

INNOVATIVE DEVELOPMENT OF TECHNOPARKS AS A KEY TO RECOVERY AND SUSTAINABLE DEVELOPMENT OF UKRAINE

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Стаття отримана редакцією 04.08.2022 р.

The article was received by editorial board on 04.08.2022

Introduction. Technoparks are considered as centers of innovation and magnets for investment all over the world. For Ukraine, whose economy is on the rails of war, the intensification of innovation is an important condition for the further development of a strong state. Digital transformation is a tremendous resource, as it makes it possible to introduce various technologies in all spheres of life, completely change the quality of life and enrich the budget. Although technoparks in Ukraine experienced stagnation until 2020, their active activity is now in the status of the dawn of the era of innovative resuscitation of the domestic economy. The war is a significant obstacle on this path, so the analysis of the current state of technoparks is more relevant than ever.

Analysis of recent research and publications. A significant contribution to the study of the importance of innovations was made by the scientist J. Schumpeter, who emphasized that overcoming global crises and economic downturns is possible only through the innovative development of technological parks. Economists and journalists-analysts such as Kharlamov P. [7], Havunika T. [11], Marchuk V. [14] are currently analyzing the activities of technology parks in Ukraine, etc.

Objectives of the article. The aim is to study the specifics of the functioning of technoparks in Ukraine during the war; statistical indicators of innovative and active enterprises; financing of innovative activities of existing and startup projects by the state, foreign partners; prospects for the growth of the investment climate of Ukraine through the development of technoparks.

The main material of the study. The issue of attractiveness of investment activity in the territory of our state is especially relevant given the need to rebuild Ukraine after the victory in the war unleashed by the Russian Federation on February 24, 2022. In addition to the direct dependence of the development of technoparks on the real level of financing of all important sectors of economic activity, there are also problems in the actual indicators of the state of the innovation market, including the generation of scientific ideas and their practical implementation in a difficult political and economic situation in the country.

Since the article is dedicated to the development of innovations in Ukraine, it is worth understanding the essence of the technopark and the priority areas of its activities. According to paragraph 1 of Article 1 of the Law of Ukraine No. 991-XIV of 16.07.1999 "On Special Regime of Innovative Activity of Technology Parks", a technology park is a legal entity or a group of legal entities acting in accordance with the agreement on joint activity without establishing a legal entity and without pooling contributions in order to create organizational framework for the implementation of technology park projects with the industrial implementation of science-intensive developments, high technologies and ensuring industrial production of products competitive in the world market. Actually, the priority areas are considered to be scientific, technical and innovative activities aimed at saturating the domestic market with competitive products, as well as ensuring the export potential of Ukraine [1].

According to the latest published statistical calculations, the number of innovatively active enterprises significantly decreased in the period 2018–2020 (2281 units) compared to 2016–2018 (8173 units) by 72%.

This was due to the stable niche position of existing enterprises and the rapid development of all spheres of activity in more developed countries, including the outflow of ideas, scientists and labor force to countries with higher wages and better quality of life [2].

As for the number of innovative technologies introduced at industrial enterprises of Ukraine in the period 2014–2020, the trend is unstable. The peak of developments was recorded in 2016, where the indicator increased by 31.98%, amounting to a total of 4139 units. In the period 2017–2019, there was a rapid decline, and enterprises introduced only 2148 units of the latest products (Figure 1).

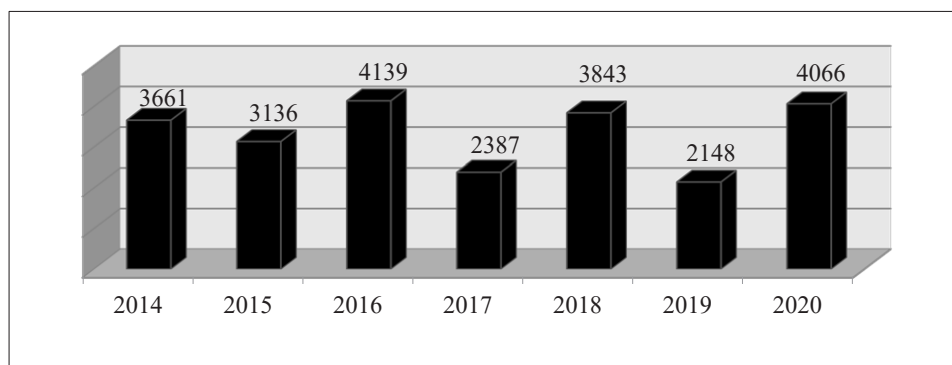


Figure 1. Number of innovative products introduced in 2014–2020 at industrial enterprises of Ukraine, units

