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MANUSCRIPT

JURISPRUDENCE

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THE COMPONENTS OF EFFECTIVE INVESTMENT POLICY OF UKRAINE

Abstract. ***The Purpose of the Study*** *is theoretical substantiation of the factors of efficiency of investment activities in Ukraine.* ***The Research Methodology****. To carry out the research, sources such as international acts, legislation of Ukraine and court practice were used. These sources became the empirical basis of the study. The goals of the research were achieved with the help of the used research methods (dialectical, autopoiesis method, structural-logical, formal-legal), as well as research techniques (analysis, synthesis, induction, deduction, etc.).* ***The Scientific Novelty*** *lies in the fact that this article is one of the first comprehensive studies of the prospects for the development of investment activities in Ukraine.* ***The conclusions****. After the full-scale attack of the Russian Federation in Ukraine, the popularity of social investments increased. Social investing also needs regulatory support, just like investing for profit. Factors ensuring the efficiency of investment activity in Ukraine have been determined, which include determination of investment areas; consideration of territorial capital; use of innovative technologies to attract investments; improvement of the legal mechanism that ensures the proper implementation of investment activities; protection of investors' rights.*

Key words*: legislation of Ukraine, investment, social investment, branding and crowdfunding platforms, territorial capital.*

СКЛАДОВІ ЕФЕКТИВНОЇ ІНВЕСТИЦІЙНОЇ ПОЛІТИКИ УКРАЇНИ

Анотація. ***Мета дослідження*** *теоретичне обґрунтування елементів, які впливають на ефективність інвестиційної діяльності в Україні.* ***Методологія дослідження****. Для здійснення дослідження використовувалися джерела такі, як міжнародні акти, законодавство України та судова практика. Ці джерела стали емпіричною базою дослідження. Мети дослідження вдалося досягти з допомогою використаних методів дослідження (діалектичного, методу автопоезису, структурно-логічного, формально-юридичного), а також прийомів дослідження (аналіз, синтез, індукція, дедукція тощо).* ***Наукова новизна*** *полягає у тому, що вказана стаття є одним із перших комплексних досліджень перспектив розвитку інвестиційної діяльності в Україні.* ***Висновки****. Після повномасштабного нападу Російської Федерації на Україну в Україні зросла популярність соціальних інвестицій. Соціальне інвестування потребує також нормативного забезпечення, як і інвестування з метою одержання прибутку. Визначено чинники забезпечення ефективності інвестиційної діяльності в Україні, до яких належать: визначення сфер інвестування; врахування територіального капіталу; використання*

інноваційних технологій для залучення інвестицій; удосконалення правового механізму, який забезпечує належне здійснення інвестиційної діяльності; захист прав інвесторів.

Ключові слова: *законодавство України, інвестиції, соціальне інвестування, франдайзингові та краудфандингові платформи, територіальний капітал.*

The Problem Statement. Attracting investments to Ukraine has always been a problematic issue. One of the important components of attracting investments to the Ukrainian economy is effective legal regulation. Since the restoration of the independence of the Ukrainian state (1991), the Ukrainian investment legislation has undergone numerous changes with the aim of attracting investments, removing obstacles in the sphere of investment, as well as protecting investments. These changes concerned not only foreign investments, but also national ones.

The state, which simultaneously acts as a rule-maker and a participant in investment relations, is obliged to simultaneously protect all subjects of investment activity from negative consequences. At the same time, excessive protection of one of the participants may lead to violation of the rights of others. At the same time, the state is an equal subject of these relations, which have a civil-legal, private nature.

After the full-scale attack of the Russian Federation on Ukraine and the task of significant destruction, all areas of the economy need to attract numerous investments already now. The development of new investment projects, the implementation of which is guaranteed by the state, as well as bringing the investment legislation of Ukraine into compliance with the legislation of the European Union, are necessary conditions for attracting national and foreign investments. Moreover, the new direction of investment policy should become social. Social investments cannot be called new for the legislation of Ukraine, but their content and essence are not sufficiently researched. All the above testifies to the relevance of the chosen research topic.

The Analysis of Sources and Recent Research. The authors emphasize the necessary conditions for attracting foreign investment for the recovery of Ukraine's economy, including the use of modern technologies. However, certain issues of investment policy and activity, in particular factors of investment attractiveness, forms and types of investment, etc., have already been the subject of separate studies. At the

same time, the mentioned studies were carried out not only from the standpoint of jurisprudence, but also of economic sciences.

According to estimates of the humanitarian, economic and financial impact of the invasion of the Russian Federation in Ukraine, to restore the Ukrainian economy and ensure the sustainable development of the European region in general, it is necessary to establish cooperation in the field of trans-European projects, including the energy system (Astrov et al., 2022). These studies, carried out in April 2022, are only a preliminary assessment of the damage and losses, as well as possible ways of recovery. However, as of today, it is possible to identify investment prospects and methods of attracting investments to the economy of Ukraine.

Russia's aggressive attack on Ukraine had a negative impact on global stock markets, and not only on Ukraine's economy. This is evidenced by the research of Boungou and Yatié, who emphasized the need to understand the impact of a full-scale invasion of Ukraine to develop effective financial strategies (Boungou, 2022). The authors indicate that with the passage of two weeks, the global stock market has adapted to the situation. This made it possible to somewhat reduce the consequences of the started war for the world economy. However, this overview is superficial, although it indicates the need for continued investment.

Thus, Haliti Rudhani et al. among the factors that determine the investment attractiveness of private companies in Kosovo, mentions the regular preparation of financial statements in accordance with international standards and their placement for public access (Haliti Rudhani et al., 2017). The authors consider the financial report and the auditor's report attached to it to be such documents that must comply with international financial reporting standards. Attracting foreign investments to such unstable regions as Kosovo is indeed problematic from the point of view of their protection and ensuring the sustainable development of the respective territories. At the same time, as the practice of Azerbaijan and Kazakhstan shows, the presence of foreign investments in the state protects it from full-scale aggression. Yes, the transparency and reliability of the company makes it attractive for investments and not only foreign ones. The investor understands the

processes taking place and sees their result without embellishments. But researchers reveal only one aspect of this problem. The article considers only private companies, but attracting investments can also be carried out by state or utility companies.

Ukrainian authors Moskalenko et al. distinguish in their research five groups of internal criteria that determine the level of investment attractiveness: socio-economic, infrastructural, innovative/research, energy resources and agricultural dimensions (Moskalenko et al.). The authors' opinion is correct that the characteristics of the country's investment attractiveness are the dynamism and interrelated development of its determinants (criteria): the government's decision-making to create a positive business climate, increasing productivity with the help of innovative technologies, effective use of agro-climatic resources, transition to alternative energy sources. This study is valuable because it highlights aspects of the investment attractiveness of individual Eastern European states. At the same time, Moskalenko et al. highlighted the factors that are common to all analyzed states, that is, without considering the specifics of the Ukrainian state.

One of the components that determine the investment attractiveness of the state is territorial capital. Jona (Jona, 2015) investigated the impact of territorial capital on the state economy using the example of Hungary. However, the influence of territorial capital on the attraction of investments, both in the local economy and in the economy of the state, was left out of the author's attention. Human, cultural, and natural resources are permanent components of territorial capital that affect economic indicators in Ukraine, while other components are variable, as their influence occurs only during crises (Getzner, 2022).

An interesting study of investments to avoid pandemic risks for trading enterprises is the article by Hanna et al. (Hanna et al.). The authors emphasize that in the conditions of the pandemic, successful investment provides business entities in the field of trade with a stable income. This article is important because it defines the phasing of investing. One of the criteria for influencing the investment attractiveness of a financial institution for trading companies in Ukraine is the availability of information about financial activity and types of financial instruments. This study is somewhat similar to Haliti Rudhani et al.

(Haliti Rudhani et al., 2017), that is, indicates the need to highlight information in a form accessible to the investor and provide him with a clear idea of the forms of investment.

No less important is the definition of areas of investment. The COVID-19 pandemic and the Russian Federation's full-scale attack on Ukraine have "exposed" existing problems in the energy system, which can be solved by changing the concept of consumption and attracting investments in renewable energy sources (Zakeri et al., 2022). Considering the conclusions made by the authors, the field of energy is one of the most promising. However, the study of Zakeri et al. aimed at identifying general trends in the energy system. The prospects of investments in the system of renewable energy sources are also indicated by studies of Ukraine's neighbors, in particular Poland. Polish scientists discuss the possibility of direct conversion of green energy from RES farms into thermal energy with planned investment in thermal power plants (Talarek et al., 2022). At the same time, research into the prospects of investing in the energy system of Ukraine remained outside the attention of the authors. Although the conclusions of foreign authors are relevant for the Ukrainian state: the need to adopt legislative acts, the priority of access to the energy system, the expansion of the auction system, the green tariff system, subsidies, guarantees of origin and the assistance mechanism aimed at the development of technologies.

Human capital should be considered a promising area of investment. When planning the policy of investing in human capital, purposefulness is necessary, as well as the combination of learning goals with the level of technological development (Ogunade, 2011). The author emphasizes that the effective use of human capital requires considering the individual characteristics of the state. Investments in this area contribute to the economic growth of the state. However, the author's research focused only on Singapore, South Africa and India. At the same time, the topic of investing in human capital is more relevant than ever for the reconstruction of Ukraine.

Not many studies are devoted to the legal aspects of investing in Ukraine. Worthy of attention is the article by Kossak and Yanovytska, which highlights the types of foreign investment (Kossak et al., 2021). In particular, the authors focused on researching the investment legislation

of Ukraine and determining the types of resources that can be objects of foreign investment. And although the title of the article mentions forms of investment, they are not given any attention in the text of the article. At the same time, national, including state, investments remained out of the authors' attention. At the same time, the experience of creating public investment funds is quite a successful experience for long-term investments (Karsten et al, 2022).

Research related to the possibility of using modern technologies to attract investments remains undeniably relevant. Interest in the specified scientific topic is growing. In particular, digital platforms help geographically dispersed investors and entrepreneurs establish long-term cooperation (Maula et al., 2022). At the same time, as noted by Butticè and Useche, the use of crowdfunding platforms enables immigrant entrepreneurs to achieve success in attracting external investment in their own business (Butticè et al., 2022). Analyzing the decision-making mechanism of investors and the management of financial projects, Zhu et al. actually discovered for the first time the relationship between such actions and the degree of information disclosure and the intensity of competition (Zhu et al., 2022).

Researchers of an equity crowdfunding platform in China expressed the same position (Li et al., 2016). When disclosing information about the entrepreneurial team, its business age, behavior, as well as information from the senior leader, investment experience and comments on the project.

One of the most thorough studies of the role of crowdfunding platforms is the scientific work of Kleinert et al., which analyzes the criteria for selecting potentially attractive projects for investment (Kleinert et al., 2022). Crowdfunding platforms create an environment for the interaction of promising investment projects and investors (accredited and non-accredited), providing the latter with enough information to make decisions. At the same time, the mentioned articles explored the use of digital technologies to attract investments in the US, China and European countries. However, in each of the countries, it is necessary to consider the peculiarities of investing, which allows to take this into account to improve the investment climate.

The specified scientific developments are valuable, as they allow for a comprehensive analysis of the problems of attracting investments for the recovery of the economy of Ukraine and the opportunities provided by fundraising and crowdfunding platforms for this purpose.

The Purpose of the Article is to describe the elements affecting the effectiveness of investment activities in Ukraine.

Materials and methods. To write the article, primary sources were worked out, which include international acts, as well as the legislation of Ukraine, the practice of its application (court decisions). The article analyzes the scientific works of foreign and Ukrainian authors, which are devoted to certain aspects of the investigated problem.

In carrying out the research, the authors used the Aristotelian (philosophical) method, as well as general scientific methods (systemic, structural-functional, ascent from the concrete to the abstract, ascent from the abstract to the concrete). Considering the topic of the article, the authors used special (developed by non-legal sciences, in particular, analysis of written sources) and separate (developed by legal sciences: dogmatic method, methods of interpreting legal norms) methods. The basis of the research was the dialectical method, which made it possible to analyze the topic holistically, as well as to determine the main trends in the development of investment activity in Ukraine.

The method of autopoiesis was also used to study investment activity. It made it possible to reflect the mutual influence of economic and legal components, as well as to demonstrate the importance of each of them. The structural-functional method ensured the identification of factors (elements) that affect the effectiveness of investment activity, promising areas of investment. The application of these methods led to the use of scientific ways: analysis, theoretical synthesis, abstraction (definition, limitation, generalization and division of concepts), description, characterization, clarification, proof, forecasting.

The scientific research was carried out in several stages, taking into account the volume of the studied material and the need to justify the conclusions drawn. At the first stage, the analysis of scientific works of foreign and Ukrainian scientists, as well as other published materials, was carried out. At the second stage, the elements that affect the efficiency of investment activity in Ukraine are determined. At the third

stage, the theoretical substantiation of the elements of the effective investment policy of Ukraine in the context of the perspective was carried out.

The Main Material Statement. Investment attraction is the result of an effective investment policy. For this purpose, the components that affect its effectiveness should be determined.

From the analysis of the above studies, it should be concluded that such elements are:

1) definition of areas of investment;

2) consideration of territorial capital;

3) use of innovative technologies to attract investments;

4) improvement of the legal mechanism that ensures the proper implementation of investment activities;

5) protection of investors' rights.

As a result of the armed aggression against Ukraine, almost all spheres of life and activity were destroyed. At the same time, the prioritization of spheres of attracting investments will help to balance the financing of those spheres that will ensure proper social conditions for the population and ensure economic growth. These two areas combine specific areas of investment.

