

CONSTRUCTION OF TECHNOLOGY PARKS AS A MEANS OF RESOLVING CONFLICTS OF INTEREST BETWEEN THE SUBJECTS OF THE INVESTMENT PROCESS

Anastasiya Ilyina¹

Abstract. The *purpose* of this paper is to determine the ways of improving the work of technology parks in Ukraine. *Methodology.* In the paper, there were used the following methods: the dialectical method (consideration of the theoretical foundations of the construction of technology parks in the context of the close interconnection of their functioning with a high-quality education system); scientific abstraction, theoretical and empirical analysis (study of the need for establishing the relations between the subjects of the investment process, the activities of which are carried out at the technology park area and its impact on the development of an innovation infrastructure in the country and also standard of living of the population); the method of modelling (studying the structure of the technology park, the process of its functioning and development); statistical methods (grouping, comparison, dynamic series), used during the comparative and statistical analysis of activities of technology parks in Ukraine. *Results* of the research study showed that each model of the construction of technology parks (American, Japanese, European) based on the principles of their operations has corresponding disadvantages, which to a large extent would negatively affect their work. The comparative analysis of the activities of Ukrainian technology parks has shown the imperfection of their functioning due to significant differences of interest among the participants in the implementation of innovation projects since each individual technology park prefers to carry out its activities according to a separate model of developed countries of the world, without taking into account the underdevelopment of the education and industrial complex in Ukraine. In addition, due to unresolved relations between state authorities and local self-government bodies, there was not enough development of any targeted program for the implementation of technology parks' projects at both the state and local levels. As the statistical analysis showed, it has suspended the work of technology parks in Ukraine due to the lack of state incentives for their innovation and investment activities. All of this made it possible to conclude that the improvement of the work of existing technology parks, which could become a successful prospect for the construction of new ones, requires the resolving conflicts of interest among all the subjects of the investment process. *Practical implications.* An improved model for the construction of technology parks is needed for the effective interconnection of the main elements of the government system, namely: state, science, business, and population in order to create harmonious relations between all the subjects of the investment process. It will contribute to the strengthening of public confidence in the authorities, harmonization between state authorities and local self-government bodies, and also improvement of the process of providing administrative services to the population. All of this will give an opportunity for innovation-active enterprises to realize the innovative products and, thus, to expand the innovation infrastructure, paving the way for a bright future in the creation of the effective e-government system in the country. *Value/originality.* A harmonious interaction between state authorities and local self-government bodies contributes to the development and approval of targeted programs for the implementation of technology parks projects, and also other innovation projects concerning the development of information and telecommunication infrastructure. In this case, the research centres, operating on the basis of the universities, at the expense of student fee, conduct research on the impact of the realized innovation project on the economic and social development, and also grant students scholarships, leading to the expansion of technopolises and, thus, variety of services for the population.

Key words: technology park, innovation project, innovation and investment activities, investment process, subject of investment process, state support, targeted program.

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Corresponding author:

¹ Kyiv National University of Trade and Economics, Ukraine.

E-mail: nnnasta@ukr.net

ORCID: <https://orcid.org/0000-0002-6374-7078>

1. Introduction

The subject of the investment process can be any natural or artificial person, resident or non-resident who has an opportunity to invest in one or another investment object. It means any material (construction/reconstruction of real estate; production of transport vehicles, luxury goods), financial (establishment/development of banks, credit unions, acquisition of securities, property rights) and intellectual (production and commercialization of intellectual property: know-how, utility models, computer technique, etc.) value. So, financial resources play a support role for the material and technical base development, material resources are the basis for conducting research, intellectual resources create conditions for increasing employees' human capital and also replenishment of budget revenues. That is why the construction of technology parks, activities of which combine all three types of investment, will lead to the establishment of relations between the subjects of the investment process.

The problems of providing information services are of concern to the Ukrainian population for many years. The practical experience shows that during the whole period of Ukraine's independence, the problems in most cases concerned reliable information when advertising goods or providing certain types of services. Any technology park is constructed with the purpose to commercialize the scientific-technical and innovation developments aimed at satisfying the needs of the population by specialists engaged in various spheres of activities (industry, transport and communications, housing and communal services, healthcare, etc.). In this case, the construction of technology parks will allow producers to constantly cooperate with scientific institutions that conduct researches on production facilities and, accordingly, receive reliable information regarding their technical and economic opportunities. It will result not only in the improvement of the innovative production process but also be an attractive factor for consumers at the expense of skills of specialists to apply publicity-related receptions.

The question of the construction and development of technology parks was studied by a number of Ukrainian and foreign scientists. So, Ukrainian researchers, such as Y. H. Kozak, O. A. Yermakova and T. Sporek (2016), N. V. Krasnokutskaya (2003) addressed in the overwhelming majority the theoretical issues of the construction of technology parks. Meanwhile, the scholars Y. M. Moiseyenko (2016), R. L. Navrotsky (2017), S. V. Voloshina, D. R. Kalinichenko and N. I. Logvynenko (2017) devoted their works to the study of the problems of technology parks' construction in Ukraine in comparison with the experience of foreign countries. The foreign scientists, in particular, M. Castells and P. Hall (1994), A. N. Link and J. T. Scott (2015), A. Rodriguez-Pose and D. Hardy (2014) studied

the relationships between public authorities, private enterprises and scientific institutions in joint activities at the technology park area. At the same time, S. Musterd and A. Murie (2010), B. M. Naik and W. S. Kandlikar (2010), J. M. Spector and S. W. Park (2018) focused on the discussion of the issue how to develop a high-quality system of education in the country as a major source in the expansion of the number of research centres and, hence, technology park area.

