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## **FUNCTIONAL MODEL OF DIGITALIZATION PROCESSES' MANAGEMENT OF REGIONAL ECONOMIC SYSTEMS**

***The article examines modern problems and prospects for the development of digitalization of regional economic systems. The main processes of the implementation of digital technologies in all aspects of the economic and social life of the regions have been studied. Based on the analysis, it was established that the development of digitalization contributes to the entry of regional economic systems into the global digital space, which contributes to the expansion of cooperation between regions and allows the formation of relevant IT clusters. It was proven that the processes of digitalization and intellectualization of economic processes are carried out in compliance with certain principles. Based on the analysis, the stages of digitalization of the regions were determined based on the number of IT specialists, IT companies and institutions that train specialists in the digital technology industry. On the basis of regional clustering, the main measures that contribute to the development of digitalization on the basis of innovation and investment were developed. The largest Ukrainian and foreign crowdfunding platforms on which communication exchange between ideas and investors is carried out were analyzed.***

**Key words:** functional model, management, digitalization, information economy, digital technologies, regional economic system, region, regional economic development.

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## **ФУНКЦІОНАЛЬНА МОДЕЛЬ УПРАВЛІННЯ ПРОЦЕСАМИ ЦИФРОВІЗАЦІЇ РЕГІОНАЛЬНИХ ЕКОНОМІЧНИХ СИСТЕМ**

*Пандемія COVID-19 та обмеження до яких вона призвела вимагають нових підходів до процесів регіонального економічного розвитку та суспільного життя. Розвиток цифрових технологій відіграє значну роль в інноваційному та цифровому забезпеченні діяльності як суб'єктів господарювання, так регіонів і країни в цілому. Процеси впровадження цифрових технологій стимулюють регіональні системи до застосування інноваційних технологій та їх використання в управлінській та адміністративній діяльності.*

*У статті розглянуто сучасні проблеми та перспективи розвитку цифровізації регіональних економічних систем. Досліджено основні процеси впровадження цифрових технологій в усі аспекти економічного та суспільного життя регіонів. На основі аналізу було встановлено, що розвиток цифровізації сприяє входженню регіональних економічних систем до глобального цифрового простору, що сприяє розширенню співпраці між регіонами та дозволяє сформувати відповідні ІТ кластери. Було доведено, що процеси цифровізації та інтелектуалізації економічних процесів здійснюються при дотриманні певних принципів. На основі проведеного аналізу було визначено етапи цифровізації регіонів на основі показників кількості ІТ спеціалістів, ІТ компаній та закладів, які ведуть підготовку фахівців індустрії цифрових технологій. На основі регіональної кластеризації було розроблено основні заходи, які сприяють розвитку цифровізації на інноваційно-інвестиційній основі. Було проаналізовано найбільші українські та зарубіжні краудфандингові платформи, на яких здійснюється комунікаційний обмін між ідеями та інвесторами.*

*Доведено, що управління та розвиток процесів цифровізації на всіх рівнях державного управління сприяє підвищенню рівня інноваційної активності бізнесу та суспільства. Розвиток цифрових платформ сприяє збільшенню інвестиційної привабливості суб'єктів господарювання та спрощує пошук інвесторів для нових новаторських проектів. Використання не тільки українських, але й зарубіжних платформ, дає змогу вітчизняним розробникам підвищувати рівень та престижність своїх розробок, сприяє пошуку інвесторів для реалізації своїх проектів. На регіональному рівні це призводить до збільшення інвестиційних потоків в регіонах та забезпечує їх соціально-економічний розвиток.*

**Ключові слова:** функціональна модель, управління, цифровізація, інформаційна економіка, цифрові технології, регіональна економічна система, регіон, регіональний економічний розвиток.