According to the legislation of Ukraine, as well as according to the legislation of foreign countries, there are two main directions of investment: for the purpose of obtaining profit and achieving another social effect. However, investment activity in Ukraine has always focused on those areas that provided profit. At the same time, the war of the Russian Federation against Ukraine and damage to the housing and social infrastructure (health care facilities, educational institutions, including educational institutions, care facilities for the elderly, and hospices) changed the emphasis. Many foreign companies, as well as states, have joined social initiatives to rebuild cities. For example, the Azerbaijani company SOCAR Energy Ukraine helped rebuild a school in Irpin (The SOCAR company..., 2022).

Examples of social investment in Ukraine include the creation and activity of the Ukrainian Social Investment Fund, which focused its activities on supporting residents of the eastern and southern regions (Results of USIF activity for 20 years, 2020). In essence, it is an

international, intergovernmental social project aimed at solving socially significant problems. Social investment initiatives include the activities of the Ukrainian Veterans Fund, which is an institution under the Ministry of Veterans Affairs of Ukraine and provides micro-grants, carries out organizational activities in the field of fundraising (Ukrainian Veterans Fund).

This shows that the initiators of social investment are state bodies, local self-government bodies, and business representatives. It is obvious that entrepreneurial companies can independently determine the principles of internal social investments aimed at the development of the company's human capital. These relations are not subject to legal regulation. But the main principles of interaction between state authorities, local governments and other social investors should be determined at the legislative level. It would be necessary to determine the forms of such interaction, as well as the forms of reporting to investors to ensure the transparency of the socially oriented investment activities and, accordingly, long-term cooperation. In Ukraine, social investment is partially regulated in the Law of Ukraine ”On the concession” (2019). The specified law mentions such terms as social importance of the “project”, “social obligations”. However, their content is not revealed. The state cannot point to non-fulfillment or improper fulfillment by the investor of its obligations in the social sphere, if their list is not specified. A similar problem arises when privatizing and leasing state and communal property.

An equally important issue is the definition of priority areas of investment for obtaining profit and growth of the economy of Ukraine. As of today, there is a state program to support businesses relocated from temporarily occupied territories. It is not only about the simplified procedure of re-registration on the Diia platform and the provision of financial support for the placement of production facilities in the territory where there are no active hostilities.

The “33-33-33” program is an example of a social project of a relocated business and local self-government bodies for the employment of internally displaced persons (The business relocated ..., 2022). As the head of Lviv OVA, Maksym Kozytskyi, notes, it is Ukrainian entrepreneurs who invest the most in the development of Ukraine, create

jobs and pay taxes (In Lviv, they want to socialize forced migrants, 2023). These examples illustrate the effectiveness of cooperation between authorities and business entities, which ensures the development of the latter under martial law and helps the state fulfill its social obligations. This also indicates a shift in emphasis to the domestic investor. At the same time, the state must show openness, transparency, stability and a real possibility of legal protection to attract foreign investors.

Considering the situation in Ukraine and the world, the most promising areas of investment seem to us to be construction and the search for new constructive solutions in this area, alternative energy sources, development of new mineral deposits, renewal of the oil and gas transportation system of Ukraine, innovative technologies, defense and agricultural fields. Such conclusions are based on the study of the needs not only of Ukrainian society, but also of the world community in general. Dependence on one or more states that provide the supply of one or another product can significantly affect the entire structure of economic ties. The blockade ports of Ukraine of Russians caused the prerequisites for a food crisis and the search for new logistical solutions. Blackmailing the Russian Federation to stop the supply of energy carriers to European countries led to the search for alternative sources of supply. Only the speed of decision-making and the availability of alternative options made it possible to stabilize the situation.

Let's briefly consider the prospects of investing in each of the proposed areas. The field of construction is relevant due to the amount of destroyed housing and infrastructure in Ukraine. Moreover, constructive decisions in the field of construction should include a safety and environmental component. This new industrial construction must be environmentally safe and use new technologies to improve the quality of production and increase its volume. Residential construction must consider possible rocket attacks and provide for the presence of bomb shelters and shelters. In parallel with the construction of housing, it is necessary to update the water supply and drainage system, heat supply, as well as the energy system.

The current crisis of Ukraine's energy system, caused by Russian missile attacks on Ukrainian energy facilities, demonstrates the need for

their additional protection, including the impossibility of interfering with the electronic control system, etc. At the same time, it is necessary to ensure energy independence of Ukraine. In this direction, two directions remain relevant - the development of new deposits and alternative sources of electricity. There are already certain developments in each of these areas. Thus, shale gas deposits and oil and gas deposits in the Black Sea are promising for development (Sore question ..., 2021; The oil and gas potential of the Black Sea ..., 2020). The main difficulties are that most of the deposits in the Black Sea are under the control of the Russian Federation, so their development is possible only after the liberation of the annexed territories. Before the start of the full-scale war in Ukraine, the number of solar power plants was growing (Naypotuzhnishi sonyachni ..., 2020). It is obvious that deep drilling and the equipment of solar and wind power plants require accurate intelligence on the features of deposits, knowledge, and the necessary equipment. These processes require investments and are promising not only for the energy system of Ukraine.

An equally important issue is the renewal of the oil and gas transportation system of Ukraine. Transportation of energy carriers to Europe is an important aspect of cooperation with the states of the European Union. Therefore, its renewal and safety is always relevant, as is the construction of new transportation routes.

One of the spheres of activity, which during the war remains profitable and due to which revenues to the budget of Ukraine do not stop, is the IT industry. Ukrainian inventors are the authors of successful startups, both in Ukraine and abroad. An example can be a startup producing paper from fallen leaves, which received €2.5 million from the EU for the construction of a factory (Ukrayins′kyy startup Releaf Paper ..., 2022). One of the most successful state startups is Diia, whose analogues want to be implemented by other states (The Ministry of Digital ..., 2023). It also demonstrates the state's cooperation with investors.

No less important developments concern the defense sphere. It is primarily about Ukrainian drones (During the war, Ukrainian masters created dozens ..., 2023). This is an opportunity to establish cooperation with NATO countries the Turkish company “Bayraktar”. New

technological solutions are needed in all spheres of life. However, it is necessary to take care of the security of personal data, the prevention of violation of the rights of others, ethical aspects and the safety of the environment.

The agricultural sector remains important not only for the economy of Ukraine, but also for ensuring food security. Of course, demining the territory of Ukraine and restoring the soil after hostilities requires time and costs. However, this is a necessity that can serve as a basis for new solutions related to the restoration of the quality characteristics of chernozems.

Analyzing the areas of investment, we came to the next component of investment – territorial capital. Each region of Ukraine has its own characteristics of territorial capital. At the same time, the components of the territorial capital of the Ukrainian state are the agricultural sector, human capital, logistical resources, cultural values and economic indicators.

The use of fundraising and crowdfunding platforms to attract investments is a relatively new phenomenon for the Ukrainian state. Their use began with the start of a full-scale war. If among Ukrainian inventors there has long been a practice of using relevant foreign platforms, it is a relatively new practice for Ukraine. As of today, the state fundraising platform UNITED24 has been launched, which allows you to make a charitable contribution in one click to one or more areas: “army of drones”, “shaheed hunters”, reconstruction of Ukraine, defense and demining, medical assistance, etc. (UNITED24). The platform's official website includes reports on the use of the funds raised, which makes information open to investors and the platform's activities transparent. This is the basis for long-term cooperation. The example of the success of the UNITED24 fundraising platform demonstrates the possibility and necessity of attracting investments to the economy of Ukraine with the help of fundraising and crowdfunding platforms. Conclusion of investment contracts with the help of electronic platforms has long been successfully used in Ukraine.

One of the biggest problems is the improvement of the legal mechanism that ensures the proper implementation of investment activities, as well as, accordingly, the protection of investors' rights. The

reform of the investment legislation of Ukraine has been ongoing since the restoration of Ukraine's independence. However, The Law of Ukraine "On Investment Activities" (On Investment Activities, 1991) and The Law of Ukraine "On the Foreign Investment Regime" (On the Foreign Investment Regime, 1996) continue to operate in our country. These laws, adopted back in the 90s, determine the basic principles of investment activities by national and foreign investors. Although they do not fully correspond to modern investment conditions, and this, in turn, does not contribute to the improvement of the investment climate in Ukraine.

One of the most extensive attempts to improve the investment climate in Ukraine was the adoption at different times of new regulations aimed at attracting investments and harmonizing the legislation of Ukraine and the legislation of the European Union within the framework of the Association Agreement between the European Union and the European Atomic Energy Community and their member states, of the one part, and Ukraine, of the other part (Association Agreement, 2014). These are the Laws of Ukraine "On Public-Private Partnership" (2010), "On the concession" (2019), "On state support of investment projects with significant investments in Ukraine" (2020), "On guaranteeing property rights to real estate objects that will be built in the future" (2022).

At the same time, despite so many laws, the issues of the activities of fundraising and crowdfunding platforms, as well as the establishment of clear requirements for the implementation of investment activities, remain unsettled. It is, first, about the disclosure of information about investment projects, as well as the assessment of their prospects. After all, it is necessary to settle the issue of protection of investors' rights, including guarantees of their activities. Legal regulation of investment activities should also eliminate or at least reduce corruption risks.

The last component of successful investment activity is the possibility of real protection of investors' rights. It should be noted that the Supreme Court is trying to develop effective ways to protect the rights of investors in the absence of a corresponding rule of law. An example of such a situation is the Resolution of the Supreme Court dated March 20, 2019 in case No. 761/20612/15-ts, where in the motivational

part the Court noted that the impossibility of fulfilling the obligation is manifested in the following, the commissioning of the construction object did not take place within the terms established by the contract, the Company with limited activity "Firm "Consol LTD" ceased its activities − this calls into question the possibility of it fulfilling its obligations under the contract. It seems that the application of such a method of protection as the recognition of property rights to an investment object is due to the fact that a person has a right of expectation but does not have objectively determined and sufficient grounds for acquiring the right of ownership due to non-commissioning of the real estate object, lack of state registration.

At the same time, the Supreme Court must ensure a fair trial without favoring any of the participants in the trial. Excessive protection, both in the legislation of Ukraine and by the courts of one of the parties to the investment activity, can lead to a violation of the investment climate.

The Conclusions. The autopoiesis method made it possible to show the influence of economic and legal elements on the effectiveness of investment policy. This method provided an opportunity to illustrate the multi-competence of investment policy as a social phenomenon. Using the method of description, the main aspects of previously conducted research by legal scholars and economists, which were used in this study, were highlighted. This made it possible to determine the components of an effective investment policy for Ukraine, taking into account the consequences of full-scale aggression by the Russian Federation. With the help of the structural and functional method, the following components of the effectiveness of investment activity are distinguished: definition of areas of investment; consideration of territorial capital; use of innovative technologies to attract investments; improvement of the legal mechanism that ensures the proper implementation of investment activities; protection of investors' rights. The method of analysis was used throughout the study.

The conclusions obtained as a result of the research can become the basis for further economic and legal studies of investment activity in Ukraine. In particular, research on changes in the components of effective investment policy, the use of modern technologies to attract investments, etc., are promising.

Referents

Astrov, V., Ghodsi, M., Grieveson, R., Holzner, M., Kochnev, A., Landesmann, M., Pindyuk, O., Stehrer, R., Tverdostup, M. (2022). Russia's Invasion of Ukraine: Assessment of the Humanitarian, Economic and Financial Impact in the Short and Medium Term. *Policy Notes and Reports 59*, April, 2022. https://wiiw.ac.at/p-6132.html [in English]

Boungou, W., Yatié, A. (2022). The impact of the Ukraine-Russia war on world stock market returns. https://hal.archives-ouvertes.fr/hal-03610963v2 [in English]

Haliti Rudhani, L., Ismajli, H., Mustafa, A. (2017). The importance of the audited financial statement in attracting foreign investors in private sector in Kosovo. *Baltic Journal of Real Estate Economics and Construction Management*, vol.5, no.1, 2017, pp.118-136. https://doi.org/10.1515/bjreecm-2017-0009 [in English]

Moskalenko, B., Lyulyov, O., Pimonenko, T. (2022). The investment attractiveness of countries: coupling between core dimensions. *Forum Scientiae Oeconomia*. Volume 10 (2022). No. 2. https://doi.org/10.23762/FSO_VOL10_NO2_8 [in English]

Jona, G. (2015). Determinants of Hungarian Sub-Regions' Territorial Capital. *European Spatial Research and Policy*, *22*(1), pp. 101–119. https://doi.org/10.1515http://www.degruyter.com/view/esrp-2015-0019 [in English]

Getzner, M., Moroz, S. (2022) The economic development of regions in Ukraine: with tests on the territorial capital approach. *Empirica*, volume 49, pp. 225–251. https://doi.org/10.1007/s10663-021-09521-w [in English]

Hanna, B., Nataliia, B., Tetiana, P., Valentyn, S., Svitlana, K., Natalia, H. (2023). Financial Investment Management of Trade Enterprises: Analytical Aspect. In: Alareeni, B., Hamdan, A. (eds) Sustainable Finance, Digitalization and the Role of Technology. ICBT 2021. *Lecture Notes in Networks and Systems, vol 487*. Springer, Cham. https://doi.org/10.1007/978-3-031-08084-5_57 [in English]

