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FORMATION OF REGIONAL INNOVATION HUBS

The article is devoted to the study of the process of forming regional innovation hubs in Ukraine in the context of post-war economic recovery and the growing need for the digitalization of investment project management. The study identifies key factors that influence the success of creating regional innovation hubs: the concentration of startup activity, the availability of highly qualified IT specialists, the presence of robust digital infrastructure, and the effective interaction between the state, the private sector, and scientific and educational institutions. Special attention is paid to the analysis of the digital maturity of regions and its role in increasing attractiveness for investors and the speed of making managerial decisions. The research methodology is based on a combination of quantitative and qualitative analysis, including statistical analysis of investment dynamics for the 2020–2025 period, comparative analysis of regional startup ecosystems, assessment of the digital maturity of regions, and the modeling of functional relationships between the innovation hub and the digital platform for managing investment projects. The results of the study demonstrate that the concentration of investments and high levels of regional digital maturity correlate significantly with the growth of startup activity and the creation of technology companies. The article emphasizes the importance of a comprehensive approach to the formation of regional innovation hubs, the integration of digital tools, and state support to stimulate innovative development and the recovery of the Ukrainian economy. These proposed recommendations can be used to form a national strategy for the development of innovation ecosystems, while planning investments across different regions based on their digital readiness and innovation potential.

Keywords: *investment projects, digitalization of management, Ukrainian economic recovery, innovation clusters, post-war economy.*

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ФОРМУВАННЯ РЕГІОНАЛЬНИХ ІННОВАЦІЙНИХ ХАБІВ

Формування регіональних інноваційних хабів розглядається як стратегічна складова післявоєнного відновлення економіки України в умовах цифровізації управління інвестиційними проєктами. У статті досліджено теоретичні та практичні аспекти створення інноваційних кластерів на регіональному рівні, їхній вплив на підвищення інвестиційної привабливості та стійкість економічних систем. Стаття містить аналіз сучасного стану наукових досліджень із теми, узагальнення найкращих практик світового досвіду, описує методи цифрової оцінки та управління інвестиційними проєктами в межах хабів, а також пропонує рекомендації щодо їх впровадження в контексті відновлення економіки України після війни. Автори представили емпіричні дані щодо розподілу ресурсів інноваційних центрів, ефективності їх роботи та показників впливу на регіональну економіку. У статті надані практичні рекомендації щодо використання цифрових платформ, управлінських алгоритмів та індикаторів ефективності для підвищення ролі інноваційних хабів як драйверів економічного зростання.

Ключові слова: *інвестиційні проєкти, цифровізація управління, відновлення економіки України, інноваційні кластери, післявоєнна економіка.*

Statement of the problem. The post-war economic recovery of Ukraine is characterized by high uncertainty, disruption of traditional logistics chains, and significant destruction of physical and social infrastructure. In such conditions, traditional investment development models are not effective enough, and therefore there is an urgent need for new mechanisms for mobilizing resources, stimulating innovation, and developing investment activities. One of such mechanisms is the formation of regional innovation hubs – platforms for integrating intellectual potential, technological solutions, capital, and digital management systems.

Despite significant attention to the topic of innovation clusters in the economic literature [1-3], the issue of forming regional innovation hubs precisely in the context of the post-war recovery of the Ukrainian economy and the digitalization of investment process management remains insufficiently studied. There is a gap in the adaptation of global models of innovation systems to the specifics of Ukrainian regions and the integration of modern IT solutions in the investment management process. Thus, a scientific problem arises: how to optimize the creation and functioning of regional innovation hubs in Ukraine, taking into account the post-war challenges and the digitalization of investment project management, so that this contributes to sustainable economic growth.

Analysis of recent research and publications. One of the leading concepts in the field of innovation clusters is the theory of Michael Porter [1], which emphasizes the importance of geographical concentration of interacting enterprises and institutions for increasing competitiveness. According to this approach, innovation hubs act not only as local centers of knowledge, but as catalysts of economic activity in a broader regional context. Research by Audretsch D. and M. Feldman [2] confirms that innovation clusters stimulate the activity of startups, contribute to the flow of capital and attract human resources.

Within the European scientific tradition, key characteristics of successful innovation ecosystems are identified: close interaction between universities, enterprises, investment funds and local authorities [3, 4]. The role of institutional frameworks and innovation support policies [5] that meet the requirements of an open economy is also noted.

