REVIEW ARTICLES

ECONOMICS AND MANAGEMENT

UDC 330.341.1:004.08:005.511
DOI: 10.56378/MOZS20231805

Oleksandra MANDYCH
Doctor of Sciences (in Economics), Professor, Professor of Finance, Banking and Insurance Department of State Biotechnological University, 44, Alchevskii St., Kharkiv, 61002, Ukraine (ol.mandych@gmail.com)

ORCID: 0000-0002-4375-22-08

Svitlana ZAIKA
PhD (in Economics), Professor, Professor of Management, Business and Administration Department of State Biotechnological University, 44, Alchevskii St., Kharkiv, 61002, Ukraine (zaika.svitlana1975@gmail.com)

ORCID: 0000-0001-8132-7643

Olena ZAIKA
Assistant of Marketing, Reputation and Customer Experience Management Department of State Biotechnological University, 44, Alchevskii St., Kharkiv, 61002, Ukraine (alyona.zayika1998@gmail.com)

ORCID: 0000-0002-7921-3273

Olena ZHYLIAKOVA
PhD (in Economics), Associate Professor, Associate Professor of Finance, Banking and Insurance Department of State Biotechnological University, 44, Alchevskii St., Kharkiv, 61002, Ukraine (ovz1913@gmail.com)

ORCID: 0000-0003-4580-1752

Oksana BLYZNIUK
PhD (in Economics), Associate Professor, Associate Professor of Finance, Banking and Insurance Department of State Biotechnological University, 44, Alchevskii St., Kharkiv, 61002, Ukraine (bliznukoksanap@gmail.com)

ORCID: 0000-0003-1321-1563

Bibliographic Description of the Article: Mandych, O., Zaika, S., Zaika, O., Zhyliakova, O., Blyzniuk, O. (2023). Risk management of innovation activities in the digital ecosystem. *Innovations in scientific, technical and social ecosystems [Scientific journal], 6,* pp. 24−45. doi: 10.56378/MOZS20231805

RISK MANAGEMENT OF INNOVATION ACTIVITIES IN THE DIGITAL ECOSYSTEM

Abstract. The Purpose of the Study *is to elaborate the content of the research categories in the field of innovation ecosystem development, to identify the features of creating network ecosystems according to various possible classification criteria, to form directions and models of risk-oriented management and digital adaptation for innovative ecosystems, and to outline the prospects for managing the risks of innovative activities of the digital ecosystem.* ***The Research Methodology.****is based on the existing theoretical results in the field of innovation management, risk management, and areas of digital transformation of ecosystems. The study uses a dialectical approach, system analysis, methods of strategic management, and modeling.* ***The scientific Novelty*** *lies in the formation of a model of risk management in the innovation ecosystem, which includes procedures for strategic analysis and strategic management, is the basis for the innovative development of the organization and is aimed at preventing risks and minimizing losses associated with the use of innovations.* ***The Conclusions.*** *Innovation ecosystems are self-organized structures that have stable relationships between individual participants, aimed at forming a flexible, adaptive environment. The innovative development of ecosystems facilitates the process from the birth of an idea to the development, commercialization, implementation, and support of various types of innovations. The study of the architecture of innovation ecosystems and key participants in different network systems confirms species diversity, differences in coverage, and interaction models. Identification of innovation ecosystems using a risk-based approach ensures the continuity of the processes of identifying existing risks, and their mitigation through the involvement of strategic management, and the use of monitoring tools, allowing updating the ecosystem architecture, identifying weaknesses, and implementing*

updated and improved models. The creation of adapted models for ecosystems in the context of digital adaptation outlines the prospects for the development of innovative digital ecosystems to the basic strategies of market behavior based on risk-oriented management.

Keywords: *innovation development, ecosystem, risk management, digital transformation, strategic management, adaptation, market activity.*

Мета дослідження *полягає в опрацюванні змістовного наповнення категорій дослідження в площині інноваційного розвитку екосистем, виявленні особливостей створення мережевих екосистем за різними можливими класифікаційними ознаками, формуванні напрямів й моделей ризик орієнтованого управління та цифрової адаптації для інноваційних екосистем, а також окресленні перспектив управління ризиками інноваційної діяльності цифрової екосистеми.* ***Методологія дослідження*** *ґрунтується на існуючих теоретичних результатах у сфері управління інноваціями, ризик-менеджменту та напрямів цифрової трансформації екосистем. У процесі дослідження використано діалектичний підхід, системний аналіз, методи стратегічного управління, моделювання.* ***Наукова новизна*** *полягає у формуванні моделі управління ризиками в інноваційній екосистемі, яка включає процедури стратегічного аналізу та стратегічного управління, є базисом інноваційного розвитку організації та спрямовується на запобігання ризиків і мінімізацію втрат, пов'язаних із використанням новацій.* ***Висновки.*** *Інноваційні екосистеми є самоорганізованими структурами, що мають стійкі взаємозв'язки між окремими учасниками, спрямовані на формування гнучкого, адаптивного середовища. Інноваційний розвиток екосистем сприяє реалізації процесу від народження ідеї до розробки, комерціалізації, впровадження та супроводу різних видів інновацій. Дослідження архітектури інноваційних екосистем та основних учасників в різних мережевих системах підтверджує видову різноманітність, розбіжності у площині охоплення та моделей взаємодії. Ідентифікація інноваційних екосистем з використанням ризик орієнтованого підходу забезпечує безперервність процесів визначення наявних ризиків, їх нівелювання за допомогою залучення стратегічного управління, а також через залучення моніторингових інструментів дозволяє оновлювати архітектуру екосистеми, виявляти слабкі позиції та імплементувати оновлені покращені моделі. Створення адаптованих моделей для екосистем в умовах цифрової адаптації окреслюють перспективи розвитку інноваційних цифрових екосистем до базових стратегій ринкової поведінки на засадах ризик орієнтованого управління.*

