

# Role of Technological Parks in Innovative Development of the Economy of Kazakhstan

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**Abstract**—The article is devoted to the problems and prospects of the development of technological parks. The key features of the development of technology parks in Kazakhstan is an actual element of the production and technological unit that forms the innovative structure of the state. The experience of the Autonomous Cluster Fund - Park of Innovative Technologies Tech Garden proves the importance of creating and strengthening the infrastructure for the development of an innovative economy and the implementation of the state program “Digital Kazakhstan”. The Autonomous Cluster Fund “Tech Garden” actively applies all forms of support of the innovative activity: public private partnership; support for startups; information support; technological cooperation with national and multinational companies; corporate innovation program; venture capital funds, industry laboratories and competence centers; single platform for the exchange and storage of data between all participants in the process - the state, business, citizens. The Autonomous Cluster Fund Tech Garden promotes to the process of creating a favorable environment for the development of innovative companies, including start-ups, through the consolidation of orders, intellectual resources, the best foreign technologies, incentive tools and attracting investment.

**Keywords**—*innovative economy, Digital Kazakhstan, Autonomous Cluster Fund, Park of Innovative Technologies, Tech Garden, technological park, cluster, innovations, Start up, Kazakhstan*

## I. INTRODUCTION

In recent decades, the whole world has been rapidly moving to a new type of economy, where knowledge and digital technology is the fundamental tool for its formation. The world experience of developed countries shows that one of the conditions for effective modernization of the economy is the activation of innovative processes based on the formation of an innovative business environment and the emergence of an increasing number of national participants. At the end of 2018, the global market for innovative technologies amounted to 3,7 trillion USD. According to leading world experts, in 2020, 25% of the global economy worked in digital format. The countries of the European Union, on average, through innovation provide about 50% of

GDP growth. For example, in Austria and Germany - about 67%, Finland and Sweden - 64%, France - 58%, Great Britain and Ireland - 55%. [1] [2]

Today, almost all the elements characterizing the national innovation system were implemented in Kazakhstan. Along with this, the modern national innovation system requires further improvement through the introduction and development of technological / technology parks (technoparks). Development of new forms of innovation infrastructure, such as technology parks and technology cities, research and development centers, science and technology centers promotes the digitalization of the economy, which is based on a broad assimilation of research and development results in production. In this regard, development of technological parks of high technologies, the main activity of which is the development of technologies that enhance the competitiveness of the national economy, plays an important role in accelerating this process.

The further development of technology parks in Kazakhstan is aimed at launching an effective mechanism for the formation of innovative enterprises, development of innovative activities and innovative entrepreneurship in scientific and technical field. Technological park is a universal mechanism for combining scientific, industrial and entrepreneurial activities with participation of local and regional authorities. In contemporary conditions, Republic of Kazakhstan, in accordance with the State program “Digital Kazakhstan”, uses the technology parks as the basis of creating a single digital platform for providing digital services to industries and citizens. Moreover, the main technological directions of this technological cluster include smart industry and new materials; additive technologies and 3D printing, thin films; industry 4.0 and automation; smart environment; accessible information infrastructure and security; Smart city; Internet of things; next-generation networks and data transmission; Fintech, E-Commerce and New Media.

This article is aimed to present a brief analysis in charge of the research related to the development of technological parks in Kazakhstan. It reviews the historical development of

technoparks and discusses how they fit into the national policies. The research is directed to outline technological parks as an important element in the development of innovative economy and to show key processes implemented on the basis of the technopark, and key areas of these processes of creating high-tech companies and R&D. The analysis of the activity of the Autonomous Cluster Fund Tech Garden shows the role of technological parks in the promotion of innovative infrastructure; creation and sale of innovations; their role in developing the infrastructure for supporting innovative entrepreneurship with the participation of the state and business. This research confirms the contribution of technological parks to the development of a professional environment for promoting innovations demanded by business, based on mutually beneficial cooperation of business, startups, investors, educational and research institutions. The experience of the Tech Garden should demonstrate a model of creating a favorable environment for the development of innovative companies.

## II. MATERIALS AND METHODS

The introduction of new forms of innovation infrastructure, such as research and development centers and science and technology centers, technological parks, which are based on the emphasis on the widespread development of research and development results in production, should contribute to the intensification of innovation, in the development and implementation of new technologies. During the past several decades, technological parks in the post-Soviet countries, including Central Asia, have witnessed rapid development. This is reflected not only in the emergence of new innovative institutions, but also in the successes of some prominent technoparks in the countries of the region.

