	32	18
Tax Privilege	1	3	14	53	97	---	12	24	66	66
Developing Joint Project with University	6	10	36	63	53	36	40	43	38	11
Usage of University Capability	10	11	43	56	47	39	34	54	27	13
Consulting Services	15	3	45	69	35	29	41	60	27	10
Access to Library&Information Sources	19	12	33	63	39	45	38	41	29	13
Test&Analysis Capability	18	16	34	57	42	42	43	45	26	11
Applied Education Capabilities	19	8	45	59	35	37	41	55	23	10
Developing Projects with firms	10	15	34	61	47	32	38	57	27	13
Synergy&Comptetition among Firms	11	12	44	58	43	28	34	62	32	12
Generated R&D Environment	4	2	24	49	88	16	26	46	55	24
Other:										

	How Much Important? Percentages (%)					How Much Realized? Percentages (%)				
	1	2	3	4	5	1	2	3	4	5
Technologic Project Support	0.6	4.8	6	29.	59.5	7.7	19.6	38.1	24.4	10.1
Credit Availability	4.2	4.2	18.5	39.3	33.3	12	18	40	19	10.7
Tax Privilege	0.6	1.8	8.3	31.5	57.7	---	7.1	14.3	39.3	39.3
Developing Joint Project with University	3.6	6	21.4	37.5	31.5	21.4	23.8	25.6	22.6	6.5
Usage of University Capability	6.5	6.5	25.6	33.3	28	23.2	20.2	32.1	16.1	7.7
Consulting Services	8.9	1.8	26.8	41.1	20.8	17.3	24.4	35.7	16.7	6
Access to Library&Information Sources	11.3	7.1	19.6	37.5	23.2	26.8	22.6	24.4	17.3	7.7
Test&Analysis Capability	10.7	9.5	20.2	34	25	25	25.6	26.8	15.5	6.5
Applied Education Capabilities	11.3	4.8	26.8	35.1	20.8	22	24.4	32.7	13.7	6
Developing Projects with firms	6	8.9	20.2	36.3	28	19	22.6	34	16.1	7.7
Synergy& Comptetition	6.5	7.1	26.2	34.5	25.6	16.7	20.2	37	19	7.1
Generated R&D Environment	2.4	1.2	14.3	29.2	52.4	9.5	15.5	27.4	32.7	14.3
Other:										

3. Technology Development Support in Turkey

1. Is there any other support or incentive other than staying in technopark? If there was, please explain.

Type of Support	Supporting Institution

Type of Support	Number	Percentage(%)
R&D Support	19	32.2
Rent Support	3	5.1
Financial Support	15	23.7
Information & Personel Support	4	6.8
Rent, R&D and Donation Support	1	1.7
Financial and R&D Support	3	5.1
Project Support	5	8.5
Donation Support	4	6.8
Donation & Credit Support	3	5.1
Market Support	1	1.7
TÜBİTAK Support	2	3.4

Supporting Institution	Number	Percentage(%)
KOSGEB	10	11.0
Other Institutions	12	13.2
TEYDEB	17	18.7
TTGV	11	12.1
TUBITAK	41	45.1

2. How is the giving support to the firms which aim to develop technology in Turkey?

1-Very Poor 2-Poor 3-Fair 4-Good 5- Very Good

Giving Support in Turkey	**Number**	**Percentage(%)**
Very Poor	14	8.33
Poor	36	21.43
Fair	71	42.26
Good	42	25
Excellent	5	2.97

Average score of support giving in Turkey = $\frac{(1*8.3+2*21.4+3*42.3+4*25+5*3)}{100}$

$= 2.9$

3. Are technopark applications successful?

	Number		**Percentage (%)**	
	Company	**Country**	**Company**	**Country**
Yes	123	109	73.7	65.3
No	44	58	26.3	34.7

4. What is the place of Turkey in the world with respect to technopark applications?

1-Very Poor 2-Poor 3- Same Level 4- Good 5-Excellent

World's Situation	**Number**	**Percentage**
Very Poor	14	8.3
Poor	119	70.8
Same	26	15.5
Good	8	4.8
Excellent	1	0.6

$$\text{Average score of placement of Turkey} = \frac{(1*70.8+2*15.5+3*8.3+4*4.8+5*0.6)}{100}$$