Ключові слова: *інноваційний розвиток, екосистема, управління ризиками, цифрова трансформація, стратегічне управління, адаптація, ринкова активність.*

The Problem Statement. An important factor in innovative development is the transformation of science and technology. This is accompanied by several challenges that generate risks. Their complexity and scale go beyond simple resolution and elimination. Risks are

becoming a significant obstacle to long-term innovation development. They can lead to the devaluation of domestic investment in science and technology. They can also reduce a country's global competitiveness. At the same time, risks are threats and challenges to digital ecosystem factors and the emergence of new opportunities and prospects for breakthrough innovation development.

With the development of the digital economy, many countries have developed digital strategies and action plans. They are aimed at realizing development opportunities. This development focuses on using digital end-to-end technologies, such as artificial intelligence technologies, big data analysis and storage, distributed ledger or the Internet of Things, and managing risks associated with digital transformation. In the context of creating competitive developments in the global market, it is necessary to develop a comprehensive and holistic approach in Ukraine, which would ensure risk management of the innovation activities of the digital ecosystem.

The Analysis of Sources and Recent Research. Currently, there is a significant amount of research devoted to the study of risks. Many theoretical and practical issues of risk management were solved in the works of domestic scientists: Gerasimenko O., Zachosova N. (Herasymenko & Zachosova, 2019), Vasilyshyn S. (Vasylishyn, 2019), Zanora V. (Zanora, Zachosova, 2020), Belyachenko V., Bobrov S., Utyushev M. (Belyachenko et al.,2020), Bondarenko S., Bodenchuk L., Krynytska O. (Bondarenko et al., 2019) and others, as well as some foreign scientists: Shakya S., Smys S. (Shakya & Smys, 2021), Durst S., Hinteregger C., Zieba M. (Durst et al., (2019).) and others.

The theoretical aspects of the risk management of innovative activities were formed by scientists in the works: Sakevych L. (Sakevych, 2018), Mandiathra P., Duffield C., Razelan, Ismail (Mandiartha et al., 2017), Babenko T. (Babenko, 2012), Stone J., Keating N. (Stone & Keating, 2010), Kadareja A. (Kadareja, 2023), Starostina A., Kravchenko V. (Starostina & Kravchenko, 2018), Bugas V., Stepanova I., Skrypka A. (Buhas et al., 2019), Parizkyi I. (Paryzkyi, 2017), Chelovan S. (Chelovan, 2020) and others. The works of scientists are devoted to the study of the development of innovative ecosystems: Moore J. (Moore, 1993), Granstrand O. (Granstrand, 2000),

Bramwell A. (Bramwell et al., 2012), Fedulova L., Marchenko O. (Fedulova & Marchenko, 2015), Adner R. (Adner, 2006) , Jackson D. (Jackson, 2011) and others.

A significant amount of research in the late 20th century was devoted to the study of systemic properties of innovation. However, these studies presented innovation systems, both at the national and regional levels, as static structures. Such structures were created on a top-down basis, and their object composition and even economic relations were built depending on the regulatory influence of the state (Malerba et al., 2004).

In more recent studies, innovation ecosystems have acquired the properties of dynamism and flexibility, as well as the ability to self-organize, which are considered necessary qualities for the implementation of modern innovations.

However, the formation of the conceptual framework for the development of innovation ecosystems in their economic perception is associated with the persistence of differences in views on the combination of the terminology "eco" and "system". Some authors believe that the innovation ecosystem is an analogy that is inappropriate to use in comparison with natural ecosystems.

The term “ecosystem” was first used in an article for the Harvard Business Review by J. Moore in the 1990s. J. Moore argued that companies do not develop in a ”vacuum“, and proposed a term that, in his opinion, defines the environment in which companies interact with suppliers, customers, investors, and financial institutions (Moore, 1993). The essence of the corporate innovation ecosystem as an economic category has many interpretations in the world of scientific literature. For example, Granstrand O. defines the corporate innovation ecosystem as a set of actors, resources, and institutions, as well as cause-and-effect relationships that play an important role in the innovative productivity of corporations (Granstrand, 2000).

According to Bramwell A., the innovation ecosystem is a dynamic set of organizations and institutions, a mobile set of multidimensional internal relations (Bramwell et al., 2012).

Fedulova L. and Marchenko O. in their work define the innovation ecosystem as a set of organizational, structural, and functional

institutions and their interrelationships involved in the process of creating and applying scientific knowledge and technologies. It determines the legal, economic, organizational, and social conditions of the innovation process and ensures the development of innovation activities at the enterprise level, as well as at the level of the region and the country as a whole on the principles of self-organization (Fedulova & Marchenko, 2015).

