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RELEVANCE OF THE CREATION AND DEVELOPMENT OF INNOVATIVE TECHNOLOGICAL STRUCTURES BASED ON PUBLIC-PRIVATE PARTNERSHIP IN THE POST-WAR PERIOD

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INTRODUCTION. The article is devoted to the study of the relevance of creation and development of innovative technological structures in Ukraine in the post-war period using the public-private partnership (PPP) model. Given the current geopolitical challenges, large-scale destruction of infrastructure, and the need for accelerated economic transformation, the need to form an innovation ecosystem is outlined.

RESEARCH HYPOTHESIS. Effective strategic management of the development of public-private partnerships (PPPs) in the post-war economic transformation is achieved through the formation of an innovative, adaptive governance model that ensures long-term alignment of interests between the state and the private sector, supported by transparent procedures, fair risk sharing, institutional trust and the integration of digital and analytical tools, which will ultimately contribute to sustainable recovery and socio-economic growth in Ukraine.

OBJECTIVE OF THE STUDY. The purpose of the article is to substantiate the theoretical and methodological foundations and practical recommendations for creating innovative technological structures based on PPPs in the post-war period.

METHODS. To achieve this goal, a set of research methods is used: system analysis, comparative method, institutional approach, analysis of foreign experience.

RESULTS. The conceptual foundations of the functioning of innovative technological structures, including technology parks, innovation clusters, business incubators and technopolises, are considered. It is substantiated that innovative technological structures can become drivers of economic growth, tools for attracting investment and platforms for the return of human capital. The article analyses the 'triple helix' model as a theoretical basis for the interaction of universities, industry and government in innovation processes. A detailed analysis of international experience in creating technological structures based on PPPs is carried out. The key success factors and opportunities for adapting international experience to national conditions are identified. Particular attention is paid to the specifics of applying PPP models in the post-war period, when structural changes in the economy create unique opportunities for a technological leap. The article emphasises the need for coordinated cooperation between the state, science and business to ensure sustainable innovative development of the country.

CONCLUSIONS. The article develops a set of recommendations on mechanisms of state support for innovative technological structures, including financial support (soft loans, grant funding, tax benefits), institutional support (special legislation, state agencies) and infrastructure support. The scientific novelty of the study lies in the comprehensive substantiation of the specifics of the creation of innovative technological structures in the post-war period and the development of practical recommendations for the application of PPP models in the context of structural changes in the economy. The practical significance of the work lies in the possibility of using the results to formulate a national strategy for the development of innovative technological structures and develop specific public-private partnership programmes.

KEYWORDS: public-private partnership; development; innovative infrastructure; post-war recovery; business; education; science.

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АКТУАЛЬНІСТЬ СТВОРЕННЯ ТА РОЗВИТКУ ІННОВАЦІЙНИХ ТЕХНОСТРУКТУР НА ОСНОВІ ДЕРЖАВНО-ПРИВАТНОГО ПАРТНЕРСТВА У ПОВОЄННИЙ ПЕРІОД

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ВСТУП. Стаття присвячена дослідженню актуальності створення та розвитку інноваційних техноструктур в Україні у повоєнний період з використанням моделі державно-приватного партнерства (ДПП). З огляду на сучасні геополітичні виклики, масштабну руйнацію інфраструктури, а також необхідність прискореної економічної трансформації, окреслено потребу у формуванні нової інноваційної екосистеми.

ГІПОТЕЗА ДОСЛІДЖЕННЯ. Ефективне стратегічне управління розвитком державно-приватного партнерства (ДПП) в умовах післявоєнної економічної трансформації досягається шляхом формування інноваційної, адаптивної моделі управління, яка забезпечує довгострокове узгодження інтересів між державою та приватним сектором, підкріплене прозорими процедурами, справедливим розподілом ризиків, інституційною довірою та інтеграцією цифрових та аналітичних інструментів, що в кінцевому підсумку сприятиме сталому відновленню та соціально-економічному зростанню в Україні.

