International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Interfaces in the R & D Ecosystem in Turkey

Seda YILMAZ, Ph. D

Hacettepe University Technology Transfer Center, Ankara, Turkey
ORCID: 0000-0001-8000-181X

Abstract: ***Regarding the emergence of technopolises, it was first introduced in 1950 when a study project at the University of the USA acted on commercial thinking for its research. The concept of Technology Transfer Office (TTO) was used for the first time in the world in ancient times. In this world, along with the technology of defense technologies, professional interfaces were needed to transfer the inventions that emerged in universities to the industry. In Turkey, the "Technology Transfer Office Program" was started in 2013 by Tübitak to develop and support university-industry cooperation. In this study, an evaluation of the current situation regarding Technology Development Zones in Turkey has been made.***

Keywords: Technology Transfer Office Technology, Development Zones, R & D, entrepreneurship, technocity

1.Definitions of Technology Development Zones

Since the scope of Technology Development Zones (TDZ) is wide, there is no general definition. Different definitions can be made for TDZs, which show different forms of application according to the science and technology policy of the country in which they were established, university facilities, industrial texture, geographical structure and technological development level (Harmancı and Önen, 1999, p.3).

In the study of Babacan (1995) (cited in Keleş and Tunca, 2010); The terms Science Park in England, Research Park in the USA, Technopole (Technology City) in France, Technopolis (Technology City) in Japan, Grunderzentrum (Founder Center) in Germany are used. Its widespread use in Asia is Technology Park / Technopark. The concept of Technopolis (Technopole) is mostly used in France.

According to the definition accepted by the International Association of Science Parks (IASP), which is the most widely accepted in the world, Technopark is defined as: "It is in official relations with a university or higher education institution or a research center, encourages the formation of technology-based companies and enterprises and grows and develops. It is an initiative that has been designed in a structure that supports the development of the company and its management actively tries to transfer technology and management skills to the relevant companies" (Eren, 2011, p.34).

In the Law 4691 Technology Development Zones, the term used in practice and in the literature, which is legally agreed upon in Turkey, a single concept is used as "Technology Development Zone". According to the definition made by the Ministry of Industry and Technology, TGB is defined as "a technological enterprise in which companies using high/advanced technology or oriented towards new technologies produce/develop technology or software by utilizing the facilities of a certain university or high technology institute or R & D center or institute. within or near the same university, high technology institute or R & D center or institute where they operate to transform the invention into a commercial product, method or service and thereby contribute to the development of the region; It represents the site where the academic, economic and social structure is integrated, or the technopark with these features" (TGB Law No.06/07/2001, 4691).

In another definition, TDZs are developed regions established to support research and development-based commercial activities. It is considered as places where the research outputs of academic researchers can be commercialized and where industrial companies can be close to academic experiences and research (Quintas et al., 2012, p.161).

In other words, TDZ not only allows the science produced in universities to be transformed into technology that can be used in the economy, but also has incubation, venture capital funds, etc. They expressed it as structures that support entrepreneurship with instruments such as (Yalçıntaş, 2014, p.86).

1.1. The Purpose and Importance of Technology Development Zones

Technology has an important place in today's competitive conditions. Especially considering that the competition is focused on quality and technology is the most important factor that determines quality, the importance of technology for businesses is increasing day by day (Delichasanoglou, 2007, pp.7-8). In today's conditions, businesses cannot gain an advantage over their competitors by offering new products to the market. Businesses can get ahead of their competitors by only offering the latest technology products to the market. Therefore, in order to achieve economic power, it is necessary to have technological power.