Development of high technology parks, the main activity of which is the advancement of digital technologies that enhance the competitiveness of the national economy, plays an important role in accelerating this process. With the current level of economic development, government may perceive technological parks as a means of introducing innovative economy, promoting collaboration in research and innovation. On the other hand, the challenge of establishing successful technoparks must not be underestimated.

Starting a study of the role of technological park, it should be first clarified the tasks, materials, sources, and methods. The first guideline to be taken into account is the situation in the technological parks, to define the main tasks. The policy of the technopark should be formed to maintain its contribution into innovative development. Second, the methods of study of technoparks are necessary to use in order to study situations that arise under the influence of other entities (the government and competitors).

During the study of the literature for writing this article, the main directions and methods of technoparks development have been determined. Through a systematic collection of data on the activities of the parks it be possible to conduct current and especially future analyses on the impact of technological park on entrepreneurship, effectiveness of

technological development, and finally economic development. To this extent, the common views of academicians, specialists from technological parks, and policy experts are crucial.

The comparative and historical method makes it possible to identify the origin and tendency of the subject of research. The analytical method provides the analysis of theoretical sources on the problem. The focus of this article is to present quantitative and qualitative methods of the analysis of the role of technological park on country's development and to raise awareness on the importance of systematic data collection and analysis. Among the methods and directions have been highlighted: 1) analysis of the activities of technological parks, especially in terms of indicator of effectiveness for innovative development of the country, since technoparks with high value attract more investors; 2) evaluation of the operational and financial activities of enterprises with the aim of improving their activities; 3) assessment of the private-public partnership.

It is important to clarify the meaning of "technological park", "public-private partnership" and other terms. There are definitions of "technological park" by several sources. Different authors use various terms, such as research park, business innovation centre, innovation park, techno-city, technopolis, and innovation and technology centre, have been used in countries. The UNESCO offers the term "science and technology park" encompasses any kind of high-tech cluster. The International Association of Science Parks (IASP) considers a technological park as an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. [3]

Specifics of technological parks established in Kazakhstan allows to consider them as a universal mechanism for combining scientific, industrial and entrepreneurial activities with the participation of local and regional authorities and end users. Analysis of the technological parks demands consideration of a full understanding of the role a government should play in supporting their development. Governments in many countries directly support their development through funding, providing tax incentives. Governments also should consider carefully whether an investment will help to achieve their intended outcomes, or whether another policy instrument might be better suited to their economic goals. [4]

Rodriguez-Pose (2014) noted, that technological parks are regarded as the ideal instrument to overcome institutional, political, economic, social and technological weaknesses and form development strategy. However, the real impact of technology parks, especially in emerging countries is still poorly understood. [5]

This article represents an approach to understand the role and potential of technological parks in Kazakhstan. It is argued that these parks are successful in solving key problems, including introduction of innovative economic instruments, acceleration of development, unemployment and a lack of investment. From this point of view public-private partnership (PPP) is regarded as one of the most effective tools for developing the technological parks, an innovative economy in

modern conditions. According to the definition of the OECD Committee on Scientific and Technological Policy (2019), the partnership between public and private sectors of the economy in the innovation sphere refers to “any formal relations or arrangements between public and private participants for interaction in the decision-making process and joint investment of resources, such as finance, personnel, equipment and information to achieve specific goals in a specific field of science, technology and innovation.” [6]

It should be noted that, according to some researches, only 25% of technological parks in the United States achieved their goal of attracting and fostering research and development (R&D) activities, and contributed to employment and economic growth, while the remaining parks contributed very little to economic goals. [7]

Amoroso (2019) explores concrete ways to systematically collect information on public and private organizations related to their support of and activities in technological parks, including incubation to start-up and scale-up, and collaborations with centers of knowledge creation. [8]

The governmental support plays an important role. The share of state funding for research and development in Kazakhstan is on average 30%. At the same time, the number of Kazakhstani organizations and enterprises implementing innovations amounted to 386 at the beginning of 2020, of which 101 were from the public sector; 99 - sector of higher professional education; 146 - business sector; 40 - non-profit sector. For example, in the EU countries, the share of government spending on research and development is on average 34,6%, and in OECD countries – 27,8%. [9] [10]

As such, Governments should consider carefully whether an investment in technological parks will be able to achieve their intended outcomes, or whether another policy instrument might be better suited to their economic goals. The creation of technological parks in Kazakhstan is aimed at launching an effective mechanism for the formation of innovative enterprises, development of innovative activities and entrepreneurship in the scientific and technological field. Technological parks are a universal mechanism for combining scientific, industrial and entrepreneurial activities with the participation of local and regional authorities.