МЕТА ДОСЛІДЖЕННЯ. Метою статті є обґрунтування теоретико-методологічних засад і практичних рекомендацій щодо створення інноваційно-технологічних структур на засадах ДПП у післявоєнний період.

МЕТОДИ ДОСЛІДЖЕННЯ. Для досягнення поставленої мети використано комплекс методів дослідження: системний аналіз, порівняльний метод, інституціональний підхід, аналіз зарубіжного досвіду.

РЕЗУЛЬТАТИ. Розглянуто концептуальні засади функціонування інноваційно-технологічних структур, зокрема технопарків, інноваційних кластерів, бізнес-інкубаторів та технополісів. Обґрунтовано, що інноваційно-технологічні структури можуть стати драйверами економічного зростання, інструментами залучення інвестицій та платформами для повернення людського капіталу. Проаналізовано модель «потрійної спіралі» як теоретичну основу взаємодії університетів, промисловості та держави в інноваційних процесах. Проведено детальний аналіз міжнародного досвіду створення технологічних структур на основі державно-приватного партнерства. Визначено ключові фактори успіху та можливості адаптації міжнародного досвіду до національних умов. Особливу увагу приділено специфіці застосування моделей ДПП у післявоєнний період, коли структурні зміни в економіці створюють унікальні можливості для технологічного стрибка. Наголошено на необхідності скоординованої співпраці держави, науки та бізнесу для забезпечення сталого інноваційного розвитку країни.

ВИСНОВКИ. Розроблено комплекс рекомендацій щодо механізмів державної підтримки інноваційно-технологічних структур, які включають фінансову підтримку (пільгове кредитування, грантове фінансування, податкові пільги), інституційну підтримку (спеціальне законодавство, державні органи) та інфраструктурну підтримку. Наукова новизна дослідження полягає у комплексному обґрунтуванні специфіки створення інноваційних технологічних структур у післявоєнний період та розробці практичних рекомендацій щодо застосування моделей ДПП в умовах структурних змін в економіці. Практичне значення роботи полягає у можливості використання отриманих результатів для формування національної стратегії розвитку інноваційних технологічних структур та розробки конкретних програм державно-приватного партнерства.

КЛЮЧОВІ СЛОВА: державно-приватне партнерство; розвиток; інноваційна інфраструктура; повоєнне відновлення; бізнес; освіта; наука.

Statement of the problem. The post-war period is characterised by unique opportunities for restructuring the economy and implementing advanced technological solutions. The experience of countries that have survived military conflicts demonstrates the critical importance of creating effective institutional mechanisms to mobilise innovation potential. One of the most promising areas is the development of innovative technological structures based on public-private partnerships, which can provide a synergistic effect of combining state strategic priorities and private initiative.

Current global trends in technology development, including the Fourth Industrial Revolution, artificial intelligence, biotechnology, and green technologies, create new opportunities for a technological leap. At the same time, the limited financial resources in the post-war period require a search for optimal models of attracting private capital to implement strategic innovation projects.

Analysis of publications on the problem. The conceptual foundations of public-private partnership in the innovation sector are laid down in the works of leading foreign researchers. H. Etzkowitz (2008) in his work "The Triple Helix: University-Industry-Government Innovation in Action" proposed a model of the "triple helix", which became the theoretical basis for understanding the interaction between universities, industry and government in innovation processes. This model is particularly relevant for the post-war period, when coordination of all institutional sectors is required to achieve technological breakthroughs. B.-A. Lundvall (1992) in his study "National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning" formulated the concept of national innovation systems, which became the basis for understanding the role of the state in supporting innovative development. His approach emphasises the importance of the institutional environment for the formation of an innovation ecosystem. R. Nelson (1993) in his collective work "National Innovation Systems: A Comparative Analysis" conducted a comparative analysis of national innovation systems of different countries, which allowed to identify the best practices of public-private partnership in the innovation sphere.