Ander R. y describes innovation ecosystems as forms of cooperation in which companies combine their offers into integrated solutions ready to satisfy the consumer (Adner, 2006).

According to Jackson, an innovation ecosystem is a complex relationship formed between entities or organizations whose functional purpose is to promote technology and innovation (Jackson, 2011).

Research by some scholars has revealed a wide range of related terms used in the economic literature to describe network interactions in the innovation environment. These include business ecosystems, software ecosystems, digital business ecosystems, entrepreneurial ecosystems, knowledge ecosystems, and even startup ecosystems. This fact confirms that in modern economic science, there is no single approach to the content of the category "innovation ecosystem".

The systematization of the works of these scholars and researchers has revealed the need to clarify the theoretical and methodological provisions that reveal the features and prospects of risk management of innovation activities of the digital ecosystem.

The Purpose of the Article is to elaborate on the content of the key categories of research in the field of innovation ecosystem development, to identify the features of creating network ecosystems according to various possible classification criteria, to form directions and models of risk-oriented management and digital adaptation for innovative ecosystems, and to outline the prospects for risk management of innovation activities of a digital ecosystem.

The Research Methods. The theoretical and methodological basis of the study is the works of domestic and foreign scientists on the problems of risk management of innovative development and digital transformation. The research methodology is based on the existing theoretical results in the field of innovation management, risk

management, and areas of digital transformation of ecosystems. The study used a dialectical approach, system analysis, and modeling. system analysis, methods of strategic management, and modeling.

The methods used are based on the existing scientific results of scientists in the field of theoretical substantiation and content of the categories of innovative development, functioning of ecosystems in different conditions, generalization of approaches to the formation of innovative ecosystems, as well as the formation of procedures, grouping by various classification criteria, development of risk management models and search for development prospects in the context of digital adaptation.

The Main Material Statement. The idea of economic system transformation is based on the influence of technical and technological factors. It developed in the industrial era and has been described and studied by many domestic and foreign scholars.

It is most appropriate to define an innovation ecosystem as a self-organized structure. This structure has stable links between its participants and is aimed at creating a flexible, adaptive environment that facilitates the process from the inception of an idea to its development, commercialization, implementation, and support.

This definition makes it possible to present the innovation ecosystem in terms of the network aspect of its development. The complexity of global economic relations, the nonlinearity of economic development, and structural shifts make it necessary to study the principles of modern organizational culture from the perspective of a network approach. Responding rapidly to environmental factors, modern ecosystems complicate the mechanisms of their organization, becoming more flexible and adaptive.

Therefore, the ecosystem forms cooperation, connections between environmental agents, critical and creative thinking, flexibility, and diversity (Fig. 1).

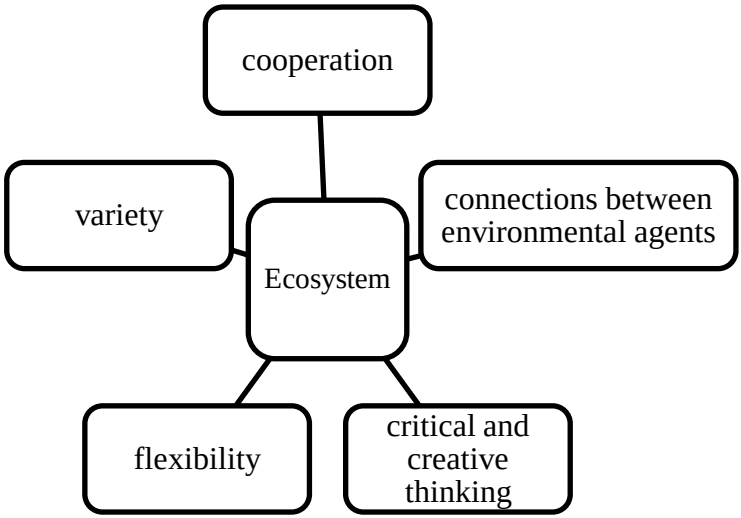

Figure 1. **Properties of the innovation ecosystem**

The species diversity of ecosystems is related to the fact that they can have a different number of participants, the scale of coverage, architecture, and models of cooperation. An innovation ecosystem can be global or transnational, in the form of a national networking community or a regional innovation center, or a local highly specialized community of innovators. Their growing prevalence is explained by the fact that innovative products and technologies will be created jointly through networking, forming relatively sustainable ecosystems (Fedulova & Marchenko, 2015; Adner, 2006). An important property of an innovation system is its self-organization. This property is another reason to compare it to an ecological, natural system. The need for it arises from the participants' shared vision of the results of the process, as well as their common desire to implement business ideas.

The innovative nature of the modern networked economic system is associated with the non-linear nature of its development, which is another argument that allows us to add the prefix “eco” to such a system. Innovation ecosystems are complex and dynamically developing structures, and therefore they are characterized by flexibility, self-

organization, and adaptation.

High-tech companies such as Apple, Ford, and Intel are considered leaders in the development of innovation ecosystems. They invest in their ecosystems, contributing to the development of faster, more creative, innovative skills among other system participants (suppliers, customers). However, ecosystem strategies are also being actively applied in industries such as financial services, trade, and logistics.