Zakeri, B.; Paulavets, K.; Barreto-Gomez, L.; Echeverri, L.G.; Pachauri, S.; Boza-Kiss, B.; Zimm, C.; Rogelj, J.; Creutzig, F.; Urge-Vorsatz, D.; et al. (2022). Pandemic, War, and Global Energy Transitions. *Energies* 2022, 15, 6114. https://doi.org/10.3390/ en15176114 [in English]

Talarek, K.; Knitter Piatkowska, A.; Garbowski, T. (2022). Wind Parks in Poland—New Challenges and Perspectives. *Energies* 2022, 15, 7004. Retrieved from: https://doi.org/10.3390/ en15197004 (in English)

Ogunade, Adeyemi O. (2011). Human Capital Investment in the Developing World: An Analysis of Praxis. *Seminar Research Paper Series*. Paper 38. https://digitalcommons.uri.edu/lrc_paper_series/38 [in English]

Kossak, V., & Yanovytska, H. (2021). Foreign Investment in Ukraine: Types and Forms. *International Journal of Criminology and Sociology*, *9*, 3057–3065. https://doi.org/10.6000/1929-4409.2020.09.372 (in English)

Staehr, K., Urke, K. (2022). The European structural and investment funds and public investment in the EU countries. *Empirica 49*, 1031–1062. https://doi.org/10.1007/s10663-022-09549-6 [in English]

Maula, M. V. J., **&** Lukkarinen, A. (2022). Attention across borders: Investor attention as a driver of cross-border equity crowdfunding investments. *Strategic Entrepreneurship Journal*, 16(4), 699–734. https://doi.org/10.1002/sej.1424 [in English]

Butticè, V., Useche, D. (2022). Crowdfunding to overcome the immigrant entrepreneurs' liability of outsidership: the role of internal social capital. *Small Bus Econ* 59, 1519–1540. https://doi.org/10.1007/s11187-021-00591-5 [in English]

Zhu, Z., Liu, J., Zhang, M. (2022). Rethinking investors' herding behavior under the conditions of reward-based crowdfunding platform. *Industrial Management & Data Systems*, Vol. 122 No. 12, pp. 2762-2782. https://doi.org/10.1108/IMDS-06-2022-0383 [in Ukrainian

Li, X., Tang, Y., Yang, N., Ren, R., Zheng, H. and Zhou, H. (2016). The value of information disclosure and lead investor in equity-based crowdfunding: An exploratory empirical study. *Nankai Business Review International*, Vol. 7 No. 3, pp. 301−321. https://doi.org/10.1108/NBRI-01-2016-0002 [in Ukrainian]

Kleinert, S., Bafera, J., Urbig, D., & Volkmann, C. K. (2022). Access Denied: How Equity Crowdfunding Platforms Use Quality Signals to Select New Ventures. *Entrepreneurship Theory and Practice*, 46(6), 1626–1657. DOI: 10.1177/10422587211011945 [in Ukrainian]

Kompaniia SOCAR za dva misiatsi vidbuduvala shkolu v Irpeni [The SOCAR company rebuilt a school in Irpen in two months] (2022). Ekonomichna Pravda [Economic Truth]. https://www.epravda.com.ua/news/2022/09/2/691050/ [in Ukrainian]

Rezultaty diialnosty UFSI za 20 rokiv [Results of USIF activity for 20 years] (2020). https://usif.ua/images/pdf/USIF_20_ukr_final_web.pdf [in Ukrainian]

Ukrayins′kyy veterans′kyy fond [Ukrainian Veterans Fund]. https://veteranfund.com.ua/ [in Ukrainian]

Verkhvna Rada Ukrayiny [VERKHVNA RADA OF UKRAINE] (2019). *Zakon Ukrainy Pro kontsesiiu* [The Law of Ukraine On the concession]. https://zakon.rada.gov.ua/laws/show/155-IX#Text [in Ukrainian]

Relokovanyi na zahid Ukrayiny biznes stvoriuye sotni tysiach robochyh mists dlia pereselentsiv – Vereshchuk [The business relocated to the west of Ukraine creates hundreds of thousands of jobs for immigrants – Vereshchuk] (2022). https://www.ukrinform.ua/rubric-economy/3635054-relokovanij-na-zahid-ukraini-biznes-stvorue-sotni-tisac-robocih-misc-dla-pereselenciv-veresuk.html [in Ukrainian]

U Lvovi hochut sotsializuvaty vymushenyh pereselentsiv [In Lviv, they want to socialize forced migrants] (2023). https://galinfo.com.ua/news/u_lvovi_hochut_sotsializuvaty_vymushenyh_pereselentsiv_394662.html [in Ukrainian]

Pytannia ruba: chomu Ukrayina ne zhadaye pro svoi zapasy slantsevoho hazu? [Sore question: Why won't Ukraine remember about its shale gas reserves?] (2021). https://www.ukrinform.ua/rubric-economy/3335840-pitanna-ruba-comu-ukraina-ne-zgadae-pro-svoi-zapasi-slancevogo-gazu.html [in Ukrainian]

Naftohazovyy potentsial Chornoho morya: real′nist′ i perspektyvy burinnya unikal′noyi nadhlybokoyi sverdlovyny na ostrovi Zmiyinomu [The oil and gas potential of the Black Sea: the reality and prospects of drilling a unique ultra-deep well on Zmiino Island] (2020). https://oil-

gas.com.ua/novyny/%D0%9D%D0%B0%D1%84%D1%82%D0%BE%D0%B3%D0%B0%D0%B7%D0%BE%D0%B2%D0%B8%D0%B9-%D0%BF%D0%BE%D1%82%D0%B5%D0%BD%D1%86%D1%96%D0%B0%D0%BB-%D0%A7%D0%BE%D1%80%D0%BD%D0%BE%D0%B3%D0%BE-%D0%BC%D0%BE%D1%80%D1%8F-%D1%80%D0%B5%D0%B0%D0%BB%D1%8C%D0%BD%D1%96%D1%81%D1%82%D1%8C-%D1%96-%D0%BF%D0%B5%D1%80%D1%81%D0%BF%D0%B5%D0%BA%D1%82%D0%B8%D0%B2%D0%B8-%D0%B1%D1%83%D1%80%D1%96%D0%BD%D0%BD%D1%8F-%D1%83%D0%BD%D1%96%D0%BA%D0%B0%D0%BB%D1%8C%D0%BD%D0%BE%D1%97-%D0%BD%D0%B0%D0%B4%D0%B3%D0%BB%D0%B8%D0%B1%D0%BE%D0%BA%D0%BE%D1%97-%D1%81%D0%B2%D0%B5%D1%80%D0%B4%D0%BB%D0%BE%D0%B2%D0%B8%D0%BD%D0%B8-%D0%BD%D0%B0-%D0%BE%D1%81%D1%82%D1%80%D0%BE%D0%B2%D1%96-%D0%97%D0%BC%D1%96%D1%97%D0%BD%D0%BE%D0%BC%D1%83 [in Ukrainian]

Naypotuzhnishi sonyachni elektrostantsiyi Ukrayiny. Infohrafika [The most powerful solar power plants of Ukraine. Infographics] (2020). https://www.ukrinform.ua/rubric-other_news/2887951-najpotuznisi-sonacni-elektrostancii-ukraini-infografika.html [in Ukrainian]

Ukrayins′kyy startap Releaf Paper otrymav €2,5 mln vid YES na budivnytstvo fabryky [Ukrainian startup Releaf Paper received €2.5 million from the EU for the construction of a factory] (2022). https://shotam.info/ukrainskyy-startap-releaf-paper-otrymav-e2-5-mln-vid-yes-na-budivnytstvo-fabryky/ [in Ukrainian]

U Mintsyfry rozpovily, skil′ky krayin khochut′ stvoryty vlasni dodatky na osnovi "Diii" [The Ministry of Digital told how many countries want to create their own applications based on "Action"] (2023). https://www.radiosvoboda.org/a/news-diya-dlia-inshykh-krayin/32254332.html [in Ukrainian]

UNITED24. Official site. https://u24.gov.ua/uk [in Ukrainian]

Ukrayins′ki maystry pid chas viyny stvoryly desyatky novykh droniv. My zibraly krylatykh pomichnykiv ZSU razom tut [During the war, Ukrainian masters created dozens of new drones. We have gathered the winged assistants of the Armed Forces together here]. (2023). https://dev.ua/news/krylati-pomichnyky-zsu-1672779775 [in Ukrainian]

Verkhovna Rada Ukrainy [VERKHOVNA RADA OF UKRAINE]. (1991). *Zakon Ukrainy Pro investystijnu dialnist* [The Law of Ukraine On Investment Activities]. Retrieved from: https://zakon.rada.gov.ua/laws/show/1560-12#Text [in Ukrainian]

Verkhovna Rada Ukrainy [V E R K H O V N A R A D A O F U K R A I N E]. (1991). *Zakon Ukrainy* Pro rezhym inozemnoho investuvannya [The Law of Ukraine On the Foreign Investment Regime]. Retrieved from: https://zakon.rada.gov.ua/laws/show/1560-12#Text [in Ukrainian]

Uhoda pro asotsiatsiyu mizh Ukrayinoyu, z odniyeyi storony, ta Yevropeys′kym Soyuzom, Yevropeys′kym spivtovarystvom z atomnoyi enerhiyi i yikhnimy derzhavamy-chlenamy, z inshoyi storony [Association Agreement between the European Union and the European Atomic Energy Community and their member states, of the one part, and Ukraine, of the other part]. (2014). https://zakon.rada.gov.ua/laws/show/984_011#Tex [in Ukrainian]

Verkhovna Rada Ukrainy [VERKHOVNA RADA OF UKRAINE]. (2010). *Zakon Ukrainy* Pro derzhavno-pryvatne partnerstvo [The Law of Ukraine On Public-Private Partnership]. Retrieved from: https://zakon.rada.gov.ua/laws/show/2404-17#Text [in Ukrainian]

Verkhovna Rada Ukrainy [VERKHOVNA RADA OF UKRAINE]. (2020). *Zakon Ukrainy* Pro derzhavnu pidtrymku investytsiynykh proektiv iz znachnymy investytsiyamy v Ukrayini [The Law of Ukraine On state support of investment projects with significant investments in Ukraine]. Retrieved from: https://zakon.rada.gov.ua/laws/show/1116-20#n2 [in Ukrainian]

Verkhovna Rada Ukrainy [VERKHOVNA RADA OF UKRAINE]. (2022). *Zakon Ukrainy* Pro harantuvannya rechovykh prav na ob″yekty nerukhomoho mayna, yaki budut′ sporudzheni v maybutn′omu [The Law of Ukraine On guaranteeing property rights to real estate objects that will be built in the future]. Retrieved from: https://zakon.rada.gov.ua/laws/show/2518-20#Text [in Ukrainian]

Postanova Verhovnoho Sudu vid 20 bereznia 2019 u spravi № 761/20612/15-ts [The Resolution of the Supreme Court of March 20, 2019 in case № 761/20612/15-ts]. (2022). https://reyestr.court.gov.ua/Review/81329476 [in Ukrainian]

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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).

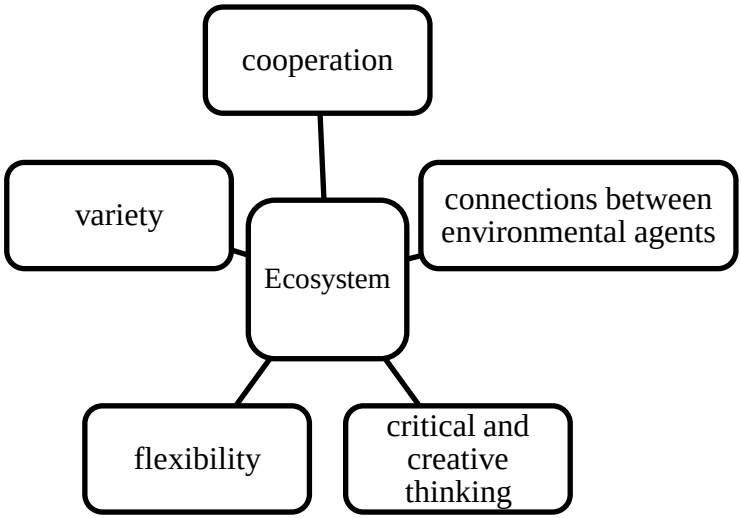

Figure 1. **Properties of the innovation ecosystem**

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.

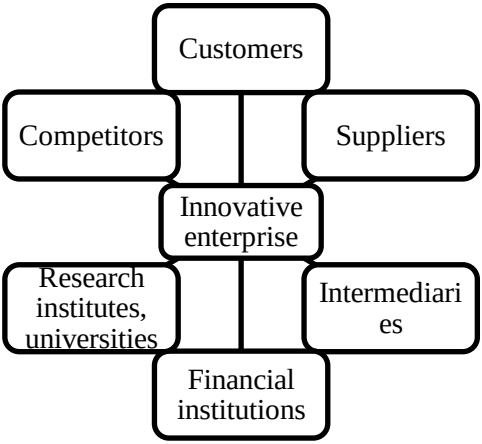

Figure 2. Scheme of the innovation ecosystem

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.