Particular attention in the literature is paid to the study of the peculiarities of innovation development in the post-war period. K. Sokoloff (1988) in his study "Inventive Activity in Early Industrial America" analysed the role of innovations in the post-war recovery of the American economy after the Civil War. D. Mowery (2012) in his paper "Defense-Related R&D as a Model for 'Grand Challenge' Technology Policies" investigated the mechanisms of transformation of military technologies into civilian innovations. S. Wallsten (2004) in his article "Do Science Parks Generate Regional Economic Growth?" conducted an empirical analysis of the impact of technology parks on regional

economic development, which is important for planning technological structures in the period of post-war recovery.

Among Ukrainian researchers, the issues of development of the innovation system of Ukraine and the role of public-private partnerships are covered in the works of V. Geets, E. Udovytska (Udovytska, 2016), A. Kropelnytskyi (Kropelnytskyi, 2024) and others.

However, despite the interest of scholars in the problem, many issues require in-depth study. In particular, there is a need to identify the benefits of forming effective innovative technological structures based on public-private partnerships in the post-war period.

Statement of the main results. The theoretical and methodological approaches to disclosing the essence of the categories of "innovation" and "innovation activity" are based on a generalisation of scientific provisions of both foreign and domestic researchers. In the modern scientific discourse, innovations are seen as newly created or improved competitive technologies, products or services, as well as organisational and technical solutions of a production, administrative, commercial or other nature that significantly improve the efficiency of production processes or the quality of functioning of the social sphere. Innovative development, in turn, is interpreted as a sequential series of processes in which an innovation goes from the origin of an idea to its implementation in the form of a specific product, technology or service that is disseminated in economic practice and social life.

It is important to study the international experience of regulating and supporting innovatively active enterprises, as well as the formation of effective regional innovation systems. Of particular practical value for Ukraine is the adaptation of models of those EU countries that demonstrate successful examples of innovative entrepreneurship development in conditions of limited financial resources, but with strong scientific and technical potential.

At the same time, in the domestic practice at the regional level, effective forms and instruments of state management of innovation activity of technological structures are still insufficiently formed. The current trends in the development of innovative technological structures indicate the absence of a comprehensive system for stimulating the innovative activity of economic entities at both the regional and national levels. In this regard, there is a need to introduce a comprehensive system of regulators aimed at enhancing innovation activity through public-private partnership mechanisms, financial assistance, tax incentives and the development of innovation support infrastructure.

Successful regional innovation activity will be facilitated by a systemic set of organisational and economic measures, primarily the following:

– creation at the highest level of an effective state body for management of scientific, technological and innovative development;

– provision of targeted subsidies and preferential loans for enterprises making technical progress in priority areas of innovation;

– introduction of tax benefits for innovation-active enterprises;

– creation of innovation banks and improvement of the financing system;

– introduction of a special procedure for the creation of innovation associations;

– introduction of a special procedure for the creation of innovation associations.

The formation of the R&D infrastructure in many countries reflects the objective integration processes inherent in individual national economies. Along with the further socialisation of production through its specialisation and concentration, and the increase in the output of marketable products, interregional, and especially international contacts are intensifying. A global territorial structure is also being created, according to which the production of certain types of products or services is being assigned to individual countries.

One of the leading trends in the development of the global economy today is the creation of so-called science and technology zones (STZs) as a form of scientific and production cooperation between countries and regions.

Science and technology zones are a way of implementing integration processes and structural transformations in the world economy and achieving openness of the economy of a particular country, stimulating international economic cooperation through the attraction of foreign investment (Fedulova, 2006).