Today, the importance of TDZs is increasing, as the most important capital is technology. By operating in TDZs, businesses can obtain technological information, services, products, etc. more cheaply and more easily. achieves. With the help of TDZs, technological information is transferred to the industry in the shortest way and made available to consumers in a short time. In terms of businesses, being able to obtain and use information in a short time creates an important advantage against their competitors. Therefore, it is very important for businesses

to operate in TDZs. For this reason, the importance of TDZs is increasing day by day and businesses are showing more demand for these regions. When we look at the TDZs that were established many years ago and have achieved significant success in the world, the importance of these regions increases even more. Within the scope of Law No.4691, the primary objectives of TDZs are explained as follows:

- To increase the production of high value-added products and services based on R & D and software and to reduce foreign dependency in such products,
- To encourage the formation and development of high-tech companies,
- To ensure that university-industry relations turn into concrete cooperation,
- To transform and commercialize academic knowledge in universities into technological products and to create a suitable environment for technology transfer,
- To increase synergy and cooperation opportunities between companies,
- To increase the export rate of technology-based products,
- To ensure the restructuring of the regional and local economy with R & D based activities, to encourage the modernization of the local industry,
- Increasing the efficiency and resilience of the local economy against crises,
- To attract foreign capital to the region,
- To prevent brain drain by creating job and entrepreneurship opportunities for qualified people,
- To lead the formation of fully-fledged and well-planned living settlements and to create a modernization and real estate valuation effect for their environment,
- To increase the welfare level of their environment, etc., thanks to the quality employment they create. Sarıçiçek (2006) (cited in Delichasanoglou, 2007).

As of September 2019, a total of 84 TDZs have been established.64 of them are still in operation, and 20 of them have not been operational yet due to the ongoing infrastructure works (www. btgm. sanayi. gov. tr).

Although the establishment models of TDZs (Technokent/Technopark) are basically similar, the degree of importance they attach to certain success criteria may differ. While the main objective of the university-led technopark is to strengthen university-industry relations, commercialize academic knowledge at the university, and create various business and research opportunities for academics and students, the main objective of the technopark established under the leadership of the local government is to contribute to regional development, create an attraction center in the region, and increase employment. and keeping qualified brain power in the region (Delichasanoglou, 2007, p.9).

1.2. Technology Development Zones Establishment Models

While establishing TDZs, they are implemented through 5 different models. Although the aims of these models are the same, they differ in terms of those who lead their organizations.

State Based Model: It is a model formed as a result of the state taking an open and active role in the production of technology based on science by using natural resources and human power within the borders of the country (İbişoğlu, 2014, p.12). The first example of the state based model in our country is the "TÜBİTAK Marmara Research Center Technopark", which became operational in Kocaeli in 2001.

University Based Model: The most preferred model in our country is the university based TDZ model. Compared to other models, the reason why this model is preferred more in our country is that the regulations regarding technology development zones are carried out by keeping them together with university institutions, and thus, a uniform application and ease of procedure are provided (İbişoğlu, 2014, p.13).

Model Based on Private Sector: This model refers to TDZs established by financially strong companies in cooperation with universities. The companies that established the TDZs have a say in the management and play an active role in the selection and acceptance of the companies that will operate in the TDZs.

Model Based on Local Governments: It is the TDZ model established by local governments to support the economic development of the region in big cities. In this model, expenses of TDZs are covered by local governments.

Mixed Model: It is the model established by local governments, universities and foundations/banks together.

1.3. Technology Development Zones in the World and in Turkey

The first technopark in the world II. Stanford Research Park (Silicon Valley), which was established in the United States of America in 1952 after World War II, was established by a group of researchers in order to commercialize their research (Tepe and Zaim, 2016, p.22; Gökdoğan, 2007, 121). In 1959, the Research Triangle Park was established in North Carolina. The first technopark in Europe; It is a Heroit Watt research park established in England and Cambridge Science Park was also established in the same year (Şahin, 2018, p.12). The first countries that pioneered the establishment of technoparks in the Asian continent were South Korea, Japan and China. The first technoparks established in these countries are; Tsukuba Science City was established in 1961 in Japan, Daedok Science City was established in Korea in 1973, and Zhongguancun was established in China in 1988 (Yusufoğlu, 2014, p.20).

By the 1980s, it was seen that there were 21 technoparks all over the world, 12 in the United States, 7 in France and Belgium, and 2 in England (Güney, 2015, p.351). In Germany, the Entrepreneur Support Center was established in Berlin in 1983. The second is the technology center established in Aachen.