Despite the in-depth researches of many scientists on various issues concerning the work of technology parks, no attention is paid to the study of disadvantages of modelling the process of the construction of technology parks, where the important role is played by resolving the conflicts of interest between public authorities, scientific institutions, and enterprises. Accordingly, the development of an improved model of technology parks' construction can serve as a benchmark for Ukraine in establishing relations between all the subjects of the investment process and, subsequently, state authorities and local self-government bodies. In the future, it will be an incentive for the development of mutually agreed state and local targeted programs in the field of innovation development and, of course, implementation of technology parks' projects.

2. Theoretical foundations for the construction of technology parks

The technology park is a united territorially separated complex of enterprises, establishments and organizations, the activities of which are connected with the provision of telecommunication, information, environmental, and other types of services. In addition, it is a complex founded on the basis of the leading university in order to implement the innovation cycle "research (science) => development (production) => introduction (consumption)" where the primary source is the introduction into the process of an education of a high-quality education system, which has long been considered the driving force of the innovation and investment development, and also scientific and technological progress. So, at the discretion of some foreign scholars, in particular, S. Musterd and A. Murie (2010), B. M. Naik and W. S. Kandlikar (2010), J. M. Spector and S. W. Park (2018), the quality system of preparation of future graduates of primary and secondary education institutions (schools, gymnasiums, colleges) needs to be improved. So, in addition to the school curriculum for basic disciplines, containing theoretical positions (chemistry, physics, mathematics), it would be worthwhile to introduce additional professional disciplines of a practical nature (draftsmanship, apprenticeship, applied economics) in conjunction with aesthetic disciplines (fine arts, labour training), which would enable pupils to apply their theoretical knowledge in practice, and also encourage

young people to generate as many new ideas as possible on the implementation of innovation projects. In this case, the relevant changes will increase the development of the higher education system, as graduates of schools will be oriented primarily to enter higher education institutions in order to obtain a specialty that will become a necessary factor in economic and social development.

Speaking about the quality of education system in higher education institutions, in particular at universities, it would be necessary to introduce changes to the curriculum based on the implementation of the vast majority of specialized disciplines in the specialty related to the knowledge of information and telecommunication technologies. It will enable future specialists not only to produce high-quality products and/or perform one or another work on the provision of relevant services but also involve as many interested customers as possible through the effective use of public relations. An achievement of such a goal needs acquisition of perfect knowledge of technical and economic parameters of some product/service, the functional features of which would create its positive image in the eyes of the population. All of this will contribute to increasing the workplaces of specialists in various fields of activities. They could play the role of both potential investors by making investments in the development of innovation infrastructure and recipients of investments by implementing infrastructure projects of the appropriate direction at the expense of investors' funds. These projects are primarily related to the construction of new and/or improvement of existing technology parks.

Taking into account the abovementioned, the construction of technology parks on the basis of scientific and educational institutions would determine the settlement of relations between investors, recipients of investments, and public authorities because of increasing the number of workplaces, and hence volumes of various sources of financing at the expense of potential investors, such as public and private institutions, financial and credit organizations and also representatives of some groups of the population. It, accordingly, will enable manufacturers to produce high-quality products with involving a large number of consumers by applying the publicity-related receptions, and also potential investors who invest in certain infrastructure projects would have a high probability of obtaining high profits and low risk of losses from investment activities.

As we know, the innovation projects of technology parks are long-term projects, when financial capital is represented in the form of venture capital intended for financing newly created enterprises (clusters, business incubators, etc.), according to which the investor is highly likely to receive a significant amount of profit but has a rather high level of risk to suffer losses. However,

in this case, the level of risk is relatively lower compared to other venture financings, in particular, in the construction of industrial parks. Despite the fact that industrial parks promote the development of an efficient industry in the country, the activities of technology parks have a number of significant financial benefits. So, in industrial parks, the responsibility for investment in infrastructure projects in selected territories of special (free) economic zones (SEZs) is assumed by private persons with the state support in the form of individual economic privileges (and, for the most part, for foreign investors). Within the technology park area, all the participants in the implementation of innovation projects not only receive economic privileges from the state but also have more opportunities to invest in the corresponding projects thanks to state investment support (Kozak et al., 2016; Krasnokutskaya, 2003; Link, Scott, 2015; Rodriguez-Pose, Hardy, 2014).

Consequently, the financial benefits of technology parks' activities are due to various factors. So, firstly, the financing of most of the innovation projects of technology parks is carried out at the expense of the state and local budgets (for example, the United Kingdom – 62%, Germany – 78%, Netherlands – 70%, France – 74%) on the basis of the development and approval of state/local targeted programs for the development of an innovation infrastructure, when it is known that, through the state support, the investor invests much smaller amounts, and thus fewer risks to incur financial losses (Krasnokutskaya, 2003; Navrotsky, 2017). Secondly, financing of technology parks' projects is carried out at the expense of various sources of financing, where investors can act as institutions functioning within the technology park area (banks, industrial enterprises, state institutions, universities, etc.), with which the investor is able to maintain a direct interconnection. Thirdly, the investor has an opportunity to receive the economic benefits provided by the state in the form of exemption from payment of income tax, value-added tax (VAT), import duty and privileges related to the exemption from the mandatory sale of funds received in foreign currency from sales of goods (Castells, Hall, 1994; Kozak et al., 2016; Rodriguez-Pose, Hardy, 2014).