Through the mechanisms of science and technology zones (STZs), the economic systems of individual countries are gradually integrating, specialising in the production of certain types of products, forming sustainable economic ties, and exchanging scientific and technological achievements, services, and information resources. As a result, the economic systems of the partner countries are gradually adapting to each other, forming a new integrated economic structure. Such a structure accumulates the disparate potential of individual economies, transforming it into a higher-level system within which the efficient use of key production factors becomes possible. This, in turn, opens up new opportunities for accelerated economic growth of national economies.

A study of the global practice of creating and operating NTZs shows a significant diversity in the forms of their organisation, strategic goals, management approaches and methods of spatial zoning. There is also a variation in the terminology of the concept of NTZs, which necessitates further systematisation of the categorical apparatus.

The main tasks of the state policy in the field of formation and support of the STZ functioning are as follows:

– stimulating the inflow of foreign investment as an additional source of financing for economic development;

– solving employment problems by creating new jobs;

– expanding export potential and developing import substitution in order to increase foreign exchange earnings and improve the balance of payments;

– rational use of local resources through the creation of institutions that act as catalysts for market transformation;

– intensification of knowledge and technology exchange, which contributes to the formation of a new quality of innovative economic development.

There are several different concepts that define the essence of a science and technology zone: technopolis, science park, technology park, technology zone, free industrial zone, investment promotion zone, technology and innovation zone.

The dominant trend in the development of the global economy is the formation of national innovation systems. Therefore, possession of new technologies is becoming a determining factor in a country's competitiveness. In order to meet the requirements of the private sector, the process of technology transfer from public research institutions (RIs) to private agents needs to be institutionalised and professionalised.

The effectiveness of the national innovation system depends on the solution of the problem of reducing transaction costs associated with ensuring close interaction between the main participants of the innovation process: private business and state research institutions. High transaction costs are an objective economic prerequisite for the development of the innovation infrastructure, which consists of technology transfer institutions.

The socio-economic development of a state is largely determined by the level of availability and efficiency of innovation processes that ensure the transformation of research results into new products, technologies and services. One of the most effective tools for implementing such transformations in global practice is innovation structures, in particular science and technology parks (STPs).

Science and technology parks are modern institutions of technology transfer that integrate research, technology and manufacturing enterprises to quickly implement the results of research, inventions and innovations in industrial production and business activities. Their functioning is aimed at creating a favourable environment for the commercialisation of knowledge, innovation activity and the development of high-tech business.

Technology transfer is defined as a formalised process of transferring new knowledge obtained through research and development activities of universities and non-profit research institutions to the commercial sector for the

implementation of socially important goals. This process involves the involvement of the results obtained through budgetary funding in addressing pressing public or private needs through the transfer of technologies, equipment or infrastructure facilities.

The term ‘park’ was first used to describe an innovative infrastructure unit in 1951 in the United States, in the state of California, in Santa Clara County, in the town of Palo Alto, at Stanford University. The idea of creating such a structure belongs to Professor of Electrical Engineering Frederick Terman, who at that time held the position of Vice President of the University. It was he who introduced the concept of a research-industrial park, which later became commonly used in the global practice of organising innovation environments.

The main concept of the newly created innovation structure was the rational use of a part of the university territory to form a compact industrial zone attractive for the location of enterprises specialising in high-tech production, in particular in the fields of electronics and aerospace engineering. These sectors grew rapidly in California in the post-war period, in particular due to growing demand from the defence industry. The financial basis for the park's creation was provided by orders from the US federal government as part of military development programmes.

Thus, the Stanford University-based research and industrial park became the first example of an organised science and technology environment that integrated the education, research and production sectors. This model subsequently formed the basis for the development of innovative technology park structures in many countries around the world.

In early 2002, the International Association of Science Parks (IASP) proposed a broad definition of a technology park as an organisation run by professionals and with the main goal of promoting the welfare of the local community by developing an innovative culture, increasing the competitiveness of innovative businesses and research institutions. To achieve this goal, technology parks act as tools to stimulate the flow of knowledge and technology between universities, research institutions, companies and markets, and facilitate the creation and growth of innovative enterprises, including through spin-off processes.

