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Nizhnikov Oleksii, Bulatnikov Stanislav
Volodymyr Dahl East Ukrainian National University

RESEARCH ON THE PROBLEMS OF FORMING COMPETITIVE INNOVATION SYSTEMS

The article analyses the problems of formation of competitive innovation systems, which are key drivers of economic growth and development of modern states and enterprises. The main focus is on identifying the factors that affect the efficiency of such systems, as well as on developing recommendations for improving their performance. The authors emphasize that the current stage of development of the world economy is characterized by an increasing role of innovations as the basis of competitiveness. In this context, the formation of national and regional innovation systems requires a systematic approach that takes into account economic, social, technological and institutional aspects. The article identifies that the key elements of competitive innovation systems are research institutions, universities, enterprises, investors, government agencies and other participants of the innovation environment. Particular attention is paid to the analysis of barriers that hinder the development of innovation systems. Among them are insufficient funding for research, low level of commercialization of developments, limited access to modern technologies, and lack of effective mechanisms for cooperation between different participants in the innovation ecosystem. The article emphasizes that in order to overcome these problems, it is necessary to intensify state support for innovation, create a favorable regulatory environment, and stimulate partnerships between business and science. The authors also investigated the impact of global trends such as digitalization, automation and sustainable development on the formation of innovation systems. It is determined that successful innovation systems must be adaptive to changes in the external environment and able to respond quickly to the challenges and opportunities associated with global technological change. Based on the study, a set of measures aimed at improving the competitiveness of innovation systems is proposed. These include the creation of innovation clusters, stimulation of startup ecosystems, improvement of the education and training system, and support for the development of venture capital.
Keywords: innovation system, formation, development, problems, solutions.

Formulation of the problem. Negative economic phenomena have a destabilizing impact on the development of science, education, innovation and business. These include social and economic instability; aging and insufficient renewal of the material and technical base of scientific and educational institutions in line with the current needs of scientific and educational activities; reduction in the number of highly qualified researchers and teachers, young scientists due to low salaries. At the same time, global trends and processes of social development confirm the position of scientists that the integration of science, education and business in modern conditions has no limits and is of exceptional importance for ensuring a high scientific and technical level of specialists.

Integration processes of science, education and business are developing in certain territories in certain organizational forms: technology parks, research universities, consulting firms and others that are able to solve research, educational and production problems, as well as meet the needs of employers for highly qualified specialists.

At the same time, the requirements for university education are growing, driven by new labour market conditions, the increasing role of lifelong learning, and the growing competition between different universities, universities and other research institutions, and between private and public education.

Analysis of recent achievements and publications. Recent research and publications in the field of competitive innovation systems focus on key trends such as the integration of digital technologies, the development of open innovation and the formation of innovation clusters. In particular, numerous authors analyze the role of artificial intelligence, blockchain and automation in the transformation of innovation processes. Attention is also paid to the development of startup ecosystems and venture capital financing as important components of modern innovation systems. Some papers examine the impact of public policy on stimulating innovation, in particular through the creation of a favorable regulatory environment and support for international cooperation. Significant contributions have been made to the study of mechanisms for integrating science, business and education to improve the efficiency of innovation systems, as well as to the study of global challenges, such as sustainable development and environmental responsibility, which determine the priorities of innovation. The **purpose** of the article is to study the theoretical and practical aspects of formation of competitive innovation systems, to identify the main problems affecting their development, and to develop recommendations for improving the efficiency of such systems in the context of modern economic and technological challenges.

Presentation of the main material. The information space of the economy consists of weakly interconnected information sectors (state, departmental, regional, commercial). However, in recent years, there has been a positive trend in the intentions of innovative activity of enterprises and innovative business: the number of small innovative enterprises and internal research and development expenditures are increasing.

The first condition is the formation of demand for technological innovations, which, also due to insufficient financial capabilities and subjective reasons, remains low and inconsistent with the task of achieving sustainable economic growth.

The second condition that affects the processes of diversification of sources and financing of R&D processes and integration of science, education, production systems and business is the creation of financial structures with the participation of the state that stimulate the processes of commercialization of science.

Awareness of the role of knowledge, intellectual values, science, education and business, and their integration in accelerating socio-economic

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development is a necessary and socially significant condition for the development of R&D. Changes in public opinion and financial conditions in the process of integration will help to raise the prestige of scientists and, accordingly, attract young talented specialists to science.

There are four groups of problems that hinder the development of integration processes in these areas. These are: insufficient financial base and support for research and production integration, including from the state; lack of coordination programs and mechanisms, hence the weak motivation of participants in the integration process; and insufficient legal framework for integration development. Some of these problems can be solved by joint efforts of representatives of science, education and business. Here, the key factor is the position of the leadership of the relevant organizations on the formation of an integrated space of interactions that generate innovations.