**Formulation of the problem.** The COVID-19 pandemic and the restrictions it has led to require new approaches to the processes of regional economic development and social life. The development of digital technologies plays a significant role in the innovative and digital provision of activities of both business entities and regions and the country as a whole. The processes of implementation of digital technologies stimulate regional systems to apply innovative technologies and their use in management and administrative activities. First of all, digitalization processes should be implemented in state regulatory bodies of all levels, business entities, and individuals. The entry of regional economic systems into the global digital space makes it possible to increase the development potential of regions and expand the scope of interregional cooperation. The restrictions that were introduced due to the quarantine in the world proved the need to find new forms of interaction and cooperation to overcome the crisis and carry out the activities of business entities. The formation of the principles of the development of the digital society requires the corresponding improvement of means and methods of interaction in matters of stimulation of socio-economic relations. The introduction of digital technologies allows expanding communication processes, increasing the level of decentralization of management decision-making in various sectors of the economy. It can be argued that a new digital space has been formed in the world, which requires all countries to implement a digital economy policy based on the application of digital transformations with the improvement of relevant sectors of the economy, the development and implementation of various projects and programs, strategies. The development of digitalization of society allows us to state that today such processes have high variability in approaches, methods, and priorities for their implementation. Research of digitalization processes at the regional level today requires the formation of an appropriate model to ensure their development.

**Analysis of recent research and publications.** Features of the formation and development of modern digital and intellectual systems formed the basis of many studies, namely J. Galbraith, D. Tapscott, N. Negroponte, T. Mesenburg. The issue of regional development using digital technologies is considered in the works of S. Davymuka, L. Fedulova, V. Rudkovsky, I. Vakhovich, O. Pryshlyak and others. However, the issues of forming a model and directions for

managing digitalization processes at the regional level, taking into account quarantine restrictions, remain unresolved today.

**The purpose of the article** is to develop an appropriate functional model for managing the development of digitalization processes at the regional level.

To achieve the set goal, the following tasks were formed and solved in the work:

- the main features of the development of digitalization processes were investigated;
- the main principles of digitalization of economic systems are considered;
- appropriate goals and tools for the development of digitalization in the regions have been formed.

**Presenting main material.** For the development of regions' digitalization, it is necessary to develop a regulatory framework, which should hide the institutional support of these processes and positively affect the general economic development of the regions. digitalization is the process of using the appropriate array of information presented in the form of an electronic communication exchange system. Thus, the World Organization Open Society Justice Initiative has formed 10 international standards in matters of availability of official information [2]: transparency and openness of information; free access of each subject to information; freedom of access to information; simplicity and speed; denial of access to information is regulated by legislative acts; the right to appeal the denial of access to information; obligations of administrators to facilitate access to information; compliance with the principle of preventive disclosure of information; the principle of harmonization of the right to access to information taking into account other normative acts and laws [4].

Thus, in 2016, the UN adopted a Resolution on the promotion and protection of human rights on the Internet. Such directions were introduced through the development of recommendations for the development of artificial intelligence, according to which a person is considered at the level of the digital architecture of the future. In 2018, the Government of Ukraine approved the Concept of Development of the Digital Economy and Society for 2018-2020 and relevant measures for its implementation. The main purpose of this concept is to implement measures aimed at the development of digitalization of the economy, social spheres, implementation of

digital competences, development of the relevant infrastructure, stimulation of the production market, development and implementation of digital technologies. The implementation of digitalization at all levels of social and economic life is achieved through its integration into industry, regional, state programs and development strategies [5].

The given concept contributes to the realization of the following principles of digitalization: equal access to information of every citizen; development of information and communication technologies; increasing benefits in various spheres of social life due to the introduction of digital technologies; increasing the level of competitiveness; reduction of the level of use of live labor due to the automation of production processes; support of mass media and development of information society on relevant digital platforms; the development of globalization with the aim of Ukraine's integration into the European Union and access to world markets; development of public administration based on the application of digitalization methods; increasing the level of security and trust in society [7].