Source: compiled by the author on the basis of [2]

The COVID-19 pandemic also contributed to the deterioration of the situation, as the focus of enterprises was on providing citizens with medicines and essential products, and a significant part of the business was forced to suspend its activities due to quarantine restrictions and lockdowns. According to a survey by the European Business Association in Ukraine, a third of businesses were unable to restore the pre-quarantine level of income by the end of 2021, and only 17% did not feel the impact of the coronavirus wave. Thus, only a small percentage of enterprises were able to modernize, which indicates the insufficient development of the domestic technology park [3].

At present, the trend remains unchanged, because the war has made its adjustments to the economy, and according to research by the Ministry of Economy of Ukraine, at the end of March 2022, 80% of enterprises were suspended and slowed down, of which 6% do not plan to resume operations, and 35% are waiting for better times to solve the problems of lack of orders (50%), logistics (21%), lack of workers (17%) [4].

The largest share in the financing of innovative work at industrial enterprises in 2020 was occupied by enterprises' own funds (85.4% of total expenditures on the technopark), funds from other sources (11.8%), as well as state budget funds from programs to support and attract investment projects to the country (1.9%), as shown in Figure 2.

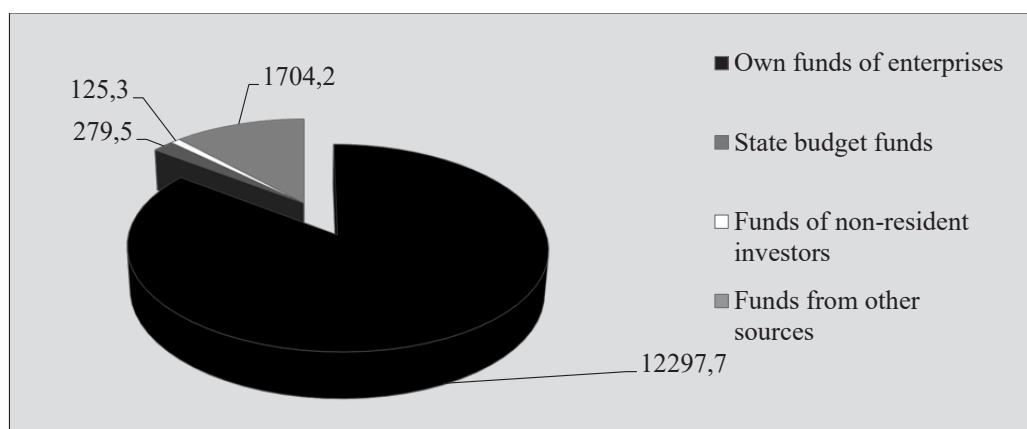


Figure 2. The structure of sources of financing of innovative activity of industrial enterprises of Ukraine in 2020, UAH million

Source: compiled by the author on the basis of [2]

Having analyzed the dynamics of innovative development of the technopark, it is clear that there is a constant lack of financial support from both investors and the state. Financing at the expense of budgetary funds is one of the effective ways to attract business to the applied implementation of the latest developments, which allows to further improve the quality of production in the global sense. In Ukraine, there are 12 registered technology parks that have been operating for more than 10 years, so the importance of updating the innovation market is undeniable [5].

Thus, among the technoparks are industrial parks (57 registered entities). According to the Law of Ukraine "On Industrial Parks" of 21.06.2012 No. 5018-VI, an industrial (industrial) park is considered to be a territory determined by the initiator of the park in accordance with urban planning documentation, equipped with appropriate infrastructure, within which the participants of the industrial park can carry out economic activities in the field of processing industry, processing of industrial and/or household waste (except for waste disposal), as well as scientific and technical activities, activities in the field of information and electronic communications [6].

The difference between an industrial park and a technopark lies in the following factors listed in Table 1.

Table 1

Differences between technopark and industrial park

Indicators	Technopark	Industrial park
Territory	Several infrastructure facilities with a common goal.	Own land plot, fully provided with energy and infrastructure.
Goal	Motivation of enterprises and citizens to participate in the creation of innovative technologies, as well as to help in their implementation.	Sales of manufactured products.
Personnel	Scientists and developers of all directions.	The latest production facilities and management personnel.
Activity result	It is not immediately visible (sometimes even impossible to calculate).	It is calculated for the short and long term.
Investments	It is difficult to prove the feasibility of innovative developments.	Easy to find.