Thus, the projects of technology parks are the perfect impetus for building a great future for the country since their work is connected not only with conducting the innovation and investment activities in a separate territory but also is accompanied by the expansion of achievements in science and technology throughout the country. However, if we analyse the works of some Ukrainian and foreign researchers, in particular, M. Castells and P. Hall (1994), Y. H. Kozak, O. A. Yermakova, T. Sporek (2016), Y. M. Moiseyenko (2016), technology parks in the whole world are constructed by imperfect models since each of three models of the developed countries has certain disadvantages.

So, the American model (USA, UK) identifies the technology park exclusively with a science park, that is, a complex of organizations carrying out research exclusively with no particular type of production (e.g. "Stanford", "Heriot-Watt"). Meanwhile, the innovation products during the implementation of innovation projects are produced by representatives out of the technology park area. It may cause an inconvenience in making an investment agreement between the subjects of the investment process that often slows down passing through its process. At the same time, financing of technology parks' projects on the basis of the state support is provided at the expense of government subsidies. In this case, the participants of the implementation of innovation projects rarely maintain relations with local authorities and, consequently, the local population, which may cause conflicts of interest between the state and latter.

The Japanese model (Japan), on the contrary, does not focus much on the theoretical study of the idea of practical implementation of technology parks' projects. It involves carrying out a science-intensive industrial production with the assumption of the construction of technopolises (e.g. science and technology centre "Tsukuba"). Thus, the activity of technology parks complicates the situation with environmental safety, because an excessive expansion of technological complexes without a thorough study of their environmental impact in the future may lead to negative environmental effects. Moreover, central authorities consider it necessary not to develop a program for funding the projects of technology parks but only provide incentives for participants in projects' implementation. Despite it gives them more rights to dispose of their own funds locally, the volume of state funding of these projects is rather insignificant, which increases the risk level of institutions with non-state capital to suffer losses.

The most optimal model is European model (France, Germany). In this variant, the technology park is merged into the whole city, which involves various scientific and educational centres, and also enterprises, institutions, and organizations, which have close cooperation among themselves by providing services to the population in different spheres of activities (technology, electronics, biology, chemistry, pharmacology, etc.). At the same time, the financing of projects of technology parks functioning on such a model is carried out at the expense of both the state and local budgets in accordance with the implementation of state/local targeted programs without taking into account the own funds of subjects of investment process (for example, "Sophia-Antipolis"). However, the overwhelming majority of works are aimed at rendering services within the framework of already realized technology parks' projects, when the research activities (American model) and construction of technopolises (Japanese model) are conducted

insufficiently. In this case, the work of the technology park will be tantamount to work as a maximum of technopolis (city). That's because its territory will not be expanded due to the creation of new technopolises, which will also serve as a cause of poor research facilities and opportunities to undertake research of projects' capabilities. In this situation, despite the constant increase in the number of newly created technology parks, the improvement of their functioning will be rather limited.

3. Comparative analysis of activities of technology parks in Ukraine

In Ukraine, the model of the construction of technology parks is rather uncertain since such an issue was raised only in 1999 after the adoption of the Law of Ukraine No. 991-XIV "On Special Regime of Innovation Activity of Technology Parks" dated 16 July 1999. According to this Law, the state support of innovation activity of technology parks is carried out through the state financial support and targeted subsidization of technology parks' projects (Supreme Council of Ukraine, 1999).

In Ukraine, there are 16 technology parks, whose status of activity and process of registration can be observed in the period from 2000 to 2017 (Table 1).

Despite the activities of technology parks are rather closed, as for results of monitoring of Platform Liga:Zakon (n.d.), the abovementioned table gives an opportunity to identify the level of innovativeness of each of them.

So, the innovation activity of the technology park "E. O. Paton Electric Welding Institute" is connected with the research and experimental development in the field of natural and technical sciences, including metallurgy, metal processing, welding, machinery and equipment manufacturing. In this case, the activity of the technology park is directed primarily to manufacturing while scientific researches of the peculiarities of its projects are carried out in insufficient volume. And this is a big risk for both investors and recipients of investments – producers of innovative products to receive losses from the implementation of technology park projects.

The technology park "Institute of Single Crystals" conducts an interdisciplinary research in many priority areas of modern material science, physics, chemistry, biology, and medicine and carries out a full cycle of scientific developments – from the idea and fundamental research to the creation of different types of unique intellectual materials and technologies, including those that have no analogues in the world. But here, on the contrary, much attention is paid to the research of the very idea of scientific development, while the production of relevant materials did not appear to be a major innovation breakthrough in the world practice because of time stretching when conducting research.

Table 1

The status of technology parks in Ukraine (2000–2017)

Sl. No.	Status	The name of technology park	Place of registration	Process of registration
1	Functioning	E. O. Paton Electric Welding Institute	Kyiv	Registered
2		Institute for Single Crystals	Kharkiv	Registered
3		Semiconductor Technologies and Materials, Optoelectronics and Sensor Technique	Kyiv	In termination
4		Vuglemash	Donetsk	Registered
5		Institute of Technical Thermal Physics	Kyiv	Registered
6		Ukrainian Information and Telecommunication Technologies	Kyiv	Registered
7		Kyiv Polytechnic	Kyiv	Registered
8		Yavoriv	Lviv region	Registered
9	Non-functioning	Intellectual Information Technologies	Kyiv	Registered
10		Agrotechnopark	Kyiv	Registered
11		Textile	Kherson	Registered
12		Machine Building Technologies	Dnipropetrovsk	Registered
13		Ukrainian Microbiological Center for Synthesis and New Technologies	Odesa	Registered
14		Eco-Ukraine	Donetsk	Suspended
15		Scientific and Educational Devices	Sumy	Not Registered
16		Resources of Donbass	Donetsk	Registered

Source: own elaboration based at Liga:Zakon (n.d.)