If we consider the processes of digitalization at the regional level, it is manifested in decentralization, service provision, continuity of education and training, openness of the information space, synergy, rights and freedom of all participants in the process. Thus, the main principles of digitalization development in Ukraine are accessibility, openness, transparency, comprehensiveness, and freedom. To implement the Concept of the Development of the Digital Economy and Society in Ukraine for 2018-2020, the following measures have been developed and implemented [7]:

- development of the necessary regulatory and legal support;
- development of priority directions for the development of the digital economy;
- identification of priority areas of digital transformation;
- formation of the principles of state policy in the digitalization of society;
- stimulating the introduction of high-tech industries.

In the regional aspect, most regions of Ukraine implement the principles of digitalization in their regional development programs and strategies. However, the digitalization of Ukrainian cities is heterogeneous, since each region has its own opportunities and potential for the development of digital technologies. Thus, among

Ukrainian regions, the leader in the field of digitalization is the Lviv Region, since the Lviv Digital Transformation Program was implemented in the city of Lviv in 2016-2020. The main directions of the program are aimed at the formation of international standards for the provision of management and communal services to the population, the accessibility and openness of government to society, and contributes to the improvement of the efficiency of city management based on the development of digitalization in all spheres of public life [8].

Thus, the "Smart Region" program was introduced in the Odesa region, which contributes to increasing competitiveness and innovative activity based on the development of the "Smart Region" program, which includes the implementation of "smart specialization" in matters of interregional and cross-border cooperation, the development of relevant innovative regional clusters, in particular within Black Sea region. This program promotes sustainable development on the basis of an open selection of priority areas of economic activity, which have a high development potential and stimulate the economy of the region, taking into account the characteristics of the resource potential of the territory.

The development of digitalization of the Kharkiv region is carried out on the basis of the development of the project "Digital transformation of the Kharkiv region", which provides for relevant communications on the development of websites, functional maps, visual 3D tours, the creation of platforms based on an online service in the environmental sphere [4].

In the Mykolaiv region, the "Smart Region" program has been developed, which provides for the development of digitalization in the region on the basis of the development of integrated web services that will contribute to further automation in various areas of the region's activities. It is a kind of platform on which business, government and the public will be able to interact [6].

Each region in the country is introducing appropriate digitalization concepts, which provide for the development and implementation of strategies and plans for increasing the competitiveness of regions both within the country and for the development of interregional cooperation. On the basis of research, it was established that Ukraine is one of the leaders among European countries in terms of the volume of cash flows and the use of digital work platforms. The majority of specialists who use such platforms are freelancers in various areas of the economy [1].

It should be noted that Ukraine is also a leader among European countries that use digital platforms through the financing and implementation of a certain amount of work. It is quite difficult to estimate the total volume of capital investments in such projects, but it is possible to estimate them according to the relevant functional characteristics. Digitalization platforms are most widely used in the field of IT technologies. In some regions of Ukraine, such a cluster is represented by specialists, educational institutions and IT companies [3].

Thus, according to regional distribution data, the largest IT cluster is concentrated in Lviv, Vinnytsia, Kharkiv, Dnipropetrovsk, Kyiv, Zaporizhia and Odessa regions, and IT technologies. Kyiv, Lviv, Vinnytsia, Kharkiv and Dnipropetrovsk regions are leading among the regions of the leaders in the placement of IT companies.