Source: compiled by the author on the basis of [7]

In the State Budget for 2022, for the first time in a long time, UAH 400 million was allocated for industrial parks, and if the results are positive, an even larger amount is planned for next year in various areas (Figure 3), which should become an incentive for the emergence of high-quality technology parks. It should be noted that the effectiveness will be assessed not by the number of parks themselves, but by the volume of attracted investments and created jobs (50 jobs/ha of industrial park is expected). It should be noted that the Ministry of Finance of Ukraine is actively cooperating with international financial organizations that plan to issue sub-loans at lower interest rates through banking services [8].

In early 2019, there was a problem of insufficient fiscal incentives for technoparks, as there was neither a preferential discount on loans nor tax benefits. That is why by the beginning of 2022, private investors became the main driver of innovation development. For example, in 2019, Kharkiv businessman O. Yaroslavskiy announced the creation of a new innovation industrial park «Ekopolis HTZ» for 10 years with an investment of 1 billion dollars. USA (multi-industry park with industrial, logistics, commercial, educational, agro-technological and scientific clusters).

The industrial technoparks of V. Khmelnytskyi are operating: «UNIT.City», «LvivTech.City», «UNIT.City Kharkiv». The residents of these centers are the Swiss company Syngenta (a leader in the production of plant protection products) and Ukrainian startups that were able to go beyond the incubator: Cardiomo (a system for monitoring the state of human health), Solar Gaps (energy-efficient blinds that accumulate solar energy), Delfast (ecological electric bikes) [9].

A striking example of the development of technoparks in Ukraine is the creation of the municipal industrial and technological park "Crystal" in Vinnytsia (the cost of the technopark is UAH 103.5 million), which should be fully operational in 2027. Its development on the territory of the former premises of the «Crystal» plant According to V. Zelenskyi's «Major construction» project, UAH 4 million was allocated from the local government and UAH 10 million from the state budget laid down for 2022, with the deadline for the completion of works until December 31, 2022. The purpose of the activity of this entity should be the development of

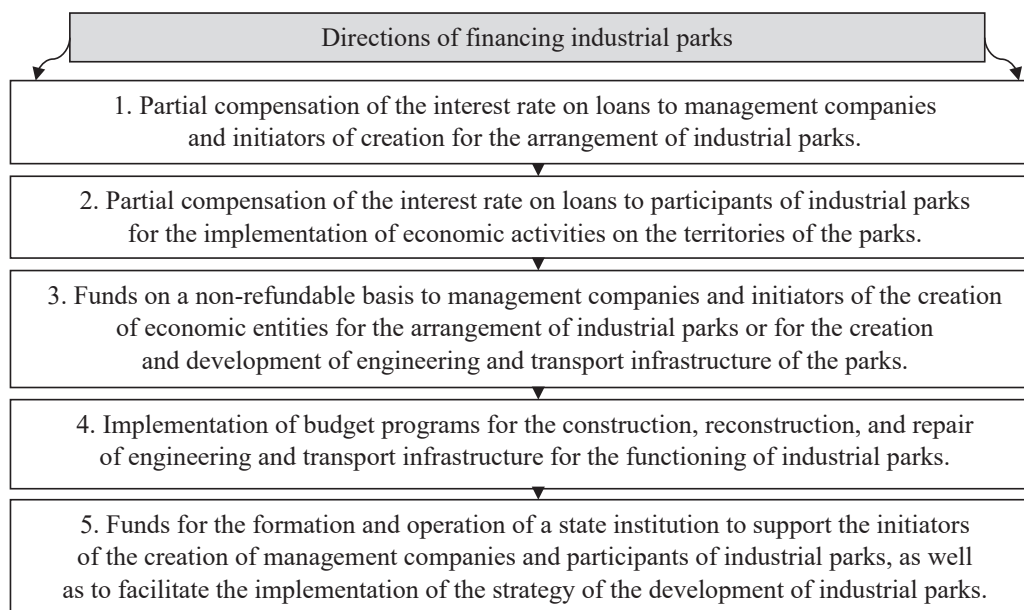


Figure 3. Directions for financing industrial parks from the 2022 Budget

Source: compiled by the author on the basis of [4]

education («children's technopark»), the IT industry and startup innovation (Entrepreneurship Development Center) with the creation of approximately 1,000 jobs in the Podilsk region [10].

