DOI: 10.55643/fcaptp.3.50.2023.4084

Volodymyr Bodrov

D.Sc. in Economics, Professor of the Department Economics, Entrepreneurship and Economic Security, State Tax University, Irpin, Ukraine; e-mail: <u>vgbodrov@gmail.com</u> ORCID: <u>0000-0002-1229-3432</u> (Corresponding author)

Iryna Zrybnieva

D.Sc. in Economics, Associate Professor of the Department of Innovation Marketing and Regional Development, Yuriy Fedkovich Chernivtsi National University, Chernivtsi, Ukraine; ORCID: 0000-0003-4156-4702

Svitlana Sazonova

PhD in Economics, Associate Professor of the Department of Management, State University of Telecommunications, Kyiv, Ukraine; ORCID: 0000-0002-9881-9692

Iryna Sydoruk

PhD in Economics, Associate Professor of the Department of Chair of Economic Theory and Entrepreneurship, National University "Zaporizhzhia Polytechnic", Zaporizhzhia, Ukraine; ORCID: <u>0000-0002-1205-2639</u>

Olena Orlenko

D.Sc. in Economics, Professor of the Department of Hotel, Restaurant and Tourism Business, State University, Kherson, Ukraine; ORCID: 0000-0002-3485-1642

Received: 24/03/2023 Accepted: 08/06/2023 Published: 30/06/2023

© Copyright 2023 by the author(s)

This is an Open Access article distributed under the terms of the <u>Creative Commons.CC-BY 4.0</u>

STRENGTHENING THE RELATIONSHIP BETWEEN DIGITALIZATION AND THE NATIONAL SMART ECONOMY MODEL FOR IMPLEMENTATION OF THE STRATEGY OF INNOVATIVE DEVELOPMENT

ABSTRACT

Modern economy development is inseparably concerned with the use of the most modern and advanced information technologies. Therefore, scientists' attention in terms of the issues of digitalisation and innovative development is constantly growing. In this paper studies different scientific views on the specifics of digitalisation of economic systems and building a modern smart economy of the future were used. The purpose of the study is to prove the relationship between the processes of digitalization and the formation of an innovative model of the smart economy in Ukraine. To achieve this goal, in the article statistical data on the state of innovative development of the Ukrainian economy and Ukrainian enterprises were analysed; the directions of the strategy of innovative development at the national level implementation was specified. The study substantiates that currently the national economy is on the way to a smart society formation, and most innovative initiatives are carried out at the expense of business, while the state uses regulatory levers without active financial participation. The mutual influence of digitalisation processes and implementation of the innovation development strategy is determined. It was established that digitalisation processes are essential and extremely important for the formation of a national model of the smart economy, as they are complex and applied, but not concentrated in a particular area or industry. At present, the national model of the smart economy cannot be formed without state support that is provided through the development and implementation of the innovation development strategy. The state has the capabilities and sufficient levers to stimulate the introduction of modern digital technologies and the development of an innovative component of scientific research that can be implemented in the practical activities of Ukrainian enterprises and organizations in the future.

Keywords: digitalization, digital economy, development strategy, innovative development, scientific progress, development, economic recovery

JEL Classification: E5, V21, L26, O31, O33

INTRODUCTION

The problems of innovative development of the modern economy and the introduction of new ideas for the development of modern economic systems are receiving increasing attention in both domestic and foreign scientific literature. There is a logical explanation for this, as innovative development is becoming the main vector of economic growth worldwide, a point of attraction for the efficient use of various types of resources and the formation of ideas for the further development of national economies. Obviously, this trend will continue to grow, and the economy will become increasingly focused on the use of digital technologies. The growing role of digital technologies in the development of socioeconomic systems at various levels is one of the characteristic features of modern society. Digital technologies are an integral part of most people's lives, a means of communication for billions of people, and a tool for solving business problems.

Digital technologies are basic, cross-cutting solutions for the vast majority of industries, social sphere, and government agencies. Today, we can say that digitalization processes

have penetrated most areas of modern society and become the basis for their transformation. In this regard, it is not surprising that digital solutions are increasingly being implemented and used as part of the development of national smart economy models. In advanced countries, projects to introduce digital technologies into various spheres of public life are increasingly being implemented. The prevailing view in the scientific community is that the implementation of such projects generally benefits economic development and enables the use of modern technologies to optimize specific application areas. At the same time, it is emphasized that ill-conceived, poorly planned innovative projects in the field of digitalization are not strategic decisions, and in some cases pose risks to the long-term development of certain areas. In this regard, the problem of effective implementation of smart economy ideas within the framework of the development of the most modern and leading innovative technologies is becoming more relevant. In modern scientific literature, the main attention is paid to the issues of smart economic development in the context of ensuring the implementation of technologies that save resources and develop new technological processes. Often, the issue of digitalization of individual components. However, it is important to focus on the synergistic effect and make efforts to introduce smart technologies into various spheres of public life.