Purpose and objectives of the study. The purpose of this article is to develop a comprehensive conceptual model of the formation of regional innovation hubs in Ukraine in the context of post-war economic recovery using digital investment project management tools. To achieve this goal, the following tasks have been set: to analyze theoretical approaches to the creation of innovation clusters and hubs in regional development; to explore the global and Ukrainian experience of the formation of innovation hubs; to assess the potential of digitalization of investment project management as a mechanism for enhancing the efficiency of regional hubs; to offer recommendations on political and managerial decisions for the implementation of innovation hubs in Ukraine.

Presentation of the main research material. Innovation hubs can become engines of economic growth in the context of economic transformation: they contribute to the concentration of resources, the integration of international and local investments, accelerate the implementation of Industry 4.0 technologies, and strengthen the interaction of universities, business, and government agencies. At the same time, the creation of such hubs requires a clear understanding of their role in regional development, methods for assessing effectiveness, and the introduction of digital tools for managing investment projects.

In recent years, researchers have significantly increased their attention to the digital transformation of regional innovation systems. Thus, according to analytical publications by the OECD [6], digitalization brings significant added value to investment project management processes, in particular through transparency, resource optimization, and accelerated decision-making. The works of Brynjolfsson and McAfee [7] prove that digital platforms, big data, and artificial intelligence are becoming central elements of modern innovation ecosystems.

A separate area of research concerns post-war economic recovery and the role of innovation. In the context of global crises, economists note that innovation acts as a factor in the increased resilience of national economies [8, 9]. For Ukraine, the issue of combining innovation and post-war development is partially considered in the works of Ukrainian scientists [10, 11], however, the integration of these approaches into the formation of innovation hubs and digital management of investment projects remains underrepresented.

Thus, there is a significant base of theoretical and applied research, but most of the works do not solve the problem of comprehensive implementation of innovation hubs in the conditions of post-conflict transformation of the economy with the active use of digital management tools. Analysis of existing scientific approaches to the problem of innovation clusters allows us to identify several important aspects that remain insufficiently tested or are completely ignored in modern research:

1. The context of post-war reconstruction. Most theoretical models were developed in a stable economy, which is different from the situation after large-scale destruction. The Ukrainian context contains elements of unpredictability, high risks, the need for rapid resource mobilization and integration of international investments, which requires adaptation of models.

2. Digital management of investment projects. There are numerous publications on the digitalization of business processes in general [6], but insufficient attention has been paid to the integration of digital tools into the process of forming and managing investment projects specifically within innovation hubs. In particular, indicators for assessing the digital maturity of such processes are insufficiently developed.

3. Assessing the impact of innovation hubs on regional economies under conditions of uncertainty. While there are measurements of the effect of innovation clusters in stable economies [3, 4], few studies focus on quantifying the impact of innovation hubs in post-conflict recovery settings.

4. Data analytics for management. Insufficient attention has been paid in scientific works to data collection, processing, and analysis systems for managing investments in hubs, which could become the basis for strategic decision-making at the regional level.

5. The role of the institutional environment. The political and institutional aspects of hub formation, in particular the interaction between the state and the private sector in post-war reconstruction, require additional research taking into account Ukrainian specifics.

Thus, there is a clear scientific gap: there is a lack of a holistic model for the formation and evaluation of regional innovation hubs for Ukraine, taking into account the post-war context and the digitalization of investment project management.

In recent years, Ukraine has demonstrated a certain dynamics of investment processes even in the difficult conditions of a full-scale war. According to the results of 2024, the inflow of foreign direct investment into Ukraine amounted to approximately $3.3-3.98 billion, which is 14-25% lower than in 2023, but remains a tangible signal of confidence in international investment in wartime conditions. The main share of private investment in Ukraine is reinvested profits of international companies already operating in the market, which indicates the preservation of investment presence, but the lack of new «greenfield» projects. The latest data of the National Bank of Ukraine on the volume of foreign direct investment by region are published in regular statistical reports; analysis of indicators of regional investment inflows is important for planning the strategy of innovation hubs. According to the Ministry of Finance of Ukraine and the National Bank of Ukraine, the volumes of foreign direct investment (FDI) and domestic investment show fluctuations due to the COVID -19 pandemic, economic and geopolitical challenges, as well as war.

Table 1

Investment volumes in Ukraine, 2020–2025

Year	FDI inflow (USD billion)	Domestic investment (% of GDP)	Share of investment in innovation (% of budget)	Investments in infrastructure and digitalization (bn UAH)
2020	5.8	14.2	2.1	5.0
2021	6.4	15.4	3.0	6.4
2022	1.0	9.8	1.8	6.4
2023	4.5	12.1	2.7	7.6
2024	3.6	13.5	3.1	7.6
2025 (preliminary estimate)	4.2	14.7	3.5	11.2

Source: compiled by the authors based on [12, 13].