In 2019, they began to actively talk about the allocation of a niche for eco-technoparks. They are characterized by the formation of a data center near the power plant to use energy that cannot be transferred to the main network, and the development of nearby farms where excess heat can be utilized in greenhouses. TECHIIA Holding plans to implement the investment project [11].

Another important stage in the evolution of technoparks is the active emergence of science parks, of which 36 units are registered in the relevant register in Ukraine. According to the Law of Ukraine "On Science Parks" dated June 25, 2009 No. 1563-VI, a science park is a legal entity established in the form of a business entity, the member of which must be at least one higher education institution and/or scientific institution. In 2017, the science park "Promprylad.Renovation" was opened in Ivano-Frankivsk, which includes about 16 business, educational and cultural projects [12; 13].

The main disadvantage for the development of innovations for a long time was the unfavorable investment climate. And the prolonged conflict in the East of the country undermined confidence in the domestic economy even before the outbreak of the full-scale Russian-Ukrainian war. Thus, the dynamics of capital investment in strategically important types of economic activity of Ukraine is negative, and decreased by 0.75% in professional, scientific and technical activities at the end of 2020 compared to the previous year, which is offset by the amount of investment in scientific research – an increase of UAH 18.6 million (Figure 4).

In 2020, actions were taken to sign many global international investment agreements and create startup support programs, which contributed to Ukraine's ranking 49th in the Global Innovation Index 2021, entering the top three leaders of the "lower middle income" economic group [4].

Thus, the first step to improve the state of technology parks in terms of diversification of emphasis by type of activity has already been made. But the lack of financial support is especially noticeable, because Ukrainian innovative enterprises are gradually returning to a more or less full life.

Therefore, the Ministry of Digital Transformation together with the Ministry of Economy are developing the Diia.Business (including "Prozorro.Sales"), where a business relocation assistance platform has been launched since the beginning of March 2022 [14].

Faced with the war, Ukraine realized the need for strong partnerships with the countries of the West, Asia, Africa and the United States. And today Ukraine has cooperation and security guarantees from almost all neighboring countries (except for the aggressor Russia and Belarus). Therefore, the regular signing of new agreements recently is a positive aspect for the implementation of innovative ideas.

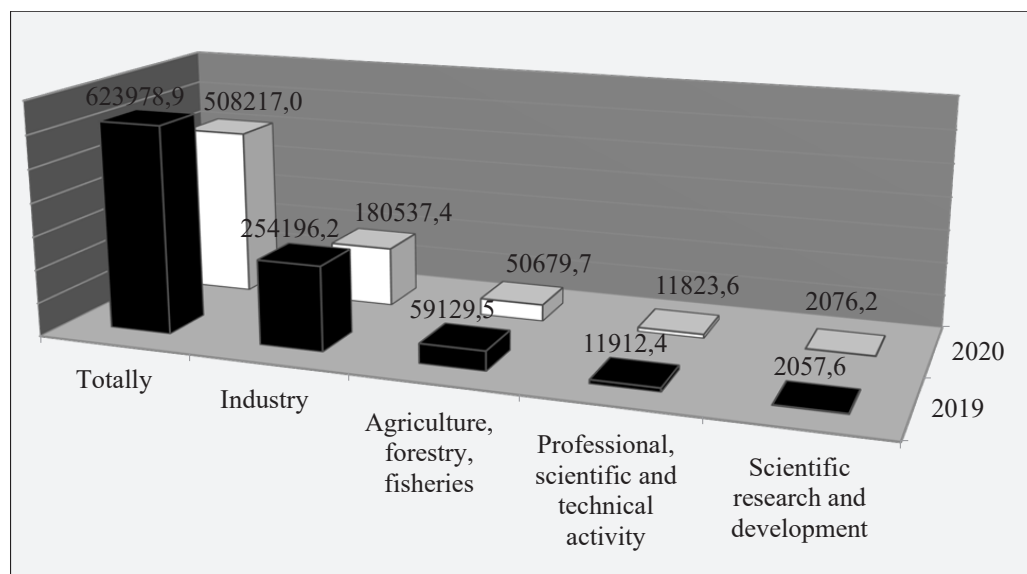


Figure 4. Dynamics of capital investments by types of economic activity, million UAH

Source: compiled by the author on the basis of [2]

Thus, on April 21, 2022, the Ministry of Education and Science of Ukraine, together with the European Innovation Council and the Ukrainian Startup Fund, held an online workshop on European opportunities for financing innovation in wartime. The Action Plan for 2022–2023 was developed in accordance with the current Strategy for the Development of Innovation Activities for the period up to 2030 [5].

