

DOI: <https://doi.org/10.34069/AI/2022.50.02.25>

How to Cite:

Khadzhynov, I., Kovalska, L., Taranych, A., Boyko, A., & Samiilenko, H. (2022). Determining impact of digitalization on the potential-forming space of regions in the context of sustainable development. *Amazonia Investiga*, 11(50), 272-281. <https://doi.org/10.34069/AI/2022.50.02.25>

## Determining impact of digitalization on the potential-forming space of regions in the context of sustainable development

### Детермінуючий вплив цифровізації на потенціалоформуючий простір регіонів у контексті сталого розвитку

Received: January 21, 2022

Accepted: February 25, 2022

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#### Abstract

The economic essence of digitalization of economic systems is investigated in the article. The challenges of digitalization of the economy of the regions include: the need for consistency of the dynamics of digitalization with economic and legal principles and institutional transformations; digital infrastructure development; intellectualization and digital literacy of the population; access to information and communication innovations. Guidelines for digitalization of the economy of the regions allow to ensure the following results: acceleration of economic business processes and innovative development; increasing the openness and accessibility of knowledge, information, communications; reduction of time and cost in production processes, sales and product promotion; formation of information databases for managing large data sets and accelerating the exchange of information; transformation of economic relations and adaptability to the demands of society. The implementation of the described goals and projects of digitalization of

#### Анотація

У статті досліджено економічну сутність цифровізації економічних систем. До викликів цифровізації економіки регіонів віднесено: потреби узгодженості динамічності цифровізації з економічно-правовими засадами та інституційними трансформаціями; розвиток цифрової інфраструктури; інтелектуалізації та цифрові грамотність населення; доступ до інформаційних та комунікаційних інновацій. Орієнтири цифровізації економіки регіонів дозволяють забезпечити наступні результати: прискорення економічних бізнес-процесів та інноваційного розвитку; нарощування відкритості та доступності знань, інформації, комунікацій; скорочення часу та вартості у виробничих процесах, реалізації та просуванні продукції; формування інформаційних баз для управління великими масивами даних і прискорення обміну інформацією; трансформація економічних відносин та адаптивність до запитів суспільства. Реалізація описаних цілей та

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the regions requires the activation of economic potential, as well as the transformation of the institutional environment of the region. Economic factors and tendencies of digital activity of the population of the region are described. Promising areas have been identified to further stimulate the implementation of programs and projects to digitize regions and increase their investment attractiveness to attract financial support.

**Keywords:** digitalization of the region, digitalization potential, sustainable development, land relations, digitalization programs, digital infrastructure.

### Introducción

Economic transformation, innovative progress in highly competitive markets and in conditions of heterogeneous distribution of resources and technologies in the regions require sustainable development incentives. The current dynamics of digitalization of the regional economy creates a strong potential for sustainable and coordinated global and national development.

Despite the activity of scientific research in economic research on the impact of digitalization on the development of its subjects, a significant number of problems for the further development of the digital economy on a regional scale remain insufficiently studied.

The aim of the study. The aim of the study is to establish the role of digitalization of regional institutions and enhance their economic potential to ensure sustainable development goals.

### Literature Review

In the current conditions of rapid development of digitalization processes, research on the role and impact of these processes on the development of the region is becoming extremely important. Among the scientists who dedicate their research to this area of research should be noted: Arefieva O. et al., (2021), da Rocha Teixeira F. et al., (2022); Derhaliuk M. et al., (2021); Ermakova A. (2021); Giraev V. et al., (2021); Ivanova N. et al., (2021); Kholiavko N. et al., (2021); Kovaleva I. et al., (2021); Kozlov A. et al., (2021); Kozonogova E. & Dubrovskaya J. (2022); Popelo O. et al., (2022); Pyankova S. et al., (2021); Roos G. et al., (2021); Samoilyovych A. et al., (2021); Shabanova M. et al., (2021); Tashtamirov M. et al., (2021); Tulchynska S. et al., (2021); Vlasov M. & Yan, K (2021) and others.

проектів цифровізації регіонів потребує активізації економічного потенціалу, а також трансформації інституційного середовища регіону. Описано економічні фактори та тенденції цифрової активності населення регіону. Визначено перспективні території для подальшого стимулювання імплементації програм і проєктів з цифровізації регіонів та підвищення їх інвестиційної привабливості для залучення фінансової підтримки.