The work of Ukrainian technology park “*Semiconductor Technologies and Materials, Optoelectronics and Sensor Technique*” is unique, as it is aimed at manufacturing various materials and components (raw, conductive, and multilayer materials, semiconductors and so on) which are necessary for manufacturing the custom-made innovation technologies (sensor-equipped devices, machines and so on) with the purpose of resource-saving monitoring and control for technological processes and manufactures in different spheres of activities (mechanical and power engineering, metallurgy, rocket and space technology, oil and gas industry, agro-industrial complex, etc.). In this case, there is a similar issue of time stretching during the research and development process. Here, the participants of projects’ implementation try to conduct in-depth researches of raw materials and components, that is, a lot of time is devoted to pre-design work that is why the process of the relevant project implementation proceeds at a slower pace. As a result, such extensive research did not bring many benefits to industrial enterprises but only slowed down their innovation activity. Thus, the registration of this technology park is at the stage of termination.

The activity of the technology park “*Vuglemash*” is aimed at the creation and introduction of new and modernization of existing technology for the development of fuel and energy and agro-industrial complex in various fields of activities (industry, transport, rehabilitation of public health, machine manufacturing and so on). However, there is an insufficient volume of research in the work of its technology park. It is connected, firstly, with the structure of raw materials and components that may cause problems in the technical functioning and, secondly, pre-design works devoted to the examination of the purpose of the

implementation of innovation projects that affects the population demand on implemented projects. And since the activity of such a technology park is connected with the provision of services, on which in most cases the population’s standard of living depends, in this case, its functioning can become quite risky for people using these services.

The work of the technology park “*Institute of Technical Thermal Physics*” is connected with the development, production, and implementation of modern energy equipment for heat and power engineering (energy and resource-saving nanotechnologies), and also environmental monitoring in the energy sector (equipment for reducing emissions of harmful substances). But as for scientific research, it is carried out precisely during the production process (innovation audit), as opposed to the pre-project planning. It significantly slows down the process of projects’ implementation since the detection of inaccuracies in pre-project developments during the innovation audit requires continuous improvement of materials in order to make innovative products more competitive.

In the technology park “*Ukrainian Information and Telecommunication Technologies*” there is the work conducted at the development of information and telecommunication technologies, which is based on the production of telecommunication equipment and upgrading of communication facilities. But, despite the thorough researches of its technical components during the performance of the relevant works, this technology park does not carry out the work on the production of advanced technologies. Accordingly, the purchase of manufactured equipment serves consumers only as an auxiliary means for replacing certain components of obsolete equipment that is not relevant to the process of updating fixed assets

by recipients of investments. It may reduce the level of its attractiveness in the eyes of consumers.

As for the technology park *"Kyivska Politehnika"*, its functioning is unique in that it is associated with the provision of various types of services in the fields of computer programming, informational consulting, and also conducting research and experimental development in the social sciences and humanities. It provides an opportunity to create high-intellectual products, and also provide scientific and personnel support for its industrial output and market take-up. But despite the harmonious relations between scientists, manufacturers, and local authorities, the research works of this technology park are insufficient for the effective production of innovative products. This has to do with the fact that the activities of the technology park are aimed mainly at providing consulting services because of the lack of university rights to create new innovation-active institutions. It discourages manufacturers to increase the number of new products and technologies and, accordingly, scientists to conduct the research on pre-project proposals for the implementation of new infrastructure projects.

The technology park *"Yavoriv"* is engaged in the production of new scientific and technological products providing services related to legal, marketing, commercial, and expert support for the implementation of innovation projects, coordination of activities of scientific, industrial, and financial institutions, and also the creation of investment-attractive territories for foreign investors. However, despite the activities of this technology park are rather extensive since it includes various fields (engineering, information technologies, biotechnologies, innovation culture development, environmental protection and so on), it is aimed mainly at the commercialization of scientific and technological development within the technology park as a separate attraction area, not contributing to the expansion of its territory due to the creation of new research centres and industrial enterprises. This technology park also acts mainly as a coordinator of activities of innovation and financial institutions operating out of the technology park area contributing to the creation of an effective system of mobilization of the financing of innovation projects. In this case, supporting the leading position among other institutional associations, the technology park leaves out of attention the conducting of effective researches of innovation projects by the establishments operating within the technology park area. It significantly complicates the process of passing through the stages of innovation projects' implementation and also requires additional state financial resources, which can cause a "crowding-out" effect.

As we can see, none of the functioning Ukrainian technology parks is adapted to the models of technology parks of developed countries of the world. If some technology parks prefer to conduct the