LITERATURE REVIEW

The introduction of modern innovative technologies is becoming increasingly important for modern economic life. The creation of the global Internet, the growth of research and development, and the popularization of artificial intelligence are just some of the factors that contribute to the digitalization of the economy. At the same time, it should be understood that digital transformation can have different rates of formation at both the micro and macro levels, as well as vary in intensity depending on the sectors of the economy and differ in the level of development, depending on the specifics of the country's location or economic development (Bartelsman et al., 2019; Cai et al., 2022). While 40-50 years ago, the welfare of a country largely depended on the availability of natural resources, in the twenty-first century, information and human capital are of particular value. Digital transformation is becoming a priority stimulus for economic growth in many countries (Novikova et al., 2022). When considering the positive aspects of digitalization, possible risks should be taken into account. However, before detailing the pros and cons of digitalization, scholars define its essence as an economic category.

The two most commonly used terms in the literature are "digitalization" and "informatization." It should be noted that the definitions of "digitalization" and "informatization" are similar but not identical (Corsi et al., 2020; Ostropolska, 2021; Sousa et al., 2021). Thus, informatization primarily involves the introduction of information technologies into various spheres of society in order to improve their efficiency. At the same time, digitalization can be considered in a narrow and broad sense. According to the narrow understanding, digitalization is defined as "the transformation of information into a form such as digital information using new digital technologies, solutions, and processes" (Yang et al., 2022; Shkarupa et al., 2022; Micozzi et al., 2022). According to a broader and more popular definition, this category involves not only the digitization of data, but also the introduction of new principles of work, the use of modern technologies, including artificial intelligence, augmented reality, blockchain, the Internet of Things, etc. that increase the efficiency of companies, organizations, institutions and industries, and create a model of economy in which the main priority is to improve human life and ensure its development (Kuznetsova et al., 2021; Ionescu et al., 2023; Oneshko et al., 2021). Thus, in a general sense, digitalization is a cultural, organizational and operational change within an organization, industry or ecosystem through thoughtful and incremental integration of digital technologies, processes and skills at all levels. The processes of digitalization and informatization are observed in most countries of the world and determine the development of the 4th Industrial Revolution and the transition to the V and VI technological modes. The development of the infrastructure of the fourth industrial revolution and a highly developed information system (respectively, "Industry 4.0" and "Society 2.0") is associated with the use of many new terms, the most significant of which are "smart economy" and "digitalization" (Müller et al., 2018; Lucato et al., 2019; Schuh et al., 2020). While digitalization has already been defined earlier, approaches to defining the smart economy need to be considered. Different scholars consider the smart economy according to the following basic characteristics - Table 1.

Table 1. Interpretation of the smart economy in the current literature.	
Approach to understanding the smart economy in the scientific literature	Characteristics of the approach
A qualitatively new type of economic system development (Abou-Foul et al., 2021)	The novelty of this type of economy lies in the fact that their development requires innovative technologies, the implementation of which minimizes the costs of various types
A system of socio-economic and organisational-economic relationships based on the use of digital information technologies and telecommunica- tions. (Ardito et al., 2021; Sermuksnyte-Alesiuniene et al., 2021)	In this context, the smart economy is focused on the development of ar- eas that are primarily important to ordinary citizens, and technologies are useful in everyday life
An economy characterized by the active introduction and practical use of digital technologies for the collection, processing, transformation and transmission of information in all fields of business. (Hryhorash et al., 2022)	Information is seen as the main source of benefit and the most valuable resource, and its correct and rational use will allow the building of an eco- nomic system of a new level of development that will automate many simple everyday functions
A type of economic system that requires significant investment in technol- ogy development (Laenens et al., 2018; Golubchikov et al., 2022)	The emphasis is on the costs necessary to implement the smart economy system, but it should be emphasized that investments in building a smart economy in general and smart cities, in particular, are temporary, and further funds will be spent on maintaining and improving the smart economy system.
An innovative way of economic life that offers many prospects and oppor- tunities for companies and citizens (Chen et al., 2022; Reardon et al., 2023)	The functioning of the smart economy will make it possible to provide companies and citizens with quick access to various types of information and services, which is also one of the basic elements of the smart econ- omy.
Can only be implemented in countries with high living standards and strong economies (Martin et al., 2022; Kuznyetsova et al., 2021)	In order to prepare for the introduction and implementation of the smart economy concept, the state must have a financial basis in the form of a sufficiently developed, stable, sustainable economy and a sufficient stand- ard of living for the population to accept innovations
A type of economic system that creates the preconditions for the uniform development of various sectors and industries (Arku et al., 2022; Strielkowski et al., 2020)	Building a smart economy implies that economic development requires uniformity and the ability to gradually focus government efforts on all ar- eas and industries

Based on these interpretations, the smart economy can be broadly viewed as the transformation of a traditional economic system into a qualitatively new type of economic system, and narrowly as the process of active implementation and practical use of modern methods of collecting, storing, processing, transforming and transmitting information.

Elements of the digital economy are entering all spheres of public life. Based on the review of scientific literature, the author has established that digitalization of the economy is a modern innovative way of economic development in various fields, based on the integration of physical and digital resources in the areas of production, transportation, labelling, processing and sale of products, which is carried out through the use of digital technologies for collecting, storing, identifying, processing, transforming and transmitting the information. The digitalization of the modern economy involves the creation of huge information arrays (for example, unified databases for end-to-end accounting of material resources, accumulation of information about their suppliers, collection of information about waste and reuse of material resources). As a result, the digitalization of the economy is becoming an important stage in its transformation, in line with the latest conditions of development and resource-saving (Czifra et al., 2020; Atik et al., 2019).

