

**I. O. NOVIK, M. Y. KUROCHKINA, A.E.Y.PEREDRII, N.M. DYAKOVA**  
**ESSENCE OF THE INNOVATION ECOSYSTEM IN MODERN CONDITIONS**

The article analyzes the economic essence of the innovative ecosystem (IEC), its characteristic features and subjects. The tools used to study the IEC are investigated, namely the theory of networks. The concepts that are related to the creation of an innovative cluster and clustering are analyzed. The attention is accented in the interaction of participants within the ecosystem and in terms of their associations. These participants include small and large business, universities, research institutes, state, investors, enterprises. The main structural units of the IEC (innovative ideas, innovative culture, electronic environment, innovative infrastructure) and their interaction on the basis of network theory were also considered. Double network interactions were considered: scientific and educational networks, scientific-production and educational and business networks. The need for the development of the IEC and an innovative cluster as the most effective catalyst for the global integration and competitiveness of any business structure is proved. The most authoritative scientists from all over the world believe that the territories that innovate clusters are created are becoming progressive leaders of the economic system and scientific development, it is easier to overcome the problems that occur in the external environment, and the budget system is faster replenished by efficiently working network systems. Such regions increase the competitiveness of the national economy. Due to the synergy of the subjects of the IEC and the functioning of innovative clusters, a certain ecosystem is created, which specifies the direction of development of all sectors of the economy. On the territory of our state there is a need for a favorable innovation ecosystem through the development of scientific and educational, scientific-production and educational and business networks. It is also necessary to develop a clustering process, interaction based on "open innovation" and forms of a network system, which in turn affects the competitiveness of the region, industry, specific enterprise or in general.

**Keywords:** Innovative ecosystem; open innovation; network system; innovative cluster; Clustering

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**СУТНІСТЬ ІННОВАЦІЙНОЇ ЕКОСИСТЕМИ В СУЧАСНИХ УМОВАХ**

У статті проаналізовано економічну сутність інноваційної екосистеми (ІЕС), її характерні ознаки та суб'єкти. Досліджено інструменти, які використовуються для дослідження ІЕС, а саме теорію мереж. Проаналізовано поняття, які пов'язані з створенням інноваційного кластера та кластеризацією. Акцентовано увагу на взаємодії учасників всередині екосистеми та на видах їх об'єднань. До цих учасників можна віднести малий і великий бізнес, університети, дослідницькі інститути, державу, інвестори, підприємства. Також було розглянуто основні структурні одиниці ІЕС (інноваційні ідеї, інноваційна культура, електронне середовище, інноваційна інфраструктура) та їх взаємодію на основі теорії мереж. Було розглянуто подвійні мережеві взаємодії: науково-освітні мережі, науково-виробничі та освітньо-бізнесові мережі. Доведено необхідність розвитку ІЕС та інноваційного кластера, як найбільш ефективного каталізатора глобальної інтеграції та конкурентоспроможності будь-якої бізнес структури. Найавторитетніші вчені з усього світу вважають, що території, на яких створюються інноваційні кластери, стають прогресивними лідерами економічної системи та наукового розвитку, легше долають негаразди, які відбуваються у зовнішньому середовищі, а бюджетна система швидше поповнюється за рахунок ефективно працюючих мережевих систем. Такі регіони підвищують конкурентоспроможність національної економіки. Завдяки синергії суб'єктів ІЕС та функціонуванням інноваційних кластерів створюється певна екосистема, яка задає напрямок розвитку всіх секторів економіки. На території нашої держави існує необхідність в створенні сприятливої інноваційної екосистеми шляхом розвитку науково-освітніх, науково-виробничих та освітньо-бізнесових мереж. Також потрібен розвиток процесу кластеризації, взаємодії на основі «відкритих інновацій» та форм мережевої системи, що в свою чергу впливає на конкурентоспроможність регіону, галузі, конкретного підприємства або в цілому держави.