With the increase in the importance of technology depending on the technological developments in the world, technology development zones have started to be established in order to ensure cooperation between universities, industry and research institutions for technology production (Gökdoğan, 2007, p.74).

Until 20 years ago, technoparks, which were only known in university circles abroad, have come to a very important position in Turkey today. The idea of establishing a technopark in Turkey first began to emerge in the early 1980s. Istanbul Technical University, together with the Istanbul Chamber of Industry and Commerce, launched the technopark application in 1985 (Güney, 2015, p.352). This technopark, which started to operate, continued its activities under the name of "Technology Development Center" in accordance with the agreement signed between Istanbul Technical University and KOSGEB.

İzmir Technopark established in İzmir in 1988, METU Technopark established by Middle East Technical University (ODTÜ) in Ankara and technopark established within TÜBİTAK-MAM in İzmit Gebze are among the first Technoparks of Turkey.

2.Major Units in Technology Development Zones

2.1. Incubation Centers (Companies Newly Established by Entrepreneurs)

Before I talk about incubation centers, I would like to start by defining entrepreneurship. Entrepreneur; We can define it as a person who transforms his capital into investment by taking the risk of profit/loss to produce/market goods or services (Küçük, 2017, p.29). In other words, an entrepreneur is a person who brings together the factors of production with his own resources or obtained from other people or institutions in order to produce and market a good or service, and take the risk that may arise while doing this activity (Yıldırım, 2000, p.27).

Incubation centers, on the other hand, are places established in universities, technoparks or public research institutions, where suitable rental conditions, office supply, infrastructure facilities and office support services are provided from a single source for entrepreneurial companies that have just completed their establishment (Akaydın, 2015, p.81).

The main purpose of incubation centers is to accelerate the establishment of technology-based companies, to encourage technical enterprises, to help the development of the economy by creating continuous and qualified jobs, and to help the effective use of resources, which are the focus of the government's promotion of technological developments (İçerli and Şahin Karadal, 2013, p.351).

Structures such as technoparks, technopolises and industrial parks are "Business Incubators" that allow entrepreneurs to concentrate all their efforts and interests on the production and marketing of their products and R & D in the early stages of their business (Güney, 2015, p.344). “Business Incubation” is a process in which necessary services are provided for the development of a project, funding and the success of a new commercial establishment, especially during the initial phase of an initiative, which can also be called the incubation period.

2.2 Technocity Management

The general purpose of Technocity managements; to continuously increase the share of technology in the national economy by combining the academic knowledge of the university with the innovative ideas of companies using high technology, and to create a source for global competition by creating synergy between companies using or producing technology (www.antalyateknokent.com.tr).

Teknokent management, which is the most important unit (interface) of TGB, aims to transform R & D studies supported by university infrastructure opportunities into economic value in order to increase Turkey's technological share in the global market.

Technocity management is the legal entity primarily responsible for the realization of the vision and objectives of the Technocity. Teknokent management is also responsible for the development of the policies determined by the board of directors, the strategies related to these policies, and the implementation of the programs.

2.3. Technocity Companies

Entrepreneurial companies that want to take part in TDZ present their projects to Teknokent management. As a result of the evaluations of expert referees, the project is accepted and the relevant company is entitled to operate in the TGB. As the projects reported in the application files are completed over time, new projects take their place. In this process, T. C. In order to determine the accuracy of the information given to the Ministry of Commerce, the Ministry of Treasury and Finance and to benefit from the exceptions and exemptions brought by the legislation, the new projects of the entrepreneurial companies in the TGB should also be evaluated.

Firms in the TDZ are required to submit the new project information form, all project-related documents to the Teknokent management at least 5 weeks before the project starts, in order to evaluate the new projects to be realized in TDZ.

Teknokent management regularly monitors the project activities of entrepreneurial companies with annual reports. Entrepreneurial companies are obliged to submit their activity reports to the Teknokent management within 14 days, in electronic form, with e-signature, every quarter. At the same time, Teknokent management can request information and documents from entrepreneur companies for their own use without a certain periodic order.