In modern conditions, Republic of Kazakhstan, in accordance with the State program “Digital Kazakhstan”, launched the process of creating the development of technological parks on the basis of a single digital platform for providing digital services to industries. There is a number of conditions necessary for the functioning of technology parks that can play a significant role in the socio-economic and technological development of the country and the region. [11] [12]

These conditions include the presence of the following factors in a country:

- state strategy and program for the development of technological parks;
- needs and demand for innovative technological park products;

- favorable business climate, scientific and industrial potential;
- basis for the development of public-private enterprise;
- qualified teams of specialists for work in technological parks;
- financial and other material opportunities to support start-ups, start-up entrepreneurs;
- availability of a large university or research center and entrepreneurship in the field of innovation.

The Law of the Republic of Kazakhstan “On Public-Private Partnership” (2015) is aimed at creating conditions for effective long-term interaction of the state with business entities by pooling their resources in order to ensure sustainable socio-economic development of the country and the implementation of socially significant tasks. Moreover, state intervention is reduced to direct participation in investment processes through the development of institutional forms of public-private partnership. [13] [14]

The creation of PPP-based technology development centers together with transnational companies is part of the Autonomous Cluster Fund's area of activity - Tech Garden Innovative Technology Park (hereinafter AKF PIT or Tech Garden). The model of relations between the public and private sectors of the economy in Tech Garden is implemented in the form of creating innovative infrastructure entities (venture capital funds, technology transfer centers, business incubators, start-up schools, free economic zones, technology parks). [15]

Legal and institutional support also are very important. Kazakhstan implemented comprehensive measures to develop the innovation sphere and support entrepreneurship, enhancing a legal basis in the form of a Concept of Innovative Development of the Republic of Kazakhstan until 2030, the Entrepreneurial Code of the Republic of Kazakhstan. Six domestic venture capital funds have been created, with a total capitalization of 110 million USD on the principles of public-private partnership with the participation of the development institute of the National Agency for Technological Development. Specialized structures and institutions that form the institutional infrastructure for the development of innovative activities such as KazAgroInnovation JSC, Science Fund JSC, Center for Engineering and Technology Transfer JSC, a number of venture funds, have been created. [16]

Almaty Tech Garden presents a platform for meetings and negotiations between innovative start-ups, investors, subsoil users, business angels with the aim of attracting financing, consolidating demand, tasks from investors, providing access to investors and clients.

Technology parks can contribute to economic diversification. Tech Garden is working towards the creation of a scientific and technological complex for the development of priority sectors and the cultivation of 2-3 new high-tech areas in order to diversify the economy of Kazakhstan through the creation of industries with high added value. So, in the industrial sector there are projects in mining metallurgy,

petrochemicals and green technologies, as well as in the field of occupational safety. [17]

Support for startups is one of the activities of the technology park. In 2018, 27 projects participating in Start Up Kazakhstan were presented to corporations at the Tech Garden site in the IT quarter. Startup business areas embrace a wide variety from traditional sectors such as mining and metallurgical (MMC) and oil and gas complexes to new energy, logistics, and machine building. [18]

Information support and the use of an online platform for the access to market information and business opportunities serve as a key factor in the development of technology parks. In order to create such an information environment, Tech Garden proposes to establish an information environment for the development of market-relevant innovations with the involvement of private capital and a gradual increase in its share to 70% in the medium term. [19]

The development of technological cooperation with national and multinational companies is becoming one of the important areas of the technology park. So, from the day of its foundation in 2015, only for two years, 161 companies were registered in this technology park. To date, 265 companies are participants in the Tech Garden, of which 90% are information technology companies, as well as universities, research institutes, technology parks, development institutes, and small and medium-sized businesses. [20]

There are priority areas of the Tech Garden: increasing the share of Kazakhstani content in high technology; creating an ecosystem of venture financing. To solve the first problem, there is a grant support of the acceleration and incubation programs, seed investments and, if necessary, co-investment tools; as well as measures aimed at developing competence and intellectual capital. To achieve the second objective, Tech Garden applies a special system of investment incentives at each stage of financing, for example, it provides investors and subsoil users with the right to choose projects; and also uses a set of specific financial instruments to provide support for projects at each stage. Co-financing programs are used to create high-tech companies and R&D centers; attracting advanced technologies and their implementation in the Republic of Kazakhstan. Tech Garden acts as a platform where corporations can effectively interact with startups. Currently, subsoil users conduct the most active work with startups. Over the past two years, 87 projects of the innovation cluster have been funded. Basically, it is a small and medium-sized business that implements solutions for subsoil users - from digitalization to environmental work, reserves assessment, databases.