$$= 2.2$$

4. Benefits of Technoparks

1. What are the technoparks' benefits which are supplied or need to be suppied?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important? (Number)					How Much Realized? (Number)				
	1	2	3	4	5	1	2	3	4	5
To Entrepreneur										
Financial Incentives & Support			7	52	109	5	22	54	64	23
Cooperation with University & HEI	1	1	20	66	80	17	41	64	34	12
Technopark Sevices (Analysis, test, library, technique education, infrastructure services)	1	8	24	58	77	31	49	56	23	9
Cooperation with other Firms	5	7	35	59	62	26	41	61	31	9
Market Advantages	3	7	30	52	76	29	47	56	27	9
Sharing Equipment	4	17	47	57	43	46	46	50	20	6
Image & Prestige	3	6	23	59	77	11	18	40	70	29
Other:										
To Country										
Creation of Technology & Added Value to the Country	1	0	10	24	133	7	27	59	58	16
Contribution to Innovative Enironment	1	0	4	40	122	2	27	61	59	17
Creation of Employment Opportunities	1	0	16	58	92	5	23	59	59	22
Contribution to Regional Development	0	2	16	72	78	13	24	61	52	18
Contribution to Cooperation with University&Industry	1	4	12	62	89	14	33	57	48	15
Financial Support to Universities	6	9	34	60	58	18	28	49	41	31
Attraction of Foreign Technology &Capital	2	5	27	60		15	49	55	37	10
Other:										

	How Much Important? Percentage (%)					How Much Realized? Percentage (%)				
	1	2	3	4	5	1	2	3	4	5
To Entrepreneur										
Financial Incentives & Support	0.0	0.0	4.2	31.0	64.9	3.0	13.1	32.1	38.1	13.7
Cooperation with University & HEI	0.6	0.6	11.9	39.3	47.6	10.1	24.4	38.1	20.2	7.1
Technopark Sevices (Analysis, test, library, technique education, infrastructure services)	0.6	4.8	14.3	34.5	45.8	18.5	29.2	33.3	13.7	5.4
Cooperation with other Firms	3.0	4.2	20.8	35.1	36.9	15.5	24.4	36.3	18.5	5.4
Market Advantages	1.8	4.2	17.9	31.0	45.2	17.3	28.0	33.3	16.1	5.4
Sharing Equipment	2.4	10.1	28.0	33.9	25.6	27.4	27.4	29.8	11.9	3.6
Image & Prestige	1.8	3.6	13.7	35.1	45.8	6.5	10.7	23.8	41.7	17.3
Other:										
To Country										
Creation of Technology & Added Value to the Country	0.6	0.0	6.0	14.3	79.2	4.2	16.1	35.1	34.5	9.5
Contribution to Innovative Enironment	0.6	0.0	2.4	23.8	72.6	1.2	16.1	36.3	35.1	10.1
Creation of Employment Opportunities	0.6	0.0	9.5	34.5	54.8	3.0	13.7	35.1	35.1	13.1
Contribution to Regional Development	0.0	1.2	9.5	42.9	46.4	7.7	14.3	36.3	31.0	10.7

Contribution to Cooperation with University & Industry	0.6	2.4	7.1	36.9	53.0	8.3	19.6	33.9	28.6	8.9
Financial Support to Universities	3.6	5.4	20.2	35.7	34.5	10.7	16.7	29.2	24.4	18.5
Attraction of Foreign Technology & Capital	1.2	3.0	16.1	35.7	43.5	8.9	29.2	32.7	22.0	6.0
Other:										

5. Success Conditions

1. What are the necessary conditions for the success of technopark?

(1-Very Poor 2-Poor 3-Fair 4-Good 5-Excellent)

	How Much Important? (Number)					How Much Realized? (Number)				
	1	2	3	4	5	1	2	3	4	5
Supplying Financial Funds, Incentives, Supports	0	0	7	45	116	7	23	72	50	16
Prestige&Image	1	5	21	55	86	6	18	63	54	27
Strong Research Capacity	0	0	13	58	97	13	40	75	33	7
Professional and Effective Management	0	2	15	61	90	17	38	54	48	11
Appropriate Selection Criteria for Firms	1	4	14	66	83	10	35	59	52	12
Suitable Designed Buildings	0	9	37	53	69	16	33	56	45	18
Easy Access (easy arrival of customers and staffs, closeness to the airport)	0	1	20	69	78	24	25	56	37	26
Transportation Capabilities (placement of docks, motor way situatio, placement of rail ways.)	3	14	41	50	60	20	30	73	35	10
Telecommunication Capabilities (Internet, telephone,…)	0	2	5	34	127	8	19	43	48	50
Infrastructure (Energy, water, sewage)	0	3	16	47	102	5	15	54	55	39
Financial Services (Banks, Insurance offices,…)	0	3	46	62	57	18	34	70	34	12
Social Services (Restaurants, Shopping Mall, Culture Center,..)	0	5	26	65	72	36	55	40	26	11
Existence and effectiveness of Incubation Center	0	1	30	73	64	22	35	80	24	7
Suitable Rents	0	4	13	51	100	32	52	55	24	5
Strong R&D Core and scientific alignment	0	5	15	56	92	22	52	63	26	5
University Support	0	3	20	71	74	20	48	69	23	8
Number of Researchers and Academicians in technopark	0	7	32	66	63	17	45	70	31	5
Physical location	0	4	35	73	56	5	33	73	46	11
Other:										