The first steps towards the implementation of a smart system in economic life are the optimization of information support and the automation of data collection, processing, and storage processes to reflect the forecast and current state of various economic objects, as well as to make informed management decisions. This determines the priority of developing a model of interaction of information flows that reflect the consumption of material resources (Akhter et al., 2022; Rybalchenko et al., 2022).

For most developed countries, which are already on the way to building a smart economy, questions arise today about how to measure the effectiveness of these processes and determine the further vector of development of economic systems. In this sense, considerable attention should be paid to the digitalization of the economy and the satisfaction of the population and business representatives with these transformations. This is the path followed by the leading countries of the world, which regularly conduct surveys on possible ways to improve the economic and social life of the population, as well as hold conferences and exchange of experience through the publication of analytical materials to understand the positive experience and negative results of certain measures within the framework of the development of the smart economy of the future.

At the same time, in Japan, which has been at the forefront of scientific progress for many years, digitalization is perceived as the basis for building Society 5.0, which involves the creation of a "super smart" society and economy (Soltovski et al., 2020; Popović et al., 2020). This smart economy strategy involves concentrating efforts, meeting the needs of each person,

including both the technological restructuring of production and solving problems related to improving the quality of life of each member of society.

The applied nature of digitalization and the emphasis on the efforts made by many governments to implement digital transformation are fully justified, as digitalization has a number of positive features and benefits. Among the undoubted advantages are increased production efficiency, reduced costs of enterprises, creation of new innovative products, the possibility of early diagnosis of risks and their prevention, improvement of the quality of services provided, creation of new jobs mainly in the segment of highly skilled labour and formation of prerequisites for the development of education directly related to digitalization processes.

AIMS AND OBJECTIVES

In accordance with the proven relevance of the study, its purpose will be to prove the existence of a relationship between the processes of digitalization and the formation of an innovative model of the smart economy at the state level, in particular in Ukraine.

To achieve this goal, the following tasks should be solved identifying indicators that can be used to assess the state of innovative economic development; analyze statistical data on the state of innovative development of the Ukrainian economy and Ukrainian enterprises; specify the directions of implementation of the strategy of innovative development at the national level.

The solution to these tasks will allow us to achieve the goal and fully disclose the topic of the study.

METHODS

At the first stage of the study, it was determined that the process of digitalization and the development of the modern smart economy are inextricably linked, which was achieved by analyzing the scientific literature on the selected topic and applying the methods of analysis, synthesis and generalization.

The next step was to specify the indicators that can be used to assess the degree of development of those innovation processes that are most important for determining the effectiveness of digitalization processes. This was done using the methods of specification, generalization, and systematization.

The analysis of statistical data on the selected indicators was carried out using the graphical method and allowed to determine the dynamics of the state of innovation activity of Ukrainian enterprises and the sources of financing of innovation projects.

After that, the author determined the directions of further development and implementation of the strategy of innovative development at the national level with the definition of specific steps for the formation of a smart economy in Ukraine. For this purpose, the following general scientific methods of induction, deduction, systematization, and generalization were applied.

RESULTS

The processes of digitalization and the formation of a smart economy can be implemented both at the level of the state and at the level of enterprises of various forms of ownership. Undoubtedly, the bulk of technological developments and innovations are carried out at enterprises, although quite often this happens with the financial or organizational participation of the state. For most business representatives, the development of the innovative component of their activities is the key to effective long-term development and the provision of opportunities to save resources of various kinds. The overall ability of the state to build a modern digital economy depends on how active enterprises are in innovative development (Vasin et al., 2018). In this context, in order to understand the current situation in Ukraine with the introduction of innovations, statistical materials on the analyzed topic deserve attention. To get a comprehensive picture of innovation trends, it is logical to focus on the following indicators:

- the proportion of the number of industrial companies that have implemented innovations (products and/or technological processes) in the total number of industrial companies;
- the proportion of the volume of innovative products (goods, services) sold as a proportion of the total volume of products (goods, services) sold by industrial companies;

sources of financing of innovation activities of industrial enterprises.

In addition, the growth of digitalization coincides with the accelerated pace and massive spread of new digital technologies in recent decades: cloud computing, machine learning, artificial intelligence, business intelligence, and the Internet of Things. New digital technologies are fundamental to the development of automation as part of the Fourth Industrial Revolution. The technologies underlying digitalization continue to evolve rapidly, even as they are being adopted by business and society. However, digitalization is not just about a large number of technologies. Digitalization is important for the company: it opens up new thinking and approaches to how the organization understands its role in the ecosystem and opens up opportunities to increase profits. Technology in this case is not an end in itself. If digitization is the transformation of data and processes, then digitalization is transformation. Digitalization is not just the conversion of existing data into digital format, but the ability of digital technologies to collect data, identify trends and make effective business decisions.

With the use of modern digital technologies, meeting consumer needs, which are being transformed by the development of technology, is becoming a more balanced and efficient process. Business interaction with the audience should be as comfortable and fast as possible. Improving a product or service and enhancing such characteristics as:

- level of quality;
- degree of attractiveness;
- ease of use;
- speed of delivery, etc.