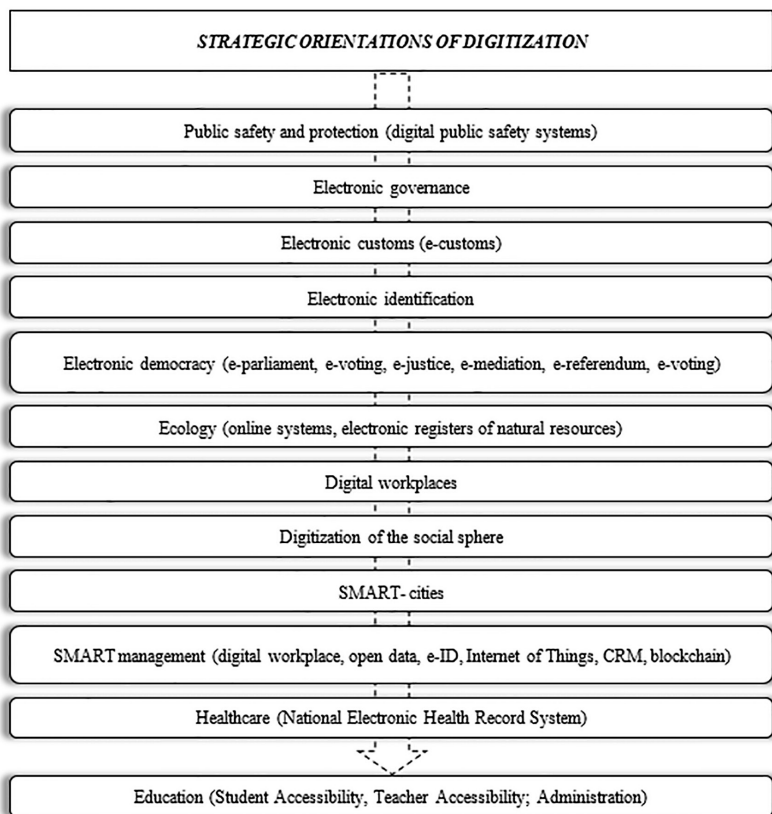
Among the largest digital platforms, Freelancehunt.com should be singled out, which hosts programming, design, optimization, engineering, mobile applications, outsourcing, translations, and text areas. In these areas, most specialists and customers are concentrated on this platform. The Kabanchik.ua platform was created for communications in the field of databases, copywriting, presentations, creation of web and mobile applications, advertising. The Freelance.ua platform includes areas of 3D graphics, engineering, management, consulting, training, advertising, translations and printing, programming, networks and information systems, and photography. However, specialists from Ukraine use other platforms to search for work and place their services, the most popular are Upwork.com (USA), Freelancer.com (Australia) et al.. Today, crowdfunding platforms, which act as intermediaries between investors and investment projects, are gaining more popularity. The modern crowdfunding market in Ukraine is at the beginning of its development, therefore it has certain differences from global markets both in terms of the scale of platforms and the number of implemented investment projects. Projects related to small business and the social sphere are mostly used in this market. Large investment projects on Ukrainian platforms are quite difficult to implement if they are aimed at the Western market. Such projects find their investors in European or American crowdfunding companies.

During 2018, Ukrainian projects were financed and implemented on the Kickstarter platform, such as Feel VR, which developed a

gaming steering wheel and pedals based on Direct Drive technology, \$500,000; Ugears, which developed 3D wooden puzzles, \$460,000; Verum 1 headphones 185,000 dol; Pix, who developed a backpack whose front side can be changed depending on your preferences, \$150,000 [8].

The main prerequisite for the development and transformation of the digital economy is the development of clusters. The implementation of investment and innovation interaction is mostly implemented in the field of IT clusters, which are the main element of the Ukrainian IT industry. The formation of such IT clusters is carried out in the main regional centers that are developed precisely in the IT industry, where IT sector enterprises, educational institutions, local authorities, service structures in the field of information and communication technologies are concentrated. The main goal of such associations is the joint implementation of projects aimed at the development of the IT sector and the sphere of digitalization of society in both regional and international markets. Implementation of social and infrastructure projects with the help of digitalization, which contributes to the corresponding transformations in the business environment of cities and regions. digitalization in the field of outsourcing of IT companies is the main goal of creating IT clusters in large cities and regions in Ukraine, based on the development of the IT cluster itself. Currently, the most developed areas of high-tech, inter-industry alliances, business incubators, venture funds, accelerators, R&D centers and other associations are the most developed in Ukraine. To date, 18 IT clusters have been formed in Ukraine, among which 12 are actively developed, regionally they are concentrated in Kyiv, Dnipro, Lviv, Odesa, Vinnytsia, Lutsk, Kharkiv and other regions. The most developed investment projects are those that deal with issues of modernization of education; activation of interaction between IT specialists, on the basis of digitalization, increasing the level of competitiveness of cities and regions both within the country and on the international arena; formation of a positive image of the regions; improvement of social infrastructure in the region; development of the business environment on the basis of digitalization, taking into account cooperation with local authorities. An important aspect is the development of relevant directions for the development of digitalization in Ukraine, which cover all spheres of the economy and social life (Fig. 1).