	How Much Important? Percentage (%)					How Much Realized? Percentage (%)				
	1	2	3	4	5	1	2	3	4	5
Supplying Financial Funds, Incentives, Supports	0.0	0.0	4.2	26.8	69.0	4.2	13.7	42.9	29.8	9.5
Prestige&Image	0.6	3.0	12.5	32.7	51.2	3.6	10.7	37.5	32.1	16.1
Strong Research Capacity	0.0	0.0	7.7	34.5	57.7	7.7	23.8	44.6	19.6	4.2
Professional and Effective Management	0.0	1.2	8.9	36.3	53.6	10.1	22.6	32.1	28.6	6.5
Appropriate Selection Criteria for Firms	0.6	2.4	8.3	39.3	49.4	6.0	20.8	35.1	31.0	7.1
Suitable Designed Buildings	0.0	5.4	22.0	31.5	41.1	9.5	19.6	33.3	26.8	10.7
Easy Access (easy arrival of customers and staffs, closeness to the airport)	0.0	0.6	11.9	41.1	46.4	14.3	14.9	33.3	22.0	15.5
Transportation Capabilities (placement of docks, motor way situatio, placement of rail ways.)	1.8	8.3	24.4	29.8	35.7	11.9	17.9	43.5	20.8	6.0
Telecommunication Capabilities (Internet, telephone,…)	0.0	1.2	3.0	20.2	75.6	4.8	11.3	25.6	28.6	29.8
Infrastructure (Energy, water, sewage)	0.0	1.8	9.5	28.0	60.7	3.0	8.9	32.1	32.7	23.2
Financial Services (Banks, Insurance offices,…)	0.0	1.8	27.4	36.9	33.9	10.7	20.2	41.7	20.2	7.1
Social Services (Restaurants, Shopping Mall, Culture Center,..)	0.0	3.0	15.5	38.7	42.9	21.4	32.7	23.8	15.5	6.5
Existence and effectiveness of Incubation Center	0.0	0.6	17.9	43.5	38.1	13.1	20.8	47.6	14.3	4.2

Suitable Rents	0.0	2.4	7.7	30.4	59.5	19.0	31.0	32.7	14.3	3.0
Strong R&D Core and scientific alignment	0.0	3.0	8.9	33.3	54.8	13.1	31.0	37.5	15.5	3.0
University Support	0.0	1.8	11.9	42.3	44.0	11.9	28.6	41.1	13.7	4.8
Number of Researchers and Academicians in technopark	0.0	4.2	19.0	39.3	37.5	10.1	26.8	41.7	18.5	3.0
Physical location	0.0	2.4	20.8	43.5	33.3	3.0	19.6	43.5	27.4	6.5
Other:										

6. Problems & Deficiencies

1. What are the effects of the factors which are shown below in unsuccessfulness of technopark?

(1-Very Poor 2-poor 3-Fair 4-Good 5-Excellent)

Number	1	2	3	4	5
Lack of Financial Aids (Support, Incentive, Credit, Tax discount, etc…..)	4	17	49	49	49
Not get benefit from Academic Environment	7	23	52	61	25
Lack of Supporting Services (technique support, management support, education support)	8	24	53	48	35
Insufficient Infrastructure	9	20	51	54	34
Ineffective Technopark Management	10	19	54	47	38
Other:					

Percentage (%)	1	2	3	4	5
Lack of Financial Aids (Support, Incentive, Credit, Tax discount, etc…..)	2.4	10.1	29.2	29.2	29.2
Not get benefit from Academic Environment	4.2	13.7	31.0	36.3	14.9
Lack of Supporting Services (technique support, management support, education support)	4.8	14.3	31.5	28.6	20.8
Insufficient Infrastructure	5.4	11.9	30.4	32.1	20.2
Ineffective Technopark Management	6.0	11.3	32.1	28.0	22.6
Other:					

7. Conclusion

1. In conclusion, your final comments about Turkish technoparks?

- Rents, common expenditures, internet, and electricity bills are very high in Turkish technoparks. Thus, earnings of firms are in low level.
- Although many firms applied for the participation in the techno parks, there is not enough place.
- Legal background of technopark concept should be defined better than the current situation of Turkish technopark today.
- The function of technopark is very important to integrate the enterprises in one area because the R&D firms come together due to the incentive of technopark.
- Technopark managements should organize educations and seminars for participant firms.
- Although participants of technoparks aren't pleased the general situation of Turkish technoparks, they can't leave these institutions owing to the fact that there is not enough number of technopark in Turkey. The behaviors of these technopark

managements are completely commercial. Therefore, they have wanted high rents. However, they give nothing to the NTBFs. Especially for software corporations, tourniquet system generates an unnecessary tracking mechanism. The control methods and mechanisms should be reviewed one more time.