Such a comprehensive definition was proposed taking into account the diversity of science and technology park models operating in 63 IASP member countries and emphasises their role as a universal tool for regional development. In particular, it emphasises the synonymity of the terms "technology park", "technopolis", "technology area", "research park" and "science park". In the UK, the term "science park" is most commonly used, in the USA – "research park", and in Ukraine – "technopark".

In the classical sense, a science and technology park is a complex of research institutes, laboratories and research and development enterprises located in specially prepared areas, preferably in close proximity to leading universities, and operating on the basis of a developed infrastructure that ensures effective communication between all participants in the innovation process.

Organisations that aim to stimulate the creation of technology parks in their countries or regions formulate more specific definitions. For example, the Queensland Innovation Council (Australia) defines a technology park as a legal entity established to effectively use scientific and technological potential to improve the economic base of the region. In this context, the main mission of a technology park is to stimulate regional development, overcome deindustrialisation and promote the commercialisation of innovations. The activities of technology parks are seen as a factor in enriching scientific and technological culture, creating jobs and generating added value in the economy.

A large explanatory dictionary of the Ukrainian language defines a technopark as a territorial association of scientific and design and engineering organisations, educational institutions, and production units.

The main goal of such an organisation is to increase the competitiveness of its sphere of influence, stimulate innovation among firms and institutions associated with it and based on knowledge, organise the transfer of knowledge and technology from its sources to companies and the market, and actively promote the creation of new viable companies through the processes of additional income and incubation.

A technology park or business incubator can be a non-profit or for-profit legal entity that is fully or partially owned by a university. The term "research park" is used mainly in the United States, while in Canada, Europe, Asia and Latin America it is used to refer to a science or technology park. A research park is an enterprise based on property that has:

– existing or planned land, facilities and premises for the provision of private and public research services, high technology, support services;

– contractual and/or formal ownership or operating relationships with one or more universities, scientific organisations, research institutions;

– opportunities to promote research in industry, established links in the field of technology transfer.

The main functions performed by technology transfer institutions cover a wide range of services aimed at commercialising scientific developments and stimulating innovation activity. In particular, the key functions of such institutions include:

– patenting of intellectual property objects and provision of support services, including disclosure, examination and execution of patent documentation;

– licensing of rights to the results of intellectual activity for the purpose of further transfer of technologies to industrial or business practice;

– intermediary activities in the field of concluding contracts for research and development, including recruitment of specialists, legal support and execution of relevant agreements;

– non-financial support of independent small and medium-sized enterprises.

The history of the creation of modern technology transfer institutions began with the organisation of the Stanford University Science Park (California, USA) in the first half of the 1950s, which became the core of the formation of the famous Silicon Valley. For several decades, the network of technology parks in the US grew relatively slowly: many initiatives launched by universities remained at the project stage. At the same time, successful examples demonstrated the significant contribution of such structures to the national economy, which subsequently led to increased attention from state authorities. As of 2006, there were already more than 140 technology parks in the United States, accounting for more than 20% of the total number of such structures in the world.

In Europe, the process of creating technology parks intensified in the early 1970s. Among the first examples are the Heriot-Watt University Research Park in Edinburgh, Trinity College Science Park in Cambridge, Leven-la-Neuve Technology Park in Belgium, Sophia Antipolis in France (Nice) and the ZIRST zone in Grenoble. The most dynamic development of the network of technopark structures was observed in the second half of the 1980s. Today, there are about 700 science and technology parks in the world, which are key elements of the innovation infrastructure at the national and regional levels.

The main structural elements of foreign technology parks are research centres, industrial enterprises and firms located on a common territory, whose activities are aimed at transforming scientific potential into competitive market products. The functioning of this complex is ensured by an administrative and management structure that performs coordination functions, as well as financial, insurance, service and other supporting infrastructure. When creating a science and technology park, a higher education institution or a research organisation of the public or private sector usually acts as a research centre.

