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WORLD EXPERIENCE AND UKRAINIAN REALITIES OF DIGITAL TRANSFORMATION OF REGIONS IN THE CONTEXT OF THE INFORMATION ECONOMY DEVELOPMENT

Abstract. The current state of the implementation of digital technologies in Ukraine and the world in the context of the information economy development is studied. The key differences are identified, the need for systematic action at both regional and national levels for the effective implementation of digitalization is substantiated. Data on the level of the digital economy development in Ukraine in general, and in the regions in particular, as well as examples of successful implementation of digitalization in some countries, are presented. It is investigated that Ukraine is one of the first places in Europe in terms of population with the Internet access.

It is established that the process of digitalization of Ukraine's economy is qualitatively different from that in developed countries. In the context of rapid development of information economy in order to bridge the existing gap with developed countries in the digitalization process, Ukraine needs to implement a number of measures, including: creating a regulatory framework for digital economy, introducing and promoting digital platforms and services for business and population, establishing education systems in order to effectively train specialists in the digital age, creating an effective digital infrastructure, promoting the implementation of Industry 4.0 technologies in industry, etc. The implementation of the proposed actions will bring Ukraine closer to the digitalization level of developed countries and increase social and economic development of the state.

The article outlines the components of digital transformation of the regions of Ukraine, among which the emphasis is on creating an effective digital infrastructure; the introduction of Industry 4.0 technologies in industry; e-government and training of the workforce according to the requirements of digital economy. It is noted that the digitalization process should be systemic in nature at both national and regional levels.

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СВІТОВИЙ ДОСВІД ТА УКРАЇНСЬКІ РЕАЛІЇ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ РЕГІОНІВ У КОНТЕКСТІ РОЗВИТКУ ІНФОРМАЦІЙНОЇ ЕКОНОМІКИ

Анотація. Досліджено сучасний стан упровадження цифрових технологій в Україні та світі в контексті розвитку інформаційної економіки. Визначено ключові відмінності, обґрунтовано необхідність системних дій як на регіональному, так і на загальнонаціональному рівнях для ефективного впровадження цифровізації. Наведено дані щодо рівня розвитку цифрової економіки в Україні загалом і в регіонах зокрема, а також представлено приклади успішного впровадження цифровізації в деяких країнах світу. Досліджено, що Україна посідає одне з перших місць у Європі за кількістю населення, що має доступ до мережі «Інтернет», проте, незважаючи на це, відсоток населення, який використовує Інтернет для отримання цифрових послуг, залишається низьким.

Установлено, що процес цифровізації економіки України якісно відрізняється від аналогічного в розвинених країнах. В умовах стрімкого розвитку інформаційної економіки з метою подолання наявного розриву із розвиненими країнами у процесах цифровізації, в Україні потрібно реалізувати низку заходів, серед яких: створення нормативно-правової бази функціонування цифрової економіки, упровадження і популяризація цифрових платформ та сервісів для бізнесу і населення, реформування системи освіти з метою ефективної підготовки спеціалістів цифрової епохи, створення ефективної цифрової інфраструктури, сприяння впровадженню технологій Індустрії 4.0 у промисловості тощо. Реалізація запропонованих дій дозволить наблизити Україну до рівня цифровізації розвинених країн і підвищити соціально-економічний розвиток держави.

Окреслено компоненти цифрової трансформації регіонів України, серед яких акцентується увага на створенні ефективної цифрової інфраструктури; запровадженні технологій Індустрії 4.0 у промисловості; електронному урядуванні і підготовці робочої сили за вимогами цифрової економіки. Зазначено, що процес цифровізації повинен мати системний характер як на національному, так і на регіональному рівнях.

***Ключові слова*:** цифровізація, цифрова трансформація, регіон, регіональна економіка, інформаційна економіка.

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Introduction. The transition to a new model of the society development in the context of digitalization requires considerable effort. Given rapid development of information economy, most developed countries began to pay attention to digitalization in the late 1990s — early 2000s, creating appropriate development programs, institutions, actively implementing the achievements of science and technology in business processes, public administration, social development and more.

