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THE ROLE OF THE INNOVATION ECOSYSTEM AS A TOOL FOR INNOVATION DEVELOPMENT

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РОЛЬ ІННОВАЦІЙНОЇ ЕКОСИСТЕМИ ЯК ІНСТРУМЕНТУ РОЗВИТКУ ІННОВАЦІЙНОЇ ДІЯЛЬНОСТІ

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The development of various industrial sectors is one of the priority tasks of the state, the solution of which is to improve the quality and life expectancy of the population. According to the authors of the article, an innovation ecosystem should be understood as an open dynamic system that provides collaborative forms of interaction between actors, taking into account the non-hierarchical relationships that have developed within the institutional ecosystem of enterprises, regions, and countries acting in the direction of sustainable advanced innovative development based on modern technological concepts. Modern innovation ecosystems are created and function to overcome individual limitations, maximise resource use, and distribute risks and costs to better achieve common goals. This approach differs from the traditional ones in that it takes into account the current level of economic development, taking into account the processes of digital transformation of all spheres of activity and provides an integrated approach to the formation of an innovation ecosystem.

The article concludes that industry is currently developing as a traditional innovation system. The analysis of different views and main approaches to understanding innovation ecosystems allowed to identify the advantages of ecosystems in comparison with traditional innovation systems and to justify the need to develop industry as an innovation ecosystem. A more detailed study was carried out on the basis of market data for various types of equipment. These conclusions were confirmed when analysing the prerequisites for the formation of an innovation ecosystem based on the results of the analysis of the current state of the equipment market. A number of systemic problems can be identified that are common to all stages of production and circulation of various products: limited financial resources of manufacturers for development (research and development, sales and promotion of products); scientific and technological lagging behind the level of

world leaders; difficulty in commercialising developments.

These problems have a complex impact on the development of the industry as a whole and its individual product segments. Eliminating these constraints will help create favourable conditions for the machinery market and unlock its potential.

Keywords: *innovation ecosystem, innovation development, innovation processes, industrial enterprises, developments, potential*

Introduction. The war has radically changed the structure of Ukraine's economy. Of course, it will continue to rely on foreign aid, payments to the military and their consumer demand for some time, but in the future, the country's development will only be possible through innovation. It is not an option to depend on supplies from the United States and individual EU countries all the time. And the political situation in these countries may change. So, innovation is a matter of national security, and it does not come about by directive. We need an environment that is called an innovation ecosystem in developed countries. In April 2023, the Ministry of Digital Transformation presented a draft vision for the development of the innovation ecosystem in Ukraine for public discussion. The document was developed by CIVITTA and the Centre for Economic Recovery. The initiators of the innovation ecosystem development project decided to eat an elephant in pieces and separated the creation of the vision and the strategy itself. According to the laws of the genre, a vision is a picture of a desired future. It must be convincing and attractive enough to make people want to implement it. As our country strives

to become a leader in the industrial, scientific and innovative space of the world, an integrated approach to innovation policy is of paramount importance. The strategic objectives of innovative development of the medical industry are no exception.

Analysis of basic research and publications.

In recent years, foreign and domestic scientists, including L. Fedulova, G. Lanovska, O. Marchenko, P. Wang, R. Adner, B. Merkan, etc. have been studying the peculiarities of the formation, development and functioning of innovation ecosystems, including. [1-5]. A description of the similarities and differences between the economy and the biosphere can be found in the works of R. Ayres, J. Moore [6; 7]. Most of the works are devoted to the study of different types of innovation ecosystems that are relevant in certain regions with specific needs and use of relevant resources. However, for Ukraine, the main features and principles of forming the environment of the innovation ecosystem are not sufficiently substantiated and require a more in-depth study.

Therefore, the **purpose** of the article is to define the role of the innovation ecosystem as a tool for the development of innovation activity and to develop measures to strengthen it.

Materials and results of the study. Organisation of the medical industry in the format of an innovation ecosystem will allow for a more efficient transformation of creative ideas into innovative products (services) and their launch on the market, compared to the current approach. To increase the effectiveness of the transition to the management of innovative development of the medical industry based on the ecosystem approach, a number of factors should be taken into account and implemented, as shown in Fig. 1.