Thus, science and technology parks are a form of spatial integration of science, education and production. They bring together research institutions, design bureaus, educational institutions, and industrial enterprises to accelerate the implementation of scientific, technical, and technological advances in practice.

The most common model in the world is the technology park model, which is closely linked to the activities of universities. Universities traditionally

perform not only educational but also research functions, acting as centres of basic and applied research. Today, there are four main models for creating technology park structures: classical, American, European and Japanese. Each of them reflects the evolution of the concept of the innovation process and corresponds to the specifics of the socio-economic development of a particular country.

The emergence of technopark structures is due to a number of factors. The dynamic development of technology parks and other innovation centres in the USA, Germany, France and Japan confirms their high efficiency as tools for accelerating scientific and technological progress. At the same time, there is a widespread perception that such innovation structures can only function in a developed economy. However, international practice shows the opposite: the creation of technology parks can be an effective mechanism for stabilising an economy regardless of its current level of development.

Moreover, even in countries with highly developed economies, initiatives to create new innovation structures are often implemented in the context of economic downturn, rising unemployment, structural adjustment of production, reduction of state funding for science, or in cases where the existing scientific and technological potential is not put to practical use due to the lack of effective mechanisms for technology transfer.

It is worth paying special attention to the fact that the experience of many countries shows that economic crisis often becomes a catalyst for the development of technology park structures. In the context of modern Ukraine, which is undergoing post-war reconstruction, this aspect is of particular relevance (Table 1).

Thus, the main principles of creating technology parks can be considered as follows:

– coordination of activities and interaction between key participants of the innovation ecosystem – scientific institutions, higher education institutions, public and private sectors of production, local and regional authorities;

– support for small knowledge-intensive businesses that contribute to the development of innovative entrepreneurship;

– concentration and efficient use of venture (risk) capital to finance innovative projects at the initial stages of development.

The hierarchical structure of technology park systems is based on a modular organisation principle. The basic unit in the creation of such structures is an incubator, which is a centre for generating innovations and supporting startups. A technology park, in turn, is a set of innovation centres, each of which provides specialised services ranging from scientific and technical expertise to business consulting. The combination of technology parks, incubators and urban infrastructure elements forms a technopolis, a comprehensive form of

integration of science, education, industry and services. In a broader context, science and technology regions can include technopolises, technoparks, incubators and other supporting institutions that support research and innovation.

Table 1

Typical reasons for creating techno-industrial structures: world practice

Name of the technology park, Country	Initiators, Founders	Reasons for creation
Evanston Research Park, Illinois, USA	The country's leading universities, private individuals, corporations	– increasing the competitiveness of products manufactured in the state; – stopping the outflow of highly qualified specialists and scientists to other states; – increasing the volume of innovative activities of enterprises; – the need to support and stimulate the development of science and education.
Dortmund Technology Park; Saarbrücken Innovation Technology Center; Aachen Technology Center; Hanover Technology Center; Munich Technology Center, Germany	State and Regional Innovation Development Centers, German Government	– the need to diversify production and overcome economic depression; – the need for structural restructuring with an orientation towards the development of science-intensive industries; – the struggle for leadership in the global market of scientific and technical products.
Shenzhen Technology Park; Shenzhen High-Tech Park, China; Dubai Technology Park, UAE; Southern Science Park, Taiwan; Tsukuba Science and Technology Center, Japan	Ministry of Science and Technology of China; Dubai Park Holding; Government of Japan and Taiwan	– development of innovative entrepreneurship; attracting foreign investment in the development of new technologies and materials; – rganizing the production of high-tech products.

Source: compiled by the authors.