**Ключові слова:** інноваційна екосистема; відкриті інновації; система мереж; інноваційний кластер; кластеризація

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**СУЩНОСТЬ ИННОВАЦИОННОЙ ЭКОСИСТЕМЫ В СОВРЕМЕННЫХ УСЛОВИЯХ**

В статье проанализировано экономическую сущность инновационной экосистемы (ИЭС), ее характерные признаки и субъекты. Исследованы инструменты, которые используются для исследования ИЭС, а именно теорию сетей. Проанализированы понятия, связанные с созданием инновационного кластера и кластеризацией. Акцентировано внимание на взаимодействии участников внутри экосистемы и на видах их объединений. К этим участникам можно отнести малый и крупный бизнес, университеты, исследовательские институты, государство, инвесторы, предприятия. Также были рассмотрены основные структурные единицы ИЭС (инновационные идеи, инновационная культура, электронная среда, инновационная инфраструктура) и их взаимодействие на основе теории сетей. Были рассмотрены двойные сетевые взаимодействия: научно-образовательные сети, научно-производственные и образовательно-производственные сети. Доказана необходимость развития ИЭС и инновационного кластера, как наиболее эффективного каталізатора глобальной интеграции и конкурентоспособности любой бизнес структуры. Авторитетные ученые со всего мира считают, что территории, на которых создаются инновационные кластеры, становятся прогрессивными лидерами экономической системы и научного развития, легче преодолевают трудности, которые происходят во внешней среде, а бюджетная система быстрее пополняется за счет эффективно работающих сетевых систем. Такие регионы повышают конкурентоспособность национальной экономики. Благодаря синергии субъектов ИЭС и функционированию инновационных кластеров создается определенная экосистема, которая задает направление развития всех секторов экономики. На территории нашего государства существует необходимость в создании благоприятной инновационной экосистемы путем развития научно-образовательных, научно-производственных и образовательно-бизнес сетей. Также необходимо развитие процесса кластеризации, взаимодействия на основе «открытых инноваций» и форм сетевой системы, что в свою очередь влияет на конкурентоспособность региона, отрасли, конкретного предприятия или в целом государства.

**Ключевые слова:** инновационная экосистема; открытые инновации; система сетей; инновационный кластер; кластеризация.

**Introduction.** Analyzing the dynamics of economic development and competitiveness in the context of globalization, it can be noted that it does not do without such concepts as "innovation", "innovation ecosystem", "innovation cluster". If we look at the experience of the

world's leading countries, we will see that a favorable innovation ecosystem is a strategic factor for success in the world market. An innovative ecosystem can provide both a positive economic and social effect in the long run. The development of sustainable competitiveness is inextricably

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linked with the creation and development of an innovative ecosystem in all sectors of the economy. This leads to an increase in the concentration of attention in the study of innovative ecosystems, the structure and methods of their study.

**Analyze the question.** Development of the national economy and raising its competitiveness in the long run is inextricably related to the development and development of innovations in all sectors of the economy. This process is characterized by the interaction of the state, business and higher educational establishments. On the territory of Ukraine there is a need for a favorable innovation ecosystem and clustering.

**The purpose of article.** The purpose of this article is to text the theoretical and practical basics formation of an innovative ecosystem and the interaction of its participants.

**Analysis of basic achievements and literature.** Theoretical and applied principles of the procedure for the formation of innovative clusters thoroughly investigated such domestic and foreign scientists, as: L. Antonyuk, I. Kuxa, V. Tribushna, R. Agarwal, D. Oberts and M. Sarkar and others.

These scientists made a significant contribution to the study and systematization of such a phenomenon as an "innovative ecosystem".

**The statement of the main research material.** In recent years, scientists have increasingly used the term "innovation ecosystem" (IES) in economics. It should be noted that the innovation ecosystem is a type of innovation system. In general, if we compare different types of innovation systems, the phenomenon of innovation system is actively studied in the cognitive stage. This can be explained by the increasing use of the evolutionary approach in the analysis of economic phenomena and processes. Also, ecosystems in nature and in the economy can be compared according to the scheme of their development and structure. Because similarly to natural ecosystems in the economy there is an interaction and constant connection between their components.

It is believed that the concept of "ecosystem" was borrowed from biology. The concept of "ecosystem" was introduced in 1935 by the English botanist A. Tensley, and certain statements about the unity of organisms and the environment appeared earlier in the works of German scientist K. Moebius, American biologist S. Forbes, Russian scientists V.V. Dokuchaev, G. F. Morozova, V. N. Sukacheva [1].

For a deeper understanding of the mechanism of formation and functioning of ecosystems in the economy, it is necessary to analyze different interpretations of this concept.

Ecosystem - (from the Greek. Oikos - housing, habitat and system) the only natural complex formed by living organisms and their habitat (atmosphere, soil, water, etc.), in which living and backward components are interconnected by metabolism and energy [2].