Countries that have not paid attention in time to the technological, economic, social and institutional components of further development in the context of digitalization, are forced to operate in the conditions of ultra-rapid systemic transformations that affect all spheres of society.

Allocation of previously resolved parts of the overall problem. Despite the large number of foreign and domestic scientific works, as well as significant interest in the economy digitalization by scientists, a number of problems that hinder the effective implementation of digitalization of the economy of Ukraine, were not sufficiently reflected in research.

The **purpose** of the article is the research and possibilities of implementation of the world experience in the Ukrainian realities of digital transformation of regions in the context of modern information economy.

Literature Review. Many scientists have devoted their research to the study of various issues of the economy digitalization and opportunities for the implementation of successful experience in the practice of different countries, among which: Butko M. [1], Kholiavko N., Dubyna M. [2], De Silva I. [3], Klymenko E. Y., Alpeissova S. E. [4], Chudnovskiy A. D., Tsabolova O. R., Zhukova M. A. [5], Myovella G., Karacuka M., Haucap J. [6], Alraja M. N., Hussein M. A., Ahmed H. M. S. [7], Gopane T. J. [8], Eichstädt S. [9], Afonasova M. A., Panfilova E. E., Galichkina M. A., Ślusarczyk B. [10], Budzinski O., Stöhr A. [11], Adam M. [12], Billestrup J., Stage J. [13].

A French scientist De Silva argues that in the context of digitalization, the French competition authority faces new challenges in addressing both law enforcement and defense issues. To better understand the features of the digital world, the work of the French Internet advertising market was carefully studied [3].

The article of scientists Klymenko E. Y. and Alpeissova S. E. aims to study the features of the education digitalization in the post-Soviet space in quarantine conditions, namely the experience of Ukraine and Kazakhstan [4].

The paper of Myovella G., Karacuka M. and Haucap I. from Turkey and Germany identifies the contribution of digitalization to the economic growth of sub-Saharan Africa (GCC) in comparison with the economy of the Organization for Economic Cooperation and Development (OECD). The main reason for comparing most and least developed countries to measure the effects of digitization is to understand whether such effects depend on the level of the country's development [6].

The main purpose of the work of Omani scientists Alraja M. N., Hussein M. A. and Ahmed H. M. S. is to study the views of the SME leader on the main factors influencing the SMEs digitalization, which they lead, using a technological, organizational and environmental model [7].

The objective of the paper of Gopane T. J. from South Africa is to examine the influence of digitalization on labor productivity. Methodologically, within the study, the econometric framework

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of the model of endogenous growth and innovative data from the database of the general economy of the Conference Council on the BRICS case study are used [8].

German scientist Eichstädt S. notes that today digitization is much more than the conversion of analog values into digital ones. The article outlines the problems, opportunities and tasks of metrology in the digitization of the economy and society [9].

The authors of the article Afonasova M. A., Panfilova E. E., Galichkina M. A. and Slusarczyk B. note that digital technologies have significantly changed the speed of the economy. The article analyzes the Russian digital economy and society in the context of comparison with EU countries and draws conclusions about future development trends [10].

The article of German scientists Budzinski O. and Stohr A. states that the widespread process of digitization in various ways changes economic competition in the markets and leads to the emergence of new business models. The authors argue that the European competition policy should follow the example of the German reform and amend its institutional framework accordingly [11].

A researcher from Spain Adam M. notes that European public investment in the infrastructure is becoming increasingly demanding in terms of efficiency and sustainability. The article argues that the use of the BIM methodology plays an important role and a role that will be more important for more balanced development in Europe [12].

Within the article of Billestrup I. and Stage I., the fact that several initiatives have been initiated in the European Union and Denmark to digitize services for citizens is examined. Several issues related to the lack of accessibility and ease of the use of e-government self-service solutions were identified in the paper [13].