The ecosystem approach to innovation in the medical industry is more effective due to the following factors.

Firstly, the emphasis will be shifted from supporting knowledge-intensive projects with a small number of participants to increasing the competitiveness of the industry as a whole [6].

Secondly, conditions will be provided for the establishment of innovative ecosystems of the medical industry at the regional level as organic components of the national sectoral innovation ecosystem. This is important because regionalisation (localisation) of innovation is a global trend. The regional level plays an important role in stimulating the development of national economies and is considered the most suitable for innovation. The process of creating new knowledge is concentrated in regions and cities, and there is an appropriate infrastructure for its further dissemination and application. The transfer of knowledge into practice is more effective at the regional level due to direct communication between innovation actors, as opposed to the use of long communication channels at the macro level. The most intensive interaction is between participants involved in innovation processes taking place within a radius of about 200 km [4].

Thirdly, it will make it easier for the industry's enterprises to enter the global market for medical devices, instruments and medical supplies, and the problem of import substitution of medical equipment will be more effectively addressed. The medical industry is developing in a new environment that has now spread to all sectors of the economy. According to experts of the World Economic Forum, the globalisation of the world economy has entered a new phase of development - Globalisation 4.0 - a phase that is not limited to the movement of goods, services and capital, but also covers intangible data flows in the form of information, searches, transactions, messages and videos. For example, approximately 50% of international trade in services has already been digitised, about 12% of global

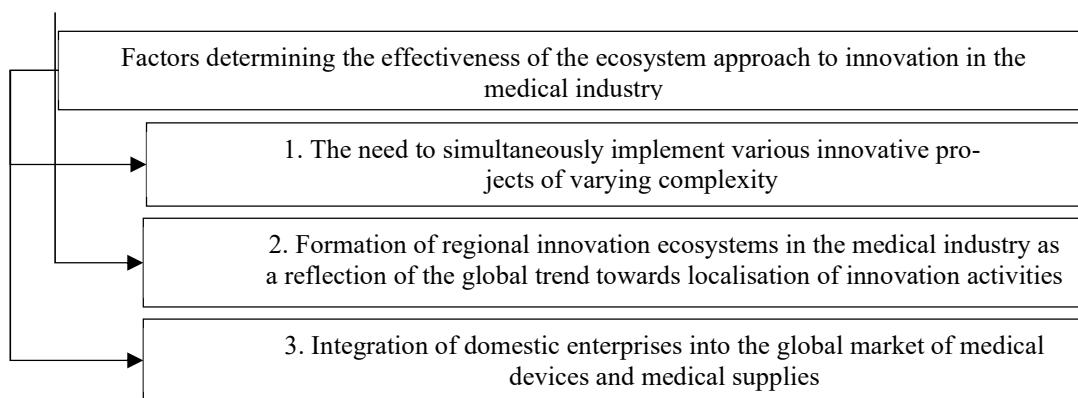


Fig. 1. Factors ensuring the effectiveness of the ecosystem approach to the organisation of innovation in the medical industry