Investigating the problems of developing new institutional forms and relations in the field of research and development, we can see that there are opportunities and directions for innovation. However, today there are a number of problems affecting the development of the innovation sphere: low innovation activity of a significant part of organizations in the real sector of the economy; lack of economic interaction between individual elements of the innovation infrastructure [9]; low investment attractiveness of scientific organizations as an object of investment and lending, underdeveloped economic and legal mechanisms for introducing business innovation.

The social conditions for the integration of science, education and business are the society's awareness of the high importance of knowledge and skills, goals and values, science and education in the development of the economy and society, which are the basis for the reproduction of innovation potential.

The development of integrated complexes of science, education and business is based on the creation of socio-cultural, political, regulatory and economic conditions. The economic conditions for the integration of science, education and business involve the pooling of resources to generate economic and commercial benefits. In this regard, it is necessary to provide tax and economic benefits for entities involved in the development, mastering and production of new equipment and technologies, including innovative small business companies established in co-founding universities and other scientific and educational organizations, as well as to ensure the creation of special economic zones, etc.

No less important than the awareness and support of integration processes at the state level is the initiative of the participants in integration processes. For example, the first American technology park emerged as a result of the active work of Stanford University aimed at the territorial and functional integration of small innovative firms.

At the same time, there is a growing belief in society that the integration of science, education and business is of crucial importance for the competitiveness of specialists, as the level of scientific achievements and creative potential is determined by the quality of specialists.

Rapid development of knowledge-intensive industries, shorter cycles of industrial equipment renewal and retraining, accelerated introduction of innovative scientific developments into mass production, and the information economy place new demands on science, education and business. The growth of these requirements means that science, education and business cannot develop and adapt to changes independently of each other.

Scientific organizations are increasingly facing the problem of financing and commercializing fundamental research, scientific developments and discoveries. Lack of funding leads to deterioration of the material and technical base, aging of equipment and outflow of highly qualified personnel. According to statistics, 75% of university graduates do not find a job in their specialty. According to analysts, one of the reasons for this state of affairs is the constant emergence of new specialties that the market does not have time to respond to. Another reason is the shortage of teaching and management staff with the necessary qualifications [7].

The solution to these problems will obviously be facilitated by mutually beneficial spatial organization of interaction between science, education and production systems of neighboring territories with a special geographical position. In particular, regions remote from major scientific centers, large universities with the necessary scientific base to conduct extensive basic and applied research, and, accordingly, to train highly qualified specialists and young scientists.

Out of the three spheres of integration partners - science, education and business – we consider education to be the key link in the impact of this interaction on the process of innovation development at the state level. Integration processes are implemented primarily on the basis of universities. This interaction is built with the help of innovation and implementation firms.

International practice has accumulated considerable experience in the integration of science, education, and production systems. Science cities, called technopolises, have been developed and include technology parks. The purpose of such entities is to provide new high-tech enterprises with the opportunity to collectively use infrastructure on the most favorable terms and to develop knowledge-intensive businesses.

A technopolis (technopolise: from the Greek techne – skill and polis – city) is a form of territorial integration of science, education and highly developed production, a single research, production, educational, residential and cultural and amenity zone united around a research centre that ensures a continuous innovation cycle based on scientific research. The first technopolis emerged in the United States after the Second World War: a number of companies on the West Coast of the United States, in California, received orders from the government to create new types of products, including electronic devices [4].

Due to the specifics of the new orders, a significant portion of the funds was transferred to the University of California and other universities on the basis of an agreement on the topics and areas of research. The scope of work was much larger than the capabilities of the universities, and as a result, they were forced to create new laboratories and institutes in suburban areas. These processes were most active in Silicon Valley, near San Francisco. Here, thanks to the assistance of the Governor of San Francisco, the world's first science town grew up, which became a symbol of the scientific transformations of the 21st century with a new style and quality of life for scientists.

The US has also established technopolises in Florida, North Carolina, Texas and other states in the Midwest and Northeast. In recent years, more than 140 science and technology parks have been actively operating in the United States [2].

The development of science and education in the United States, their integration with production and various types of business is facilitated by the fact that, according to US law, part of the profits of companies and business structures invested in the development of universities and institutes is considered a charitable contribution and is not taxed.

The close relationship with universities and government research centers is a key feature of American technopolises and technology parks. They differ in this form of interaction. For example, about 20% of technology parks are structural units of universities, about 10% are independent legal entities, 28% operate on the basis of contracts with developers of innovative projects, 38% are joint ventures, and about 4% are technology parks with a share of government participation [7].

Since the 1970s, technology parks have been actively created in Western Europe and other countries. The European innovation infrastructure includes more than 1500 different innovation centers and 260 science and technology parks [4].