Methodology. The authors used general and special methods. Historical and logical methods were used for the qualitative analysis of the properties, functions and principles of digitalization of the regional development. The grouping method was used in the systematization and hierarchical identification of the elements of digitalization of the regional economic space. To form an understanding of the current role of the economy digitization and analytical assessment of the digitalization level in the regions of the country, the method of generalization was used. The deductive method was used in the process of proposing and arguing the feasibility of implementing measures aimed at the digitalization development of the regional economic space.

Results. The rapid widening of the digital divide poses a growing gap for developing countries. In particular, this applies to Ukraine. The development of the manufacturing sector on the basis of Industry 4.0 is a strategically important national task for the development of the economy, services and ensuring the growth of income and national welfare of any country.

The concept of digitalization in Ukraine is fundamentally different from what is currently being actively implemented in the world. In Ukraine, the concept of «digitalization» is focused mainly on the creation of new services and their types, which is based on the collection and analysis of data from various physical objects and does not cover radical changes in the production system, approaches to design, production, marketing and operation of these physical objects, which is laid down in the concept of Industry 4.0. However, 4.0 [14] technologies provide full digital integration of the enterprise vertically and horizontally, the creation of more «smart» products and services, the transition to new business models through new technologies, changing the approach to both direct production and indirect processes — training of the workforce, maintaining and improving its quality level, changing the nature of work and employment, creating institutions and adapting legislation for effective operation in the new environment.

In contrast to this approach, in industrialized countries — the United States, Germany, Italy, Japan, China — under the «digital economy», the processes of creating and using a single production and service (or product and service, PSS) [15] systems are meant. Outside of such a system, a service component without a physical product, even if it is based on the most advanced technologies (neural networks and the Internet of Things), will not give a significant economic effect and cannot be fully monetized [14].

The level of digitalization of Ukraine's economy differs significantly depending on the industry. For example, in the field of financial services, communication services, logistics,

Ukrainian companies use the achievements of information technology at the same level as foreign ones; however, in some areas the intensity of the digital technologies use is extremely low. This is the reason for the significant lag in development and productivity.

Innovative development is based on the introduction of digital technologies that contribute to the formation of new business models. According to scientists [16], the level of enterprise spending on the development of new technologies and products and the state of investment in innovation in Ukraine is completely unsatisfactory. For example, to perform research and development of Ukrainian enterprises spent in 2017, about ($ 400—450 million) [17], the world's 1,000 largest companies — $ 702 billion, the leader of the Amazon rating — $ 16.1 billion, Volkswagen — $ 12.5 billion [18].

According to the State Statistics Service in Ukraine in 2017, only 16.4% [17] of enterprises were engaged in innovative activities in industry. In developed countries, the share of innovative enterprises is 4—5 times higher and is 50—60% of the total number of enterprises [17]. The share of innovative enterprises on average in the EU is 51%. The highest level is in Belgium — 68%, Portugal — 67%, Finland — 65%, Germany — 64%, Luxembourg — 64%. The lowest in Romania — 10% and Poland — 22% [19]. An important feature of the digitalization process of the Ukraine's economy is the difference in the intensity of this process depending on the region. More than 80% of government spending in this direction falls on the 10 largest regions [20]. Systematic implementation at both the national and regional levels will allow Ukraine to emerge from the crisis and bridge the digital divide with developed countries.

Ukraine is one of the first countries in Europe in terms of the number of people who have access to the Internet, however, the percentage of the population that uses the Internet to receive digital services remains low (*Table*).