**Ключові слова:** цифровізація регіону, потенціал цифровізації, сталий розвиток, земельні відносини, програми цифровізації, цифрова інфраструктура.

In the article (Kozonogova & Dubrovskaya, 2022), scientists study the convergence of regions in terms of digital development, taking into account the spatial location. Scientists have established regional unconditional  $\beta$ -convergence and positive global spatial autocorrelation according to the level of development of digital infrastructure of regions.

Scholars (Tashtamirov et al., 2021) argue that digital transformations of regional socio-economic systems have a significant impact on economic growth and financial stability of individual territorial entities. The authors investigated that global trends of "digitalization" of economic and financial relations affect the peculiarities of regional development. The article examines the features and problems in the processes of digitalization of the regional banking system and the market of banking services in terms of digitalization and affordability of depressed regions of the country.

In the articles of scientists (Kholiavko et al., 2022; Popelo, 2022) the main attention is paid to the peculiarities of the functioning of higher education in the conditions of rapid development of digitalization processes. Researchers have identified that enhancing the positive impact of higher education on the development of the digital economy is facilitated by: improving dual education, implementing lifelong learning programs, forming an information and innovation culture in society; generation of innovative ideas and their commercialization, support of youth innovative projects; improving English language proficiency.

The aim of the article (Popelo et al., 2022) is to develop a methodological approach to the qualimetric assessment of innovation activities of

regional economic systems, taking into account the processes of digitalization. As a result of the research, the authors present a cartographic analysis of the regions of Ukraine.

The authors (da Rocha Teixeira et al., 2022) prove that digital transformation increases the competitiveness of companies, improves the economic positioning of organizations and is responsible for the globalization of business. The study is based on an analysis of the impact of higher education institutions on the digital development of the Portugal's regions. The study revealed a positive impact of universities on the digital development of regions.

The article (Derhaliuk et al., 2021) substantiates the direction of providing institutional prerequisites for the transformation of the potential-creating space in the conditions of intensification of regional development. Scientists have analyzed the existing shortcomings of the state policy of transformation of the potential-creating space in the context of intensifying regional development.

According to the study (Kozlov et al., 2021), the impact of the level of digital infrastructure development on the formation of Industry 4.0 in the Arctic regions was analyzed. The authors of the article assessed the level of regional digital infrastructure by analyzing individual indicators and calculating the integrated indicator. The results of the study revealed a slight positive trend in the development of integrated digital infrastructure.

According to the research (Samoilovych et al., 2021), the article identifies key differences, substantiates the need for systematic action at both regional and national levels for the effective implementation of digitalization. The authors analyze the components of digital transformation of the regions of Ukraine, among which the emphasis is on creating an effective digital infrastructure; introduction of "Industry 4.0" technologies in the industry; e-government and training of the workforce in accordance with the requirements of the digital economy.

The author of the paper (Ermakova, 2021) analyzes the role and importance of digitalization in the modern world. As a result of the study, the scientist proves that the transition to digital subsoil use will open new opportunities for regional development of the fuel and energy complex. According to the author, this will avoid some existing environmental problems and bring the region's economy to a more favorable level.

Studying the results of scientific research (Pyankova et al., 2021), the features of the impact of digital development on the competitiveness of countries and regions are analyzed. The authors use a structured methodology adapted to solve the problem of nonlinear optimization by choosing the optimal scenario of public management of digital development of regions. Researchers consider the study important and useful, as it highlights the components of the digital economy that affect both the digital and the competitiveness of regions as a whole.

The authors of the article (Tulchynska et al., 2021) claim that in the process of activating the modernization potential, resources are transformed into the results of the implementation of innovation and investment strategies of modernization both at the micro level and at the regional level. Scientists argue that the key vectors of activation determine the nature and properties of investment resources and the necessary innovations to enhance the modernization potential.

The authors (Kovaleva et al., 2021) argue that elements of the digital economy are being actively implemented in various sectors of the economy. Scientists point to the need to use innovative technologies, including the digitalization of the industry in the field of agriculture. The study claims that industry digitalization will increase the level of competitiveness of the region.