Innovation ecosystems allow firms to create value that no single firm could have created on its own. In general, the architecture of an innovation ecosystem includes corporate partners, research institutes, and leading universities, as well as specialized government agencies. A core company that plays a central role in innovation is valued by the rest of the ecosystem, serving as the nucleus. Other actors forming the periphery can leverage the capabilities of the ecosystem. For example, these may be services, tools, or technologies to improve their innovation performance and also to add value to the ecosystem by providing new applications and complementary products (Fig. 2). In this context, the network of customers, suppliers, intermediaries, financial institutions, research institutes, universities, and even competitors constitute the innovation ecosystem that supports the innovation activities of the central innovation enterprise.

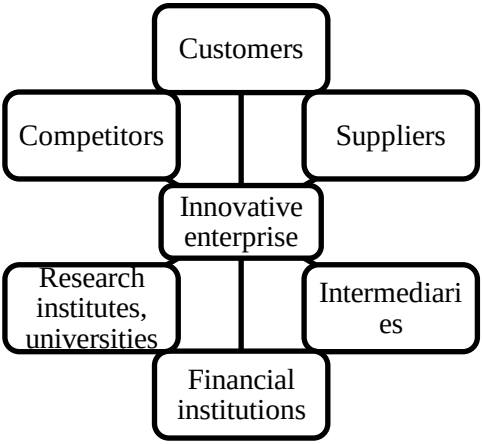

Figure 2. Scheme of the innovation ecosystem

Most researchers believe that innovation ecosystems emerge or are created around a central hub. Key players can be connected either by a technological platform or a set of social or economic conditions.

The rapid development of digital technologies has led to the emergence of a new form of networking - digital platforms. Platforms create value by coordinating transactions between groups of consumers whose interaction would not be possible without the existence of a digital platform.

As a networked form of business organization, a digital platform has a much larger scale and brings together a huge number of participants, which allows it to meet the wishes and needs of customers. The specifics of a platform such as Alibaba allow for online sales in a low-trust environment, allowing the buyer to make deferred payments. Digital business rules embedded in platforms create obligations for participants, the violation of which may be accompanied by sanctions.

An innovation platform accumulates innovative resources, including technological, information, financial resources, and specific services in the areas of law, marketing, and distribution channels. The platform serves as a link between core businesses and research and innovation firms.

The business strategy of a platform differs from the traditional rules adopted in an industrial economy. The costs of developing the platform and software are fixed costs. As the platform's content is promoted and user groups are formed, the marginal cost of adding new members decreases significantly. Therefore, the economies of scale and the speed of platform expansion are important. This encourages market participants to aggressively capture the market, sometimes at a considerable cost, when prices for services are set below the cost of production.

Researchers in this area argue that platforms can connect networks and coordinate users not only as consumers but also as suppliers, thereby helping businesses achieve network economies of scale and combinatorial innovation. Significant value can be added through cheap and fast combinations of existing basic elements. An example of this is the Google Play Store and Apple App Store platforms.

Innovations vary in nature, scale, or degree of novelty. Companies take risks associated with developing and commercializing new products

and technologies. The ability to identify risks and control their possible occurrence is considered important in the implementation of innovation activities. To survive, modern companies must innovate at a pace that exceeds the capabilities of their competitors, which means that the level of risk is increasing.

Considerable attention is paid to the study of the category of economic risks. Risk in the general sense means the probability of an uncertain event and its consequences.

Any factor that affects the company's operations may be a source of risk. Risk arises when there is an uncertain and significant impact on the organization's performance.

The implementation of the risk management strategy of the innovation ecosystem participants is seen in the implementation of two groups of measures. The first group of measures - risk assessment - involves actions related to the identification and analysis of risk sources, their localization, and prospects for spread. The second group of measures is directly related to making management decisions to reduce risks to an acceptable level or eliminate them.

A study of sources on risk management has revealed that there is no established classification of risks. However, risks can be conditionally grouped into blocks:

− information (threats: cyber threats, threats with violation of information availability, threats with violation of information integrity, threats with complex impact on information, unauthorized access, disruption of logistics, violation of information confidentiality, unauthorized sending of data on behalf of another user) information leakage, malware, deficiencies in software development, errors in software configuration, the unauthorized introduction of malware, unintentional actions of employees, and

− financial and economic (threats: bankruptcy of the entity, financial instability of the national economy, economic crisis, investment threats): currency risks, risk of financial imbalance of development, financial losses in the course of investment activities, untimely completion of design and construction works, loss of investment attractiveness of the project due to a possible decrease in its efficiency;

− production and technological (threats: industrial espionage,

dependence on imported equipment, underdeveloped infrastructure, the emergence of innovative technologies): deliberate actions that undermine the technological potential of the enterprise, errors and violations of technological discipline, obsolescence of the technologies used as a result of the emergence of new technologies;

− environmental (threats: natural disasters, natural force majeure): losses due to high levels of environmental fines and payments, loss of profits due to natural disasters;

− marketing (market) (threats: economic crisis, inflation, increase in energy prices): weakening of competitive positions, low ability to withstand competitive pressure, reduced adaptability of the company to changes in the market, lagging behind market requirements;

− political and legal (threats: changes in the legal framework, corruption): low legal protection of the company's interests, violation of the rights of the company and its employees, violation of patent law, risks associated with instability of the government (Durst et al., 2019; Stone & Keating, 2010; Kadareja, 2023) and others.

The classification of risks in the ecosystem should be considered at four levels:

− at the level of participants,

− micro-,

− meso-,

− macro levels.