Table

Distribution of the population in order to use Internet services, 2019

Regions	Proportion of households with the Internet access at home, %	Distribution of the population for the purpose of using Internet services					
		sending (receiving) e-mail, %	interaction with public authorities, %	training and education, %	banking services, %	finding information related to health issues for themselves and others, %	order (purchase) of goods and services, %
Vinnytsia	63,9	22,2	1,7	23,8	28,6	37,9	19,5
Volyn	53,8	27,0	1,5	21,2	23,4	37,5	13,9
Dnipropetrovsk	79,3	20,7	5,0	27,4	35,0	31,7	15,9
Donetsk	68,0	25,3	3,5	15,2	23,3	22,4	25,1
Zhytomyr	54,6	21,3	2,2	20,5	16,7	37,1	23,9
Transcarpathian	75,9	14,8	1,3	22,6	5,6	35,7	12,8
Zaporizhzhia	68,5	28,5	1,8	23,3	18,9	25,7	14,1
Ivano-Frankivsk	65,3	20,6	2,6	30,0	21,4	29,6	12,1
Kiev	60,8	32,6	0,0	23,3	22,5	29,2	21,5
Kirovohrad	54,1	42,4	0,5	18,3	24,7	20,6	19,8
Luhansk	63,3	24,2	4,6	20,7	20,0	27,1	14,8
Lviv	68,9	25,8	0,8	22,5	12,0	33,2	19,2

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Table (continued)

Regions	Proportion of households with the Internet access at home, %	Distribution of the population for the purpose of using Internet services					
		sending (receiving) e-mail, %	interaction with public authorities, %	training and education, %	banking services, %	finding information related to health issues for themselves and others, %	order (purchase) of goods and services, %
Mykolaiv	66,8	19,3	2,0	23,5	24,8	24,4	17,6
Odesa	69,8	39,2	1,8	27,5	17,2	22,8	11,0
Poltava	52,2	27,0	0,9	28,1	13,5	34,5	14,4
Rivne	49,3	10,0	0,3	18,2	11,0	26,8	12,4
Sumy	67,2	25,4	0,7	29,9	20,4	21,2	7,4
Ternopil	64,9	19,4	3,6	24,3	14,9	24,4	8,6
Kharkiv	65,0	27,6	1,7	19,5	17,7	39,5	13,1
Kherson	50,6	26,1	4,2	25,6	23,8	33,9	21,5
Khmelnytsky	55,3	25,3	0,8	20,9	8,1	32,6	17,0
Cherkasy	59,3	17,3	2,0	22,7	18,9	37,5	15,8
Chernivtsi	69,3	23,2	4,7	31,2	12,2	32,2	7,9
Chernihiv	55,3	28,2	4,1	22,1	31,0	30,4	25,2
Kyiv city	83,7	45,8	4,5	29,0	30,5	33,3	22,9

Source: The source is compiled by the authors (http://www.ukrstat.gov.ua/druk/publicat/kat_u/2019/zb/12/zb_ru1ch2019.pdf).

As noted above, most developed countries have been actively implementing the achievements of digitalization in recent decades. Consider the successful experience of some countries.

Denmark. Implementation of a 5-year digital strategy, which continues to be developed in the direction of digital public administration, communication and electronic services; an approach in which electronic interaction is legally binding.

Launch of the Digital Post, through which citizens receive messages from the state. Today, more than 90% of citizens aged 15 and older have their own personal digital mailboxes and use them to communicate with government agencies, reducing spending on the public sector [21].

Great Britain. Establishment of the Ministry of Digital Economy as a state institution responsible for managing the country's digitalization processes, introduction of the large-scale use of «cloud technologies» with the creation of «Date cents» «G. Glouds» [22].

Creation of a central government portal www.gov.uk, which provides general government information, combining information and consulting services from different sources. The portal integrates all pages of ministries and departments of the United Kingdom, which provide most of the services online.

In addition, on the site you can find more than 350 official web pages or links to pages of organizations that have not yet been integrated into a single state portal. More than 650 services are available in electronic form on the national portal www.gov.uk [23].

Germany. Implementation of the «Program of transition to the digital economy», the main purpose of which is to create production exclusively on a digital basis to overcome possible economic crises of the XXI century.