The basis of the study (Vlasov & Yan, 2021) is the assessment of digital technologies for human capital, identifying correlations between the factors of digital economic and human capital in different regions. Scientists have proven the significant impact of digital economic development on the development of human capital. In the article, the authors identified the impact of digital economy factors on human capital development in the regions.

The article (Arefieva et al., 2021) defines that the system of economic security of regions, which acts as a system, has its subsystems, which include: production, financial, environmental, innovation, investment and social subsystems. The authors identified possible threats due to the transformation of power. The authors performed a PEST analysis of the impact of various factors on economic security and development of regional economic systems in modern conditions.

The authors (Roos et al., 2021) analyze the possibilities of sustainable economic development of coastal areas in the Baltic Sea region in the context of digital transformation. Scientists argue that the use of digital technologies in the process of commercialization of territorial resources will have a positive impact on sustainable economic development of regions. As a result of the study, the authors note that increasing the competitiveness of coastal areas requires investment in digital solutions in the blue economy and the development of communication infrastructure.

The aim of the article (Ivanova et al., 2021) is to study the problems of e-commerce development, which are becoming increasingly important in the context of mass quarantine restrictions. The authors substantiate the importance of digitalization as a driver of economic development and investigate the main business models of e-commerce and their modifications.

Scientists of the article (Girayev et al., 2021) have developed a method of indicative assessment of the effectiveness of public administration of the region in the digital economy. The authors note that indicators of the effectiveness of regional development management in the digital economy are the use of digital economy to maximize revenues and minimize expenditures of the regional state budget. The article proves the expediency of stimulating digital modernization of the economy of the regions in order to increase the efficiency of public administration.

The purpose of the article (Shabanova et al., 2021) is to study the new challenges of public and corporate governance in the context of digital development of the modern region, identify scenarios and the optimal model for managing this development. The authors prove that the digital development of the regional economy is based on measures of state financial support for digital modernization of the economic system of the region. As a result of the study, the authors proposed a model of state and corporate governance of digital development in the region, which, according to scientists, will help optimize and ensure greater management efficiency.

### Methodology

The methodological basis of the study is the fundamental provisions of the theory of development of productive forces and regional economy, as well as the theory of post-industrial development of society, including digitalization. This made it possible to apply general scientific

techniques and specific methods of scientific research in relation to the justification of the role of digitalization in the development of regions and the use of their potential in terms of sustainable development.

The study used a set of methods of scientific knowledge to ensure the disclosure of the topic and achieve the goal, including: logical method - to identify the genesis of digitalization as a progress of social development, which allows to more effectively achieve sustainable development goals using the potential of regions; analysis, synthesis and generalizations - to highlight the challenges of digitalization and its benchmarks, the results for the development of regions as a result of the introduction of digitalization, justification of the role of digitalization in ensuring sustainable development of regions; formalizations and generalizations - to determine the impact of digitalization on sustainable development of regions, highlighting the legal principles of digitalization of the economy and their implementation in order to ensure sustainable development of regions; graphic and cartographic - to visualize the results of the study.

### Results and Discussion

The processes of digitalization of the economy in the regional manifestation are aimed at the formation of new competitive opportunities created by information and communication innovations. In economics, the concept of digital economy was first substantiated at the end of the last century, with emphasis on research in the field of digitalization on the use of information and channels of its dissemination to describe the transformation of the economy.

This is due to the fact that the theory of the digital economy is seen as digitalization, and most importantly as a potential factor in ensuring the competitiveness and efficiency of innovation. The digital economy can be considered as a kind of traditional economy, but from the standpoint of constant and mass implementation of information and communication technologies digitalization of the economy is aimed at implementing the principles of openness and global markets and information. This stimulates the search for innovative tools for the formation of new competitive advantages, is a factor in stimulating productivity and competencies of individual workers, as well as territorial economic heterogeneity.

It is necessary to emphasize the role of intellectual capital and the impact of expanding digitalization in education, aimed at improving the quality of education and communications. In turn, the newly created digital capital as a result of digital technologies and logistics information infrastructure can accelerate economic business processes, promote the availability and openness of information about markets and resources, which increases the competitiveness of individual regions.

The digital economy is innovation-oriented and directs the introduction of digital technologies to the socio-economic development not only of the national economy, but also of individual industries, territories or markets. According to scientists, the digital economy can accelerate the allocation of resources and the creation of goods or services, which ultimately reduces economic costs and increases profitability.