pre-project in-depth research under manufacturing innovations, trying to act in accordance with American model (*"Institute of Single Crystals"*, *"Semiconductor Technologies and Materials, Optoelectronics and Sensor Technique"*, *"Institute of Technical Thermal Physics"*, *"Ukrinfotech"*), there is a lack of state funds for conducting relevant researches in Ukraine. This situation contributes significantly to the slowdown of the investment process in these technology parks. Speaking about the technology parks carrying out their activities close to Japanese model in preference to manufacturing innovative products under conducting pre-project researches (*"E. O. Paton Electric Welding Institute"*, *"Vuglemash"*), here the situation is rather complicated. So, due to the underdeveloped decentralized governing system in Ukraine, the local state institutions and self-government bodies have no right to independently solve the issues of the creation of technopolises at the expense of local budgets while negotiations with central authorities require a lot of time. Because of this, the activities of the relevant technology parks put at risk both the participants in the implementation of innovation projects and the local population. As for technology parks functioning like European model, which unify their activities by providing different types of services (*"Kyiv Polytechnic"*, *"Yavoriv"*), they are forced to diversify their activities by providing the relevant services in the form of consultations on how to use, as a rule, only certain components and materials for the repair of outdated equipment and also other types of advertising services. Thus, because of the lack of own funds to finance the innovation and technology development in a particular industry, advisory work is not enough to introduce innovative technologies into the investment process. Such a situation complicates the process of conducting pre-project studies of innovation projects since in many cases the replacement of individual components requires more funds than the purchase of new technologies, which is not beneficial for both investors and recipients of investments.

Commenting on the situation with the technology parks, which since the beginning of the registration did not produce any innovation products, including those whose registration is suspended (*"Eco-Ukraine"*) and only started (*"Scientific and Educational Devices"*), it once again confirms the practical absence of the state incentives for their work at the expense of budget support of innovation projects, the implementation of which will be reflected to a large extent on the economic and social development of the country.

Thus, the lack of activity of the technology parks *"Intellectual Information Technologies"*, *"Ukrainian Microbiological Center for Synthesis and New Technologies"*, *"Eco-Ukraine"*, *"Scientific and Educational Devices"*, whose powers include the research and experimental development in the field of natural and technical sciences, is a significant factor of slowing

down of the scientific and technological progress of some particular branches of physics, chemistry, biology, medicine, ecology, and other similar sciences. Thus, the lack of implemented innovation projects for the production of new informational technologies and improvement of existing ones became a cause of the low quality of education in the training of qualified specialists at a practical level. It prevents specialists in respective scopes of the work from being able to provide reliable information to their customers (for example, during the environmental assessment, medical check-up, astronomical forecast, repair work, etc.) and leads to a decrease in living standards of the population, presenting social discord and conflict.

At the same time, the activity of registered technology parks in certain sectors also leaves much to be desired. Thus, the technology park "Agrotechnopark" did not sufficiently implement any of the relevant projects of production of food technologies. Despite the agrarian sector in Ukraine is one of the most influential in strengthening the national economy, there are not enough modern economic mechanisms for regulating agricultural markets, due to which there is no developed by its technology park program of special certification and standardization procedure met international requirements. This situation can lead to excessive country's dependence on imports that jeopardizes its domestic market. The work of the technology park "Textile" envisaged the implementation of the main project for the construction of an experimental line of the cotton-cleaning plant in order to develop technologies (universal equipment, modular complexes) for the production of new competitive textile materials and conducting researches based on an automated control system. However, its practical inactivity has become

a significant factor in the gradual decline of the cotton industry due to increased country's import dependence, which led to an increase in the cost of fabric production. As for the technology parks "Machine-Building Technologies", whose powers include providing financial support to automobile associations, and "Donbas Resources", whose activities are related to the wholesale trade in high-tech components to automobiles, they also did not produce any of innovation products. This in some way has slowed the process of technological change in the fields of machine and automobile industries, which often causes the rapid depreciation of vehicles and, as a result, increases the number of road traffic accidents.

4. Statistical analysis of activities of technology parks in Ukraine

The activities of Ukrainian technology parks were particularly developed in 2000–2003. However, after the adoption of the Law of Ukraine No. 3333-IV "On Amendments to the Law of Ukraine 'On Special Regime of Innovation Activity of Technology Parks' and Other Laws of Ukraine" dated 12 January 2006 (Supreme Council of Ukraine, 2006) and, finally, Tax Code of Ukraine No. 2755-VI dated 02 December 2010 (Supreme Council of Ukraine, 2010), when almost all privileges for each category of taxpayers carrying out their activities within the technology park area were cancelled, the actual work of technology parks was almost stopped (Figure 1).

As illustrated by Figure 1, it is evident that the innovation and investment activities of technology parks and industrial enterprises in Ukraine are closely interconnected. Thus, during the period from

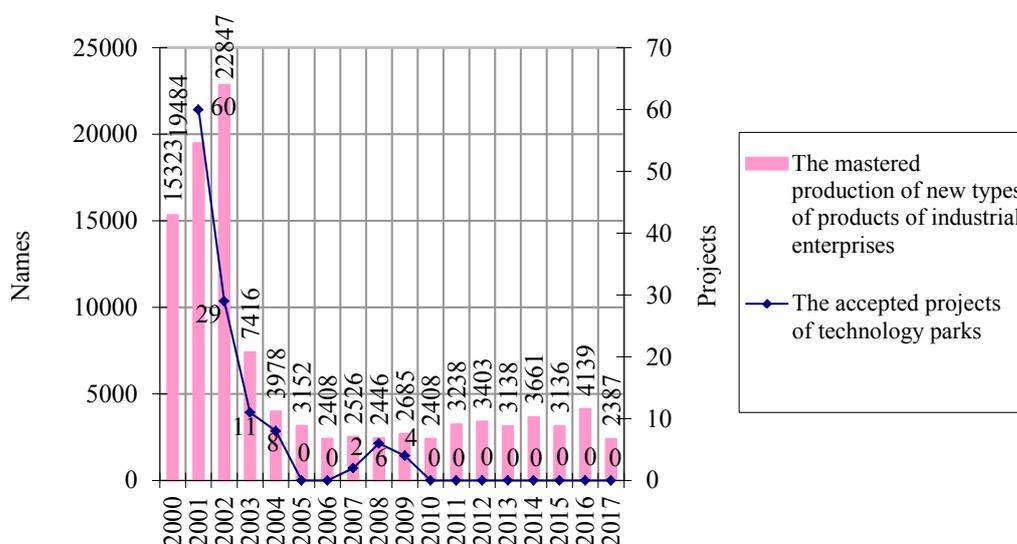


Figure 1. Dynamics of the innovation and investment activities of technology parks related to industrial enterprises in Ukraine during the period from 2000 to 2017