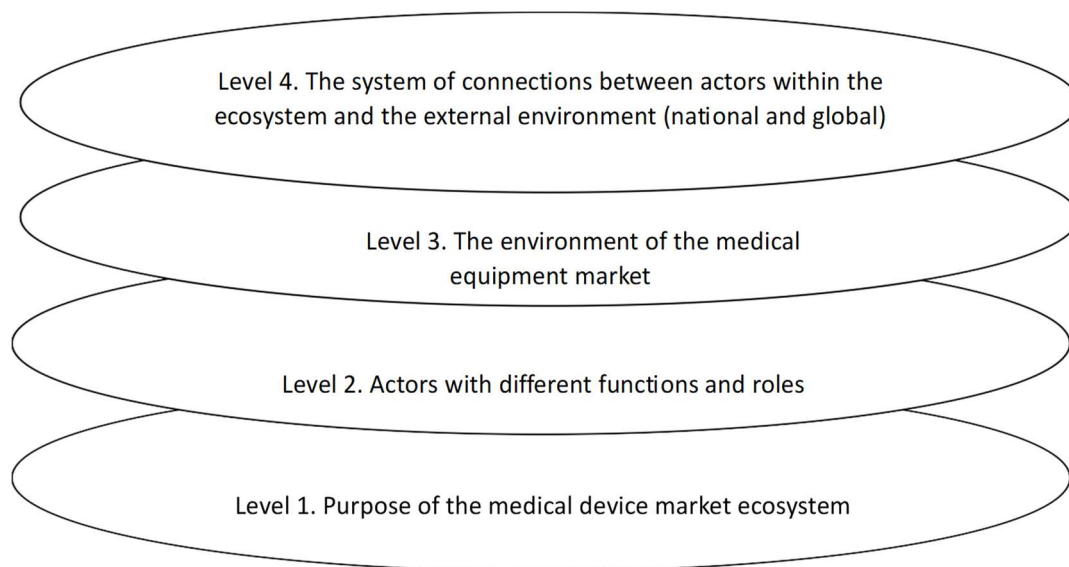


Fig. 2. Configuration of the conceptual innovation model of the medical equipment market ecosystem as a multidimensional model

trade in goods is carried out through international e-commerce, and cross-border calls via messengers or specialised apps account for 46% of the total number of traditional international calls. Digital technologies and data flows are becoming the "connective tissue" of the global economy [6].

In order to demonstrate the role of the innovation development ecosystem as a tool for intensifying innovation activities and implementing innovative projects in the medical industry, we will consider the conceptual model of the industrial innovation ecosystem from the perspective of systems theory [2]. In doing so, we will use the medical equipment market for the purposes of further research and, on its basis, conduct a systemic and structural-functional analysis, which will be guided by the above definition of the innovation ecosystem. The innovation ecosystem of the medical equipment market can be represented as a model as follows (Fig. 2).

These dimensions together determine the configuration of the medical device market ecosystem, ensure its unity and integrity [3].

The goal (purpose) is the fundamental basis of the ecosystem in the sense that without the goal, the ecosystem is not a system, but only a set of elements and their connections. According to the basic tenets of systems theory, a system is not just a collection of things; it is an interconnected set of elements that are coordinated and organised in such a way as to achieve something. Any system should consist of three things: elements, relationships, and a goal.

The knowledge that circulates in innovation ecosystems is a public good, and innovations in the form of products and services bring benefits to

society and its members - benefits that can be created by individuals. Therefore, the goal of the sectoral innovation ecosystem of the medical equipment market should be to ensure sustainable, advanced innovative development of the medical industry as the basis for a high standard of living for the general population.

The actors of the innovation ecosystem of the medical equipment market are considered as organisations embedded in the institutional structure of the medical sector of the economy, represented by a set of institutions - official regulations (laws, norms, rules, procedures, regulations) and informal rules (repeated patterns of behaviour, inherited social habits, traditions, values) that determine the institutional scope of organisations' activities, affecting the relations between people in organisations, between organisations, between organisations and the external environment. Organisations and institutions are interconnected and influence each other: institutions change in the process of interaction with organisations through their practical activities, and organisations adjust to new institutions.

Traditionally, ecosystem participants (actors) are divided according to the triple helix (science - business - state) or four-linked helix (science - business - state - civil society) models [8], focusing on institutional sectors rather than on the functions and roles of participants.

As part of the concept of developing the medical device market as an innovative ecosystem, we propose to expand the list of actors and group them into six sectors, depending on the functions and roles they perform:

1) business sector – creates innovations and generates the main demand for innovations;

2) the public sector - promotes (supports) or blocks innovation;

3) the research and education sector - teaches, builds human potential; produces new knowledge, ideas, and discoveries;

4) the financial support sector - finances innovations throughout the innovation cycle;

5) Infrastructure support sector - connects actors in one location, provides incubation, testing, approval, and market promotion;

6) the sector of public associations - provides and disseminates information, unites actors in solving common problems.