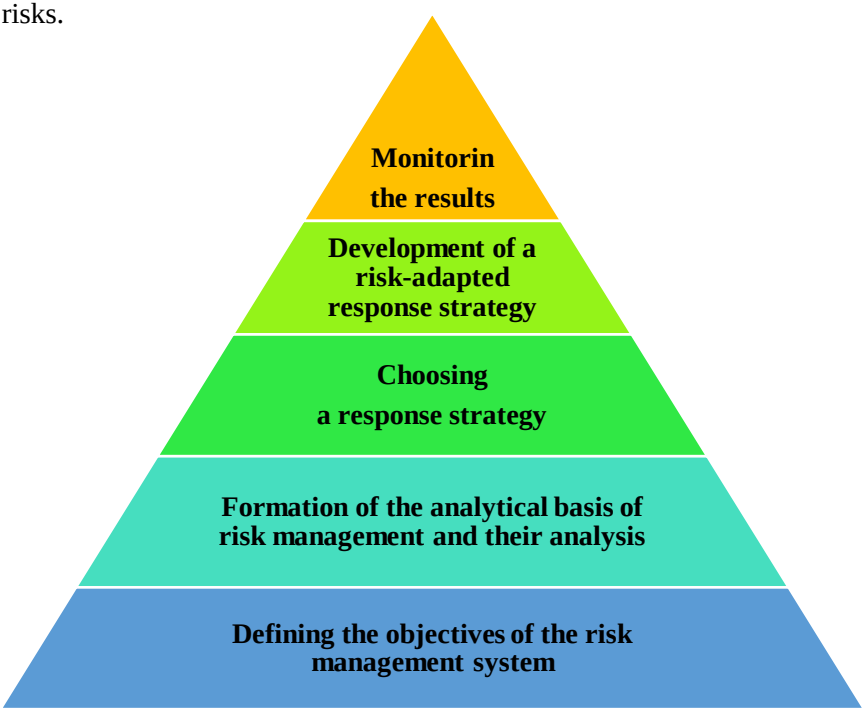

Figure 3. Model of risk management in the Innovation ecosystem

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]

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THE MUSEUM CASE IN THE CHERKASY REGION IN THE CONTEXT OF THE DEVELOPMENT OF HISTORICAL LOCAL HISTORY IN THE 20S AND 30S OF THE 20TH CENTURY

The Purpose of the Study *is theoretical substantiation of the contribution of museums to the deployment of historical and local studies of Cherkasy region in the 20s and 30s of the XX century.* ***The Methodology****. The following methods were used for the study: historical methods, comparative-historical, problem-chronological, and retrospective methods were used, which provide an opportunity to reconcile the events and facts under investigation, to present the material in a clear chronological sequence and logical completeness.* ***The scientific novelty****. Of the first time, an attempt was made to comprehensively analyze the process of development of historical local history in the Cherkasy region in the 20s and 30s of the 20th century by means of museums. In chronological order, the processes that took place in local history during the researched period were analyzed. The range of local history work of museums is considered.* ***The Conclusions.*** *The trend of the development of local history had a rather positive direction because new museums were opened all over Ukraine and in the territory of Cherkasy region in particular. A peculiarity of the museum business in the Cherkasy*

region is the filling of museums with exhibits from other regions, as this territory was part of other regions during the research period (Cherkasy Oblast was formed in 1954).

***Keywords**: museum business, local history, museums, historical memory, historical-local history movement, museum funds, expositions, museum exhibits.*

The Problem Statemen. Nowadays, the study of the history of Ukraine and historical regional studies as a historical discipline is relevant and important, since the country is currently in a total war with the Russian Federation. There is an attempt to destroy Ukrainian statehood, culture and historical memory during the war. The Ukrainian historical knowledge and regional history is extremely important and necessary.

The period 1920−1930 marks the rise of the local history movement, which acquired a mass character and covered the territory of Ukraine as a whole. Cherkasy was no exception in the development of the local history movement and needs detailed study and research. There was no comprehensive analysis and assessment of the local history process in Cherkasy in 1920 −1930. The study of the local history movement of the specified period should enrich scientific research with factual material and provide local history researchers the opportunity to study local history activities of museums, archival institutions, educational institutions. The study of features that gives characteristic of the local history movement of Cherkasy should take place in the context of general historical events, trends in the development of regional history. It is important to note about the territorial boundaries of Cherkasy during 1920−1930. The reason was current boundaries of Cherkasy region created in 1954. The territory of right-bank Cherkasy became part of the Kyiv region, and the left-bank region became part of the Kharkiv region in 1929.

Left-bank Cherkasy region was transferred to the newly created Poltava region in 1937. Kamianskyi and Chihyrynskyi districts were transferred to Kirovohrad region in 1939. It is important to consider the development of the local history movement in these areas for researching local history. According to the authors opinion it is necessary to pay attention to local history formation and development on territory of Cherkasy region in the specified period. Chronological boundaries from 1923 − the beginning of “Ukrainization”, characterized by the active

development of the museum business, the revitalization of the historical and local history movement after 1933 − the collapse of "Ukrainization", the beginning of oppression of the local history movement.

The Analysis of Sources and Recent Researche. There are still no general studies dedicated to this problem because the history of the development of local history in Soviet Ukraine and its regions has been studied quite fragmentarily. R. Mankovska's research is devoted to the development of the museum business in Ukraine. The activities of museums of Cherkasy region are dedicated by L. Nabok (Nabok, 2013), O. Barvinok (Barvinok, 2016), N. Nagornaya (Nagorna, 2004), O. Troshchinska.

O. Barvinok studied the activities of the Uman Museum of Local History in the context of changes in the ideological concepts of museum work in Ukraine. The author identified the priority areas of the museum's activity as an important center of scientific-methodical and regional studies of the region. L. Nagorna studied the Uman Museum and analyzed the museum's exposition and funds in detail as well. L. Nabok analyzed the activities of museums in Cherkasy region and make a conclusion: museums were actively created and developed. O. Troshchynska, I. Chepurna were engaged in the activities of the Chigyryn Historical and Local History Museum. The authors investigated the prerequisites for the creation of the Chigyryna Historical and Local History Museum and its activities. The archive funds of the State Archive of the Cherkasy region were processed and put into circulation. Used during the writing of the publication: fund 131, description 1, file 14, sheet 14, which contains information about the activities of the museum in Chigyrin. Fund 131, description 1, file 19, sheet 9 which contains information about visiting the museum in Cherkasy as of 1920. Fund 131, description 1, case 23, sheet 60 where the minutes of meetings on the protection of cultural monuments and the description of the exhibits of the Cherkasy District Museum are placed.

The Purpose of the Article is to show the level of study of the role of Cherkasy region museums in the development of historical local studies in the 20s and 30s of the 20th century. The realization of the set goal involves the following tasks: to analyze the process of creation and the main directions of museum activity in the region in the 20s and 30s of

the 20th century; to investigate and characterize the contribution to the development of the local history movement and to determine the significance of the activities of museums in the deployment of historical and local history research on the territory of Cherkasy region.

The Research Methods. The development of historical regional studies took place in the context of the ”Ukrainization“ policy. This policy has an undeniable achievement, because the study of the history of Ukraine has begun, interest in local history has increased, characterized by the creation of museums and the development of museum work. New museums are being created in Ukraine, the museum business is being promoted, and scientific research work of museums is gaining momentum.

Thanks to such research methods as retrospective and comparative-historical, we were able to harmonize the events and facts under investigation, to present the material in a clear chronological sequence.

The Cherkasy Museum of Local History was established in February 1918 by the decision of the Cherkasy Regional Military Revolutionary Committee. The museum was created on the initiative of the Cherkasy Society “Prosvita”, which was founded in 1917. On April 6, 1919, the Cherkasy regional department of public education together with the “Prosvita” society. Discussing this issue at their joint meeting, came to the conclusion that the scientific-historical-pedagogical museum should serve as the basis for the creation of a single national museum, since only the educational museum is organized in Cherkasy region. has scientific availability of up to 6,000 exhibits, prepared cultural forces (Shcherbyna, 2004).

The initial period of the museum's operation was marked by the search for optimal forms of work organization in the difficult political and economic conditions of that time (Sosa, 1998).

The basis of the museum collection was the materials of the 35th Orlovsky and 36th Bryansk infantry regiments of the Russian Imperial Army, which were stationed in Cherkasy, including regimental relics, military banners and weapons (Smolii, 2013). Also, antiques and private collections from noble estates looted during the revolutionary events of 1917−1918 began to enter the museum collection.

The exposition of the museum was represented by unique works of European and Russian artists, which were removed from the estates of Counts Bobrynskyi, Balashovy, Branytskyi. Attracted attention were items of Chuma and peasant use, a collection of Easter eggs, pottery, geological and paleontological finds of Cherkasy region. Three employees worked in the museum, who were engaged in the systematic study of Cherkasy region, Shevchenkiv region, excavated the Masliv clay, studied Prytiasmin during 1922−1926. The museum staff arranged temporary exhibitions: 1918 – mineralogical and paleontological exhibition of the Kozlovskys; in 1920, 1922, 1924 − Shevchenkivska; 1922 − sanitary and epidemiological; 1923 – tuberculosis; 1925 − pottery products; 1926 − in memory of 1905; in 1924−1925, historical-revolutionary Cherkasy was demonstrated. (Nabok, 2013).

So, we come to the conclusion that the museums of the Cherkassy region are replenished at this time with exhibits from other regions.

With the help of the problem-historical method of research, the content of museum expositions was established. The locations of the museums have also been determined.

The basis of museum's first exhibition in 1918 was the mineralogical-paleontological collection of Dr. Kozlovsky, the collection of the Cherkasy boys' gymnasium, and the etymological collection of teacher Balkovsky (Nabok, 2013).

According to the report by D. Bochkov, the director of the museum, the museum in Cherkasy had six departments: the archaeological department with a total of 1,700 exhibits, which were displayed on a table, in a closet, on a shelf, and in pharmacy showcases, artifacts from the excavations of the village were exhibited. Maslova, the local history cabinet, the exposition row presented etymological exhibits in one cabinet, drawings and 50 books. The art department had 226 exhibits: paintings, 12 pieces of furniture, tableware, sculpture. Ethnographic department, where 423 exhibits were placed on 4 table-type showcases, of which the largest group consisted of Easter eggs − 183 attributed and not yet accounted for 190 units, 4 carpets, dishes, drawings, and the largest was the natural history department, which was headed by Comrade Timnikom, which included 5,000 zoological, botanical,

geological, mineralogical and entomological items. All museum material was exhibited in glass cabinets and showcases like tables. (Nabok, 2013).

The official opening date of the museum's permanent exhibition in Uman is considered in the 15th of October, 1917, when the First Ukrainian Gymnasium was opened in the city. B. Grinchenko (Barvinok, 2016, p. 274). P. Kurinny compiled and published the "Index of the Historical Museum of the Uman Region in 1918". It provides an overview of the exposition of all five departments of the museum, describes the exhibits and names their sizes. (Nagorna, 2004, p. 367).

The museum's funds were replenished, and the transition of the gymnasium to a new building made it possible to deploy a permanent exhibition for the first time. From the report written by P. Kurinny "The current state of the historical museum of the Uman Region", compiled on the 20th of May 1921. It is known that the museum occupied one hall in which historical and archaeological collections were exhibited, and 6 rooms and a corridor were adapted for a picture gallery (Nabok, 2013).

The museum received state status and the name − District Social and Historical Museum of the Uman region, moved to a new spacious premises in 1923 (according to other data, in 1924). This area is occupies nowadays. The museum has the following departments: the archaeological department has many materials from the Tryplian, Cimmerian, Gothic, Scythian, and princely cultures during 1924. Department of social struggle with subdivisions: a) old times; b) history of Umanshchyna; c) new times. The picture gallery, which contains works by Italian, Flemish, and Dutch masters of the 16th and 16th centuries, as well as many unsystematized items of Western European art, engravings, etchings, and lithographs. The department of old prints includes literature from the libraries of tycoons. There are Venetian editions of the 16th century, a description of wars by B. Khmelnytskyi, written 30 years after the last war, acts and documents mainly from the saved library of the Polish historian Hotkevich among others development posittions. The cartographic department where the most valuable exhibit is Simpson's Atlas of Europe of the 17th century were taken place. The numismatic department includes, in addition to a large numismatic collection, a collection of sphragistics (seals) and dacteliotics (rings). (Nagorna, 2004).

From the analysis of archival sources, it was established that in 1935, the Uman District Museum of Local Lore was reorganized into the Inter-district Scientific Research Museum of Local Lore, which was supposed to cover 15 surrounding districts for museum work. This indicates that historical local history on the basis of museums is developing and acquiring a systemic character.

The idea of creating a museum in Chygyrin was not new. Local historians tried to create a historical museum was made in the 20s of the 20th century. The idea belongs to P. Yaremenko. The decision to create a museum was made in 1921 (Troschynska, 2011, p. 37). The first director of the museum was L. Rvachev. He was a local teacher who was interested in and studied the history of the Cossack state. Later he, headed the Society for the Protection of Monuments. The first exhibits of the museum were the archaeological collection of P. Yaremenko, which collected near the village of Yarmarky in the floodplain of the Tyasmin River not far from the village of Novoselitsy on this territory. He investigated the settlements of primitive man and the settlements of later times. (Chepurna, 2004). P. Yaremenko cooperated and corresponded with the Ukrainian Academy of Sciences. The Chigyry Historical Museum received an appeal from the Expedition of the Ukrainian Academy of Sciences on December 4, 1921. No. 362. The appeal stated: to submit an official statement to the Chygyryn district department about the personal composition of the museum. Otherwise, the duties and the requirements that can describe department demand from creative department the approval of these persons as employees from the time of election to work. The museum should add that the regional department agreed with all the candidates, submit a copy of the said statement in two copies for signature to Gubkomi and Vukopis. It could be taken decisive measures to take possession of the museum building, take the library out of Kamianka. Among them: two pieces of books that have been written off and are in school no. 1. At the same time, to take measures to remove the property from the Krasynskyi house in the village of Nesvyatkovo, which is necessary for furnishing the museum, to dig up the chest with manuscripts and correspondence collected in 1919 by P. Kurinny and F. Glenenko. Chihyrynsky Museum in the Regional Department of

Education was take as a, registration of libraries and the establishment of a scientific library at the H. Steletsky museum.