Over the past ten years, digitalization has been actively displacing offline businesses around the world, literally driving them online, where the majority of customers are concentrated. When embarking on the digitalization of any project, it is important to understand that with the use of new technologies, the main task is not absolute changes in business, but the simplification of business processes.

The analysis of statistical data on these indicators will allow us to assess the current state of innovation in the Ukrainian economy. Information on sources of financing of innovation projects and their total number is shown in Figure 1.



With the introduction of martial law in Ukraine, the publication of statistical materials has been suspended, and accordingly, the official data for analysis ends in 2020, but it is obvious that in 2022-2023, the amount of funding for innovative projects decreased significantly due to the need for businesses to focus on the formation and implementation of a survival strategy in the context of hostilities, and therefore it is impossible to talk about an increase in investment funding. However, it should be understood that Ukraine has a significant innovation potential that can be quickly realized after the end of martial law, and domestic enterprises will be able to quickly catch up with all the costs incurred during martial law. If we return to the analysis of the statistical material presented in Figure 1, it becomes possible to outline general trends, which consist primarily in the growth of innovation financing costs. The first stage of slowing down the pace of innovation financing was in 2008-2009, when, as a result of the global financial crisis, companies were short of capital, and the uncertainty of the external environment deterred them from investing in innovative projects. In 2010-1014, the trend of growth in spending

on innovation projects resumed but slowed down significantly with the outbreak of military aggression against Ukraine, the occupation of part of the eastern regions and the annexation of Crimea. The situation has been improving since 2015, and in 2016, innovation development peaked due to the adoption of innovation development programs in various sectors of the economy. At the same time, the financing of innovation activities at the expense of the State Budget accounts for a small share in the structure of funding sources, which is directly related to the budget deficit. In particular, in 2016, there was a tendency to increase budget expenditures directed to the innovation sector of the economy compared to the previous year. Further, the development had a jumpy trend, which was caused by the growth of the cost of capital and the instability of both political and economic life in the country.

Figure 2 shows the number of enterprises engaged in innovative activities and active in the formation of the smart economy of the future in Ukraine.



According to the data shown in Figure 2, it can be argued that there has been a catastrophic reduction in the number of enterprises engaged in innovation and the number of innovative products manufactured by Ukrainian enterprises. For the most part, this can lead to a significant reduction in the level of technological sophistication of products manufactured in the country, which will negatively affect the overall state of the economy and its potential for further development.

The current situation in the economy with regard to the problems of developing the smart economy and implementing the strategy of innovative development is quite complicated, since under martial law, the priority is to ensure power security. At the same time, in the context of military operations on the territory of the state, the issues of capital development are relegated to the background. It is obvious that after the end of martial law, the issues of digitalization and innovative development will become relevant and will become a priority for the state, as the process of recovery from hostilities will require the use of the most modern and innovative technologies.

Ukraine has approved the Strategy for the Development of the Innovation Sector until 2030 (Bulkot, 2021). The goal of the Strategy is to build a national innovation ecosystem to ensure the rapid and high-quality transformation of creative ideas into innovative products and services, increase the level of innovation in the national economy, which involves creating favourable conditions for the development of the innovation sector, increasing the number of implemented developments, increasing the economic return on them, and attracting investment in innovation. The Strategy envisages that by 2030 it will be possible to create a national innovation ecosystem and ensure the development and effective interaction of elements of the national innovation ecosystem, which can become a driver of accelerated economic growth and promote the introduction of new technological solutions. However, the Strategy was adopted before the outbreak of hostilities, so adjustments will need to be made, but innovation will certainly be of great importance for post-war recovery.

To create favourable conditions for the development of the smart economy, it is planned to implement the following measures through programmatic activities:

create an enabling regulatory environment for commercial entities engaged in innovative activities;

- developing innovation infrastructure, methodological and advisory support, expanding links between scientists and domestic inventors and foreign companies;
- capacity building, which is achieved through both cultural and educational activities, enhancing the culture of innovation, and educational activities to ensure successful careers for young people after graduating from a higher education institution in one of the selected fields: to create their own business, to work in a business that meets the modern technological level.

According to the above, Ukraine has already outlined the directions of development of the national model of the smart economy, and after the end of martial law, these directions will be further updated. In particular, these areas today include the following:

- attention should be paid to creating a favourable legal framework for business entities engaged in innovative activities even under martial law, as the legislature continues to work and has the opportunity to prepare the ground for further innovative economic development in the post-war period;
- it is currently advisable to develop innovative infrastructure only in the areas that are not under fire, but it is logical to restore the energy infrastructure using the latest technologies;
- ensuring cultural, social and educational conditions for innovative development can be partially ensured under martial law since the implementation of educational activities is limited by security requirements and can be carried out mostly in a remote format; educational processes have been restored and established, but under martial law, the quality of educational services and processes is generally significantly reduced.

Thus, it is obvious that in order to form an innovative smart economy, it is necessary to introduce modern digital technologies, i.e. to actively implement the concept of digitalization of all spheres of public life and ensure the development of most economic processes using the principle of innovation and taking into account the trends of global information societies.

Figure 3 shows the close connection between the processes of digitalization and building a national model of the smart economy to achieve strategies of innovative development. At the same time, it is worth noting that for the vast majority of spheres of public life and economic development, digitalization processes are becoming a condition for effective development, early diagnosis of risks, finding optimal ways to use resources, determining the prerequisites for further development and priority areas that can ensure the most effective development of various spheres of economic life.