Risks can be social, demographic, geopolitical, economic, financial, information, technological, and organizational, occur at all levels of the ecosystem, and pose varying degrees of threat to the target attitudes of participants and the sustainability of the ecosystem (Shakya & Smys, 2021; Starostina & Kravchenko, 2018; Babenko, 2012) and others.

These macro-level risks may arise as a result of global crises, such as trade wars, biological weapons, etc. The risk of political information isolation implies closing the national market to external cooperation, complicating interaction with foreign investors, developers, entrepreneurs, and the use of information.

Risks arising at the meso-level are industry-specific: agricultural, industrial, service sector risks, etc. Sectoral risks are driven by the stages of the industry's life cycle, the quantity, and quality of resources, the

degree of competition and concentration of production, the tax regime, etc.

The interaction of ecosystem actors includes economic security risks at the micro and macro levels. At the initial stage of ecosystem formation, the most destructive risk is the one associated with the problem of finding areas of common interest (selection of a pacesetter, partners), which jeopardizes the possibility of project implementation.

At the stage of defining roles and coordinating project work within the ecosystem, there are risks associated with psychological conflicts based on a lack of coherence. There is also a risk of unscrupulous behavior by a participant who may participate in the ecosystem to secure their interests. Over time, this can reduce the effectiveness of the relationship or lead to its breakdown.

Investment risks mean lost profits due to failure to receive the expected return on investment and loss of invested capital. Monopoly risks arise when one entity has a monopoly on a resource and, as a result, sets high prices that may be unfavorable to other entities.

Monopolistic risks relate to the actions of entities aimed at setting, as a rule, high prices to achieve their benefit, as they are a source of unique resources.

Behavioral risks are related to the typology of relationships established between partners as a result of the interaction. Identification includes, in particular, assessing the risks of transferring key competencies, such as intellectual property rights, to other parties to the cooperation.

In some projects, integration risks may arise when actors are included in the value chain. This risk is associated with the likelihood and consequences of ecosystem participants failing to fulfill their functional responsibilities on time or in full, which will subsequently lead to disruptions in the work of other participants in the supply chain.

A participant's exit can stop or slow down the process of project implementation in the digital ecosystem. It depends on the factor - which participant left the ecosystem for one reason or another.

If a participant that is a source of unique resources and knowledge has left the ecosystem, this will be a problem (threat) for other ecosystem businesses.

Risks arise at the level of participants that threaten the stability of the enterprise's economic security system. During the interaction between participants for the implementation of the project, a situation may arise such as “luring employees” from other participants − the risk of “headhunting”, which may subsequently violate the trusting relationship between ecosystem participants. The risk of information leakage is the unauthorized transfer of confidential information, which can be intentional or accidental. Any information stored on the company's servers has its value.

In the context of digitalization, the key issue is the security of information data and the lack of qualified management personnel (in planning, and implementing innovations, and the lack of a digital strategy). This leads to other threats to economic security that determine the stable functioning of an entity − production, finances, and information. The most common risks include any complexity of the participant's activities in the process of planning, implementation, and realization. Production and technological risks should be singled out separately, as they are key to the participant's functioning. Risks associated with problems in the production cycle include accidents, equipment breakdowns, depreciation of fixed assets, and technical safety violations due to a lack of qualified engineers and technologists. The participant's production, social, and information risks are most closely interrelated. For example, improper equipment settings can lead to a deterioration in product performance, ultimately negatively impacting demand and the company's reputation (Paryzkyi, 2017; Belyachenko et al., 2020; Vasylishyn, 2019) and others.

Scientists unanimously agree that effective management is essential to protect businesses from risks.

Risks and innovations are closely linked both analytically and empirically. At the same time, risk management is an ongoing process of dealing with the possibility and consequences of losses. Risk management is often described as a logical, continuous process divided into three stages: identifying risks, selecting an appropriate risk response strategy, and monitoring results.

It is proposed to manage risks in the innovation ecosystem according to the following model (Fig. 3).

A technological risk management strategy is a system of influences built on the goals of an organization's innovative development, aimed at preventing risks and minimizing losses associated with the use of technological innovations.

The application of the proposed risk management model allows an innovative organization to take into account the risks that are significant for it. It also allows for predicting their possible occurrence in the future and promptly making management decisions to eliminate the impact of internal and external factors on innovation development.

Management methods can be structured into methods of direct and indirect influence. While direct influence is the direct participation in the process of eliminating or minimizing the consequences of emerging crises, indirect influence is aimed at eliminating the preconditions for risks.