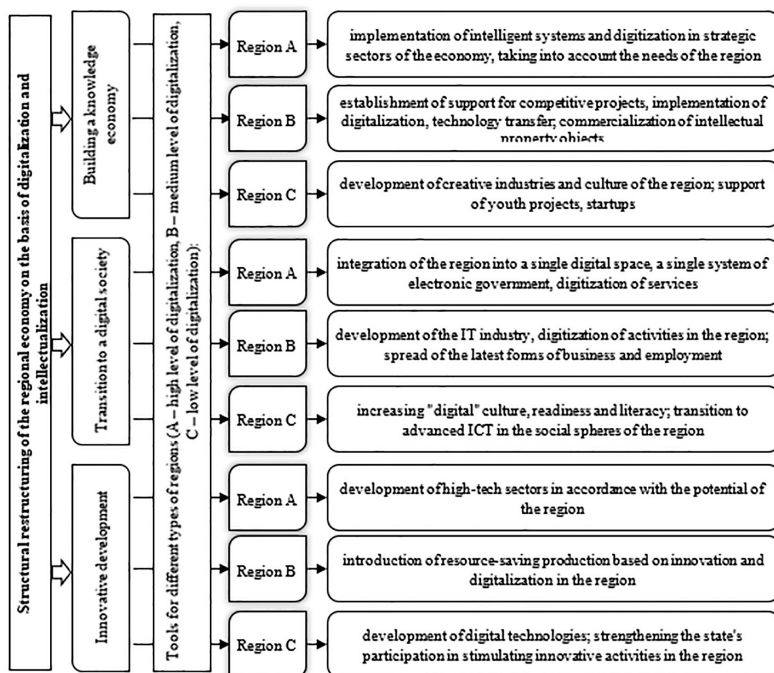


**Fig. 1. Strategic directions of digitalization in the state**

Source: systematized by the author

It should be noted that from a scientific point of view, sustainable development based on the digitalization of society has relevant advantages that will contribute to: increasing the competitiveness of goods and services; reduction of costs for the production of goods and services; expanding the range of products; increase in purchasing power due to online sales; emergence of new professions; development of medicine and innovative technologies in this segment; flexibility of the education system at all levels; improving the quality of life of the population. The main advantage of digitalization is the high investment attractiveness of such projects, which will contribute

to the increase of capital investments in the future. The main obstacle to speeding up the development of digitalization in Ukraine is the imperfect digital infrastructure, which is manifested in the low level of coverage of regions, the absence of separate digital infrastructures, and unequal opportunities for citizens to access digital technologies. In order to reduce such negative phenomena in the regional aspect, it is necessary to develop and implement appropriate directions depending on the stage of development of a separate region (Fig. 2).