Creation of a federal government Youtube channel that broadcasts videos on topical political issues: an overview of the most important events, a program in which the Chancellor talks about his attitude and expectations from the upcoming events, a program in which ministers answer questions. With Twitter, citizens can communicate directly with a government spokesman.

The project «Live + Gov», which aims to strengthen the dialogue focused on citizens, using mobile technologies — smartphones. Citizens are encouraged to report and discuss issues with selected employees via mobile devices [24].

Estonia. Digitization of registers conducted by government agencies to provide the necessary information to support electronic services; the creation of the X-Road platform, which integrates the various systems used in the public and private sectors and allows them to share information; providing citizens with secure means of access to online services through the use of digital IDs and digital signatures equivalent to handwritten ones [25].

The European Union. Approval of the «Digital Strategy Europe 2020», the action of which is aimed at the digital economy development and mass introduction of Internet technologies.

Adoption of the «Digital Order for the EU», which aims to maximize the potential of information and computer technology, especially the Internet as a vital method of economic and social activities: for business, education, games, communication and free expression.

The Digital Initiative for Digital Industry Transformation, which focuses on six strategic areas: logistics, media, consumer goods, electricity, automotive and healthcare.

The Digital Single Market Strategy, which outlines actions on online platforms, the data economy and cybersecurity as one of the top 10 policy priorities for 2015—2019. The Digital Single Market Strategy had 16 initiatives to promote better access to the Internet for goods and services across Europe; developing an optimal environment for the development of digital networks and services; ensuring that the European economy and industry make full use of the digital economy as a potential driver for growth. Digitalization projects have been initiated and adopted in eight more industries: chemical industry, oil and gas production, aviation, hotel business, services, insurance and telecommunications.

The USA. The Institute of Digital Production and Innovative Design has been established, which today is one of the largest centers of digital economy in the world.

Ukraine. Order of the Cabinet of Ministers «On approval of the strategy for the information society development in Ukraine».

Ukraine's accession to the Declaration of the First EU Eastern Partnership Ministerial Meeting on the Digital Economy.

Approval of the «Digital Agenda of Ukraine — 2020», which contains a vision of economic transformation from «analog» to «digital», as well as outlines the role of digital competencies of citizens in the process of the country digitalization.

Approval of the Concept of Development of the Digital Economy and Society of Ukraine for 2018—2020 and the action plan for its implementation: implementation of appropriate incentives for digitalization of the economy, public and social spheres, awareness of existing challenges and tools for digital infrastructure development, acquisition of digital competencies, and identifies critical areas and projects of digitalization, stimulation of the internal market of production, use and consumption of digital technologies.

Given the above, it can be concluded that Ukraine has already taken many steps towards digitalization of its economy, but in the absence of effective infrastructure, public confidence in digitalization and the introduction of Industry 4.0 technologies in industry and business, these measures are ineffective (*Fig*.).

Given the quantitative disparities in the use of digital technologies depending on the region, it should be noted that the process of digitalization should take place systematically, both at national and regional levels, taking into consideration the specifics of social and economic development of a particular region.