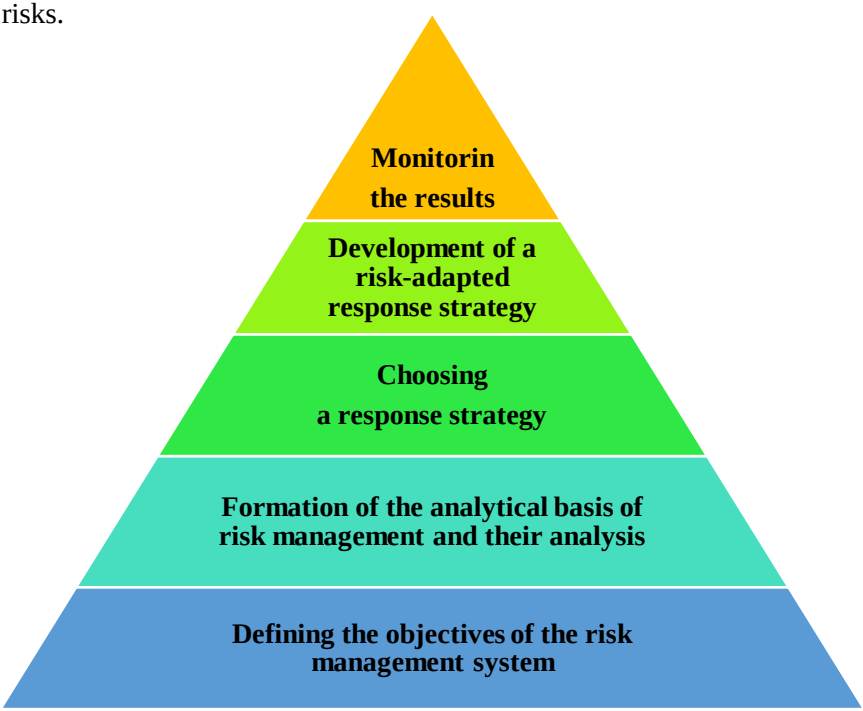

Figure 3. Model of risk management in the Innovation ecosystem

A central part of the risk management strategy is to determine the methods of risk management. Risk management is based on the use of the following strategies: risk reduction, risk distribution/transfer, risk prevention, and risk retention (Fig. 4).

Figure 4. Risk management strategies in the digital ecosystem

Risk reduction involves actions that reduce either the probability of a certain event occurring or the severity of its impact. Since interdependence risk refers to the probability that economic entities will be able to fulfill their obligations, measures to reduce the probability of these risks include efforts aimed at improving cooperation between economic entities.

One of the ways to overcome the risks faced by independent enterprises is to maintain a high level of flexibility in the implementation of innovative activities. Orientation to the future in the context of this factor is not considered a quick adaptation but an active desire for a possible future. The scanning of market opportunities is connected with the purposeful achievement of progress in the development of the company, the constant search for opportunities, and the readiness to change directions of activity taking into account market impulses. Instead of trying to reduce the risks of the chosen path, the innovator constantly explores different possibilities and develops some alternative paths. Thanks to active management and research of possible ways of development, the innovation process acquires leverage for the future. This process is associated with a locally oriented and adaptive view of risk, innovation, and the future. From this point of view, the innovator realizes that the existing evolution of the enterprise is only one of many ways in which this process can develop. And since the enterprise is oriented towards a flexible choice from many possible alternative options for the future, it is always ready to move quickly, choosing the appropriate direction, guided by internal preferences or external requirements.

From the point of view of the impact on innovation risk, the factor of creating and maintaining autonomy allows for solving the innovation dilemma. Research shows that too much or too little freedom tends to stifle innovation. Although companies are formally independent, they are usually under constant pressure from multiple stakeholders such as venture capitalists, owners, partners, and customers. Some innovators tend to actively look for a field in which they will have the opportunity to develop the enterprise according to their wishes (needs, ambitions). Such reliance on one's strength and resistance to external pressure can be considered a manifestation of entrepreneurial reflection. The above lays the foundations for risk assessment not only as an objective category that constantly exists in connection with the implementation of the innovation process. The conducted research allows us to approach the meaningful conceptualization of risks from the standpoint of their awareness by innovators.

In the digital ecosystem, it is important to understand and

simultaneously combine competitive and risk management strategies (Popelo et al., 2021; Tajudeen et al.. 2022; Brynjolfsson et al., 2021). The synergy of the defined models of strategic management and digital transformation is a key factor in the development of ecosystems and will allow us to fully level existing risks in conditions of uncertainty (Nandal et al., 2021; Skare & Soriano, 2021).

In the conditions of digitization, the key issue is the security of information data and threats to economic security.

The Conclusions. One of the trends in the modern development of the world economy is the deployment of globalization processes, while at the same time, innovative ecosystems are spreading in the global space. This allows more effective use of scientific, educational, and production potential by establishing an exchange of information, developments, technologies, and implementation of joint scientific projects and research.

Innovative ecosystems should be defined as self-organized structures that have stable relationships between individual participants, aimed at forming a flexible, adaptive environment that facilitates the implementation of the process from the birth of an idea to the development, commercialization, implementation, and support of various types of innovations. The architecture of the innovation ecosystem includes corporate partners, research institutes, and leading universities, as well as specialized government structures. The species diversity of ecosystems is related to the fact that they can have a different number of participants, the scale of territory coverage, architecture, and cooperation models.

The ability to identify risks and control their possible occurrence is considered important when implementing innovative activities. Ecosystem risk management is described as a logical continuous process: identifying risks, selecting an appropriate risk response strategy, and monitoring results. Companies assume the risks associated with developing and commercializing new products and technologies.

One of the areas of risk mitigation for the innovation ecosystem is the creation of an appropriate platform for interaction. The innovation platform for the ecosystem is a connecting link between specialized enterprises and research and innovation firms. The platform's business strategy differs from traditional rules. The innovative platform

accumulates innovative resources, including technological, informational, and financial resources and specific services in the field of law, marketing, creation of distribution channels, etc.