The Zolotonsky Museum of Local History was created in 1920. The act of inspection of the museum was drawn up in October 1925 by O. Oleksandrov. The authorized representative of the Air Force Academy of the Academy of Sciences of the Cherkasy region. With the accession of the city of Zolotonoshi to the Cherkasy District, the Zolotonoshi Museum became dependent on the Cherkasy Okrpolitosvit. During the liquidation of the Zolotoniska district in July, the museum found itself without funds for financing. In 1925−1926, the Regional Inspectorate contributed funds to the budget for the maintenance of the city of Zolotonosha. It must be mentioned that, later this decision was canceled. The museum was handed over by O. Denysenko to the supervision of the head of the Zolotonosha Pedagogical Technical College, according to the resolution of the District Executive Committee in September.

The museum was handed over to the Pedagogical College and moved to the second building with 6 rooms on Cherkaska Street, building number 17 othe 20th of September. It is situated opposite the building of the Pedagogical College. Head of Zolotoniskyi R.V.K. Mr. Kravchenko and the director of the Pedagogical College, Mr. Denysenko, proposed that the museum be headed by Mr. Balyura. He was in charge of a demonstration school at the Pedagogical College without separate maintenance, only for an apartment at the museum. (Nabok, 2013).

The most interesting of the exhibits is the art gallery. There is a painting by Titian − Cupid and Psyche, which is an old copy, and among them there are portraits of local landowners and artists Bryullov, Borovykovsky, Kiprensky. There are copper cannons in the Military Department, a Tatar mace also. The library of the museum housed printed books in foreign languages from the 16th century (Nabok, 2013).

The museum was under the District Archives Office in Korsun, in 1922−1924. The main fund consisted of a collection of icons collected by schoolchildren in the village. Zhurlyntsy, and the rest of the art gallery of the former owners of the Lopukhin-Demidov estate, staffed by Comrade Efimov et al. Shevchenko. Archaeological materials discovered during sand mining in the quarry near Voronov Horodyshche were also kept (Nabok, 2013).

So, from the given historical facts, we can come to the following conclusion: the formation of museums in the Cherkasy region reflects the natural process of development of historical local lore, acquiring specific features taking into account socio-political features.

The Conclusions. The development of historical local lore in the studied period is heterogeneous, but consistent in the direction of the accumulation of museum exhibits and their research.

The tendency to expand the number of museums and their contents had a positive direction, because new museums were opened throughout the territory of the Cherkasy region.

The peculiarity of the museum business in Cherkasy region is that many museums have started their activities for the first time. Expositions and funds were filled with exhibits that were from other regions. It was made since during the researched period the territory of Cherkasy was part of other regions, and the region was created in modern boundaries in 1954. The development of the museum business in the region contributed to the development of the local history movement in Cherkasy region. It formed interest the public in studying the historical past of the region. But the curtailment of "Ukrainization" in the 1930s had a negative impact on the development of the museum business and historical regional studies in general, as the mass curtailment of the regional studies movement began. It was caused by a break in social and historical sciences and repression against local studies scientists.

The 1920s and 1930s went down in history as the "golden time" of Ukrainian local history. This topic is relevant and needs further study, since local history is an important component of historical science. In general, the scientific problem of studying local history of Ukraine in the 20−30s of the 20th century needs detailed study and broad scientific discussion.

Reference

Barvinok, O.V. (2016). *Umanskyi kraieznavchyi muzei u konteksti zmin ideolohichnykh kontseptsii ukrainskoho muzeinytstva (1930−1950 rr.).* [Uman Museum of Local Lore in the Context of Changes in Ideological Concepts of Ukrainian Museums (1930−1950)]. Architectural and Cultural Heritage of Historical Cities of Central and Eastern Europe: a collective monograph Issue 3. 273−284 pp. [in Ukrainian]

Chepurna, I.V. (2004) *Pamiatkookhoronna robota na Chyhyrynshchyni v 20-kh rokakh XX st.* [Monument protection work in the Chyhyryn district in the 20s of the twentieth century]. Materials of the first scientific and local history conference of Cherkasy region (dedicated to the 50th anniversary of Cherkasy region). 243−248 pp. [in Ukrainian]

DACHO (1920). FR-131, Op 1, Spr 19, Ark 9. Knyha obliku vidviduvannia Cherkaskoho istoryko-pedahohichnoho muzeiu za 1920 rik. [FR-131, Op 1, Spr 19, Ark 9. Book of visits to the Cherkasy Historical and Pedagogical Museum for 1920]. [in Ukrainian]

DACHO (1921-1924). FR 131, Op 1, Spr. 21, Ark 14. Dopys uchytelia m. Chyhyryna Yaremenka pro pamiatky starovyny, mystetstva ta pryrody, shcho zberehlysia v okolytsiakh Chyhyryna za 1921−1924 pp. [FR 131, O DAChO (1920). FR-131, Op 1, Spr 23, Ark. 60. Protokoly zasidan komitetu po okhoroni pamiatnykiv kultury. Opys eksponativ Cherkaskoho okruzhnoho muzeiu 6 zhovtnia 1923 r. – 28 lystopada 1924 r. p1. Sp 21, folio 14. Report by Yaremenko, a teacher in Chyhyryn, on the monuments of antiquity, art, and nature preserved in the vicinity of Chyhyryn, 1921−1924)] [in Ukrainian]

DACHO (1923-1924). FR-131, Op 1, Spr 23, Ark. 60. Protokoly zasidan komitetu po okhoroni pamiatnykiv kultury . Opys eksponativ Cherkaskoho okruzhnoho muzeiu 6 zhovtnia 1923 r. – 28 lystopada 1924 r. [FR-131, Op 1, Spr 23, p. 60. Minutes of meetings of the Committee for the Protection of Cultural Monuments. Inventory of exhibits of the Cherkasy District Museum, October 6, 1923. November 28, 1924]. [in Ukrainian]

Mankovska, R. (2000). *Kraieznavchi muzei v Ukraini: istoriia i suchasnist.*[Local History Museums in Ukraine: History and Modernity] Local History, 2000. Issues 1-2. 153−162 pp. [in Ukrainian]

Nabok, L. M. (2013). *Istoriia muzeinoi spravy Cherkashchyny 1921−1931 rr.* [History of museum affairs in Cherkasy region in 1921−1931] Pereyaslavsky chronicle Issue 4. 3−8 pp. [in Ukrainian]

Nahorna, N. (2004). *Do istorii formuvannia fondiv zibrannia Umanskoho kraieznavchoho muzeiu.*[On the History of the Formation of the Collections of the Uman Museum of Local Lore]. Proceedings of the First Scientific and Local History Conference of Cherkasy Region (dedicated to the 50th anniversary of the formation of Cherkasy region), 352−361 pp. [in Ukrainian]

Shcherbyna, M.M. (2004) *Prosvitianskyi rukh na Cherkashchyni v roky Ukrainskoi revoliutsii (1917−1920)* [The Educational Movement in the Cherkasy Region during the Ukrainian Revolution (1917−1920)]. Scientific and Local History Conference of Cherkasy Region (dedicated to the 50th anniversary of the formation of Cherkasy region), 213-219 p. [in Ukrainian]

Smolii, V.A. (2013) *Cherkaskyi oblasnyi kraieznavchyi muzei* . Cherkasy Regional Museum of Local Lore . Kyiv: Nauk. dumka, 2013. Vol. 10. Encyclopedia of the History of Ukraine: in 10 volumes / NAS of Ukraine, Institute of History of Ukraine 499 p. [in Ukrainian]

Sosa, P. (1998). *Cherkaskomu kraieznavchemu – 80.* [Cherkasy Museum of Local Lore turns 80] Cherkasy: Siyach, 1998. 67 p. [in Ukrainian].

Troshchynska, O. I. (2011). *Z istorii Chyhyrynskoho istoryko-kraieznavchoho muzeiu Z istorii Chyhyrynskoho istoryko-kraieznavchoho muzeiu* [From the history of the Chyhyryn Museum of History and Local Lore From the history of the Chyhyryn Museum of History and Local Lore]. Bulletin of the Odesa Museum of History and Local Lore number 10. 37−4 pp. [in Ukrainian]

F. UKM-643, pp. 1−4. Passport. *Pasport Umans'koho mizhrayonnoho naukovo-doslidnoho krayeznavchoho muzeyu* [Passport of the Uman Interdistrict Research Museum of Local Lore, 1936] [in Ukrainian].

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RUSSIA'S NAME IN HISTORICAL CONTEXT: A RETROSPECTIVE ANALYSIS

Abstract. The purpose of the study *is the theoretical justification of the transformation of the historical names of Russia from the princely period to the present.* ***The research methodology*** *includes retrospective analysis, historical analysis, theological analysis, philosophical analysis, comparative and bibliographical methods that contribute to understanding of Russia's history, Russian philosophy of name and Russian belief in own unique culture.* ***The scientific novelty*** *of the article is based on analyzing the genealogy of name "Russia" along historical, theological, geopolitical and philosophical lines within the Moscow school of philosophy. Special attention is paid to religious nature of Russia's understanding of own history, as well as some specific facts regarding Russian historical narratives which arise in the sector of Russian nationalistic ideology.* ***The Conclusion.*** *Using the mentioned methods, it is proven that the toponym "Russia" indicates the artificiality of the name of the territory of the modern Russian Federation, which was adopted by the Moscow monarchies in order to prove their right to create their own geopolitical empire.*

Keywords: *Russia, Kyivan Rus, Orthodoxy, history, historical narrative, historical myth, philosophy of history, philosophy of name, theory of ethnogenesis.*

Relevance of the topic. Any reader of the history of the Russian Federation at some point will face way too many answers to a very

simple question: where did Russia take its name from? There's no single prevailing narrative on this in the Russian historical literature. Being produced most of the time by historians, who are loyal to the Russian government, such literature is usually filled with ideological conclusions rather than fair analysis.

Formulation of the problem. Right now, when Russian Federation is fighting the war against Ukraine, trying to bring to Ukraine its historical narratives, it's important for us to have a better understanding of what Russia is and where it came from. In my previous articles, I wrote several explanations on what ethnicity should be considered to be Russian per se – meaning, ethnicity that created Russian nation. Such an ethnicity is Mordva, a territory not far away from the cities of Moscow and Vladimir.

Russian historians kept trying to prove that Mordva is a Finno-Hungarian ethnicity and, basically, one of the European identities. For instance, Lev Gumilyov wrote about this profoundly (Gumilyov, 2018). However, no serious argument was ever made on why we should believe that territories to the east from Moscow were populated by Finnish and/or Hungarian tribes.

We know that Gumilyov didn't have any sort of academic freedom in modern sense. To be able to publish his writings in the Soviet Union, he had to obey the rules. Moreover, his father Nikolay was put to death by the Bolshevik regime in 1921 – and, therefore, Lev Gumilyov had to keep proving that, unlike his father, he's loyal to the Soviet government in Moscow.

Gumilyov's task was to contribute to the Soviet theory of ethnic identities that had several subsets of political tasks:

1) Establishing a narrative that Russians, Belarussians and Ukrainians are the same nation.

2) Establishing a narrative that Russia is a European country, not an Asian country.

3) Establishing a narrative about Soviet identity, which was important for political use in the Caucasian region and Baltic countries.

4) Creating a theory of melting pot for smaller nations (Yakutia, Buryatia, Kabardino-Balkaria, Tuva, Birobijan etc.) where they would

eventually be recognized as people of Soviet ethnicity. (Gumiloyv, 2018; Hill, 2021).

That's why Gumilyov was constantly writing about all kinds of medieval ethnicities populating eastern and central regions of Europe, as well as western part of Asia. To him, Russians were proto-Hungarians mixed with proto-Finns in the age before the Mongolian era of 13th century. This shouldn't be taken at face value.

Firstly, such a presupposition is based on a belief in a thesis that most of the migration processes in early medieval times were happening along the East-West axis, while it's obvious that North-South axis was at least as important. To Gumilyov, that's Mordva people who came to live on the territories where modern Hungary and Finland is. But what seems to be more likely, is that northern tribes from Siberia and Arctic archipelagos traveled to the South in order to find a more comfortable climate and do some sort of agriculture work. So, instead of Gumilyov's theory of Finn-Hungarian identity being born somewhere to the east of Moscow, we should rather pay attention to how Arctic tribes were able to travel to the Moscow region and what kind of ethnic culture prevailed there.

Secondly, we can't really see any proximity, any substantial parallels in the structure, phonology, semantics and semiotics of modern Russian, Hungarian and Finnish languages. You can always find similarities between pretty much any languages spoken on the planet if you need to do so for political reasons, but, to be fair, Russian, Hungarian and Finnish languages are way too different between each other.

Thirdly, in the medieval times, Moscow was not in any way an influential geopolitical center. If Moscow somehow would by connected to principalities in Finland and Hungary through dynastical lines, this would bring to substantial political consequences. For instance, Kyiv had connections with Scandinavian dynasties in in he 10th−11th centuries, which is why Kyiv principality had rulers of Scandinavian origin. Nothing of this type was happening in Moscow. Only much later, dynasty of Romanovs tried to interconnect with older Byzantium dynasties, but that didn't become an important development for the Moscow monarchy. Windsors, a British dynasty, had connections to

Greek royal families, so Russians though this way: if we get connected dynastically to Greek and/or Byzantium elites, we'll get closer in our connection to Windsors. This is a very doubtful logic.