Considering individual companies that have sided with Ukrainian scientific and technological progress, it is possible to single out Google, which announced the creation of a startup support fund in Ukraine (\$ 5 million grants by the end of 2022). In addition, up to \$ 100 thousand. Funded by the US without equity participation, benefits include direct ongoing mentoring from Google and product support and cloud credits. A large number of innovative startups have already been invited to Google for Startups Campus Warsaw as a temporary office. Such support from multinational companies is extremely important for modern business, which cannot receive help in the above-mentioned Diia.Business relocation project [15].

As the practice of the leading countries of the world shows, the rejection of the industrial economy and the transition to innovative technologies for the exploitation of natural resources, that is, the transition to technologies of the 5th and 6th modes, gives a very good result for the state to reach a new level of development. In turn, Ukraine tried to build its prosperity on chemistry and metallurgy, which work on the technologies of the last century, until 2020. According to the calculations of the Institute for Economics and Forecasting of the National Academy of Sciences, only 3% of the economy is occupied by technologies of the future: nanotechnology, cell technology and genetic engineering, information and communication technologies (cryptocurrency, which was legalized only in September 2021) [4; 16].

In general, such technologies help to solve a number of issues that have existed for a long time, and the development of fintech tools has a positive impact on the transparency of the market of products and services, which helps the country to be competitive in terms of technology parks in the world. For example, the Ukrainian IT solution to the problem of bee poisoning and pollination of agricultural crops using the Wi-Hi (Wireless Hive) online platform allowed to manage data, provide information about bee colonies from anywhere to beekeepers. Such equipment works in digital format, equipped with a program for keeping records by the owner, which are supplemented by an automatic monitoring system using various sensors. The functionality allows to maintain the health of bee colonies and respond quickly when negative factors are detected. Similar were the projects "DrT-Tech", "Smart Apiary i-bee", which were able to interest investors and this improved the general situation in the agrarian-industrial complex, the IT industry and the innovative direction of the technological park of Ukraine [4].

So, the main prospects of technoparks of Ukraine are as follows:

1. Technoparks can gather a bunch of innovative ideas and become a meeting place for investors and businesses. The work of business incubators at universities is effective, but their number is small, and their

work is especially complicated in the realities of war, so active advertising of incubators by their owners is relevant to attract new investors from abroad, especially now that support for Ukraine is growing every day.

2. With the modernization of the legislative framework, namely the updating of normative legal acts on technoparks, industrial and scientific parks, the conditions for creating powerful centers of innovation will improve.

3. Simplification of the tax burden will improve the conditions for the implementation of innovative ideas during the war. Among the priorities is the exemption of technoparks from income tax for the first few years, from VAT on equipment invented or imported for personal use. Local authorities can also reduce the burden of land tax.

4. According to the optimistic scenario, the full launch of 100 industrial parks in Ukraine, for which \$ 100 million will be invested in existing industrial parks and \$ 200 million in new ones, will provide an additional amount of attracted investments in the amount of \$ 15.7 billion, according to the calculations of the Ministry of Economy. This will facilitate the return of Ukrainians from abroad (both migrant workers and refugees) in order to create new high-paying jobs.

5. Thanks to eco-technoparks, the agro-industrial complex of Ukraine will be able to take an even larger share of the world market, because the existing problem of providing countries with agricultural products is currently one of the most acute. With the minimization of utility costs and the introduction of innovations, the process of activity in peacetime will be facilitated.

6. Before the war, the IT sector grew by 25-30% annually, and in 2021 it became a key category in the export of services: the share of IT in the export of all services amounted to 37%. Therefore, one of the priorities of the state strategy for Ukraine's recovery in cooperation with leading IT companies should be a program to create educational IT parks on the basis of higher education institutions. If at the beginning of 2022 half of Ukrainian IT companies were service companies, and only 16% developed their own brand, now the capitalization of the latter category is much higher, and after the war the state should focus on the development of such product companies [4; 17; 18].