Source: own elaboration based at Website State Statistics Service of Ukraine; Voloshyna, Kalinichenko & Lohvynenko (2017)

2000 to 2001, there were implemented 60 projects of technology parks, when from 2000 to 2002 the process of development of new types of products by industrial enterprises sharply accelerated (from 15323 to 22847 names, respectively). However, by the end of 2005, one can observe the opposite situation, when the number of accepted projects of technology parks was gradually decreasing. In 2005 it reached zero, while in 2006 the situation remained unchanged. At the same time, from 2003 to 2006, there was a decline in the process of mastering new types of products, which were decreased to 2408 items. In 2007, two projects of technology parks were implemented and the number of developed new types of products for manufacturing increased to 2685 names. However, in 2008, despite the increasing number of accepted projects of technology parks (to 6 projects), the number of developed innovation products decreased to 2446 names. In 2009, under the conditions of mastering the production of new types of products in 2685 names, 4 projects of technology parks were accepted before the implementation. It is due to the onset of the crisis, when there were not enough funds for the development of innovative production by industrial enterprises, and also when the state support for the implementation of innovation projects of technology parks was stopped. It served as a practical termination of their work, starting from 2010 until the end of the analysed period. Subsequently, industrial enterprises of Ukraine began to perform their activities at max conserve and master innovation products, relying on their own funds and other sources of financing, including bank loans, foreign investments, state and local budgets. Thus, during the period from 2010 to 2017, in the process of mastering the production of new types of products, moderate fluctuations took place at a rather low level, and in 2017, the number of these products decreased to 2387 names, compared with 2016 (4139 names). And finally, this figure became the smallest indicator for the whole analysed period. This shows that the infrastructure development level is falling.

As we can see, the activities of technology parks in Ukraine do not correspond to any of the models of developed countries of the world since their work is oriented mainly on the industrial potential of industrial enterprises and scientific opportunities of scientific institutions without the state support. This is explained by the fact that during the whole period of the work of technology parks in Ukraine, there was not developed any state and local target program for the implementation of projects of any technology park. In this case, the subjects of investment process were disoriented in terms and conditions, making constant changes in technical and economic parameters of investment proposals for projects of technology parks. This situation eventually caused the delaying of the process of passing through all the stages of acceptance of new projects of technology parks for

the implementation. All of this led to a lack of funds for investing in technological, innovation, and investment activities of technology parks and, eventually, gradual suspension of their work. As for the data of the State Statistics Service of Ukraine, it was also reflected in the innovation activity of industrial enterprises, when during the period from 2000 to 2017, the share of the innovation product sold in industrial output was gradually decreasing (from 9.4% to 0.7%, respectively).

However, as for the information from the official website of newly constructed in Kyiv Ukrainian Technology Park "UNIT City" (UNIT.City, n.d.), the initial stage of its work illustrated that Ukraine has a high technological potential and opportunities to move away from the raw material economy to the economy of the development of national income. However, these changes require the creation of certain conditions for resolving conflicts of interest between the subjects of investment process since there are unresolved issues regarding the acceptance of some innovation projects for the implementation between the state, industrial enterprises, and scientific institutions, despite the potential of the latter. All of this greatly complicates having to go through all the steps in the investment process.

5. Improvement of technology parks' construction by modelling method

The research of comparative and statistical analyses illustrated the imperfection in activities of Ukrainian technology parks. Despite the high productive capacity of industrial enterprises and strong desire of scientific institutions to conduct in-depth studies of pre-project proposals since the technology parks try to work only in selected models of developed countries of the world, the conflicts of interest of participants in the implementation of technology parks' projects remain unresolved. Thus, there are no harmonious relations between scientific institutions whose research activities require additional funds, industrial enterprises, whose activities are constantly in need of renewal of fixed assets, other establishments, whose profitability, and therefore, investment potential depends on the quality of providing certain types of services, and also financial organizations, which along with the state carry out additional financial support for innovation projects. And, given that each of such a model has a number of shortcomings, there is no competitive environment between the technological parks, which also generates stagnation in their work and thus often causes the formation of monopolies.

So, let's suggest a step-by-step mixed model of construction of new technology parks and improvement of existing ones covering all three models of developed countries (Figure 2).