The same results of the introduction of digital technologies in the economy of the digital economy allows:

- firstly, to change business processes and mechanisms of profit generation;
- secondly, reduces the role of mediation in economic processes of resource supply and sales;
- thirdly, ensure customer focus and rapid adaptation to changes in market demand;
- fourthly, allow to increase the quality of products by individualizing its characteristics.

However, in our opinion, the globalization and universality of information and communication technologies require not only the acceleration of innovation and technological renewal, but also the transformation of all relevant areas. Because the availability of new technologies requires their compliance with economic and legal principles

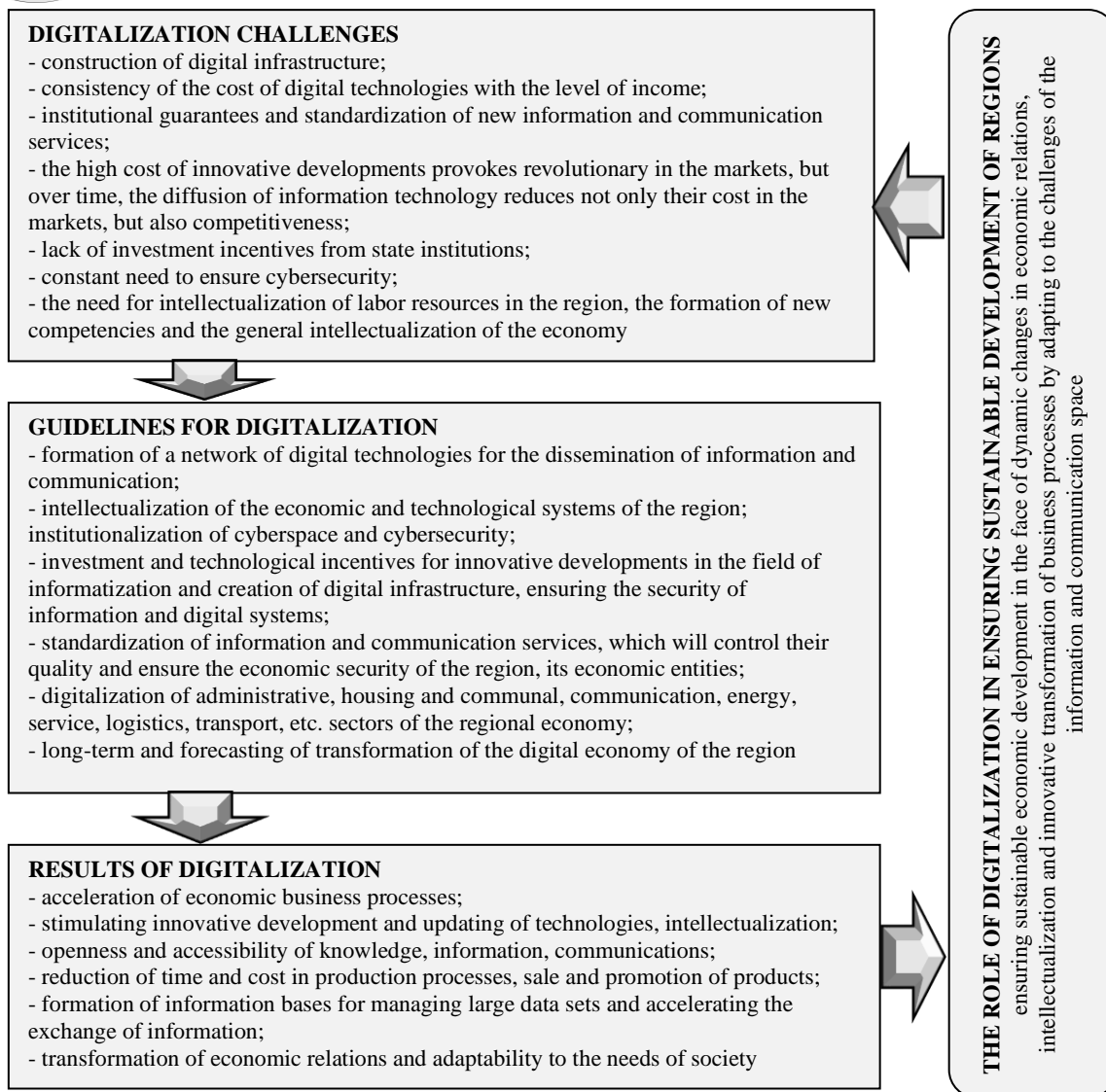
and norms. In addition, the uneven distribution of information due to the inconsistency of digital infrastructure to the needs of the regional economy provokes disparities in competitiveness and adaptability to the challenges and pace of digitalization. Therefore, noting the stimulating role of digitalization of the economy, we must note the negative manifestations:

firstly, the heterogeneity of digital infrastructure provokes the dominance of individual regions in the national or global economy, their monopoly in certain markets;

secondly, the availability of information and communication tools for the population is dictated by the general level of well-being in certain areas, age and socio-cultural characteristics, which affects the disparities in innovation development;

thirdly, the dynamics of digital services development exceeds the pace of institutional adaptation of the regional system and provokes economic threats to cybersecurity of information; fourthly, for the uniform spread of digital technologies and, accordingly, the homogeneity of the economic system of the region, it is necessary to ensure the formation of digital literacy, intellectualization of labor resources.

These challenges require consistent solutions and adaptability of the regional economy to the pace of digitalization. The effectiveness of the digital economy in the regional dimension depends on the pace of implementation of information and communication innovations, as well as institutional support and stimulation of these processes. Therefore, we propose to consider the processes of digitalization of the regional economy as the interaction of challenges, benchmarks and expected results. Collectively, this will determine the functional role of digitalization in the economic development of regions and the accumulation of their potential to ensure further sustainable development (Fig. 1).



**Figure 1.** The impact of digitalization on the sustainable development of the regions' economy.  
Source: suggested by the authors

Summarizing the impact of digitalization and its role in the development of regional economies, it is necessary to note the following characteristics that are formed by the need for further structural changes:

- firstly, digital technologies, as an element of the regional economy, are characterized by a network structure that allows for synergistic and rapid results;
- secondly, digitalization is primarily aimed at information and communication processes, availability of knowledge and information, and therefore its effectiveness directly depends on the speed of diffusion of innovative technologies, their openness and dissemination;
- thirdly, the relevance of digital infrastructure and tools for working with information requires constant capital investment in