Purpose of the article is to present the results of the study of the genesis of the toponym "Russia", which is the basis of the name of the modern country, the Russian Federation. In older manuscripts, the territory to the East from Ukraine are called "Moscovia" or "Muscovia". We see this in "Samovydets Litopys" (Dzyra, 1971), "Samiylo Velychko Litopys" (Boryak, 2020), we see this in writing of Kyiv Lavra monks, like Ioannyky Galyatovsky (Chepiga, 2011). The very verbal root "Rus" was born in the city of Kyiv in 10th century, when local prince Volodymyr the Great, who was a Swede, called his principality "Kyivan Rus".

Presentation of the topic. In later XVII century, when the Russian army de facto occupied Ukraine following the 1654 Pereyaslav treaty that Russian side broke, Moscow historians started creating this narrative that it's Moscow that is "Rus" de facto, while "Kyivan Rus" was a historical mistake. Basically, Moscow privatized linguistical root "Rus" in 17th century, after the era of Bogdan Hmelnitsky, a political leader of Ukraine, and metropolitan Petro Mogyla, a spiritual leader of Ukraine. Those were too vocal on the European political scene on the Ukrainian matters, which is why Muscovites had to wait for both of them to die in order to privatize name "Rus" for own geopolitical purposes.

Then, Muscovites, who started calling themselves "Russians" in early 18th century, turned to monastic writers who were becoming increasingly popular. With most of the local literature being too elitist for ordinary Russians, that's the monastic writers who were read by people living in rural regions, outside the big cities in the Russian Empire. Many of those monks, who were writing books on history, were contributing to the narrative that Moscovia is Rus per se.

We see signs of this in writing of Ioann Tobolskiy (1651−1715), a bishop of the Russian Church who was born in the ancient Ukrainian city of Uman, but later went to serve the Christian mission to Siberian tribes (Panchenko, 1999). Then we should also mention books by bishop Leonid Krasnopevkov (second part of 19th century) (Smirnova, 2015). We also see signs of this in later ages – take writings of Illarion Troitsky

(1886−1929) (Gorbachev, 2016). That's how we know that Russia wasn't really Russia before the XVII century, but it was Moscovia – this is the name by which this territory was known on the scene of global diplomacy of that age. But, to substantiate own understanding of why Moscovia needs to be an empire, Moscow put a lot of efforts in spreading the narrative about it being Russia, sometimes even know by the name "Greater Russia" ("Velikorossiya").

Let's pay attention to the philosophy of renaming Moscovia into Russia. This is a very, very important factor. As a country having a monastic type of Christianity, Moscovia was following the most conservative version of faith in God, in Holy Trinity. In eastern Christianity, when a person chooses to become a monk, he or she should get his or her name changed. That means that, after becoming a monk or a nun, that person is now a totally different human individual and has to start writing own biography from scratch.

To Moscovia, changing the name to "Russia" was a symbolic act of analogous to a monastic tonsure. Moscovia wanted a greater life, a greater historical fate – and by changing the name of this country through a monastic-like procedure meant it wanted to devote itself to God to receive this holy blessing for being a big and mighty empire. That was the logic.

Earlier, elder Filofey Pskovskiy (1465−1542) created a narrative about Moscow becoming a third Rome, after another two Romes – Rome of the Roman Empire and Rome of the Byzantium Empire – lost the virginity of their Christian faith. That's a totally Moscovian narrative as we know well – both western Europe and eastern Europe have been having their own, very interesting Christian traditions. "Moscow is the third Rome and where won't be the fourth!" – Filofey Pskovskiy wrote.

Now let's go back to how Moscovian intellectual tradition understands what name is. It has its own philosophy of name, which is somewhat based on the medieval Latin philosophical tradition that also paid a lot of attention to what names and words mean philosophically. The greatest accomplishments in the sector of the philosophy of name were bade by Russian philosophers Sergey Bulgakov, Pavel Florenskiy and Aleksey Losev. All of them knew each other and learned a great deal from each other. Florenskiy was one of those who persuaded Bulgakov to

become a Christian priest. Meanwhile, Losev, who also talked to Florenskiy, decided to become a monk, taking name Andronik. Later, Florenskiy's grandson also become a monk, taking this very name – Andronik. That was the special feature of the spiritual life of this Russian intellectual group.

All three, Bulgakov, Florenskiy and Losev presented their own philosophy of name. To Bulgakov, name was a theological reality, where spiritual energy gets substantiated through a word (Bulgakov, 1999). This philosophy is based somewhat on the Jewish intellectual tradition, but also on the Bible and how names are described there. Florenskiy's philosophy of name took a lot from Aristotle and Immanuel Kant. To Florenskiy, name is a matter of teleology, which means a person, a human individual should be trying to reach the goal of own life which is transcribed in that person's name. Such an approach is also a basis for changing the name in Russian monasticism (Florenskiy, 2004). Losev was a much more conservative philosopher, than both, Bulgakov and Florenskiy. Spending most of the time writing about Antique Age, Losev prioritized logic over other intellectual methods and, therefore, his philosophical descriptions are usually very, very lengthy. The word-count in Losev's book is enormous which makes them difficult for many to read. Finally, Losev's philosophy of the name is a matter of so called "spiritual geometry", where numbers co-exist with names in the world of ideas (Losev, 2018). Such a theory is based on Platonic tradition that has own methods for analyzing these issues. As a seeker of principles of metaphysical harmony, Losev was thinking that the name is something that puts you in a certain place in this complicated world of being and not-being. Name brings a person, an individual or, basically, any essence from not-being to being. So, Losev's philosophy of name is existential.

Given how important the philosophy of name is to Moscow philosophical tradition, there's nothing surprising that Moscovia decided in XVII century to change its name which symbolizes a radical shift in its geopolitical trajectory. Russians, having own tradition of Christianity, believe that the name matters a great deal. The world is all about the name. And life is in its nature carrying a name.

Now, let's pay attention to writings of metropolitan Ioann Snychev (1927−1995). As a bishop of Petersburg in the Soviet times, he was

known for being a Russian far-right spiritual radical. A Russian nationalist. An author of a nationalistic version of Russia's history. As an ideologist, Snychev was a very prolific writer, spending most of his spare time with books. Some of his faithful even though that metropolitan Ioann should be doing more praying and more spiritual work, serving liturgies for the believers. But Snychev thought that writing books is like a prayer to him. That's his way of praying with words (Snychev, 1996).

I obtained a collection of historical works of Snychev in 2004 in a small private library in Russia's Tver region, that's to the north from Moscow. Snychev was no longer popular in that part of Russia, nor he was popular in Moscow or Petersburg. The reason was this. In 2000, Vladimir Putin became a ruler of the Russian Federation and soon decided that the Russian Orthodox Church plays a role which is too big within the Russian society, which is why it needs to be sidelined.

Snychev was one of the most influential Orthodox thinkers in Russia in the early 1990s. Born in a Russian ethnic settlement in Ukraine's Herson region in 1927, Snychev was a spiritual student to bishop Manuil Lemeshevsky, another Russian nationalist. Herson used to have lots of people of Russian ethnicity that were brought here in late 17th centuries from places like Siberia and Arctic. There, in Herson, these people had a much better climate where they could live with their families.

It's well known that agriculture industry has serious problems in Siberia and, of course, Arctic region. Back in the 1990s, the World Bank was providing investments for Boris Yeltsin's government in order to finance development of Russia's North. In order to receive those funds, Yeltsin's government had to implement certain social and economic reforms. However, when Vladimir Putin became Russian leader, he refused to cooperate with the World Bank, saying that he's not going to obey any of the Western demands for reforms in the Russian Federation that has to pursue own path, thought Putin. Since then, many Russians living in Siberia and Arctics had to relocate to different parts of the country to make a living. After Russia exited the World Banks's "Northern Development" program, no one has ever invested anything substantial in Russia's North.

Kremlin decided to sideline books by Snychev from the Russian historical mainstream, so they wouldn't be producing any serious impact on what Russian citizens think about own history. It's not Snychev's nationalism that scared Putin. It's the essence of Snychev's nationalism that Kremlin had fears about. While Putin was more of a communist-type political leader, Snychev was standing behind the idea of resurrecting monarchy in Russia through a modern political system. Moreover, Snychev was a big fan of historical teaching of Anton Denikin, Russian general who fought against the Bolsheviks in 1917−1922.

Some of the Putin's advisors were telling him he should also get engaged into Denikin's political philosophy, but, as a former KGB officer, he didn't really like the so called Russian White Movement led by Denikin, since it was anti-Soviet. Besides this, one of Denikin's generals – Petr Krasnov – led the Russian Cossack regiment within the German army, fighting against the Soviet army during the World War II. So, there's no way Putin would trust Denikin's theories.

Back to Snychov's philosophy of Russian history. Metropolitan Ioann Snychev was pushing forward this idea that European dynasties were trying to take over Moscow in most of the historical ages (Snychev, 1996). They were creating tension that surrounded Moscow. They tried to influence Russian emperors through their embassies. They were crafting plans for overthrowing Romanov's dynasty in Russia. That what Snychev wrote. His main concept for producing own version of Russian history was grounded on this West vs Russia geopolitical approach. That what made Snychev somewhat popular among Russian nationalists and different far-right groups.

The Conclusion. Let's draw some conclusions. In this article, we explained where the name "Russia" came from and why modern Russia is de facto Muscovia. This territory's key ethnicity is Mordva, which produced a cultural genotype of contemporary Russian nation.

Throughout the ages, Russian historians tried to hide this. They were claiming European roots of the Russian nation, they were trying to prove that Ukrainians and Belarussians are Russians. They were producing lots of fake narratives for own political reasons which were imperialistic in their nature.

What matters now is that Russia faces own national history the way it is, in a proper and fair manner. There are no reasons to believe that Russia possesses any sort of "greatness" which would allow it to invade neighboring countries – Moldova (1992), Georgia (2008), Ukraine (2014, 2022), political operation in Belarus (2020). Russia needs to be changed and should become a peaceful nation. It shouldn't be organizing wars or so called "special military operations". A price for these wars and these operations is too costly for Russia which has been mostly living in poverty for the past 30+ years.

Bibliography

Gumilyov, Lev. (2018). *Drevnyaya Rus i Velikaya Step* [Ancient Rus' and the Great Steppe]. Moscow: AST, 736 p. [in Russian]

Hill, Fiona. (2021). *There's nothing for you here.* NYC: Harper Collins, 350 p. [in English]

Boryak, Gennadiy. (2020). *Litopys Samiyla Velychka* [Chronicle of Samiylo Velichko]. Kyiv: Klio, 224 p. [in Ukrainian]

Dzyra, Yaroslav. (1971). *Litopys Samovydtsia* [Chronicle of Samovidets]. Kyiv: Naukova dumka, 206 p. [in Ukrainian]

Chepiga, Inna. (2011). *Klyuch rozuminnya Ioannykia Galyatovskogo* [The key to understanding Ioannikiy Halyatovskyi]. Kyiv: Naukova dumka, 46 p. [in Ukrainian]

Smirnova, Irina. (2015). *Leonid Krasnopevkov. Pravoslavnaya Encyklopedia* [Leonid Krasnopevkov. Orthodox Encyclopedia]. Vol. XL, p.473−477. Moscow: Izdatelstvo Moskovskoy Patriarhii, 752 p. [in Russian]

Gorbachev, Aleksandr. (2016). *Zhizn i trudy svyashchennomuchenika Illariona* [The Life and Written Works of Hieromartyr Hilarion]. Moscow: Izdatelstvo Sretenskogo Monastyrya, 208 p. [in Russian]

Losev, Aleksey. (2018). *Filosofiya imeni* [Name philosophy]. Petersburg: Izdatelstvo Olega Abyshko, 672 p. [in Russian]

Bulgakov, Sergey. (1999). *Filosofiya imeni* [Name philosophy]. Moscow: Iskusstvo, 175 p. [in Russian]

Florenskiy, Pavel. (2004). *Filosofiya kulta* [Philosophy of the cult]. Moscow: Mysl, 884 p. [in Russian]

Snychev, Ioann. (1996). *Samoderzhavie duha [*Autocracy of the Spirit]. Petersburg: Tsarskoe delo, in 5 volumes. [in Russian]

Panchenko, Aleksandr. (1999). *Maksimovich Ioann* [Maksimovich John]. Petersburg: Nauka, 296 p. [in Russian]

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LOW TEMPERATURE HEAT TO POWER COUPLER

Abstract. The Purpose of the Study *is to substantiate the possibility of a real connection of thermal energy, where heat generates energy (electricity) for low temperatures (below 120 °C).* ***The Research Methodology:*** *Methods of analysis, modeling, description and generalization of the data of the studied problem of low temperature heat to power coupler.* ***The Scientific Novelty*** *lies in the fact that for the first time, technical extensions of the well-known steam technology have been investigated, which, in combination with the newly chosen environment, make possible the innovative implementation of the technology.* ***The Conclusion****. The method is able to provide large amounts of energy, free of charge and indefinitely, because the energy reservoir "Earth" provides energy indefinitely and 24 hours a day. Of course, the application of low-temperature combined heat and power is not limited to geothermal energy. Hot industrial exhaust gases can also be considered if the volume flow is sufficiently high. The grade of efficiency of the system is infinitely large, since the effort = 0. Remaining task: finding the right turbine. At least as a first approach, the pentanes appear to solve the problem of selecting a refrigerant for energy transfer. As far as the turbine or piston machine is concerned, a solution is being sought that can reasonably drive a generator with pressures of 5−12 bar, with the power ultimately being adjusted via the volume flow.*

Keywords*: thermal energy, low temperatures, steam technology, pentanes,volume flow.*

The Relevance of the Topic. The tried and tested method of using warmth / heat to drive machines and thus also electric machines works in such a way that a fluid (water) is caused to evaporate by heating it. The resulting steam pressure drives either a piston engine or a turbine, which generates mechanical power, i.e. develops power. This is how it worked in the good old steam engine, and this is how electricity generation works in nuclear power plants. Water now has the attitude of evaporating under normal pressure = 1 bar at 100 °C and thus developing the pressure that is needed to drive a turbine or a piston machine. When pressurized, higher boiling temperatures can also be reached. The boiling point is the temperature at which a fluid changes its physical state from “liquid” to “gaseous”. This boiling point depends on the external pressure.