Ecosystem - any unit (biosystem) that includes all co-functioning organisms (biotic community) in this area and interacts with the physical environment so that the flow of energy creates clearly defined biotic structures and the cycle of substances between living and non-living parts that make up the ecological system, or ecosystem [2].

But in economics, the concept of "ecosystem" is revealed through processes such as innovation and productive relationships between ecosystem participants. There are

different approaches to the systematization of this concept (Table 1).

Table 1 – Different interpretations of the concept of "innovation ecosystem"

№ п/п	Interpretation	Author, scientific works
1	Ecosystem - network community, whose members combine their resources on mutually beneficial principles for the sake of joint achievement of innovative results.	M. Chessell. Innovation Ecosystems — an IBM Academy of Technology study. IBM, May 2008 [3]
2	The ecosystem is a dynamic and adaptive organism that creates, consumes and transform knowledge into innovative products.	T. Munro. Triple Helix Newsletter. Triple Helix Association, Stanford. – 2012. – № 1. – С.12-15 [4]
3	Ecosystem - between organizational interactions, spatial localization, availability of general infrastructure, resource interdependence of participants, mutuality of goals and values.	Mynyna V. N. Yntehratyvnyi kompleks kak form setevoho vzaymodeistviya nauky, obrazovaniya y byznesa / V. N. Mynyna, N. V. Basov, Y. D. Demydova // Zhurnal sotsyolohyy y sotsyalnoi antropolohyy. — 2012. — № 5, t. XV. [5]
4	Innovative ecosystem is territorial co-covers aimed at collective action in creating knowledge flows, support for technological development and commercialization of innovations.	Washington Economic Development Commission Strategy 2009; World Economic Forum. Global Competitiveness Index [6,7]
5	Innovative ecosystem is a new organizational integrity and means of production of innovation in the XXI century.	Smorodynskaia N. Setevue ynnovatsyonue ekosystemu y ykh rol v dynamyzatsyy ekonomycheskoho rosta / N. Smorodynskaia // Ynnovatsyy. — 2014. — № 7 (189). — S. 27–33 [8]

Referring to all the previous definitions, we can conclude that IEC is a platform for promoting innovation in the market, using the synergy of their participants. These participants include small and large businesses, universities, research institutes, the state, investors, businesses. An innovative ecosystem allows you to cooperate to create innovations.

The following components can be called a characteristic feature of IEC: innovative ideas, innovative culture, electronic environment and innovative infrastructure (Picture 1).

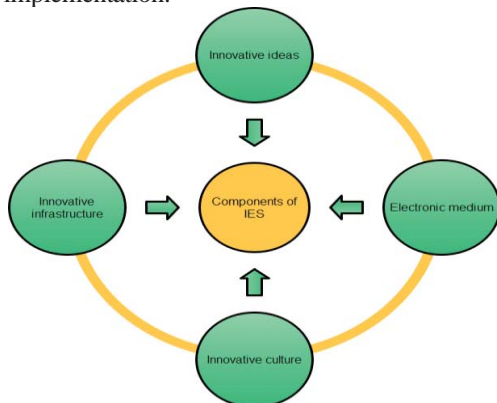
An innovative idea is the core of this system. Because only thanks to the idea we can form a full-fledged innovative economic system.

Innovative culture forms the value orientation of society to create and implement innovations and is enshrined in knowledge, skills and norms of behavior. This in turn is a socio-cultural mechanism that regulates innovative behavior of people. Favorable innovation culture allows to overcome difficulties in creating and implementing innovative ideas and projects.

Due to evolutionary changes in information and communication technologies, the electronic environment (Internet) comes to the fore.

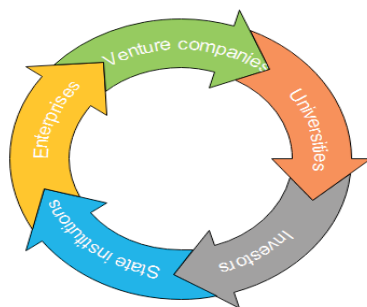
Innovation infrastructure brings together interconnected and interacting organizations for effective innovation. The

organizations include: firms, investors, educational institutions, government agencies. They cover the entire cycle of innovation, namely from the creation of an innovative idea to its implementation.