As we see, first of all, the innovation and investment activities of technology parks needed the state support,

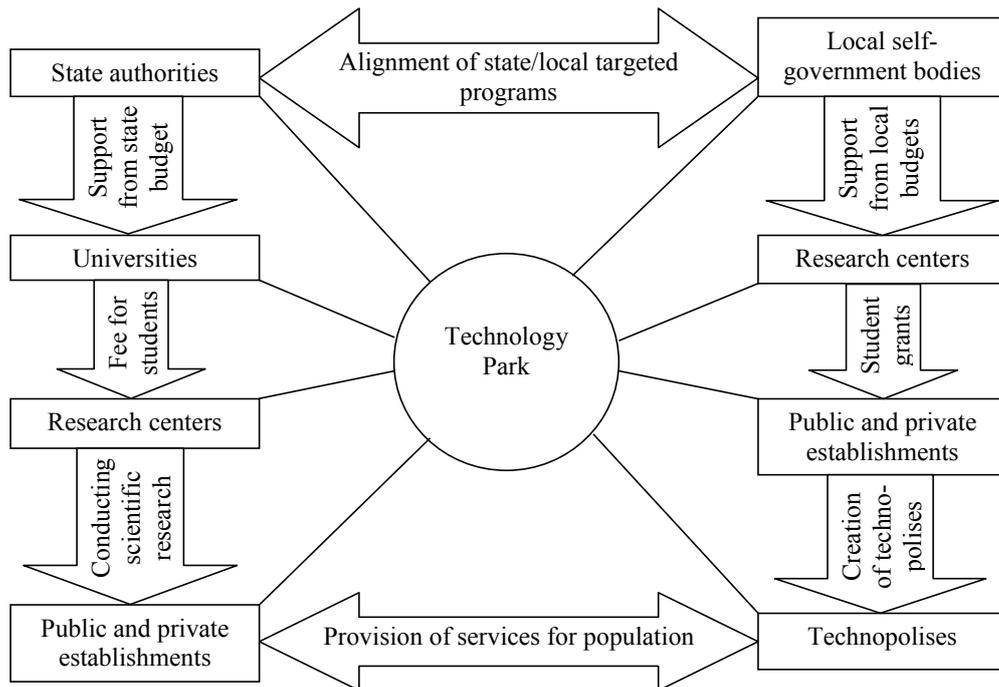


Figure 2. An improved mixed model of the construction of technology parks

Source: formalised by the author

which should be based on the development and approval of state/local targeted programs for the implementation of the projects of technology parks. However, in this case, the relevant programs should be agreed upon by the state both at the central (ministries, departments) and local (regional, city, and district administrations) levels. So, the targeted programs developed at the local level should be approved in an established manner. Here, the local state authorities, by conducting joint meetings with local self-government bodies and, accordingly, representatives of territorial communities, should make an agreement on the need for the implementation of certain projects within created technology park area (construction and/or reconstruction of innovation infrastructure objects), which are then added to the relevant target program. At the same time, central state authorities approve the elaborated target program only if it is agreed upon with local state authorities after holding a meeting with local self-government bodies.

If the target program has been developed at the state level, the implementation of the program projects should include funds aimed at the development of higher education, in the formation of which the universities, closely cooperating with research centres, plays a major role. These centres, at the expense of students' tuition fees at universities, carry out the research on various processes and phenomena that should be applied in practice by both private enterprises (industrial enterprises, service centres, communication centres, etc.) and public institutions (institutions of primary and secondary education, healthcare, culture,

sports, utilities, etc.) during the manufacturing of innovation products and provision of various types of social services.

Meanwhile, the implementation of innovation projects in accordance with the local targeted program includes funds for the development and operation of research centres, at the expense of which the corresponding centres pay students scholarship grants. And students, in turn, have an opportunity not only to work in separate private enterprises or public institutions but also to act as investors, making investment support by spending a part of their funds on the construction of technopolises. These innovation centres can be modern cities with developed infrastructure, lives of which are concentrated on providing educational, scientific, industrial, technical, transport, residential, and other services aimed at satisfying the needs of the population.

Thus, the improved mixed model of the construction of technology parks involves, firstly, the decentralization of authority since the close cooperation of local state authorities with local self-government bodies will give more rights to the population to be formed in the territorial communities, and therefore, to solve common issues concerning the implementation of a particular investment project, including at the state level, since these issues are always aligned between the central authorities and local administrations. Secondly, the development of a high-quality education system, as any technology park is always constructed on the basis of a particular university, which is interested in training future professionals in relevant specialties. Thirdly,

an increase in the number of newly created organizations carrying out the research and development, and hence the number of scholars and people with scientific degrees that will serve as a factor not only in improving the quality management system for providing educational services in higher education institutions but also in the development of an innovation infrastructure in the whole country. Fourthly, the involvement of students to research, methodological and practical activities in one or another specialty with providing an opportunity to increase workplaces for future graduates of higher education institutions. Fifthly, the expansion of the technology park area not only on the city level but also on the region and country level by increasing the number of technopolises and expanding the scope of services providing by government agencies and public/private enterprises.

6. Conclusion

In spite of the potential of Ukrainian industrial enterprises and scientific institutions, due to the constant emergence of conflicts of interest between the subjects of the investment process, the work of technology parks in Ukraine was suspended temporarily. It is confirmed by the absence of developed and approved state/local targeted programs for the implementation of the projects of technology parks. Moreover, the eight Ukrainian technology parks function according to the principles of certain models of the developed countries of the world, without taking into account all their shortcomings, due to which the issue of establishing relations between the subjects of the investment process in technology parks remains problematic. Meanwhile, the innovation activity of another eight technology parks, as a very

important factor in the country's economic, social, and technological development, has not yet begun, and the process of registration of some of them has been suspended or frozen. All of this led to the phasing out of the activity concerned the implementation of innovation projects of technology parks because of the lack of state support.