In Japan, the state program «Technopolis» is being implemented, according to which a network of 19 technopolises is being created in Japan. The Japanese attach national importance to technopolises and develop a network of technopolises on the basis of state planning. The sources of funding for technopolises in Japan are: 30% – the state, 30% – municipalities, 30% – business and individuals, 10% – foreign investors [2].

Such an organizational form as parity funding of research and creation of science and technology parks has proved to be effective in foreign countries. However, the creation of technology parks is not universally welcomed in the West. Some economists, for example, E. Staud, a professor at the University of Ruhr in Germany and head of the Institute for Applied Aspects of Innovation, reject the very idea of parks as contrary to the laws of the market economy. In our opinion, the development and intensity of the innovation process in the economy is largely determined by the integrative interaction of science, education and production, the forms of which are being improved in the course of their development, go beyond the boundaries of individual administrative units, and become both interregional and intercountry.

Industrialized countries are completing the transition from machine technology and a three-tier technological structure to a four-tier one. Information-controlled electronic machines are becoming the fourth link. Then it's on to the fifth technological mode. Its distinctive feature is the automation of technological processes and the widespread use of automation tools. At the same time, humans cease to be an element of the technological system, but rather control it, forming the technological basis of the knowledge-based information post-industrial society.

In fact, a new basis for social production is being formed - an organizational and technological one based on functionally integrated cycles of product creation and sales, including research, design and development, marketing, pilot and mass production, and sales. It plays a decisive role in the sphere in which information wealth in the form of new knowledge is accumulated through the development of science and education, which is then transformed into new technologies.

New knowledge is becoming a sustainable source of competitive advantage. In this context, the concept of knowledge has an expansive interpretation. It includes the ability to capitalize intangible assets, create brands, produce new technologies and know-how, and accumulate practical and theoretical experience in corporate governance. It also includes the ability to create social resources, invent complex financial structures and schemes, initiate business research, influence ratings, indices, quotes, intuitively make the right decisions in the field of investment, assess the value of companies in a situation of information deficit, avoid possible risks, and so on.

Various forms of associations between enterprises are developing, including the organization of scientific research, pilot production, joint marketing and sales. Innovative entrepreneurial firms are becoming the main driving force, unlike large industrial companies in an industrial economy, placing high demands on the professional competence of technical specialists.

Mass production is giving way to production focused on meeting the changing requirements of individual consumers, where the product turnover cycle (product life cycle) is becoming shorter. The need to accelerate the renewal of products (goods) requires appropriate innovative changes and development.

Innovation susceptibility is the ability of an enterprise or individual to quickly adopt innovations in the process of production, sale, and delivery to the end consumer.

In recent years, due to the awareness of the need to intensify innovation processes and the beginning of the formation of the innovation market, the study of demand for innovations remains a weak link. In addition, when developing innovative projects, their economic evaluation is often not carried out, and schemes for promoting the results obtained in production are not worked out. As a result, up to 40-50% of completed scientific and technical developments remain unclaimed by practitioners every year, which is a consequence of the lack of an effective organizational and economic mechanism for managing innovation in the marketplace, which encourages developers to create effective innovation projects and consumers to implement them.

The innovative activity of enterprises is multifaceted and requires large material, financial, labor costs, improvement of organization and management. In this regard, they can be involved in the innovation process at different stages. Some start with fundamental research and end with the launch of a new product on the market, while others are at the stage of production development of a new product or its sale.

Based on their innovation activity, enterprises can be divided into pioneer enterprises that provide technical and technological breakthroughs; follower enterprises that follow the leaders; and imitator enterprises that do not actually engage in innovation processes.

Experience shows that leading enterprises that carry out large-scale research and development provide the country with real economic growth, become growth points and centers for the distribution of new technologies and goods.

The practice of foreign countries shows that the status and importance of medium and small enterprises is maintained, despite the dominant position of large businesses in innovation processes. This is primarily due to the development of specialization and separation of functions of large, medium and small production with convergence of their technical level; as well as the development and introduction of new technologies that do not require large capital investments, production lines and machine systems and are effective at relatively small production volumes.

In particular, the US science and technology policy is based on a developed institutional structure. A feature of the US innovation management system is the active interaction between the state and private business. There is a developed network of special organizations, such as the National Center for Industrial Research, the National Academy of Sciences, the National Academy of Engineering, and the American Association for the Advancement of Science, funded by public and private sources. These organizations have also played a major role in shaping the modern model of public administration of the country's innovative economic development.

The Government of Japan has established a Science Council chaired by the Prime Minister and comprising heads of a number of ministries and representatives of major private corporations. The Council for Science formulates the vector of scientific and technological development of the country and determines the amount of expenditures on R&D from the state budget.

In the leading European countries (Germany, the UK, France), national government agencies also play an important role in shaping the national innovation potential, providing state support to corporations with innovative potential and the ability to create new products, and increasing the competitiveness of their own products in particular and the national economy in general.