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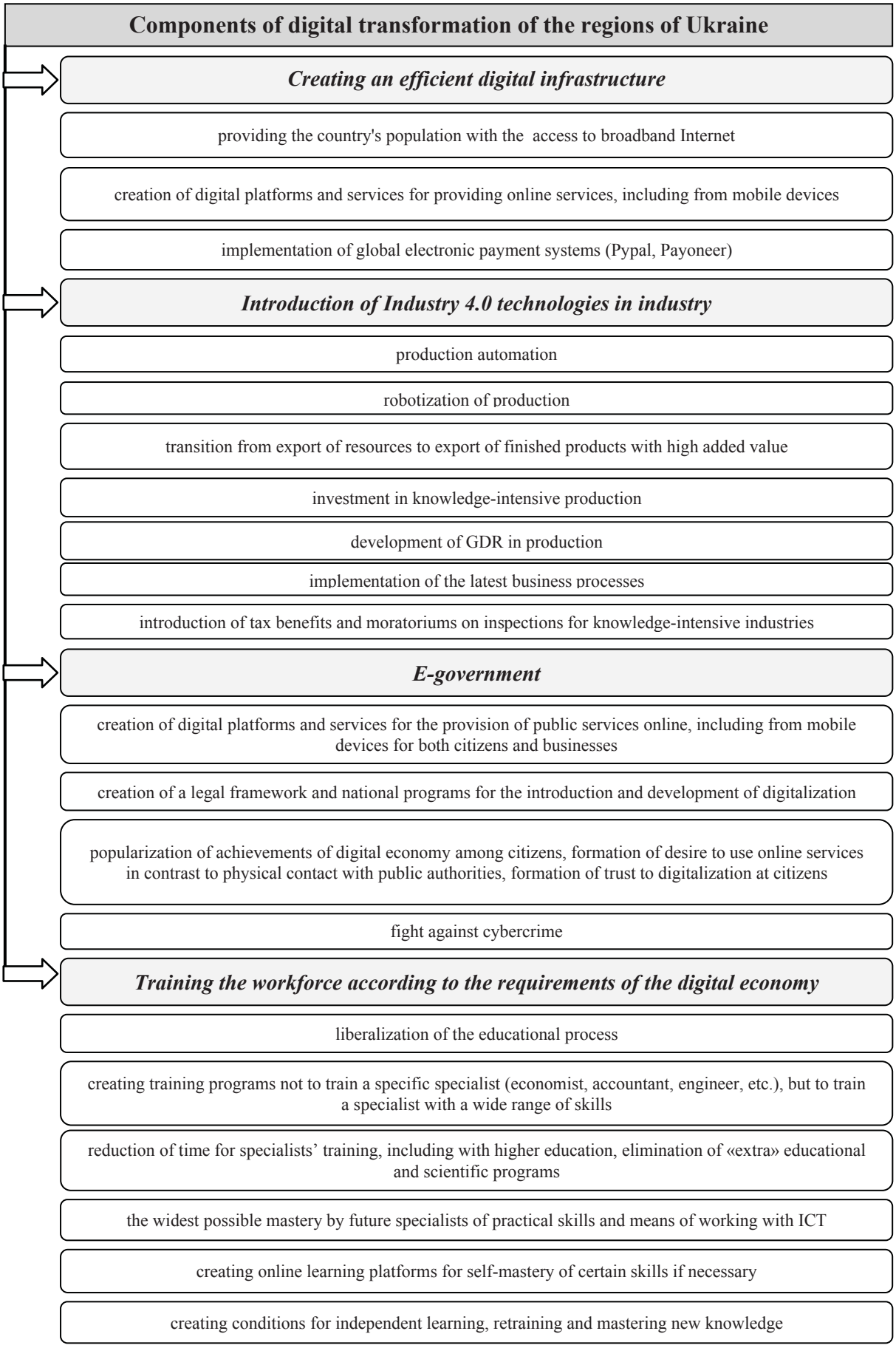

Fig. **Components of digital transformation of the regions of Ukraine**

Source: developed by the authors.

Conclusion. Digitalization of Ukraine's economy is a natural process that will take place with or without state support. At present, Ukraine lags behind developed countries in a number of indicators, so the implementation of measures to bridge the existing gap should be a priority for the state, namely: the access to digital technologies, effective digital infrastructure, the implementation of state programs and platforms for digitization of all spheres of society, training of the workforce according to the requirements of the digital economy, the introduction of Industry 4.0 technologies in production.

With the rapid development of the information economy, Ukraine lags far behind the pace and scale of digitalization, which could lead to the fact that Ukraine will be on the sidelines of the scientific and technological progress, will eventually become a country exporting raw materials, will be deprived of innovative development prospects. will lead to more active labor migration.

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