**Fig. 2. Main tasks and tools of regional innovation and digital development of Ukraine**

Source: systematized by the author

The regional distribution of measures is explained by interregional differentiation in digitalization issues, as there are regions with a high level of development and population incomes and the periphery, which is less developed and with a low income level, which affects the

ability to access digital networks. Depending on the location (center-periphery), the development of digitalization allows increasing the supply of labor in new specialties based on increased access to digital networks in the peripheral zone. Such access makes it possible to increase the search for jobs with a higher level of remuneration, which positively affects the quality and well-being of the population. Appropriate measures should be developed taking into account the resource and innovation capacity of the regions for the development of digital technologies. Depending on the level of digitalization, it is advisable to divide the regions into high-level, medium-level and low-level regions. To what type does a separately selected region belong, it is appropriate for it to develop and implement appropriate measures for the development of digitalization. This approach makes it possible to single out priority types of economic activity in which it is expedient to activate innovative development and intellectual and creative resources. One of the promising directions for the development of regional systems is the formation of the intellectual property market, which will include the transfer of knowledge and technologies, the development of international data exchange standards, the introduction of digitalization in the public sector, and the improvement of the level of digital literacy in society. Such measures will contribute to strengthening the intellectual potential of the regions, increasing the level of their competitiveness, adaptability, and international investment attractiveness.

However, despite the positive changes in the economy with the introduction of digitalization, there are a certain number of threats and dangers.

Risks associated with digital transformations and risks associated with digitalization of the economy should be separated. The risks of digital transformation are primarily associated with an increase in the level of unemployment among the population due to the introduction of production automation, which facilitates the release of workers. Innovative development in production requires new professional skills, which requires the emergence of new professions and requires time for the training of such specialists and the transformation of existing processes, due to the need to master new work skills. One of the methods of reducing the impact of such risks is to stimulate self-employment of the population, develop freelance platforms and obtain contiguity of professions. The development of digital transformations

contributes to the emergence of cybercrime (disclosure of conference information, theft of databases, funds, etc.) at various levels of implementation, from personal to regional and state.

In order to ensure the effective development of digitalization by regional authorities, it is necessary to create appropriate conditions for technological and informational support of business entities and the population.

The main threats to the development of digital technologies include: illegal use of Internet technologies (video surveillance, cyber terrorism); the development of robotics and industrial automation technologies, which will negatively affect the labor market and increase the number of laid-off workers, which will negatively affect the social climate in society and create more tension in it; threats of unfair use of blockchain technologies due to the lack of adaptation of information support to risks and changes and related financial fraud; dependence on imported technological equipment for carrying out relevant operations on foreign software; threats of using cloud technologies, which are associated with unreliability of functioning and information storage in them, low level of security; unreliability of Internet providers; threats from the use of developments that affect the cognitive and behavioral characteristics of society; the complexity of business models and the lack of necessary qualified personnel. But despite the sufficient number of threats, the development of digitalization of the economy and society at the regional level has more positive moments than negative ones.

**Conclusions.** Management and development of digitalization at all levels of state administration contributes to increasing the level of innovative activity of business and society. The development of digital platforms helps to increase the investment attractiveness of business entities and simplifies the search for investors for new innovative projects. The use of not only Ukrainian, but also foreign platforms allows domestic developers to raise the level and prestige of their developments, helps to find investors for the implementation of their projects. At the regional level, this contributes to the increase of investment flows in the regions and ensures their socio-economic development.

## REFERENCES

1. Deiaki pytannia pidhotovky proiektiv aktiv zakonodavstva v elektronni formi [Some issues of preparation of draft legislative acts in electronic form], Resolution of the Cabinet of Ministers of Ukraine dated August 18, 2017. URL: <https://zakon.rada.gov.ua/laws/show/608-2017-%D0%BF#Text>.

2. Kargin, B.B. (2019). Vprovadzhennia innovatsiinykh informatsiinykh tekhnolohii u diialnist promyslovykh pidpriemstv [Implementation of innovative information technologies in the activities of industrial enterprises] [PhD dissertation] / DVNZ "Priazov State Technical University". Mariupol, 242 p.

3. Kunanets, N.E., Nebesnyi, R.M., & Matsyuk, O.V. (2016). Osoblyvosti formuvannia tsilei sotsialnykh ta sotsiokomunikatsiinykh skladovykh u proiektakh "rozumnykh mist" [Peculiarities of forming goals of social and socio-communication components in "smart cities"]. *Visnyk Natsionalnoho universytetu "Lvivska politekhnika". Informatsiini systemy ta merezhi*, Vol. 854, pp. 257-274.