Technoparks are key instruments for technology transfer, especially in the area of small innovative businesses. Their effectiveness is largely determined by close integration with research institutes and universities. The main idea is to involve scientific personnel in fulfilling applied orders of the park's resident companies. At the same time, scientists are able to apply the results of their research in practice by providing expert advisory services to innovative companies.

By providing a favourable environment for the development of entrepreneurship in the fields of high technology and knowledge-intensive production, technology parks act as a link between science and industry, facilitating the continuous process of introducing technological innovations into production.

At the same time, technoparks serve as a tool of selective regional policy, which allows accelerating the socio-economic development of certain regions, updating the technological base of industry and boosting entrepreneurial initiative.

Thus, the importance of creating technopark structures in the post-war period is due to the following factors:

– technoparks facilitate the convergence of science and production, ensuring synergy between theoretical developments and their practical implementation;

– they are able to play a leading role in the structural transformation of the economy aimed at increasing its innovation component;

– technoparks function as sustainable and autonomous microsystems that can play the role of backup industrial centres, increasing the overall sustainability of the economic system.

These aspects are especially relevant in the context of Ukraine's post-war recovery, when there is a need to create flexible, adaptive and technology-oriented structures that can quickly respond to new challenges and help restore the country's industrial potential.

The functional features of technology parks and their structural differentiation are presented in Table 2.

Table 2

Characteristics of the main types of technological parks

Economic forms	Functions performed
Business incubator	An organizational structure that creates favorable conditions for the effective operation of newly established small innovative firms: – providing premises and necessary equipment for a certain period; – providing consultations on economic and legal issues on a preferential basis; – organizing information and advertising support; – examination of innovative projects, etc.
Research Park	Focused on scientific and research activities: – the emergence of a scientific idea; – fundamental research; – applied research and technology; – high-tech research and development.
Technology Park	Added to the previous ones are: – development of implementation technologies; – the emergence of venture firms; – acceleration of the introduction of innovations into production.
Gründer Park	Added to the previous ones are: – consulting enterprises on the use of developments; – establishing production and searching for partners.

End Table 2

Economic forms	Functions performed
Industrial park	The following are added to the previous one: – a range of services; – venture financing; – rental of equipment, premises, land for office accommodation; – banking services; – training and retraining of personnel for work in the conditions of scientific and technological progress.
Technopolis	They have a developed scientific, industrial and social infrastructure: – technical and socio-economic innovations are developed and implemented; – their continuous reproduction is ensured: – accelerated testing of innovations; – combination of fundamental scientific research and applied developments.

Source: compiled by the authors.

The conceptual basis for the functioning of technostructures is the Triple Helix model (Etzkowitz, 2008), which provides for close interaction between universities, industry and government. In the post-war environment, this model is of particular importance, as it allows for the optimal use of limited resources to achieve the maximum innovation effect.

By the end of the 1980s, the research sector in higher education institutions (HEIs) was significant both in Ukraine and globally. However, subsequently there was a significant reduction in budgetary funding for science – relative in developed countries and absolute in Eastern Europe. This resulted in an outflow of scientific personnel. Today, there is a gradual revival of research departments in higher education institutions.

Modern forms of co-investment in scientific and technical activities, participation in grants and programmes require high-quality organisational, technical and information support of the scientific infrastructure. Although HEIs in different countries face common challenges, they are developing according to different organisational and legal models.

In the context of limited resources, the integration of science and education should ensure better coordination of work, concentration of funds on priority areas, and effective training of personnel.

Global experience shows that universities are capable of training specialists of all levels and conducting both fundamental and applied research for various industries. This system is implemented in the United States and other highly developed countries. Here, universities are not only educational institutions, but also powerful research centres that are closely integrated with industry.

In most cases, large universities drive regional development through the creation of technology parks. The concept of a research university is based on the combination of education and science, and the use of research in the educational process. They receive funding from the state in the form of grants, contracts, and cooperation agreements. An important component is intellectual property, which is commercialised and generates additional revenue.