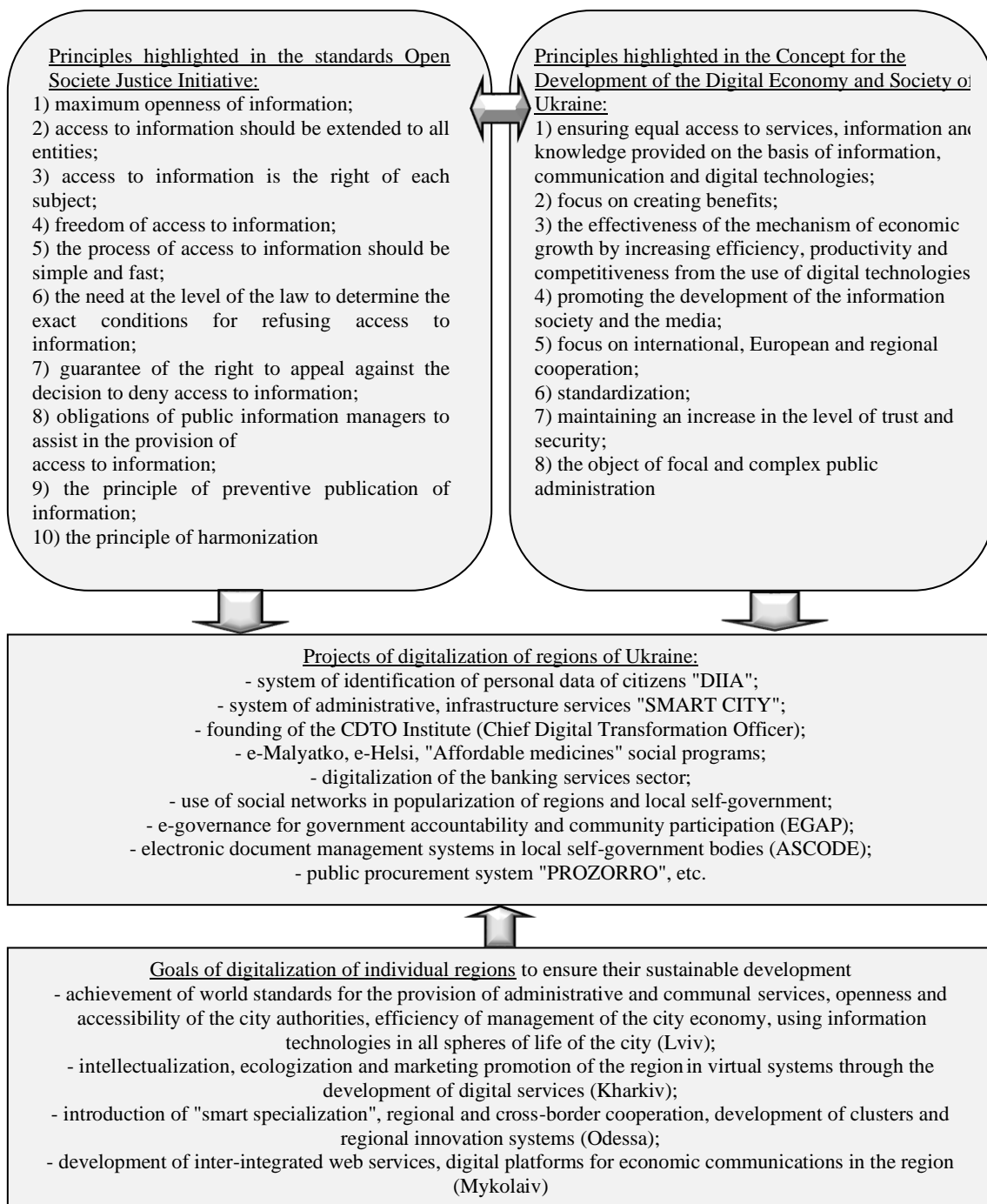
modernization, which provokes demands for building the potential of digital development of the regional economy;

- fourthly, the potential of digital development of the region is dynamic and stochastic, depends on the cost of investment in virtualization of capital, distribution and capitalization of intellectual, innovative, industrial, financial, etc. capital;
- fifthly, the development of digital technologies affects the even distribution of resources and income, the likelihood and characteristics of economic risks, as they are the result of innovative progress, as well as difficult to predict and depend on public and business perceptions of the region;
- sixthly, the development of digital technologies and their spread in the regional economy provokes an overall increase in

digital literacy, as well as the digitalization of services and distribution channels.

Stimulation and motivation of digitalization of regions in the described conditions and taking into account the specified characteristics of the process by international and national institutions is carried out in accordance with the already

adopted regulations. At the same time, the established scientific principles of digitalization of the economy of regions or individual territories allow to reveal the prospects of ensuring adaptability to the emergence of innovative technologies and sustainable development of the entire economic system (Fig. 2).



**Figure 2.** Regulatory principles of digitalization of the economy and their implementation in order to ensure sustainable development of regions.

Source: formed on the basis of:

Open Societe Justice Initiative. Article19: Website. 2019. <https://www.article19.org>.