Figure 3. The relationship between the processes of digitalization and building a national model of the smart economy to achieve strategies for innovative development.

As shown in Figure 3, digitalization processes are essential for the formation of a national model of the smart economy, as they are complex and applied, but not concentrated in a particular area or industry, digitalization is now characteristic of all spheres of public life. At the same time, the national model of the smart economy cannot be formed without significant state support, which is provided through the development and implementation of the strategy of innovative development.

DISCUSSION

The scientific literature today is replete with scientific publications on the issues of introducing modern digital tools into various spheres of public life and economic development (Micozzi et al., 2022; Laenens et al., 2018). However, it is important to realize that the process of digitalization should be exclusively applied and allow solving important practical problems, and not be aimed solely at introducing innovative technologies and digital tools for the sake of the digitalization process itself. This is the main controversy in the development of the smart economy of the future. Today, digital technologies are often used where there is no need for them, and efforts could be directed to more productive processes. However, digitalization can certainly become a tool that will allow us to use resources efficiently and form a society aimed at the economical use of various types of resources. For the most part, this is the task and focus of building the smart economy of the future. Digitalization minimizes time, human resources, and money. This is achieved by simplifying and automating all processes, including data collection and analytics, communication, forecasting, etc.

Modern digital technologies also play an important role in stimulating the economic growth of countries, with the digital economy growing much faster than the traditional one, which is a definite argument in favour of the smart economy. Most of this growth is based on and supported by modern technologies, including digitalization processes. The potential economic benefits from the digitalization of production and economic activity are great - first of all, the formation of new sources of income and the expansion of the country's economic opportunities. This economic growth leads to increased global competitiveness and improved living conditions for the population. Digital economic development is dual in nature. On the one hand, it creates potential risks in the form of qualitative changes in society, in the structure of production and the economy as a whole, which require economic entities to take effective measures to reduce costs, and on the other hand, it creates a mechanism to minimize these risks, based on the progressive opportunities provided by the digitalization process. Traditional factors of economic growth are increasingly giving way to digital technologies for a number of reasons.

1. Prior to the digital economy, economic growth was driven by a number of factors, including traditional industries, dynamic exports, foreign investment, labour cost advantages, and financing from international funds. However, with the digitalization of the economy, these factors are weakening. However, they cannot completely disappear, as investment or international trade processes will exist regardless of economic conditions, while digitalization processes significantly improve and facilitate both organizations and control mechanisms to ensure them. However, the digitalization of the above processes leads to the opening of information flows and requires the development and implementation of powerful financial information protection tools. And here a contradiction arises, which is the need to strike a balance between the digitalization of certain financial processes and ensuring proper protection of financial information.

2. Countries and effectively integrated economic regions are the most attractive for investment. This allows developing countries to partially close the economic gap with developed countries and significantly improve the standard of living and quality of life. This can be achieved by ensuring a high level of investment attractiveness of certain areas, provided that they have the potential for further economic and technological development.

3. Digitalization implies a reduction in the use of low-skilled labour, while there will be a growing demand for workers who are sufficiently qualified to operate high-tech processes or equipment. In this context, the cost of labour is also rising due to increased requirements for education and professional skills, which can be a serious problem in a resource-constrained environment. Nevertheless, the digitalization of education allows solving this problem by creating conditions for training highly skilled personnel and "engaging" them in economic relations and, consequently, reducing unemployment.

4. The use of digital technologies leads to high growth in labour productivity in all areas of social production. It should be noted that the process of digitalization of the economy is not uniform in different societies. At the same time, one of the tasks of the state is to control production volumes and stimulate the free market to prevent a crisis of overproduction.

In Ukraine, digitalization processes are stimulated by the state, but business, following global trends, is also taking steps to develop digital technologies, but, as the analysis of statistics has shown, the trends are not sufficiently positive for the prospects for the development of digital technologies in Ukraine.

The public sector also has an extremely important role to play in transforming the business sector into a high-tech one, as well as to participate in stimulating growth by using digital technologies to build faster and more efficient service delivery processes for both companies and citizens. It is clear that the state (government authorities at all levels) should support this process in various ways: create conditions for digital innovation (e.g., a regulatory framework or a digital environment for practical testing of production activities); promote the full implementation of innovative technologies and optimization processes, improve the ecosystem for startups; ensure the development of a system of additional education in the field of digitalization, including by supporting research and educational institutions that implement relevant retraining programs, etc. However, under martial law, it is quite difficult to allocate funds for such purposes, and thus the processes of digitalization and development of the smart economy of the future in Ukraine are slowing down, but not stopping. Citizens must also be active in creating the smart economy of the future. Investing in lifelong learning stimulates greater flexibility in their careers and opens up new opportunities in the labour market. This "behaviour" of citizens, all other things being equal, helps to minimize such problems common to many countries as brain drain or emigration of skilled professionals. Thus, the smart economy of the future appears as a factor of economic growth, representing a special system of social and financial development. The current trends in the global economy are largely determined and will be determined in the future by the trends of the global electronic network, information, intellectual and digital technologies, and in this regard, the development of digital technologies should be subordinated to the trends of each particular society or economic system, state or region.