Against the background of global change in energy supply, it is of particular interest to develop efficient methods, especially for power generation.

The Formulation of the Problem. Renewable energies are often mentioned as an energy source, such as wind power and solar radiation. (Whereas these two examples are not actually "regenerative", but stochastically available: unpredictably the wind blows or not. The same with the sun.)

In this respect, such energy sources are at best suitable as an addition to network relief and to cover peak loads and also make an important contribution. The latter also applies to all types of pumped storage power plants. But: a reliable supply of the base load cannot be achieved with all these methods.

River hydroelectric power is a hybrid: it can serve as a base load supply if the constant flow of water is secured year-round. And tidal power plants on the coast would certainly also be a solution for base load supply if the tidal range is sufficiently large.

Only conventional power plants are suitable for reliably covering the base load in the supply far from the coast: gas and coal-fired power plants as well as nuclear power plants. What all of these have in common is that they have to be fueled, i.e. they require an energy source that is used up.

The search for innovative technologies for the production of stable electricity is a modern scientific problem and requires a thorough solution.

The Purpose of the Article is to describe the innovative technology of low temperature heat to power coupler.

The Presentation of the Topic. Only in countries like Iceland the global geostructure accommodates the situation so far that the near-surface earth temperatures are very high in some places. Water vapor escapes on the surface, sometimes at 120 °C, and at a depth of a few hundred meters one finds earth temperatures of well over 100 °C in these places. In this respect, it is easy for the Icelanders, for example, to use the earth's energy free of charge and, above all, constantly and endlessly; in other words, to use the good old water vapor technology and use it to operate steam turbines.

But they only cook with water and that boils / develops steam at 100 °C. For differentiation, this temperature limit of 100 °C is referred to as the high-temperature range in the context of this publication.

The known procedures are therefore heat-power couplings in the high-temperature range.

New development / invention: Low-temperature heat to power coupling. The new idea is now to use this basically simple technology in the low-temperature range; i.e. in the temperature range below 100 °C.

The technical innovation (progress, inventive height) consists in:

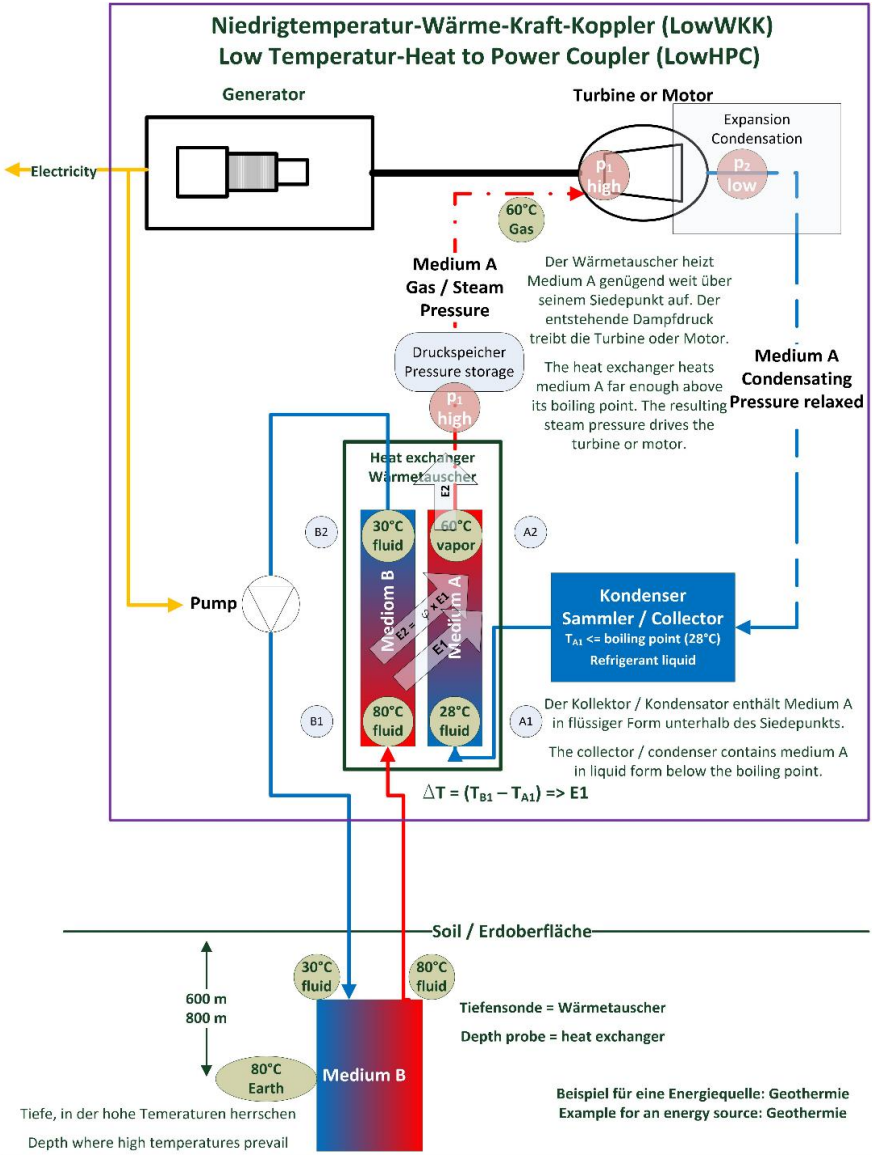
1. that instead of one working circuit, as has been the case since then, two working circuits are used: the first conveys the energy and the second delivers it to the mechanical unit (turbine or piston engine) as part of a Carnot cycle.

2. For the second working cycle (Carnot process), a refrigerant is used which meets the condition:

(Temperature $_{\text{source}}$ – T $_{\text{boiling point refrigerant}}$) >= 25 K approximately or at least fulfilled.

In practice, two media circuits are required as well as a heat exchanger and a fluid as one of the two media, which has its boiling point well below the temperature of the other medium:

Figure 1. Low Temperature-Heat to Power Coupler



Note: the temperatures shown are to be understood as examples, as is the type of heat exchanger shown. Depending on the need, other elements such as throttle valves, an expansion and condensation chamber after the turbine and the like can also be used.

Description:

The invention solves the problem of using relatively low source temperatures to generate power or electricity.

Two circuits are used for this, which exchange thermal energy from the ground. Medium B is always liquid and draws the heat from the source in the circuit. It can be water. Medium B flows through the heat exchanger and transfers its energy to medium A.

Medium A is a low-boiling fluid from the refrigerant class. It is crucial that the boiling point (boiling temperature) is far enough below the temperature that medium A brings with it from the source.

Medium A is heated above its boiling point and will accordingly vaporize or assume its gaseous state. The resulting pressure drives the turbine, whose shaft drives the generator.

So the refrigerant becomes the energy

$$\mathbf{E_1 = m_{H2O} \times c_{p\ H2O} \times (T_{H2O\ source} - T_{boiling\ point\ refrigerant})}$$

supplied when medium B is water.

C_p is the specific heat capacity of the medium.

As it flows through the turbine, the pressure and temperature of medium A decrease. The design of the machine determines that complete condensation of the medium A only occurs after leaving the turbine.

Medium A, which has been cooled to below its boiling point, collects in the liquid aggregate state in the collection container. This is attached in such a way that the resulting column of liquid is sufficient to fill the heat exchanger to a sufficient level without the aid of a pump.

The system is started by starting the feed pump for medium B. A shut-off valve remains closed until the required operating pressure is reached.

Energy balance. The table below shows the energy balance for the nergy quantity 1 MWh:

Table 1. Energy in hot water

Specific heat capacity	H2O liquid	
Cp H2O	4,183	kJ/(kg*K)
	0,001162	kWh/(kg*K)

E = m * Cp * DT

m = V = E / (Cp * DT)

DT	25	K
E	1	kWh
Cp	0,001162	kWh/(kg*K)
V = m	34,42	L

DT	25	K
E	1000	kWh
	1	MWh
Cp	0,001162	kWh/(kg*K)
V = m	34.423,41	L
required flow rate	34,42	m^3

Example Beuren thermal bath		
extraction depth	600	m
water temperature source	48	°C
boiling point refrigerant	25	°C
DT	23	K
E	1000	kWh
	1	MWh
Cp	0,001162	kWh/(kg*K)
V = m	37.416,75	L
required flow rate	37,42	m^3

E is the energy transferred in the heat exchanger.
Heat exchanger + turbine have efficiencies.
The head of the pump = 0 m, only frictional resistance.

In order to generate 1 MWh of energy, with a temperature difference

DT = (source temperature – boiling point of refrigerant) = 25 K

approx. 35 m^3 of the source medium must be pumped. This is within reasonable limits, especially since no hydraulic height has to be pumped due to the U-tube principle.

If this amount of energy is related to a period of 1 hour, then the prerequisites for a power plant with an output of 1 MW have been created. To do this, V = 35 m^3 of the source medium must be pumped per hour; V. = 35 m^3/h.

Of course, some efficiency-related losses still have to be deducted here, but they also occur in comparable systems.

Result: The method is simple and consists of proven components. It is able to provide large amounts of energy, free of charge and indefinitely, because the energy reservoir “Earth” provides energy indefinitely and 24 hours a day.

What we need is a suitable refrigerant for the circulatory process of medium A. "Suitable" here means that the condition is met

(Temperature $_{\text{medium B}}$ - boiling point $_{\text{medium A}}$) >= 25 K

i.e. the selection of the refrigerant always depends on the temperature of the source. However: the higher the temperature of the source, the greater the energy yield will be.

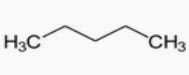
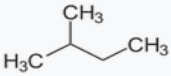
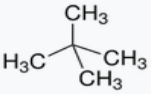
Of course, the application of low-temperature combined heat and power is not limited to geothermal energy. Hot industrial exhaust gases can also be considered if the volume flow is sufficiently high.

It is definitely conceivable to replace cooling towers with such systems.

Selection of a suitable refrigerant. We want to work in a working range from ambient temperature to, say, 85 °C source temperature. That would be an expected maximum value for the source temperature if geothermal energy is to be the energy source. At ambient temperature, the refrigerant should assume the liquid state without additional cooling. The boiling point of the coolant should therefore (in cooler regions) be above 25 °C.

You will find what you are looking for right away in the field of pentanes.

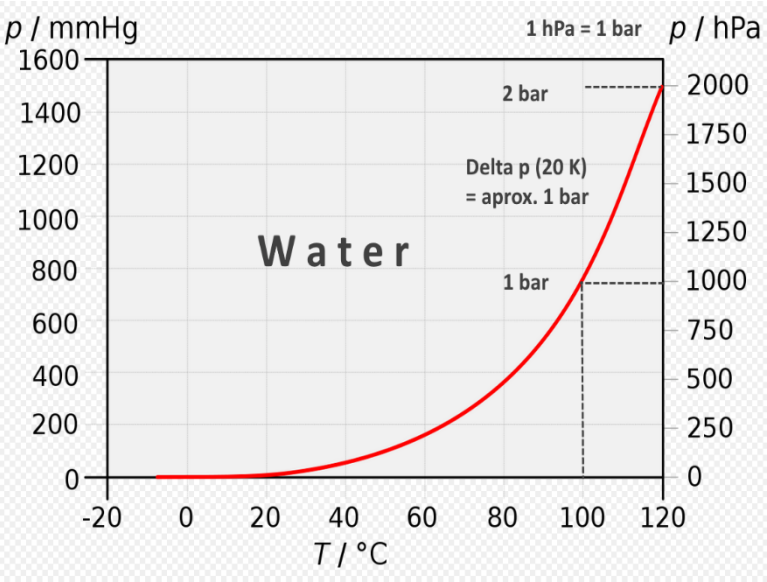
Table 2. Properties of the Pentanes

Eigenschaften der Pentane[1]			
Name	Pentan[2]	Isopentan[3]	Neopentan[4]
Andere Namen	Pentan (IUPAC)	2-Methylbutan	2,2-Dimethylpropan
Kältemittel	R-601	R-601a	R-601b
Strukturformel			
CAS-Nummer	109-66-0	78-78-4	463-82-1
PubChem	8003	6556	10041
Summenformel	C_5H_{12}		
Molare Masse	72,15 $g \cdot mol^{-1}$		
Kurzbeschreibung	farblose Flüssigkeiten		farbloses Gas
Schmelzpunkt	−130 °C	−160 °C	−16,6 °C
Siedepunkt	36 °C	28 °C	9,5 °C
Dampfdruck (20 °C)	562 mbar	761 mbar	1456 mbar
Dampfdruck (30 °C)	815 mbar	1080 mbar	2100 mbar
Dampfdruck (50 °C)	1590 mbar	2042 mbar	3700 mbar
Dichte	0,63 $g \cdot cm^{-3}$	0,62 $g \cdot cm^{-3}$	0,6135 $g \cdot cm^{-3}$
Löslichkeit in H_2O	39 $mg \cdot l^{-1}$	50 $mg \cdot l^{-1}$	33 $mg \cdot l^{-1}$
Flammpunkt	−49 °C	−57 °C	<−7 °C
Heizwert	12,6 $kWh \cdot kg^{-1}$ oder 45,4 $MJ \cdot kg^{-1}$		
Untere Explosionsgrenze (UEG)	1,1 Vol.-%	1,3 Vol.-%	1,3 Vol.-%
	33 $g \cdot m^{-3}$	38 $g \cdot m^{-3}$	40 $g \cdot m^{-3}$
Obere Explosionsgrenze (OEG)	8,7 Vol.-%	7,6 Vol.-%	7,5 Vol.-%
	260 $g \cdot m^{-3}$	230 $g \cdot m^{-3}$	230 $g \cdot m^{-3}$
Zündtemperatur	260 °C	420 °C	450 °C

It is immediately apparent that pentane R-601 and isopentane R-601a come into question because of the suitable boiling point, while neopentane R-601b is ruled out because the boiling point is too low.