Picture 1 – Innovative ecosystem components

The tools used in the study of IEC include network theory. This model assumes the interaction of all IEC entities. It consists of the following participants: universities, venture companies, entrepreneurs, government agencies and others (Picture 2). The components of the ecosystem interact with each other through the use of information technology, the creation of innovative ideas, the dissemination of new knowledge.



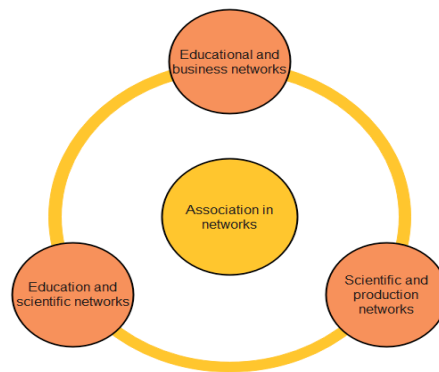
Picture 2 - Interaction of all subjects of IES

There are also dual associations in these networks. For example, there are research and education networks, research and production networks and educational and business networks (Picture 3).

Scientific and educational networks are formed on the basis of universities in cooperation with other educational institutions. They can have regional or international ties, public or private status.

Research and production networks are typical of multinational corporations. That is, the whole innovation process is controlled by the latter.

Educational and business networks exist on the basis of universities and leading innovative companies and are controlled by the state. Universities are the core of innovation here, companies play the role of customers of high-tech innovations, and the state - the regulator of relations between them, provides support and resources.



Picture 3 - Double associations in networks

At the present stage, the most common organizational forms of innovation are regional and national clusters, in which certain innovation ecosystems are formed. The cluster approach is widely used for effective organization of the innovation process through cooperation and networks of universities, enterprises and various organizations. This makes it possible to create "open innovations". The term "open innovation" was introduced into scientific circulation by Henry Chesbro in the book "Open Innovation. A new way of creating and using technologies" (2003) [1]. That is, to create and promote new ideas in a network consisting of economic and scientific entities that interact with each other. They help to remove barriers to the transformation of ideas into a product or new technology, and maximize the benefits of collaboration and globalization in the ecosystem.

Basic principles of open innovations:

- use of external knowledge;
- the priority is to create a sustainable business model than to achieve market leadership;
- active use of both internal and external ideas.

An innovation cluster is a network of organizations and enterprises that are bound by certain agreements, a form of network interaction. The development of an innovation cluster can contribute to the competitiveness of a region, industry, specific enterprise or country. This is due to certain positive features of the cluster approach, namely: partnerships within the network and open and fast ways of transmitting information and important knowledge. Clusters also have a synergistic effect. This means that revenue from sharing resources and ideas will exceed the amount of revenue from individual use of resources. The factors that form the innovation cluster have different origins, but the most important ones are shown in picture 4.



Picture 4 - Main factors for forming an innovative cluster

An important component of an innovation cluster is its detailed analysis and objective evaluation. Careful analysis allows to determine the location of the cluster, its features, the role of each participant, competitiveness.

Thus, we can conclude that innovation clusters are the most effective way of global integration of financial, productive and intellectual capital.

The dynamism of international competition and globalization have given rise to a modern type of economic cooperation - open innovation in the innovation ecosystem. The creation of innovations in open markets encourages primarily the shortening of the life cycle of goods and global competition. Another feature of the innovation ecosystem and clustering is that it has no geographical location. That is, an innovative idea can arise anywhere, and is implemented using the synergy of the participants of the innovation project.

**Conclusions.** Analyzing the concept of "innovation ecosystem" it becomes clear that the phenomenon of this manifestation is not yet sufficiently studied and is in the process of development. But scientists are actively exploring the interaction of all IEC participants through network theory, open innovation and a cluster approach.

This paper presents different views on the definition of "innovative ecosystem". But based on these interpretations, we can conclude that IEC is a platform for promoting innovation in the market, using the synergy of their participants. These participants include small and large businesses, universities, research institutes, the state, investors, businesses. The main structural units of IEC (innovative ideas, innovative culture, electronic environment, innovative infrastructure) and their interaction based on network theory were also considered. Dual network interactions were considered: research and education networks, research and production and educational and business networks. Concepts such as cluster approach and "open innovations", their factors of formation, features and positive effects on the state of the innovation ecosystem were studied.

On the territory of Ukraine there is a need to create a favorable innovation ecosystem through the development of scientific and educational, research and production and educational and business networks. It will increase the competitiveness of the region, industry, enterprise or the state as a whole.

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