The question of who the leader in financing innovative transformations should be, the state or business, is also debatable. For Ukraine, it is obvious that after the end of martial law, the state will focus on restoring the economy and rebuilding the de-occupied territories, while innovative development at this stage can only be realized through funding from business or external investors.

Nevertheless, as Ukraine's economy recovers from the hostilities, significant investments from partner countries and international organizations can be expected, and these funds should be used as efficiently as possible and for the most relevant purposes. And here, digitalization will not only allow for more efficient use of investment or borrowed funds but also for more thorough and high-quality control over the use of these funds, which will increase the level of trust in the Ukrainian economy and increase the investment attractiveness of the national economy for international investors.

CONCLUSIONS

As a result of the study, it can be argued that the national Ukrainian economy today requires significant transformations in the field of innovation development, as economic development trends have slowed down significantly over the past seven years, and companies are not incentivized to invest in the development of innovative technologies. At the same time, statistics confirm that Ukraine has a significant potential for innovative development and implementation of advanced digital technologies, but favourable conditions should be provided for financing all these innovative processes.

The study allowed us to draw a number of conclusions in accordance with the objectives set. It is proved that in order to obtain a systematic view of the state of development of digitalization and the smart economy, attention should be paid to statistical material, and it is also proved that in order to obtain a comprehensive view of the trends in the introduction of innovations, it is logical to focus on the following indicators:

- share of the number of industrial enterprises that implemented innovations (products and/or technological processes) in the total number of industrial enterprises;
- share of the volume of innovative products (goods, services) sold in the total volume of products (goods, services) sold by industrial enterprises;
- sources of financing of innovation activities of industrial enterprises.

The next step was to directly analyze these indicators, which resulted in the identification of problems in Ukrainian society related to the financing of innovative projects and the lack of state involvement in the development of modern technologies in various fields.

Further, the authors identify the main directions for implementing the strategy of innovative development in the national market and determine that it is possible to take preparatory steps for the development of innovations even under martial law.

Further directions in this area may include ways to stimulate investors to finance innovative projects and to insure the financial risks of implementing innovative projects.

In general, the growing involvement of digitalization of economic processes in all spheres of social and economic development leads to an increase in the use of various types of resources and the formation of prerequisites for the active development of the company's potential. Accordingly, there is a need to substantiate the optimal areas of application of modern digital tools in the development of the economic life of each company. As it was proved in the course of the study, digital tools should primarily be concerned with stimulating innovative development, since it is especially important for domestic enterprises, especially in the context of martial law and post-war recovery, to ensure that they can use all available technologies for further development.

ADDITIONAL INFORMATION -

AUTHOR CONTRIBUTIONS

Conceptualization: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Data curation: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Formal Analysis: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Methodology: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Software: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Resources: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Supervision: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Validation: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Validation: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Validation: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Visualization: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Visualization: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Visualization: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Writing – review & editing: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko Writing – original draft: Volodymyr Bodrov, Iryna Zrybnieva, Svitlana Sazonova, Iryna Sydoruk, Olena Orlenko

REFERENCES

- Abou-Foul, M., Ruiz-Alba, J. L., & Soares, A. (2021). The impact of digitalization and servitization on the financial performance of a firm: an empirical analysis. *Production Planning & Control, 32*(12), 975-989. http://www.rioxx.net/licenses/all-rightsreserved
- Akhter, A., Islam, K. M. A., Karim, Md. M., & Latif, W. B. (2022). Examining determinants of digital entrepreneurial intention: A case of graduate students. *Problems and Perspectives in Management*, *20*(3), 153-163. https://doi.org/10.21511/ppm.20(3).2022.13
- Ardito, L., Raby, S., Albino, V., & Bertoldi, B. (2021). The duality of digital and environmental orientations in the context of SMEs: Implications for innovation performance. *Journal of Business Research*, *123*, 44-56. https://ideas.repec.org/a/eee/jbrese/v123y2021i cp44-56.html
- Arku, R. N., Buttazzoni, A., Agyapon-Ntra, K., & Bandauko, E. (2022). Highlighting smart city mirages in public perceptions: A Twitter sentiment analysis of four African smart city projects. *Cities*, *130*, 103-157. https://doi.org/10.1016/j.cities.2022.103857

- Atik, H., & Ünlü, F. (2019). The measurement of industry 4.0 performance through industry 4.0 index: an empirical investigation for Turkey and European countries. *Procedia Computer Science*, *158*, 852-860. https://doi.org/10.1016/j.procs.2019.09.123
- Kuznetsova, A. Ya., & Pohorelenko, N. P. (2021). Mechanism of providing financial stability of the banking system of Ukraine. *Financial and Credit Activity Problems of Theory and Practice*, 2(33), 37– 47. https://doi.org/10.18371/fcaptp.v2i33.206396
- Bartelsman, E. J., Falk, M., Hagsten, E., & Polder, M. (2019). Productivity, technological innovations and broadband connectivity: firm-level evidence for ten European countries. *Eurasian Business Review*, 9(1), 25-48. http://link.springer.com/10.1007/s40821-018-0113-0
- Bulkot, O. (2021). Formation of Ukraine's Smart Economy in the Context of Global Challenges. *Futurity Economics&Law*, 1(1), 11–23. https://doi.org/10.57125/FEL.2021.03.25.2
- Cai, X., Li, J., Wu, J., Zhang, H., Chen, P., & Huang, X. (2022). The Impact of Enterprise R&D Investment and Government Subsidies on Technological Progress: Evidence from China's PV Industry.