### III. RESULTS AND DISCUSSION

The analysis of the activity of the Autonomous Cluster Fund Tech Garden confirmed the role of technology parks in the promotion of innovative infrastructure; creation and sale of innovations. The research showed the contribution of technology parks to the development of a professional environment for promoting innovations demanded by business, based on mutually beneficial cooperation of business, startups, investors, educational and research

institutions. There is an analysis of the importance of technology parks in promoting the improvement and sale of innovations created in other technology parks; modernization of existing innovations in new areas of their application. The model of creating a scientific and technological complex for the development of priority sectors and cultivating 2-3 new high-tech areas in order to diversify the economy of Kazakhstan through the creation of industries with high added value was approved.

The experience of the Autonomous Cluster Fund Tech Garden can be used as a model of creating a favorable environment for the development of innovative companies, including start-ups, through the consolidation of orders, intellectual resources, the best foreign technologies, incentive tools and attracting investment. Technological park plays a key role in positioning itself as a national center for business and innovations using public private partnership; support for startups; information support; technological cooperation with national and multinational companies; corporate innovation program; venture capital funds, industry laboratories and competence centers. Tech Garden makes a contribution into development of a single platform for the exchange and storage of data between all participants in the process - the state, business, citizens. The perspective directions of the activities of this technological park smart industry and new materials; additive technologies and 3D printing; industry 4.0 and automation; smart environment; accessible information infrastructure and security; Smart city; Internet of things; next-generation networks and data transmission; Fintech, E-Commerce and New Media. Technological parks became technological platform for industrial automation and digitalization to optimize the production processes of subsoil users (mining, oil & gas). Technological parks based on IntelliSense-LAB LLP in cooperation with World Economic Forum can make an important contribution into innovative development of the economy.

### IV. CONCLUSION AND RECOMMENDATIONS

Technological parks are an important element in the development of innovation. Technology parks, new business accelerators, scientific and technical centers play an important role in developing the infrastructure for supporting innovative entrepreneurship with the participation of the state and business. Thus, three key processes are being implemented on the basis of the technical park:

1. Creation and sale of innovations.
2. Improving and selling innovations in other technology parks.
3. Modernization of existing innovations in new areas of their application.

The key areas of these processes of creating high-tech companies and R&D are: public-private partnership; support for startups; information support; development of technological cooperation with national and transnational companies with use of co-financing programs; visiting corporate innovation program; creation of venture capital funds, industry laboratories and competence centers;

formation of a single platform for the exchange and storage of data between all participants in the process - the state, business, citizens.

These measures contribute to creating an enabling environment for the development of innovative companies, including start-ups, through the consolidation of orders, intellectual resources, best foreign technologies, incentive tools and attracting investments. Moreover, it contributes to the promotion of such promising technological areas of technology centers as: smart industry and new materials; additive technologies and 3D printing, thin films; industry 4.0 and automation; smart environment; accessible information infrastructure and security; smart city; Internet of things next-generation networks and data transmission; financial technologies, E-commerce and new media.

#### Recommendations

1. To use the experience of the technology park in the creation of high-tech companies and R&D Centers, business incubators, technology parks, business accelerators.
2. To work out measures to support innovative entrepreneurship.
3. To promote the development of an effective infrastructure to support innovative entrepreneurship.
4. To consider public-private partnerships as a key factor in the development of technology parks, the creation of a network of scientific and technical centers, and the strengthening of cooperation with business.
5. To use an example of the activities of the Autonomous Cluster Fund Tech Garden in creating an information environment based on the development of market-relevant innovations with the involvement of private capital and a gradual increase in its share to 70% in the medium term.
6. To use the model of creating the Tech Garden science and technology complex for developing priority sectors and cultivate 2-3 new high-tech areas in order to diversify the economy of Kazakhstan through the creation of high value-added industries.
7. To continue the development of technological cooperation with national and multinational companies through the development of technology parks.
8. In order to increase the share of Kazakhstani content in the field of high technologies, implement acceleration and incubation programs supported by grants, seed investments and co-investment tools.
9. To apply a special investment incentive system at each stage of financing: provide investors and subsoil users with the right to independently choose projects; use a set of specific financial instruments to provide support for projects at each stage.
10. To develop venture capital financing and the creation of venture capital funds while financing innovative developments.

11. To implement measures aimed at developing competence and intellectual capital.

12. To promote increased investment in human capital, in the development of education.

13. to strengthen the policy of attracting and training specialists and developing local competencies.

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