In a market environment, there is a growing need for technology parks and incubators at higher education institutions – institutions that facilitate technology transfer, bring scientific developments to a finished product and introduce them into production.

The integration of universities, research institutions and high-tech businesses should be comprehensive, aimed at forming innovation clusters that meet the strategic needs of the region or industry. They should have a clear industry focus and modern forms of interaction between participants.

The country's intellectual potential is a key factor in creating an effective network of technology parks. The government of Ukraine should more actively support the interaction of higher education institutions with technology transfer institutions.

The issue of science funding cannot be resolved without active cooperation with business. Businesses can provide resources and funding by using the scientific base of higher education institutions. This is not only support for science, but also an investment in the country's future, competitiveness and technological leadership.

The most effective form of cooperation between universities and industry is science and research parks, which combine infrastructure, research and production units. In Ukraine, technology parks were most often created on the basis of academic institutes, but the problem of effective innovation management is still relevant.

For Ukraine, it is important to use international experience in staffing the activities of technology parks, especially when a brain drain occurred during the full-scale invasion. In particular, China pays special attention to this issue. The country has adopted a programme to transform hundreds of Chinese universities into research centres of global significance.

China maintains constant contacts with its scientific emigrants and creates conditions for the re-emigration of skilled personnel and capital. Under the national 1000 Talents programme, scientists who have left for the West are offered the same salary upon their return. Therefore, China is experiencing a strong inflow of highly qualified specialists from the United States who once emigrated from the country and are now ready to work in the country's information and other sectors.

Innovation requires special attention in the context of ensuring the integration of education and science. The growing role of knowledge as a key factor in economic development is leading to a profound transformation of the scientific sphere, the education system and the functioning of higher education institutions (HEIs) in particular. The traditional model of a university, which used to be based mainly on educational and research functions, is undergoing significant changes. It is being supplemented by a new area of activity - active support for innovative entrepreneurship.

Modern higher education institutions are increasingly focused on the development of knowledge, technological and organisational solutions adapted to market needs, as well as on supporting small and medium-sized businesses. With this in mind, it is extremely important to:

– initiating sustainable partnerships with the business environment;
– developing entrepreneurial competences of scientists and students;
– commercialisation of research results.

Over the past decades, universities and leading research institutes around the world have been creating an innovative environment, represented by a network of small and medium-sized enterprises based on the results of the scientific activities of teachers, researchers and students. This process is stimulated by the targeted activities of educational institutions aimed at developing innovative infrastructure.

In particular, specialised institutions are being formed within the structure of higher education institutions to support innovation, technology transfer and entrepreneurship, including:

– technology transfer centres,
– business incubators,
– technology and science parks,
– academic entrepreneurship incubators, etc.

These institutions play an important role in the formation of a new type of university, which not only provides training and research, but also acts as a catalyst for innovation development and entrepreneurial activity in the region and the country as a whole.

Conclusions. The creation and development of innovative technological structures based on public-private partnerships in the post-war period is a strategic imperative to ensure the technological sovereignty and competitiveness of the national economy. Successful implementation of this area requires a comprehensive approach, including the creation of a favourable legal environment, attraction of private investment, human capital development and international cooperation.

Quite convincing international experience suggests that technology parks and business incubators for small knowledge-intensive firms can act as a form of

decentralisation of decision-making in the field of science and technology policy, and can enhance risk-taking by entrepreneurs by providing support to venture capitalism. They can improve the skills of employed workers in the production of high-tech products and high technologies, and create new jobs. International experience shows that countries that managed to effectively use the post-war period to create innovative technological structures have achieved significant success in technological development and economic growth. Therefore, investments in innovative technological structures should be viewed not as costs but as strategic investments in the country's future.

Further research in this area should focus on the development of specific mechanisms for financing technological structures, analysing the effectiveness of different models of public-private partnerships, and exploring the possibilities of adapting international experience to national conditions.

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