Energies, 15, 4462. https://doi.org/10.3390/en15124462

- Chen, Z., & Chan, I. C. C. (2022). Smart cities and quality of life: A quantitative analysis of citizens' support for smart city development. *Information Technology & People, 36*, 263–285. https://www.emerald.com/insight/content/doi/10.11 08/ITP-07-2021-0577/full/html
- Corsi, A., Pagani, R. N., & Kovaleski, J. L. (2020). Technology transfer for sustainable development: Social impacts depicted and some other answers to a few questions. *Journal of Cleaner Production*, 245, 118522. <u>https://doi.org/10.1016/j.</u> jclepro.2019.118522
- 12. Czifra, G., & Molnár, Z. (2020). Covid-19 and industry 4.0. *Research Papers Faculty of Materials Science and Technology in Trnava*, 28(46), 36-45. https://doi.org/10.2478/rput-2020-0005
- 13. Economic statistics. Science, technologies and innovations. (2023). State Statistics Service of Ukraine. https://www.ukrstat.gov.ua/
- Golubchikov, O., & Thornbush, M. J. (2022). Smart cities as hybrid spaces of governance: Beyond the hard/soft dichotomy in cyber-urbanization. *Sustainability*, 14(16), 100-180. https://doi.org/10.3390/su141610080
- Hryhorash, O., Bocharov, D., Korneyev, M., Rudyanova, T., & Hryhorash, T. (2022). The quality of higher education and its funding in countries with different levels of socio-economic development. *Knowledge and Performance Management*, *6*(1), 49-61. https://doi.org/10.21511/kpm.06(1).2022.05
- Ionescu, R.V., Zlati, M.L. & Antohi, V.M. (2023). Smart cities from low cost to expensive solutions under an optimal analysis. *Financ Innov, 9*, 60-83. https://doi.org/10.1186/s40854-023-00448-8
- Kuznyetsova, A., Kozmuk, N., Klipkova, O., & Stetsevich, A. (2021). Structural paradigm of innovative and investment partnership. *Financial and Credit Activity Problems of Theory and Practice*, 2(37), 351–361. https://doi.org/10.18371/fcaptp.v2i37.230303
- Laenens, W., Mariën, I., & Broeck, W. V. D. (2018). Channel choice determinants of (digital) government communication: A case study of spatial planning in Flanders. *Media and Communication*, 6(4), 140–152. https://doi.org/10.17645/mac.v6i4.1652
- Lucato, W. C., Pacchini, A. P. T., Facchini, F., & Mummolo, G. (2019). Model to evaluate the Industry 4.0 readiness degree in Industrial Companies. *IFAC*-

PapersOnLine, 52(13), 1808-1813. https://doi.org/10.1016/j.ifacol.2019.11.464

- Martin, A., Mikołajczak, G., Baekkeskov, E., & Hartley, K. (2022). Political stability, trust and support for public policies: a survey experiment examining source effects for COVID-19 interventions in Australia and Hong Kong. *International Journal of Public Opinion Research*, *34*(3), 24-43. https://doi.org/10.1093/ijpor/edac024
- Micozzi, N., Yigitcanlar, T. (2022). Understanding Smart City Policy: Insights from the Strategy Documents of 52 Local Governments. *Sustainability*, 14, 10164. <u>https://doi.org/10.3390/_su141610164</u>
- Müller, J. M., Kiel, D., & Voigt, K. I. (2018). What drives the implementation of Industry 4.0? The role of opportunities and challenges in the context of sustainability. *Sustainability*, *10*(1), 247. https://doi.org/10.3390/_su10010247
- Novikova, O., Khandii, O., Shamileva, L., & Olshanskyi, O. (2022). The impact of digitalization on ensuring economic growtH. *Management Theory and Studies for Rural Business and Infrastructure Development, 44*(2), 223–234. https://doi.org/10.15544/mts.2022.23
- Olena Shkarupa, Dmytro Vlasenko, Halyna Makedon, Svitlana Bilan, and Desislava Serafimova (2022). Economy of knowledge and transfer of innovations: Ukraine's progress through the lens of European development trends. *Knowledge and Performance Management, 6*(1), 100-113. doi: https://doi.org/10.21511/kpm.06(1).2022.09
- 25. Oneshko, S., & Pashchuk, L. (2021). Industry 4.0 and creative economy (globalization challenges of the time). *Futurity Economics&Law*, 1(4), 4–11. https://doi.org/10.57125/FEL.2021.12.25.01
- Ostropolska, Y. (2021). Problems and prospects of development of SMART economy in the Post-Socialist States (challenges of the future). *Futurity Economics&Law*, 1(3), 4–16. https://doi.org/10.57125/FEL.2021.09.25.01
- 27. Popović, A., (2020). Implications of the Fourth Industrial Revolution on sustainable development. *Economics of Sustainable Development*, 4(1), 45-60. DOI: <u>https://doi.org/10.5937/ESD2001045P</u>
- Reardon, L., Marsden, G., Campbell, M., Gupta, S., & Verma, A. (2023). Analysing multilevel governance dynamics in India: Exercising hierarchy through the Smart Cities Mission. Territory, Politics, Governance, 1-19. <u>https://doi.org/10.1080/21622671.2022.21075</u> 59