All companies operating within the TDZ are provided with income tax exemption for R & D studies, incentives for academic staff working in Teknokent companies, and corporate tax exemption for companies within the scope of the Technology Development Zones Law No.4691. Companies and foreign investors can benefit from all the supports and incentives provided in the region.

2.4. Technology Transfer Offices (TTO)

Incubation centers (TEKMER), which started to be established by KOSGEB in 1990 in Turkey, are seen as an important beginning regarding TTOs, which is also the subject of the research. These centers have played an important role in opening up start-ups and spin-outs. Then, "University-Industry Joint Research Centers Program" (ÜSAMP), which was established by Tübitak in 1996 and continued for 10 years, has been an important experience. With the TDZ law numbered 4691, Technopolises started to be established in universities in 2000, and TTOs started to operate in the second half of the same year.

Tübitak assigned the "Science and Technology High Council" to support TTOs. TTOs are actively supported by Tübitak in order to trigger innovation and entrepreneurship in the university.

In Turkey, it is possible to group TTOs in four (4) different categories, based on the type of establishment.

- TTOs operating as a unit of a university or scientific research institution,
- TTOs operating with an identity affiliated with a university or scientific research institution,
- TTOs that are associated with more than one university or scientific research institution but continue their activities with a public or private independent identity (Technology Development Foundation of Turkey (TTGV), 2017, p.19),-TTOs in which the technology development zone management company is a partner,

Currently, there are 62 TTOs in Turkey and as of May 2020, 25 universities have been included in the scope of support within the framework of Tübitak 1513 "Technology Transfer Offices Support Program".

3.Result

In the current study, the definition of TDZ is made and the benefits it provides are emphasized. By referring to the establishment models in Turkey, the current situation analysis of TDZs in the world and in Turkey has been made. In addition, the units in the TDZ were explained in detail and a general framework was drawn by evaluating the situation.

References

[1] Akaydın, A. (2015). The role of technoparks in the innovation ecosystem and a model proposal for their development: Technology Transfer and Development Center. (Unpublished PhD Thesis) Dicle University, Diyarbakir
[2] Atalay, I. (2003). What is Technology Transfer, How is it done?", accessed on March 13, 2020 from http://www.ilkeratalay.com/articles/teknolojitransferi.php.
[3] Audretsch, D. B., Keilbach, M. C., and Lehmann, E. E. (2006). Entrepreneurship and economic growth. New York: Oxford University Press.
[4] Honey, B. (2015). Determining the factors affecting the establishment of university spin-off companies specific to Technology Development zones: The case of Turkey. (Unpublished Master's Thesis) Karadeniz Technical University, Trabzon.
[5] Celepov, S., Kaçar, S., and Bulut, N. (1997). Technology and Technology Transfer. Ankara: TMMOB Chamber of Mechanical Engineers Publication.
[6] Cosh, A. and Hughes, A. (2010). Never Mind the Quality Feel the Width: University-Industry Links and Government Financial Support for Innovation in Small High-Technology Businesses in the UK and the USA. The Journal of Technology Transfer, 35 (1), 66-91.
[7] Delichasanoglou, M. (2007). Technology Development Zones, its development in Turkey, the tax advantages it provides and a survey application. (Unpublished Master's Thesis) Istanbul University, Istanbul.
[8] Eren, M. (2011). Technoparks and R & D Support in Turkey's technological development. (Unpublished Master's Thesis) Marmara University, Istanbul.
[9] Gokdogan, T. (2007). Technology development zones within the framework of SME and national technology policies: Attitudes of SMEs at NUTS2 TR61 (Antalya-Isparta-Burdur) level. (Unpublished Master's Thesis) Süleyman Demirel University, Isparta.
[10] Güney, S. (2015). Entrepreneurship, Basic Concepts and Some Current Issues (4th Edition). Ankara: Political.
[11] Harmancı, M. and Önen, M. O. (1999), Technopark and Technopolis Applications in the World and Turkey. Ankara: Türkiye İş Bankası Publications.
[12] Hauksson, A. G. (1997). The Commercialization of University Research Discoveries: Are University Technology Transfer Offices Stimulating the Process? (Unpublished PhD Thesis) MIT, USA.
[13] Inzelt, A. and Hilton J. (1998). Technology Transfer: From Invention to Innovation, 4. Science and Technology Policy. Boston London: Kluwer Acadmic Publishers.
[14] Ibisoglu, C. (2014). City and Regional Planning Department Regional Planning Program. (Unpublished Master's Thesis) Istanbul Technical University, Istanbul.
[15] İçerli, L. and Şahin Karadal, M. (2013) Social Entrepreneurship. Karadal, H. (Ed.) In Entrepreneurship (pp.343-361). Istanbul: Beta Publishing and Distribution.
[16] Kaymakçı, O. (2010). International Economics. Istanbul: Digital Art Publications.