Further research seeks to involve modern digital adaptation strategies in innovative ecosystems. Digital transformation of business processes requires ecosystems to quickly respond to dynamic changes in market activity. Modeling of innovative development of ecosystems should be based on a risk-oriented approach.

References

Adner, R. (2006). Match your innovation strategy to your innovation ecosystem. *Harvard Business Review*. Vol. 84. Pp. 98–110. https://hbr.org/2006/04/match-your-innovation-strategy-to-your-innovation-ecosystem [in English]

Babenko, T. (2012). Upravlinnya ryzykamy innovatsiynoyi diyal′nosti na pidpryyemstvi [Risk management of innovative activities at the enterprise]. https://feu.kneu.edu.ua/ua/confere_nce/conf_social_dev_ukr_12/section1/tez13/ [in Ukrainian]

Belyachenko, V. V., Bobrov, S. V., & Utyushev, M. K. (2020). Upravlinnya ryzykamy stvorennya elementiv avtomatyzovanykh system upravlinnya [Risk management of creating elements of automated management systems]. *Zbirnyk naukovykh prats' Tsentru voyenno-stratehichnykh doslidzhen' NUOU imeni Ivana Chernyakhovs'koho, A collection of scientific works of the Center for Military and Strategic Studies of Ivan Chernyakhovsky National University.* Pp. 101–106. https://doi.org/10.33099/2304-2745/2020-3-70/101-106 [in Ukrainian]

Bramwell, A. et al. (2012). Growing Innovation Ecosystems: University-Industry Knowledge Transfer and Regional Economic Development in Canada. *The University of Toronto. Final Report*. http://sites.utoronto.ca/progris/presentations/pdfdoc/2012/Growing%20Innovation%20Ecosystems15MY12.pdf [in English].

Brynjolfsson E., Wang C., Zhang X. (2021). The economics and digitization: Eight questions for research. *MIS Quarterly*. 45(1), pp. 473–477. https://www.blog.mikezhang.com/files/8questions.pdf [in English]

Buhas, V. V., Stepanova, I. V., Skrypka, A. V. (2019). Upravlinnya ryzykamy innovatsiynoyi diyal′nosti pidpryyemstva: mizhnarodnyy dosvid [Risk management of innovative activity of the enterprise: international experience]. *Naukovo-vyrobnychyy zhurnal "Biznes-navihator", Scientific and industrial magazine "Business-navigator"*. Vol. 6 (55), pp. 52–57. http://business-navigator.ks.ua/journals/2019/55_2019/11.pdf [in Ukrainian]

Chelovan, S. (2020). Metody ta instrumenty upravlinnya ryzykamy pry zdiysnenni innovatsiynoyi diyal′nosti. doi: https://doi.org/10.15802/rtem.v0i3(19).210777 [Methods and tools of risk management in the implementation of innovative activities]. *Review of transport economics and management*, Vol. 3(19).

https://doi.org/10.15802/rtem.v0i3(19).210777 [in Ukrainian]

Durst, S., Hinteregger, C., & Zieba, M. (2019). The linkage between knowledge risk management and organizational performance. *Journal of Business Research*, Vol. 105, pp. 1−10. https://www.sciencedirect.com/science/article/abs/pii/S0148296319304618?via%3Dihub [in English].

Fedulova, L.I., Marchenko, O.S. (2015). Innovatsiyni ekosystemy: sutnist′ ta metodolohichni zasady formuvannya [Innovative ecosystems: essence and methodological principles of formation]. *Ekonomichna teoriya ta pravo, Economic theory and law*. № 2(21), pp. 21−33. http://econtlaw.nlu.edu.ua/wp-content/uploads/2015/11/2_21.pdf [in Ukrainian]

Granstrand, O. (2000). Corporate Innovation System: A Comparative Study of Multi-Technology Corporations in Japan, Sweden, and the USA. *Paper submitted to the Dynacom Project.* https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=c8e36b93ba064cd5fffc7527d4a579d9230d008e [in English]

Haivoronska, I., Bondarenko, S., Bodenchuk, L., Krynytska, O. (2019). Modeling instruments in risk management. *International Journal of Civil Engineering and Technology (IJCIET)*. Volume 10, Issue 01, pp. 1561−1568, Article ID: IJCIET_10_01_143. https://iaeme.com/Home/article_id/IJCIET_10_01_143 [in English]

Herasymenko, O. M., & Zachosova, N. V. (2019). Otsinka rivnya zrilosti upravlinnya ryzykamy v protsesi zabezpechennya ekonomichnoyi bezpeky pidpryyemstva: analitychne doslidzhennya [Evaluation of the maturity level of risk management in the process of ensuring the economic security of the enterprise: an analytical study]. *Visnyk Kyyivs'koho natsional'noho universytetu tekhnolohiy ta dyzaynu. Seriya Ekonomichni nauky, Bulletin of the Kyiv National University of Technology and Design. Economic sciences series.* Vol. 3 (135), pp. 66−81. https://doi.org/10.30857/2413-0117.2019.3.7 [in Ukrainian].