- Rybalchenko, S., Lukianykhina, O., Alamanova, C., Saienko, V., & Sunduk, T. (2022). Anti-crisis management of banking institutions: current problems and prospects for improvement. *Financial and Credit Activity-Problems of Theory and Practice*, *5*(46), 29-39. https://doi.org/10.55643/fcaptp.5.46.2022.3907
- Schuh, G., Anderl, R., Dumitrescu, R., Krüger, A., & Ten Hompel M., (2020). Industrie 4.0 Maturity Index Managing the Digital Transformation of Companies. *Munich: ACATECH – National Academy of Science and Engineering.* https://boundarysys.com/wpcontent/uploads/2021/03/ Acatech_Maturity_Index_2020-IAN.pdf
- Sermuksnyte-Alesiuniene, K., Simanaviciene, Z., Bickauske, D., Mosiiuk, S., & Belova, I. (2021). Increasing the Effectiveness of Food Supply Chain Logistics Through Digital Transformation. *Independent Journal of Management & Production, 6* (12), S677-S701. DOI: https://doi.org/10.14807/ijmp.v12i6.1748
- Soltovski, R., Rodrigues, T. V., De Resende, L. M. M., Pontes, J., & Tadashi Yoshino, R., (2020). Industry 4.0 risks: a theoretical framework from the perspectives of sustainability. *The Journal of*

Engineering and Exact Sciences, 6(5), 0695-0703. https://doi.org/10.18540/jcecvl6iss5pp0695-0703

- Sousa, R. D., Boranbayeva, A., Satpayeva, Z., & Gassanova, A. (2021). Management of successful technology transfer in agriculture: The case of Kazakhstan. *Problems and Perspectives in Management*, *19*(3), 488-501. https://doi.org/10.21511/ppm.19(3).2021.40
- Strielkowski, W., Veinbender, T., Tvaronavičienė, M., & Lace, N. (2020). Economic efficiency and energy security of smart cities. *Economic Research-Ekonomska Istraživanja*, *33*(1), 788–803. https://doi.org/10.1080/1331677X.2020.1734854
- Vasin, S., Gamidullaeva, L., Shkarupeta, E., Palatkin, I., & Vasina, T. (2018). Emerging Trends and Opportunities for Industry 4.0 Development in Russia. *European Research Studies Journal, 21*(3), 63-76. https://www.ersj.eu/dmdocuments/2018_XXI _3_5.pdf
- Yang, W, Chen, Q., Guo, Q., & Huang, X. (2022). Towards Sustainable Development: How Digitalization, Technological Innovation, and Green Economic Development Interact with Each Other. Int. J. Environ. Res. *Public Health*, 19, 12273. https://doi.org/10.3390/ijerph191912273

Бодров В., Зрибнєва І., Сазонова С., Сидорук І., Орленко О.

ПОСИЛЕННЯ ВЗАЄМОЗВ'ЯЗКУ ДИДЖИТАЛІЗАЦІЇ ТА НАЦІОНАЛЬНОЇ МОДЕЛІ СМАРТ-ЕКОНОМІКИ ДЛЯ РЕАЛІЗАЦІЇ СТРАТЕГІЇ ІННОВАЦІЙНОГО РОЗВИТКУ

Розвиток сучасної економіки нерозривно пов'язаний із використанням найбільш сучасних і провідних інформаційних технологій. Тому увага науковців до проблематики диджиталізації та інноваційного розвитку постійно зростає. У роботі проведене дослідження різних наукових поглядів на специфіку диджиталізації економічних систем і побудови смарт-економіки майбутнього. Мета дослідження – доведення наявності взаємозв'язку між процесами диджиталізації та формування інноваційної моделі смарт-економіки в Україні. Для досягнення мети у статті здійснено аналіз статистичних даних щодо стану інноваційного розвитку української економіки та українських підприємств; конкретизовано напрями реалізації стратегії інноваційного розвитку на національному рівні. У результаті дослідження доведено, що національна економіка сьогодні перебуває на шляху до формування смарт-суспільства, а більшість інноваційних ініціатив здійснюється за рахунок бізнесу, тоді як держава використовує регулятивні важелі без активної фінансової участі. Визначено взаємний вплив процесів диджиталізації та реалізації стратегії інноваційного розвитку. Установлено, що процеси диджиталізації є ключовими та надзвичайно важливими для формування національної моделі смарт-економіки, оскільки вони мають комплексний та прикладний характер, але не зосереджуються в певній сфері чи галузі. Наразі національна модель смарт-економіки не може формуватися без державної підтримки, яка й забезпечується саме за рахунок розробки та реалізації стратегії інноваційного розвитку. Держава має можливості та достатні важелі для стимулювання впровадження сучасних цифрових технологій, розвитку інноваційної складової наукових досліджень, які в перспективі можуть бути впроваджені в практичну діяльність українських підприємств і організацій.

Ключові слова: диджиталізація, цифрова економіка, стратегія розвитку, інноваційний розвиток, науковий прогрес, розвиток, відновлення економіки

JEL Класифікація: E5, V21, L26, O31, O33