The state science and technology policy of Western European countries is based on stimulating the innovative development of a small number of large corporations, the so-called 'national champions', capable of competing on world markets with the leading firms of the USA and Japan. They receive the largest share of public funds allocated for R&D.

Also, since the early 1980s, in search of levers to accelerate the process of technological innovation, the governments of leading European countries have taken measures to strengthen the implementation of the results of R&D by state research organizations in the basic sectors of the economy.

The main feature of the Western European science and technology policy in these years was the state regulation of large-scale international programs on the basis of interstate European cooperation and integration. The EEC Council began to play an increasingly important role in coordinating the scientific and technological development of the Community countries, primarily in new fields related to electronics, physics, and chemistry.

The complex nature of the modern management of the innovation process is manifested in its intersectoral nature and cross-functionality [4]. In this regard, when considering the innovation process management system, it is legitimate to use two terms «innovation management» and «innovation management», which cannot be considered identical.

In a market environment, economic methods of implementing innovation policy are of great importance for increasing the innovation activity of business entities. These include: creating economic conditions for the implementation of innovative projects and programs, state financing of innovation activities, broad attraction of investments, including foreign ones, in the innovation sphere, as well as the development of entrepreneurship, intellectual capital, and commercialization of innovative projects.

These measures will help to increase the solvency of enterprises and their ability to acquire innovations and the resources necessary for their implementation in production.

Conclusions. Thus, the conditions and principles of integration interaction of science, education and production systems in the modern economy consist of the following positions. First of all, there is a need for an adequate innovation policy aimed at forming regulatory mechanisms, regulating innovation activities, developing and adopting laws of national and regional importance, and regulatory documents that define the state policy in relation to the development of sectoral innovation processes. It is necessary to develop areas and measures of state support to create favorable conditions for investing in innovation, and to assign responsibility to state organizations.

The implementation of a successful innovation policy will be facilitated by measures to encourage investors in high-tech products, which will accelerate the development of innovation processes in business. This can be done through investor support, as well as through the creation of temporary teams working on the implementation of any major innovation project.

Other measures to stimulate this type of activity are also effective: the adoption of tax and other benefits for entities that implement innovations; improvement of depreciation policy to provide enterprises and organizations with opportunities to increase depreciation funds as a source of investment; development of leasing of high-tech unique equipment, etc.

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Ніжніков О. М., Булатніков С. О.
Східноукраїнський національний університет імені В. Даля

ДОСЛІДЖЕННЯ ПРОБЛЕМ ФОРМУВАННЯ КОНКУРЕНТОСПРОМОЖНИХ ІННОВАЦІЙНИХ СИСТЕМ

Анотація
Стаття присвячена аналізу проблем формування конкурентоспроможних інноваційних систем, які є ключовими драйверами економічного зростання та розвитку сучасних держав і підприємств. Основна увага зосереджена на виявленні факторів, що впливають на ефективність функціонування таких систем, а також на розробці рекомендацій щодо підвищення їхньої результативності. Автори акцентують на тому, що сучасний етап розвитку світової економіки характеризується посиленням ролі інновацій як основи конкурентоспроможності. В цьому контексті формування національних і регіональних інноваційних систем вимагає системного підходу, який враховує економічні, соціальні, технологічні та інституційні аспекти. У статті визначено, що ключовими елементами конкурентоспроможних інноваційних систем є науково-дослідницькі установи, університети, підприємства, інвестори, урядові структури та інші учасники інноваційного середовища. Особливу увагу приділено аналізу бар'єрів, які стримують розвиток інноваційних систем. Серед них виділено недостатнє фінансування наукових досліджень, низький рівень комерціалізації розробок, обмежений доступ до сучасних технологій, а також відсутність ефективних механізмів співпраці між різними учасниками інноваційної екосистеми. У статті підкреслюється, що для подолання цих проблем необхідно активізувати державну підтримку інноваційної діяльності, створювати сприятливе нормативно-правове середовище, стимулювати партнерство між бізнесом і наукою. Автори також дослідили вплив глобальних тенденцій, таких як цифровізація, автоматизація та сталий розвиток, на формування інноваційних систем. Визначено, що успішні інноваційні системи мають бути адаптивними до змін зовнішнього середовища та здатними швидко реагувати на виклики і можливості, пов'язані зі світовими технологічними змінами. На основі проведеного дослідження запропоновано комплекс заходів, спрямованих на підвищення конкурентоспроможності інноваційних систем. Серед них – створення інноваційних кластерів, стимулювання стартап-екосистем, удосконалення системи освіти та підготовки кадрів, а також підтримка розвитку венчурного капіталу.
Ключові слова: інноваційна система, формування, розвиток, проблеми, шляхи вирішення.