Jackson, D. J. (2011) What is an innovation ecosystem. *National Science Foundation, Arlington, VA.* https://erc-assoc.org/sites/default/files/topics/policy_studies/DJackson_Innovation%20Ecosystem_03-15-11.pdf [in English]

Kadareja, A. (2023). External Risks of Innovation Projects [Electronic resource]. https://innovationmanagement.se/2012/08/20/external-risks-of-innovation-projects/ [in English]

Malerba, F., ed. (2004). Sectoral Systems of Innovation: Concepts, Issues, and Analyses of Six Major Sectors in Europe. *Cambridge University Press*. https://www.cambridge.org/core/books/abs/sectoral-systems-of-innovation/sectoral-systems-concepts-and-issues/8F155632429B01F46C047F15241D1126 [in English]

Mandiartha, P., Duffield, C., Razelan, I.S.B.M., Ismail, A.B.H. (2017). Risk management, governance and financing issues in Public Private Partnerships – Transportation projects. *FGIC 1st Conference on Governance & Integrity, "Innovation & Sustainability Through Governance".* Malaysia, 2017, pp. 378−395. https://core.ac.uk/download/pdf/159194077.pdf [in English]

Moore, J. (1993). Predators and Prey: A New Ecology of Competition. *Harvard Business Review*. https://hbr.org/1993/05/predators-and-prey-a-new-ecology-of-competition [in English]

Nandal, N., Nandal, N., Mankotia, K., Jora, N. (2021). Investigating Digital Transactions in the Interest of a Sustainable Economy. *International Journal of Modern Agriculture*. № 10(1), pp. 1150–1162. http://www.modern-journals.com/index.php/ijma/article/view/1378 [in English]

Paryz′kyy, I. V. (2017). Innovatsiyno-tekhnolohichni osnovy upravlinnya ryzykamy konkurentospromozhnosti natsional′noyi ekonomiky [Innovative and technological bases of risk management of competitiveness of the national economy]. *Problemy systemnoho pidkhodu v ekonomitsi, Problems of the systemic approach in economics*. Vol. № 4(60), pp. 70−75. http://psae-jrnl.nau.in.ua/journal/4_60_2017_ukr/10.pdf [in Ukrainian]

Popelo O., Kychko I., Tulchynska S., Zhygalkevych Z., Treitiak O. (2021). The Impact of Digitalization on the Forms Change of Employment and the Labor Market in the Context of the Information Economy Development. *International Journal of Computer Science & Network Security*. № 21(5), pp. 160−167. http://paper.ijcsns.org/07_book/202105/20210523.pdf [in English]

Sakevych, L. S. (2018). Upravlinnya ryzykamy innovatsiynoyi diyal′nosti, orhanizovanoyi v mezhakh derzhavno-pryvatnoho partnerstva [Risk management of innovative activities organized within the framework of public-private partnership]. *Naukovyy visnyk Uzhhorods'koho natsional'noho universytet: Seriya: Mizhnarodni ekonomichni vidnosyny ta svitove hospodarstvo, Scientific bulletin of the Uzhgorod National University: Series: International economic relations and world economy*. Vol. 20, P. 2, pp. 185−189. http://visnyk-econom.uzhnu.uz.ua/archive/20_2_2018ua/41.pdf [in Ukrainian]

Shakya, S., & Smys, S. (2021). Big data analytics for improved risk management and customer segregation in banking applications. *Journal of ISMAC*, Vol. 3(3). Pp. 235−249. doi: https://doi.org/10.36548/jismac.2021.3.005 [in English]

Skare M., Soriano D. R. (2021). How globalization is changing digital technology adoption: An international perspective. *Journal of Innovation & Knowledge*. № 6(4), pp. 222−233. https://doi.org/10.1016/j.jik.2021.04.001 [in English]

Starostina, A.O., Kravchenko V.A. (2018). Ryzyk-menedzhment [Risk management]. Kyiv: Kondor. https://www.slideshare.net/vladimir_krav/ss-86353815 [in Ukrainian]

Stone, J., Keating, N. Innovation − a business risk that can be managed and mitigated. https://search.informit.org/doi/10.3316/informit.945331831152012 [in English]

Tajudeen F.P., Nadarajah D., Jaafar N.I., Sulaiman A. (2022). The impact of digitalisation vision and information technology on organisations' innovation. *European Journal of Innovation Management*. Vol. 25 No. 2, pp. 607−629. https://www.emerald.com/insight/content/doi/10.1108/EJIM-10-2020-0423/full/html [in English]

Vasylishyn, S. I. (2019). Ryzyky ekonomichnoyi bezpeky v systemi oblikovo-

analitychnoho zabezpechennya upravlinnya pidpryyemstvamy [Risks of economic security in the system of accounting and analytical support for enterprise management]. *Problemy systemnoho pidkhodu v ekonomitsi, Problems of the systemic approach in economics*. Vol. 3(2), pp. 178−183. https://doi.org/10.32782/2520-2200/2019-3-63 [in Ukrainian]

Zanora V. O., Zachosova N. V. (2020). Upravlinnya ryzykamy proyektiv rozvytku pidpryyemstva: teoretyko-metodychni zasady [Risk management of enterprise development projects: theoretical and methodological principles]. *Pryazovs'kyy ekonomichnyy visnyk, Pryazovsky Economic Bulletin.* Vol. 1(18), pp. 8−86. https://doi.org/10.32840/2522-4263/2020-1-15 [in Ukrainian]

The article was received 20/04/2023.
Article recommended for publishing 18/05/2023.