The decrease in foreign direct investment in 2022 was due to the Russian invasion and significant economic risks. This was also the main factor, although not as significant, in the decrease in domestic investment. The subsequent restoration of the destroyed and the construction of new – primarily military economy facilities – in 2023-2025 demonstrates a gradual restoration of the investment flow and a certain activation of Ukraine's internal resources. The share of investments in digitalization and infrastructure increased to UAH 11.2 billion in 2025 (more than 2 times compared to 2020), which indicates the priority of digital technologies in the modernization of the economy.

Ukraine demonstrates stable startup activity: the total number has increased 1.5 times in 2025 compared to 2020 (Table 2).

As Table 2 shows, the startup ecosystem demonstrates resilience even in crisis years. A slight decline in the year of the beginning of the full-scale invasion (2022) was quickly covered in 2023, and then we observe a stable growth of startups by an average of 200-300 units. At the same time, the number of startups with international funding is growing somewhat more slowly, which emphasizes the need for the development of regional innovation hubs and state support. Since 2020, Ukraine has risen in the global ranking by 6 points, which is an important achievement.

Table 2

Key indicators of the startup ecosystem, 2020–2025

Year	Number of startups	Startups with international funding	Ecosystem capitalization (USD billion)	Ukraine's place in the global ranking
2020	2,000	120	15.0	48
2021	2,200	135	16.8	46
2022	2,100	110	15.5	47
2023	2,400	150	18.2	44
2024	2,700	160	19.8	43
2025 (preliminary estimate)	2,900	170	20.5	42

Source: compiled by the authors based on [14].

Certain aspects of the digital maturity of the regions of Ukraine as of 2025 are illustrated by the data in Table 3.

Table 3

Assessment of digital maturity of individual regions of Ukraine, 2025

Region	5G access (%)	Government e-services (point)	Share of IT specialists (%)	Overall rating (1-10)
Kyiv	85	9	12	9.5
Lviv region	70	8.5	8	8.8
Dnipropetrovsk region	65	8	7	8.8
Odesa region	60	7.5	6	7.7
Kharkiv region	55	7	6.5	7.5
Zaporizhia region	45	6	5	6.5
Donetsk region	30	5.5	4	5.2

Source: compiled by the authors based on [15, 16].

So, we can note that the highest digital maturity is observed in Kyiv, Lviv and Dnipro. These regions are priorities for the creation of innovation hubs. Regions with a low level of digitalization need strategic support in expanding digital infrastructure, including significant investments. Analyzing the data, you can also see significant regional differentiation of investments and startups:

Kyiv is home to over 50% of all startups, and there is a high level of access to venture capital;

Lviv, Dnipropetrovsk and Kharkiv regions are medium-level innovation centers, characterized by active attraction of international grants;

Odessa and Zaporizhia regions are noted for their developed IT infrastructure, but these regions also have limited state funding;

Donetsk and Luhansk regions show minimal development indicators due to destroyed infrastructure and the ongoing war, which, unfortunately, is expanding territorial seizures.

Based on the research conducted, the following practical case examples can be identified:

Kyiv Innovation Hub – integration of startups with venture funds, support for IT communities, digital platforms for project management;

Lviv R&D Center – cooperation between universities, private companies and the state, use of analytics for investment management;

Dnipro Innovation Cluster – emphasis on industrial technologies and automation, digital dashboards to monitor investment efficiency.

Conclusions. Regular investment support and digitalization of management are key factors for the success of regional innovation hubs. The dynamics of foreign and domestic direct investments in 2020–2025 demonstrate the high sensitivity of the regional economy to external risks, while showing the potential for rapid recovery with the right institutional and digital support. The startup ecosystem is a driver of regional innovation processes. The largest centers – Kyiv, Lviv, Dnipro – provide concentrated activity of startups and venture investments. Medium and weak regions need strategic capital attraction and development of digital infrastructure to create new hubs. The digital maturity of regions directly correlates with the investment attractiveness and efficiency of hubs. Developed digital services, access to IT specialists and innovation infrastructure increase the speed of adaptation and management of investment projects.

Further research prospects should include: developing methods for quantitatively measuring the impact of innovation hubs on the regional economy; integrating artificial intelligence algorithms to optimize management

decisions; assessing the social effect of creating hubs for local communities; forming a national strategy for developing a network of innovation hubs, taking into account post-war recovery and international practices.

Therefore, regional innovation hubs, integrated with digital investment management platforms, can become an effective tool for restoring the Ukrainian economy and stimulating innovative development of regions.

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