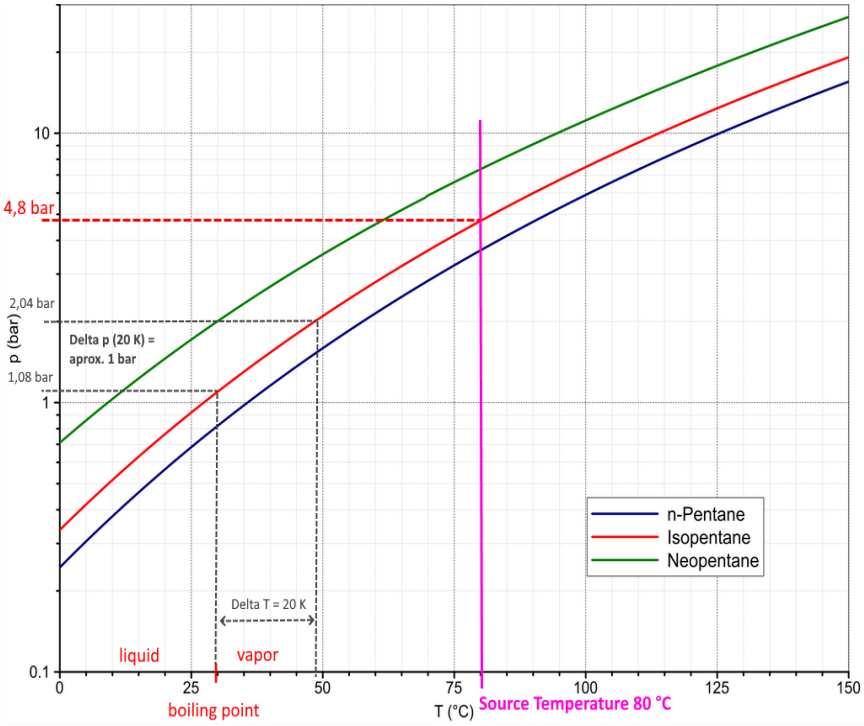
The pressure gradient **Dp (20 K) = aprox. 1 bar** shows up: when the temperature increases by 20 K above the boiling point, the vapor pressure has doubled from 1 bar to 2 bar. (isopentane). Interesting at this point is the comparison with water, which has been proven to be suitable for energy transfer:

Figure 2. Steam pressure water



A comparison with the vapor pressure curve of water also shows a pressure increase of 1 bar when the temperature rises by 20 K above the boiling point at 100 °C. One can now compare the vapor pressure curves of the pentanes:

Figure 3. Steam pressure Pentanes



One first notices that the vapor pressure curve for water tends to increase exponentially with increasing temperatures. However, it should be noted that Figure 4 is a logarithmic representation! In this respect, one might initially assume that the courses of the curves will be similar. In the case of the low-temperature application in question here, however, really high temperatures are not reached per se.

If one evaluates Figure 4 for isopentane in more detail, then for a source temperature T source = 80 °C one arrives at a pressure increase Dp of around 5 bar, calculated from the boiling point T boiling point = 28 °C.

This pressure, which is solely dependent on the source temperature, would now act on the blades of the turbine or on the pistons of the piston

engine and, multiplied by the volume flow and some other factors, the machine output would result.

Application in geothermal energy (as an example). It is known that the temperature of the ground increases with increasing depth. The gradient is given as 35-40 K / 1000 m. Existing mines have a depth of up to 3000m. If you calculate with 35 K / 1000 m, this means that at a depth of 3000 m there is a temperature of 105 °C, if you consider the earth's surface with 0 °C. In this example we therefore have a source temperature of 105 °C. Isopentane has a boiling point of 28 °C. If you now insert these values into the already known calculation, you get:

Table 3. Energy and volume flow

Example Mine 3000m depth			
DT / 1000m		35	K
Lit.: 35-40K /1000m			
depth		3000	m
T in depth		105	°C
water temperature source	T_{source}	105	°C
boiling point refrigerant	$T_{boiling\ point\ refrigerant}$	28	*C
refrigerant: R-601a Isopentan			
DT	$T_{source} - T\ b_{oiling\ point\ refrigerant}$	77	K
E		1000	kWh
		1	MWh
Cp_{H2O}		0,001162	kWh/(kg*K)
V = m		11.176	L
required flow rate H2O		11,18	m^3

A look at Figure 4 shows that for T = 105 °C we already get a pressure of well over 10 bar. That should be enough to operate a turbine or a piston machine tailored to this application.

For comparison: hydroelectric turbines in hydroelectric power plants produce quite reasonable electrical output with a head of 12 m. Ultimately, however, a turbine is not driven by the head, but by the mechanical pressure on the blades, which is only 1.2 bar at a head of 12 m.

If we now enlarge the system by a factor of 100 and refer to one hour of time, then we get a power plant with an output of 100 MW:

Table 4. Energy and volume flow

Example Mine 3000m depth	Faktor 100	**100 MW**	related to 1 hour
DT	$T_{source} - T\,b_{oiling\ point\ refrigerant}$	77	K
P = E / h		100000	kW
		100	MW
Cp_{H2O}		0,001162	kWh/(kg*K)
V = m		1.117.643	L
required flow rate H2O		1.118	m^3/h
		18,63	m^3/min

For this we need a pumped volume flow of 18.63 m^3/min. That's not much, especially since we − it should be remembered - due to the U-tube principle we only have to overcome the flow resistance, but not have to pump 3000 up.

Exactly this consideration encourages to increase the plant again by a factor of 10 and we get a power plant with an output of 1 GW:

Table 5. Energy and volume flow

Example Mine 3000m depth	Faktor 1000	**1 GW**	related to 1 hour
DT	$T_{source} - T\,b_{oiling\ point\ refrigerant}$	77	K
P = E / h		1000000	kW
		1000	MW
Cp_{H2O}		0,001162	kWh/(kg*K)
V = m		11.176.431	L
required flow rate H2O		11.176	m^3/h
		186,27	m^3/min

Even pump capacities of 186 m^3/min are not a problem if the geodetic height to be overcome is = 0.

The earth energy supplies free and infinitely.

Again as a reminder and to avoid misunderstandings: P or E in the calculations does not mean the power or energy of "the water". The hot water only supplies the energy to the heat exchanger.

The refrigerant actually gets fed the energy:

E = m H2O x cp H2O x (T H2O source – T boiling point refrigerant)

This energy is passed to the turbine in the form of isopentane vapor (here in the example, minus small efficiency losses).

E leaving the heat exchanger can of course be expressed in the form of pressure x volume (flow).

For large volume flows, the lower heat exchanger is designed not just as a probe, but as a real heat exchanger with dimensions. But mine shafts with their existing cross section (10x x 10 m) and existing elevators are particularly suitable for this.

Total energy balance and efficiency. The useful energy of the plant calculated as:

$$E_{win} = E_1 \times f_{Heat\ exchanger} \times f_{Turbine} \times f_{Generator} - E_{Pump}$$

with

$$E_1 = m_{H2O} \times c_{p\ H2O} \times (T_{H2O\ Source} \times f_T - T_{boiling\ point\ refrigerant})$$

This equation applies when the boiling point is around ambient temperature. In real operation, there will always be deviations due to temperature fluctuations, etc. Thermodynamic systems always adapt to the current operating conditions

and

$f_{Wärmetauscher}$	efficiency	Ca. 0,85
$f_{Generator}$	efficiency	Ca. 0,99
$f_{Turbine}$	efficiency	to be determined with the turbine manufacturer
f_T	temperature factor HE	Ca. 0,95 (cause heat exchanger)
m_{H2O}	mass or volume	of the circulated water
$c_{p\ H2O}$	Spez. heat capacity H2O	

E pump is calculated from the hydraulic resistance and the volume flow. The hydraulic resistance is expressed as a pressure loss Dp and due to the series connection of the individual sections, the following applies:

Dp total = Dp Heatexchanger top + Dp Heatexchanger bottom + 2x Dp Pipe lenght

Pressure loss due to geodetic head does not occur.

Now the energy expenditure has to be determined to calculate the overall efficiency. However: the necessary energy is provided by the earth itself. =>

The grade of efficiency of the system is infinitely large,

since the effort = 0.

Heat exchanger as evaporator, evaporator performance. The upper heat exchanger is of particular importance, as it also acts as an evaporator for the refrigerant. The table below quantifies the mass used and the evaporator performance for a pentane compared to water.

Table 6. Mass of refrigerant comparision

Mass of used Refrigerant		(in comparision to water)		Evaporation performance in heatexchanger
$Dh_{v\ n\text{-}pentan}$	357 hJ/kg	0,10 kWh/kg		
$Dh_{v\ Water}$	2257 hJ/kg	0,63 kWh/kg		
$E = H = m \times Dh_v$		$m = E / Dh_v$		/ 60 min
E_2 (to store)	1.000 kWh	0,44	kg H2O	0,01 kg H2O/min
	1 MWh	2,80	kg n-Pentan	0,05 kg n-Pentan/min
	100.000 kWh	44	kg H2O	0,74 kg H2O/min
	100 MWh	280	kg n-Pentan	4,66 kg n-Pentan/min
	1.000.000 kWh	443	kg H2O	7,38 kg H2O/min
	1 GWh	2798	kg n-Pentan	46,63 kg n-Pentan/min

It turns out that water is the better energy carrier in terms of vaporization enthalpy. But in relation to the amounts of energy, the masses used and the necessary evaporator capacities for pentane are within tolerable limits.

Remaining task: finding the right turbine. At least as a first approach, the pentanes appear to solve the problem of selecting a refrigerant for energy transfer.

As far as the turbine or piston machine is concerned, a solution is being sought that can reasonably drive a generator with pressures of 5−12 bar, with the power ultimately being adjusted via the volume flow.

Renewable energies are often mentioned as an energy source, such as wind power and solar radiation (Whereas these two examples are not actually "regenerative", but stochastically available: unpredictably the wind blows or not. The same with the sun).

In this respect, such energy sources are at best suitable as an addition to network relief and to cover peak loads and also make an important contribution. The latter also applies to all types of pumped storage power plants. But: a reliable supply of the base load cannot be achieved with all these methods.

River hydroelectric power is a hybrid: it can serve as a base load supply if the constant flow of water is secured year-round. And tidal power plants on the coast would certainly also be a solution for base load supply if the tidal range is sufficiently large.

Only conventional power plants are suitable for reliably covering the base load in the supply far from the coast: gas and coal-fired power plants as well as nuclear power plants. What all of these have in common is that they have to be fueled, i.e. they require an energy source that is used up.

Other technologies for producing electricity from heat. Other research approaches in the field of photoelectric and thermoelectric effects are known.

The Seebeck effect is an example of this. And with such methods, researchers in the USA have also managed to generate a power of 56 W with some setup.

But our topic is the performance class of supplying society and above all industry with a reliable power supply in the base load range (several 100 MW or 1 GW range), and such methods are simply not suitable for this.

The Conclusions. The procedure described is new and has not yet been put into practice.

Research perspectives:

• A correspondingly powerful upper heat exchanger, which functions as an evaporator and is pressure-resistant up to 20 bar, has to be developed.

• The Carnot cycle process with turbine or piston machine must be dimensioned.

But the investigation of the basic thermodynamics presented here gives reason to believe that the process in total works.

Research for comparable solutions, rights. I haven't found anything comparable. I did some internet research, which of course doesn't rule out the possibility that someone had this idea before me. If there is one, then he should contact me and prove his older rights. As long as this does not happen, I personally claim the rights to the idea for my own good, but also for the good of all mankind. The publication that happened here made it impossible to patent the idea and with it the well-known procedure that patents are acquired, but mankind is prevented from implementing the patents for profit reasons. I want to prevent this idea from ending up as a "drawer patent" in the drawer of a large company.

Request to refrigerant manufacturers, turbine manufacturers and geologists. I expressly request the first two to contact me for the purpose of a possible technical implementation of such systems. It is important to find suitable refrigerants with boiling points in the range of 20 – 35 °C that generate the highest possible vapor pressure during evaporation. And it is important to find turbines driven by steam pressure or gas pressure that work reasonably well even at low pressures.

I call on the geologists to think about possible locations where temperatures are as high as possible at depths of, say, 3000 m that are still technically easy to reach.

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