[17] Keleş, M. K. and Tunca, M. Z. (2010). Examination of the Current Situation of Technopolises in Turkey. Journal of Suleyman Demirel University Institute of Social Sciences, (11), 1-22.
[18] Khalil, T. (2000). Management of Technology: The Key to Competitiveness and Wealth Creation. New York: McGraw Hill,
[19] Small, O. (2017). Entrepreneurship and Small Business Management (9th Edition). Ankara: Distinguished.
[20] Muir, A. E. (1997). The Technology Transfer System. Latham, New York: Latam Book Publishing,
[21] Ozdemir, M. (2017). The development of technology transfer offices in the world and in Turkey & Gaziantep Technopark example. (Unpublished Master's Thesis) Gaziantep University, Gaziantep
[22] Quintas, P. et al. (1992), Academic-Industry Links and Innovation: Questioning The Science Park Model. Technovation, 12 (3), 161-175.
[23] Ministry of Industry and Technology, accessed on October 28, 2019 from https://btgm.sanayi. gov.tr/Handlers/DokumanGetHandler.ashx?dokumanId=4d9b6b9a-839b-446e-af35-aafe40b65946.
[24] Şahin, E. (2018). Examination of accounting and tax applications related to intangible rights obtained from R & D activities within the framework of TMS-38: Technology Development Zones. (Unpublished Master's Thesis) Tokat Gaziosmanpaşa University, Tokat.
[25] Tatar, H. A. (2016). Technology transfer and applications: The case of Turkey. (Unpublished Master's Thesis) Istanbul University, Istanbul. Technology Development Zones Law. (2001). Retrieved from https://www.mevzuat.gov.tr/MevzuatMetin/1.5.4691. pdf on 10 January 2020.
[26] Tepe, S. A., and Zaim, H. (2016). Technopark Applications in Turkey and the World: The Example of Technopark Istanbul. Istanbul Commerce University Journal of Social Sciences, (19), 3-4.
[27] Turkey Technology Development Foundation (2017). University Industry Cooperation and Regional TTO Analysis Report for Technology Transfer Offices and EAP Region in the World and Turkey.
[28] Yalçıntaş, M. (2014), The Effects of University-Industry-State Cooperation on National Economy: Technopark Istanbul example. Journal of Financial Research and Studies, 5 (10), 83-106.
[29] Yildirim, V. (2000). General Business (I, II). Adapazari. Exchange Publications.
[30] Yalçıntaş, M. (2014), The Effects of University-Industry-State Cooperation on National Economy: Technopark Istanbul example. Journal of Financial Research and Studies, 5 (10), 83-106.
[31] Yildirim, V. (2000). General Business (I, II). Adapazari. Exchange Publications.
[32] Yusufoglu, A. (2014). Incentive practices within the scope of technology development zones and evaluation of their contribution to the economy. (Unpublished Master's Thesis) Pamukkale University, Denizli
[33] www.antalyateknokent.com.tr (Access Date: 10 December 2019) www.btgm.sanayi.gov.tr (Access Date: 28 October 2019) www.tubitak.gov.tr (Access Date: September 21, 2019)