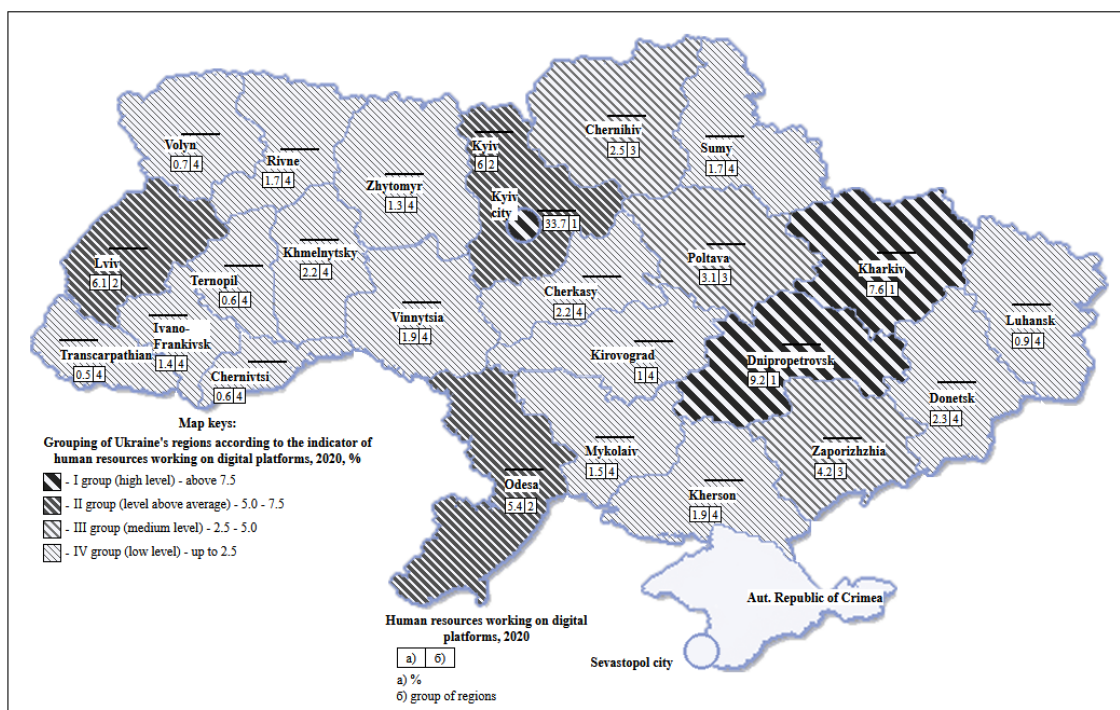
Official portal of the Verkhovna Rada of Ukraine. <https://rada.gov.ua/>.

Ministry and Committee for Digital Transformation of Ukraine. <https://thedigital.gov.ua/ministry>.

Key regulations governing digital technology management, information exchange, and the development of artificial intelligence include the UN Resolution on the Promotion, Protection and Exercise of Human Rights on the Internet, the norms of the World Open Society Justice Initiative, the National Concept for the Digital Economy and Society of Ukraine 2018-2020, as well as regional digitization programs in some regions of Ukraine.

The implementation of the described goals and projects of digitalization of the regions requires

the activation of economic potential. The need for intellectualization and digital literacy of the population is especially relevant, in particular, the regional distribution of human resources needs more detailed research, which reflects not only the level of digital infrastructure development, but also economic guidelines for innovation in digitalization of regions. The dominance of individual regions in the territorial distribution of economic activity of the population on electronic platforms is presented in Fig. 3.



**Figure 3.** Regional distribution of human resources working on digital platforms, %  
 Source: formed on the basis of Ministry and Committee for Digital Transformation of Ukraine.  
<https://thedigital.gov.ua/ministry>

It should be noted that in the Central and Southern regions of Ukraine there is a higher level of activity of IT workers (20 and 22% respectively). Also, interesting for strategic planning of priorities of digitalization of regional economies is the factor of dominance of IT in the structure of employment and concentration of its employees in cities with a population of more than 100 thousand people: Kyiv, Lviv, Kharkiv, Odessa account for 52% of freelancers digital platforms.

Thus, the realization of the potential of digital transformation of regions is aimed at ensuring sustainable development in the context of activating the population and meeting its needs for access to services, communication between people and regional authorities. Thus, 94 projects

of digital transformation of the administrative sector in local self-government bodies are currently being implemented in Ukraine.

These national projects (see Fig. 2) in the regional economy are developing through targeted financial support, as well as the implementation of national programs for digital infrastructure development. However, the effectiveness of digitalization of regions primarily depends on the motivation of the population and the political will of local authorities.

**Conclusions**

The study reveals the directions and conditions of digitalization of economic systems of regions



in the context of the implementation of international principles and programs. The described landmarks and challenges allow to formulate landmarks for sustainable development of regions. Ensuring the sustainable development of the regional economy in the context of dynamic changes in economic relations, intellectualization and innovative transformation of business processes should be carried out by adapting to the challenges of the information and communication space. The principles of digitalization defined by normative legal acts are implemented for regional purposes, as well as currently represented by regional programs. National programs, as well as the implementation of projects for the development of digital infrastructure have an important impact on the digitalization of regions.

Further research should focus on analyzing the effectiveness of the economic potential of digitalization of regions and its impact on sustainable development in the future.

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