Conclusions. Thus, based on the study, it can be concluded that in the conditions of an uncompromising war with the aggressor, the stage of transformation of Ukraine into a self-sufficient state with a strong economy has begun. And the dynamics of innovation development is progressively growing. The economic front is no less important than the military one, therefore, even in difficult conditions of solving the problems of insufficient financing of innovative technology parks, weak connection of the scientific sector with the industrial sector (the interest of entrepreneurship in innovative products remains at the level of 6% according to the Ministry of Economy), Ukraine should move according to existing strategies. Therefore, in order to prevent the loss of a potential resource of enrichment, the country, in the current conditions of war, must take drastic measures to stabilize the work of existing technology parks and planned industrial parks. Right now, the Ukrainian model of technoparks, thanks to the support of the world, has all chances to become a highly effective budget-filling source, working for today's needs and for the prosperous future of our country.

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UDC 330.341.1:[332.122:001](477)

JEL O32

Svitlana Kushnir, Doctor of Economics, Associate Professor. **Viktoria Karmazina**, Student, Zaporizhzhia National University. **Innovative development of technoparks as a key to the recovery and sustainable development of Ukraine.**

The development of innovative activities of technology parks and their investment support is one of the strategically important tasks for Ukraine today. The statistical data on the dynamics of innovation-active business development are investigated. The financing of innovation activities by both domestic investors, the state and foreign partners during the COVID-19 crisis and in war conditions is analyzed. The data on the projects of existing technology parks and planned industrial, scientific and environmental technology parks with the prospect of benefiting from their effective functioning in Ukraine are summarized. Particular attention is paid to the detailed acquaintance with interesting investment projects of 2020–2022, as well as the study of investment attractiveness during the Russian-Ukrainian war. The prospects for the development of technology parks and innovations for our country after the war are highlighted.

Key words: innovations, technoparks, industrial parks, science parks, eco-technoparks, financing, investments.

УДК 330.341.1:[332.122:001](477)

JEL O32

Кушнір С.О., доктор економічних наук, доцент. **Кармазіна В.С.**, студентка, Запорізький національний університет. **Інноваційний розвиток технопарків як запорука відновлення та сталого розвитку України.**

Розвиток інноваційного напрямку технопарків та їх інвестиційна підтримка сьогодні є одним з стратегічно важливих завдань для України. У даній статті розглянуто ефективність діяльності та еволюція технопарків за останні роки. Досліджено статистичні дані щодо динаміки розвитку інноваційно-активного бізнесу, в тому числі щодо кількості інноваційно-активних підприємств та впроваджених на них новітніх технологій. Проаналізовано фінансування інноваційної діяльності як з боку вітчизняних інвесторів, так і з боку держави та іноземних партнерів під час кризи, спричиненою наслідками COVID-19 та російсько-української війни, розпочатої 24.02.2022 р. Визначено низку істотних відмінностей у природі існування технопарку та індустріального парку. Узагальнено дані щодо проєктів існуючих технопарків та запланованих до розбудови індустріальних, наукових та еко-технопарків з перспективою отримання вигоди від їх ефективного функціонування на території України. Особливу увагу приділено детальному ознайомленню з цікавими інвестиційними проєктами 2020–2022 рр., і дослідженню інвестиційної привабливості під час реалій існуючої війни. У статті проаналізовано динаміку капітальних інвестицій за видами економічної діяльності, що впливають на функціонування технопарків, акцентовано увагу на важливість пошуків роботи зі створення в Україні потужного комплексу інноваційних центрів різного профілю. Розглянуто спектр допомоги міжнародних компаній (наприклад, Google), глобальних програм підтримки стартапів і вітчизняного проєкту «Дія. Бізнес» від Міністерства цифрової трансформації, котрі спрямовані на полегшення прийняття удару економічних потрясінь українським інноваційним бізнесом під час бойових дій. Досліджено також наявність стратегій поетапного розвитку технопарків, які описані у статті. Виокремлено перспективи розвитку технопарків та інноваційної сфери для нашої країни після завершення війни. Виокремлено важливість руху нашої держави у руслі намічених планів щодо створення низки кардинальних заходів, потрібних для стабілізації роботи вітчизняної інноваційної сфери наразі.

Ключові слова: інновації, технопарки, індустріальні парки, наукові парки, еко-технопарки, фінансування, інвестиції.