- Technopark managements are unsuccessful in Turkish technoparks due to the fact that there isn't cooperation between technoparks and universities.
- Finding a place in technoparks is really difficult. Moreover, evaluation time takes from 1 year to 5 years which is a very long time period for enterprises.
- Renting conditions are very difficult in technopark applications in Turkey.
- There are not enough social and financial services in centers of technoparks. This situation generates bad image for technoparks. Moreover, there isn't also enough synergy and cooperation.
- Technopark and universities are far away from each others. In technoparks, merely technology is bought from the abroad in order to develop and sell. This is done for making money. On the other hand, technoparks should be the places which turn theories into applications.
- Technoparks are generated by coming together of many firms in some areas. However, instead of establishing technoparks, if all incentives and tax privileges were given to the corporations which are developing technology in their own places, this situation would increase the number of firms and entrepreneurs. Technology development capacity of country can be grown up by using of controls. This situation also makes a positive effects on the employment level of the country.
- Entrance and exit of goods create problems in TÜBİTAK TEKSEB due to the fact that customs which is applied in technology free zone in Gebze. Technopark management wants to pay the tariffs of products in entrance.
- Projects which are developed in technoparks have to be reported to the technopark management. This situation prevents the technologic competition among NTBFs.
- Transportation capabilities and social life which contains cafes, sport complexes, other activities are not in sufficient level.
- There must be lower bureaucracy in technopark. The firms have to employ more personnel due to the bureaucratic interactions. Then, firms' educated personnel also have to deal with the bureaucracy. This affects the efficiency of the firms negatively.

- Generally, the rent of technoparks are stabilized as the same level as tax privilege. The rents are regulated by technoparks management without taking the opinions of the participant firms. If the number of technoparks increased, this issue would be solved automatically. There are one technopark in Istanbul and merely two technoparks in Gebze. This is the starting point of problem.
- Generally, the transportation capabilities are weak in Turkish technoparks. This is true for both internal and external capabilities of technoparks.
- Technoparks are placed not only to university campuses, but they also establish in TÜBİTAK Gebze Settlement and Gebze Industrial Zone. Thus, the technoparks which are established in outside of universities can not take academic support from universities and research institutes.
- KDV advantage exists for the corporations in technoparks. However, customers have to pay this KDV.
- The incubator firms should take state support in the areas of the business administration and commercialization of products. At the same time cost of the technopark should be in the lower levels. Furthermore, the technoparks should give export support and consulting services to export products which are produced in the technoparks.
- There is a little connection between technopark firms and management.
- The supports and incentives should be also given the state institutions other than TÜBİTAK, TEYDEB, and TTGV. These institutions should be politically neutral.
- The receiving the R&D supports and incentives takes too much time.
- The technopark should be managed by more professional managers.
- The definition of technopark explained in dictionaries and the technopark applications in Turkey is different from each other.
- The management personnel of technopark are less educated and experienced.
- The technoparks should be established in places which are close to universities.
- The technopark firms should be develop technologies in a short period of time unlike universities. Universities complete these technology development studies in a long period of time, this situation causes to increase the financial load of corporation which is very dangerous for the continuity of the firm. The greatest disadvantage of technoparks is that both firm and personnel can not get benefit

from both personnel support and tax privileges in installations which are done in customer fields.

- The technoparks should cooperate with universities in technology development area. Thus, academic institutions can find cash more easily. Furthermore, the academic and technologic studies should be supported more.
- There should be more social services of technoparks in order to increase the motivation of the technopark staff.
- The technoparks should give educational supports related to the advanced products. Furthermore, the absenteeism right should be increased.
- The application period should be decreased. Moreover, applications could be done by the firms directly.
- The technoparks are not completely mature in Turkey. On the other hand, they will increase the efficiency in long term.
- The technopark management should differentiate the firms which make R&D activities in technopark and firms which enter the technopark for tax privilege.
- The technoparks have to make huge investments to internet accesses. Sometimes, there is no internet connection in technoparks.
- There are no warehouses in Turkish technoparks. This situation doesn't generate problems for software corporations. However, the other firms producing the physical products find themselves in difficulty.
- The technopark personnel can't use the university capabilities such as services, discounts, etc…
- The technoparks are utilized for the purposes that are different than their establishment goals. They have to assign merely to firms which show function in software industry. The firms which don't operate in software industry are not accepted to technoparks.
- There is not an environment promoting synergy.
- There is no socialization in technoparks due to the mentality and attitude of people. These behaviors causes to a socialization.

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