4. Nikolaev, S. (2018). Tsyfrovaia ekonomyka kak zaslonka kvantovoho skachka v «zolotoi vek» [Digital economy as a shutter of the quantum jump in the "golden age"]. *Tsifrovizatsiia ekonomiki. BIT. Biznes & Informatsionnye tekhnologii*, Vol. 1(74). URL: <http://bit.samag.ru/archive/article/1960>.

5. Official website Ministry of Development of Communities and Territories of Ukraine URL: <https://www.minregion.gov.ua/about>.

6. Pro informatsiiu [On Information], Law of Ukraine dated 02.10.1992 № 2657-XII. URL: <https://zakon.rada.gov.ua/laws/show/2657-12#Text>.

7. Pro skhvalennia Kontseptsii rozvytku elektronnoho uriaduvannia v Ukraini [On the approval of the Concept of the development of e-government in Ukraine], Decree of the Cabinet of Ministers of Ukraine dated September 20, 2017 № 649. URL: <https://zakon.rada.gov.ua/laws/show/649-2017-%D1%80#Text>.

8. Fedulova, L.I. (2019). Tsyfrova transformatsiia (tsyfrovizatsiia) rehioniv Ukrainy. Analychna zapyska [Digital transformation (digitalization) of the regions of Ukraine. Analytical note]. 16 p. URL: [academy.gov.ua/pages/dop/198/files/4ba4c1b4-cefe-4f27-b58b-3aee7c-8cf152.pdf](https://academy.gov.ua/pages/dop/198/files/4ba4c1b4-cefe-4f27-b58b-3aee7c-8cf152.pdf).

## ЛІТЕРАТУРА

1. Деякі питання підготовки проєктів актів законодавства в електронній формі : Постанова Кабінету Міністрів України від 18 серпня 2017 р. URL: <https://zakon.rada.gov.ua/laws/show/608-2017-%D0%BF#Text>.
2. Каргін Б. Б. Впровадження інноваційних інформаційних технологій у діяльність промислових підприємств: дис...канд. екон. наук / ДВНЗ «Приазовський державний технічний університет». Маріуполь, 2019. 242 с.
3. Кунанець Н. Е., Небесний Р. М, Мацюк О. В. Особливості формування цілей соціальних та соціокомунікаційних складових у проєктах "розумних міст". *Вісник Національного університету "Львівська політехніка". Інформаційні системи та мережі*. 2016. № 854. С. 257-274.
4. Николаев С. Цифровая экономика как заслонка квантового скачка в «золотой век». *Цифровизация экономики. БИТ. Бизнес & Информационные технологии*. 2018. № 1(74). URL: <http://bit.samag.ru/archive/article/1960>.
5. Офіційний сайт Міністерства розвитку громад та територій України. URL: <https://www.minregion.gov.ua/about>.
6. Про інформацію : Закон України від 02.10.1992 № 2657-XII. URL: <https://zakon.rada.gov.ua/laws/show/2657-12#Text>.
7. Про схвалення Концепції розвитку електронного урядування в Україні : Розпорядження Кабінету Міністрів України від 20 вересня 2017 року №649-р. URL: <https://zakon.rada.gov.ua/laws/show/649-2017-%D1%80#Text>.
8. Федулова Л. І. Цифрова трансформація (цифровізація) регіонів України. Аналітична записка. 2019. 16 с. URL: [academy.gov.ua/pages/dop/198/files/4ba4c1b4-cefe-4f27-b58b-3aee7c8cf152.pdf](https://academy.gov.ua/pages/dop/198/files/4ba4c1b4-cefe-4f27-b58b-3aee7c8cf152.pdf).

**СТАТТЯ НАДІЙШЛА ДО РЕДАКЦІЇ 29.11.2022**