Thus, to manage conflicts of interest of all the subjects of the investment process, it is necessary to develop a new improved mixed model of technology parks at the world level that would cover all the benefits of developed American, Japanese, and European models of technology parks. Firstly, it requires the government to amend the budget legislation (in Ukraine – the Budget Code of Ukraine), basing on paying special attention to the branch of education during the budget formation for the next year, and tax legislation (in Ukraine – the Tax Code of Ukraine), with the purpose of introduction of tax privileges for a separate category of workers performing their work within the technology park area. Secondly, there must be resolved the relations between managers and subordinates in public/private enterprises, institutions, organizations that would have an opportunity to create competent management of the entrepreneurial activity. Thirdly, it is necessary to solve the conflicts between the state authorities and local self-government bodies, which will allow accelerating the pace of transition to decentralized decision-making and thus give more rights to the local population to agree on the implementation of one or another innovation-investment project. All of this will allow the subjects of the investment process to develop proposals for projects, the implementation of which will be a step towards the development of adjacent infrastructure, making the gradual transition to an improved model of technology parks.

References:

- Castells, M., Hall, P. (1994). *Technopoles of the World: The making of 21st Century Industrial Complexes*. New York: Routledge, 275 p. Retrieved from: <https://books.google.com.ua/>
- Kozak, Y. H., Yermakova, O. A., Sporek, T. (2016). *Osnovy zovnishnoekonomichnoyi diyalnosti [Fundamentals of foreign economic activity]*. Kyiv-Katovitse: Tsentr uchbovoyi literatury, 325 p. Retrieved from: https://pidruchniki.com/2015101166727/ekonomika/tehnoparki_osoblivosti_rozvitku (in Ukrainian)
- Krasnokutska, N. V. (2003). *Innovatsiynyy menedzhment [Innovation management]*. Kyiv: KNEU, 504 p. Retrieved from: <http://library.if.ua/book/4/511.html> (in Ukrainian)
- LIGA:ZAKON (n.d.). *CONTRAGENT*. Retrieved from: <https://ca.ligazakon.net/search>
- Link, A. N., Scot, J. T. (2015). *Research, Science and Technology Parks: Vehicles for Technology Transfer. The Chicago Handbook of University, Technology Transfer and Academic Entrepreneurship*. Chicago, London: The University of Chicago Press, Ch. 6, pp. 168–187. Retrieved from: <https://books.google.com.ua/>
- Moiseyenko, Y. M. (2016). *Upravlinnya tekhnoparkom u systemi upravlinnya rynkom intelektualnoyi vlasnosti (na prykladi natsionalnoyi nanotekhnolohichnoyi sitky) [Management of the technopark in the system of management of the market of intellectual property (on the example of the national nanotechnology network)]*. *Bulletin of Dnipropetrovsk University. Series Economics*, Vol. 24, No. 10(1), pp. 17–26.
- Musterd, S., Murie, A. (2010). *Making Competitive Cities*. Oxford, Ames: Wiley-Blackwell, 360 p. Retrieved from: <https://books.google.com.ua/>
- Naik, B. M., Kandlikar, W. S. (2010). *Higher and Technical Education: Book of Knowledge*. New Delhi: Gyan Publishing House, 326 p. Retrieved from: <https://books.google.com.ua/>

- Navrotsky, R. L. (2017). Zarubizhnyy dosvid formuvannya rozvytku innovatsiyanoi infrastruktury [Foreign experience in forming the development of innovation infrastructure]. *Black Sea Economic Studies: Economic Research Journal*, 14, 106–109.
- Rodriguez-Pose, A., Hardy, D. (2014). *Technology and Industrial Parks in Emerging Countries: Panacea or Pipedream?* London: Springer, 121 p. Retrieved from: <https://books.google.com.ua/>
- Spector, J. M., Park, S. W. (2018). *Motivation, Learning and Technology: Embodied Educational Motivation (Third Avenue)*. New York: Routledge, 216 p.
- State Statistics Service of Ukraine. *Economic statistics / Science, technology and innovation / Research and Development Activity (1995-2016)*. Retrieved from: http://www.ukrstat.gov.ua/operativ/operativ2005/ni/ind_rik/ind_u/2002.html
- Supreme Council of Ukraine (2010). Podatkovyy kodeks Ukrayiny [Tax Code of Ukraine]. Code of Ukraine, adopted on 2010, December, 02, No. 2755-VI. Retrieved from: <http://zakon3.rada.gov.ua/laws/show/2755-17>
- Supreme Council of Ukraine (1999). *Pro spetsialnyy rezhym innovatsiyanoi diyalnosti tekhnolohichnykh parkiv* [On Special Regime of Innovation Activity of Technology Parks]. Law of Ukraine, adopted on 1999, July, 16, No. 991-XIV. Retrieved from: <http://zakon2.rada.gov.ua/laws/show/991-14>
- Supreme Council of Ukraine (2006). *Pro vnesennya zmin do Zakonu Ukrayiny "Pro spetsialnyy rezhym innovatsiyanoi diyalnosti tekhnolohichnykh parkiv" ta inshykh zakoniv Ukrayiny* [On Amendments to the Law of Ukraine "On Special Regime of Innovation Activity of Technology Parks" and Other Laws of Ukraine]. Law of Ukraine, adopted on 2006, January, 12, No. 3333-IV. Retrieved from: <http://zakon4.rada.gov.ua/laws/show/3333-15>
- UNIT.City (n.d.). The first Ukrainian innovation park – the gate to UA tech scene. Retrieved from: <https://unit.city/en/home/>
- Voloshyna, S. V., Kalinichenko, D. R., Logvynenko, N. I. (2017). Rozvytok tekhnoparkiv yak osnova formuvannya innovatsiyanoi ekonomiky z konkurentospromozhnym lyudskym kapitalom [The development of technology parks as the basis for the formation of an innovation economy with a competitive human capital]. *Innovation Economy: Scientific and Production Journal*, 11–12, 40–47.