Such a grouping provides an understanding of the purpose of each actor in the ecosystem, since in order to be part of the ecosystem, one must not only be within it, but also contribute to its formation and development.

Two points are important in this context: first, the presence and sufficient number of actors in each sector; second, the quality of actors and their performance.

However, even if these important conditions are met, an innovation ecosystem can only be said to exist (rather than be formed) if a system of interconnections and exchanges is established between its actors within the same sector, across sectors and with actors in other innovation ecosystems (regional, national, interstate and cross-border). In other words, for a sectoral innovation ecosystem in the medical device market to work, it is not just a matter of having all the necessary actors in place, but of ensuring that they are in the right combination so that people working in different organisations can find each other and interact, and that organisations are interested in innovation. This requires the creation of an innovation-friendly environment - business, regulatory and innovation; the development of inclusive and blocking extractive institutions [3]. As Hwang and Horowitz point out, "serendipity in the form of innovation cannot be designed, but the environment - that which fosters serendipity - can" [4].

A study of existing practices of innovation systems development suggests that they are based on the well-known formula for creating Silicon Valley, defined by M. Andriessen:

build a large, beautiful, well-equipped technology park;

connect research laboratories and university centres;

create incentives to attract scientists, firms and users;

establish interconnections within the industry by creating consortia and specialised suppliers;

protect intellectual property and ensure technology transfer;

create a favourable business environment and regulatory framework [2].

However, the experience of other countries has shown that by acting in this way, the success of Silicon Valley could not be repeated. According to A. Ross, this is impossible, as Silicon Valley emerged as an ecosystem several decades ago, providing a perfect environment for launching Internet-related businesses, and "today it may work to create conditions to compete and succeed in those innovative areas that will develop in the future" [7]. This refers to the emergence and development of such industries as genomics, biotechnology, artificial intelligence and robotics, cybersecurity, and blockchain, which will soon determine the position of countries in the global economy.

An ecosystem approach to the development of the medical equipment market will help to "get away" from the lack of innovation policy implementation: innovation systems are often perceived as special infrastructure projects implemented by the government or regional authorities without regard to the needs and capabilities of the participants in the innovation process. Ecosystem development will eliminate this approach, as the essence of an ecosystem is the natural establishment of relationships between organisations and people in an environment favourable to innovation.

The innovation ecosystem contains a key factor that ensures the success of innovation activities at the current stage of economic and social development - the diversity of talents and cooperation of people belonging to different cultures.

"The greatest achievements take place where people who are significantly different from each other interact. The fact is that cultural heterogeneity helps to break down associative barriers that limit the ability to think broadly, be creative, and combine ideas and concepts." F. Johanson, author of *The Medici Effect*, explains why cultural heterogeneity breaks down associative barriers" [3]: "Cultures differ in rules and traditions, they endow their representatives with a certain way of thinking and acting. Some cultures are sociable, while others are more reserved; some cultures encourage teamwork, while others encourage individual work; some cultures recognise only secular rules and lifestyles, while others place great importance on the spiritual component. All of these norms are valuable and important in their own way, and when applied together, they help people to reject mental clichés, avoid patterns, overcome traditional ways of

thinking, and, as a result, generate creative ideas and innovations" [3].

Another condition for enhancing innovation in the medical industry is the possibility of creating open innovation platforms in the innovation ecosystem.

Open innovation platforms facilitate this task by providing companies with access to external knowledge and skills and ensuring the rapid and efficient use of innovations. The main advantage of such platforms is that companies act as "problem owners" and have access to a global network of experts, which allows them to find the right innovative solution to a problem for which they lack internal resources and skills in just a few months.

Platforms differ from clusters in that they are more open, organise horizontal flows and focus on combining knowledge from different disciplines. However, there is no point in contrasting platforms and clusters, which are complementary.

As organisational mechanisms for business and government cooperation, open innovation platforms can be divided into two categories.

The first category is independent partnerships between government, academia and business, platforms that modernise the economy by improving the skills of the sector's technological infrastructure.

Platforms in the second category are based on the concept of interaction between the state and business, which was proposed in 2005. The UK Technology Strategy Board proposed in 2005. Such interaction is a forum for exchange of views focused on designing solutions in the field of innovation, the most relevant social and political points of development. Such innovation platforms have the following advantages:

Identify bottlenecks for innovation and solutions that are beyond the capabilities of individual stakeholders, such as infrastructure development;

facilitating dialogue and mutual understanding between actors, resolving problems and conflicts;

provide equal opportunities for all stakeholders (SMEs, large companies, local communities and government representatives) and foster a sense of ownership of the problem among all stakeholders, which has a positive impact on success.

The use of the open innovation platform in the development of the innovation ecosystem of the medical industry allows the author to propose an improved model of the innovation ecosystem of the medical equipment market that meets modern requirements and levels of development, including in the context of global digitalisation. This model ensures the implementation of the "everyone with everyone" approach, providing equal opportunities for all participants in the decision-making process to

achieve the goals of the medical device market ecosystem with the participation of a wide range of stakeholders, their useful knowledge, ideas and skills at all levels of management of the process of innovative development of the medical industry.

Conclusions and proposals. The ecosystem approach to innovation in the medical industry is more effective due to a number of factors. The emphasis has been shifted from supporting knowledge-intensive projects with a small number of participants to increasing the competitiveness of the industry as a whole. The conditions for the establishment of innovative ecosystems in the medical industry at the regional level as organic components of the national sectoral innovation ecosystem have been provided. The simplified entry of the business sector into the global market of medical devices, instruments and medical supplies will more effectively address the problem of import substitution of medical equipment. The above analysis allowed us to draw convincing conclusions about the need to create an innovative ecosystem for the development of the medical equipment market. This approach will fully ensure development in the R&D sector and continuous improvement of technologies in line with market needs..

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Фоменко Д.В., Ніжніков О.М., Піменоа В.С. Роль інноваційної екосистеми як інструменту розвитку інноваційної діяльності.

Розвиток різних сфер промисловості є одним з пріоритетних завдань держави, вирішенням якої є підвищення якості і тривалості життя населення. Під інноваційної екосистемою, за думкою авторів статті, слід розуміти відкриту динамічну систему, що забезпечує колабораційні форми взаємодії акторів з урахуванням неієрархічних зв'язків, що склалися в рамках інституційної екосередовища підприємств, регіонів, країн, діючих в напрямку стійкого випереджаючого інноваційного розвитку на базі сучасних технологічних концептів. Сучасні інноваційні екосистеми створюються і функціонують для подолання індивідуальних обмежень, максимізації використання ресурсів, розподілу ризиків і витрат для кращого досягнення загальних цілей. Такий підхід відрізняється від традиційних тим, що він враховує сучасний рівень розвитку економіки урахуванням процесів цифрових трансформацій всіх сфер діяльності і забезпечує комплексний підхід по формуванню інноваційної екосистеми.

В статті зроблено висновок, що промисловість в даний час розвивається як традиційна інноваційна система. Проведений аналіз різних поглядів і основних підходів до розуміння інноваційних екосистем дозволив виявити переваги екосистем в порівнянні з традиційними інноваційними системами і обґрунтувати необхідність розвивати промисловість як інноваційну екосистему. Більш детальне дослідження проводилося на матеріалах ринку різних видів техніки. Підтвердження цих висновків знайшли і при аналізі передумов формування інноваційної екосистеми за підсумками проведеного аналізу поточного стану ринку техніки. Можна виділити ряд системних проблем, характерних для всіх етапів виробництва та обігу різних виробів: обмеженість фінансових ресурсів виробників на розвиток (проведення розробок, збут і просування продукції); науково-технологічне відставання від рівня світових лідерів; складність комерціалізації розробок.

Дані проблеми комплексно впливають як на розвиток галузі в цілому, так і на її окремі продуктові сегменти. Усунення розглянутих обмежень дозволить створити сприятливі умови для розвитку ринку техніки та реалізації потенціалу.

Ключові слова: інноваційна екосистема, інноваційний розвиток, інноваційні процеси, промислові підприємства, розробки, потенціал

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