

FACTORS AND CONDITIONS OF DIGITAL TRANSFORMATION OF THE ECONOMY AT THE STATE AND REGIONAL LEVELS

Larysa HRYSHYNA

*Admiral Makarov National University of Shipbuilding
Heroes of Ukraine Avenue, 9, Mykolayiv 54025, Ukraine,
E-mail grishinappi@gmail.com
ORCID ID: 0000-0002-3099-1453*

Abstract. Trends in the digital transformation of Ukraine's economy in modern conditions are studied in this scientific publication. The purpose of the research is to study current trends in the digital transformation of Ukraine's economy and determine areas for its support in ensuring the socioeconomic development of the regions of the state. The structure of digital business transformation is determined, which includes digital data, digital infrastructure, digital models, and the digital economy. At the same time, an important task of the digital economy is to help improve the living standards of the population through the availability and quality of goods and services produced using modern digital technologies.

The principles of digitalization are defined, the observance of which serves as a basis for the creation and realization of advantages in the process of using digital technologies. Such principles include ensuring equal access to digital technologies for all citizens, promoting the development of the information society and the media, building a mechanism for economic growth by increasing efficiency and competitiveness via the use of digital technologies, personal data protection and information security, and others.

Factors in the development of the digital economy – which must be considered in two groups: external and internal – are investigated in the article. Factors of the development of the digital economy have both positive and negative roles in ensuring the development of information and communication technologies, intellectual production, digitalization of the economy, etc. Such factors are complementary and interdependent. The level of regulatory and legal framework for digitalization is an important factor in supporting the development of the digital economy at both the state and regional levels. However, the regulatory and legal framework for regulating the process of building the digital economy in Ukraine is underdeveloped – in particular, the legislative coverage of issues related to the digital economy is extremely superficial. An important prerequisite for the development of Ukraine's digital economy and the integration of the digital market into the single digital space of the European Union is the introduction of e-government. The creation of the Action online public services portal has become one of the most popular activities of the government in the field of digital environment.

The proliferation of digital platforms is another important factor in the digital economy. Digital platforms act as mechanisms that allow different participants in economic relations to interact online. In the business environment, the digital age means that many dynamic digital platforms are actively developing and are a strategic resource for maintaining competitive advantage during constant change.

The level of development of the digital economy also depends on the differentiation of incomes between individual regions. Ukraine's economy is characterized by inequality in the level of average wages and unemployment in the regions of the country. The development of the digital economy in Ukraine also depends on the possibility of broadband Internet access. This is a problematic issue today, as there is a digital divide where the availability of broadband access differs markedly in large cities and small villages. An important condition for the development of the digital economy is the formation of a modern labor market when increasing demands on education and skills, changing the rules of hiring, and increasing the flexibility and mobility of staff.

Thus, accelerating the processes of the digital transformation of the economy in Ukraine requires the formation of appropriate measures. Such support measures should include: improving the regulatory framework to intensify the process of digitalization of the economy, promoting digital technologies among businesses, creating government programs to support public sector and business cooperation in digital technologies, building digital infrastructure and expanding digital platforms in all regions to address digital inequality among Ukrainian citizens, and others.

Keywords: digital technologies, economy, development, state, region.

Introduction

In the modern conditions of globalization processes, the scientific and technical development of many countries, and the informatization of all processes of society, there are significant

changes in the field of economic activity. Traditional economic activity is being restructured in the direction of using information and communication and digital technologies, which determines its transition from an economy that consumes resources to one that creates them. The accelerated development of digital technologies has intensified the deepened interest in the formation of the foundations of the digital economy and the study of its impact on economic growth. The issues of digital transformation were decisive in the decisions of the G20 summit in 2015, when the place of the Internet economy as the basis of global growth was identified among the strategic priorities. It is through the use of the latest information technologies that the digital economy becomes the main condition for solving many problems of the socioeconomic development of the country as a whole and its individual regions.

Many scientific works are devoted to the study of the problems of digital transformation of the economy. The results of the study of the preconditions and the need to implement the concept of digital transformation (digitization) of the regions of Ukraine are reflected in the works of L. Fedulova. Also, among Ukrainian scientists who study the problems of formation and development of information and communication technologies in all spheres of public life, scientists such as A. Vasylyk, O. Guseva, A. Danylytska, I. Irtysheva, L. Ligonenko, G. Lopushnyak, O. Mykhaylenko, K. Pugachevska, B. Teteryatnyk, S. Tymbalyuk and others should be noted.

In particular, aspects of the formation of digitalization strategy in business organizations were studied by L. Ligonenko, A. Khripko, A. Domansky. Issues of the peculiarities of formation and development of Internet trading were studied in the works of S. Naumenkova, S. Mishchenko, D. Gladun, O. Semchuk. Agreeing with the significant theoretical achievements of this issue, it is appropriate to investigate the practical manifestations of the problem in the light of recent changes in the economic situation in the regions of Ukraine. The urgency of these issues has led to the choice of topic and purpose of research.

The aim of the research is to study current trends in the digital transformation of Ukraine's economy and determine areas for its support in ensuring the socioeconomic development of the regions of the state.

To achieve the stated goal and solve the related tasks, the tools of scientific research methods were used: the dialectical method of cognition and the systematic approach; generalization and systematization – to determine the functional purpose of the digital economy and to reveal the features of public policy in this area; economic-statistical and computational-analytical – to study the dynamics of current trends in the digital economy; graphical and tabular – for the visual display of statistical data and the presentation in schematic form of the results of scientific work; and the methods of induction and deduction – to draw conclusions about the state and prospects of digital transformation of the economy of the regions of Ukraine.

The main body of the paper

Today, new digital technologies and innovative business models penetrate into all economic spheres of society, influencing the very essence of the economy and forming qualitative structural changes in it. As a result, the digital economy is being formed as a subsystem of the economy, characterized by the active use of digital technologies and the turnover of specific electronic goods in the process of its operation. The level of development of the digital economy significantly affects the level of competitiveness of the country, which requires special attention of the state and the business environment to the prospects of its development. Therefore, it should be assumed that the e-economy is already beyond purely economic processes. Digitalization is being implemented in social processes which increasingly depend on the success of both citizens and the work of government organizations and structures, which involves the large-scale introduction of information and communication technologies

(Pugachevska, 2018). Thus, the digital economy can cover everything that can be formalized or transformed into logical schemes, starting from the system of production and distribution at all levels of government and business, and ending with the exchange and consumption of goods and services. Therefore, the spread of digitalization in the economic sphere has many advantages in ensuring the socioeconomic development of the country and its regions, public demand for goods and services, etc. (Figure 1).

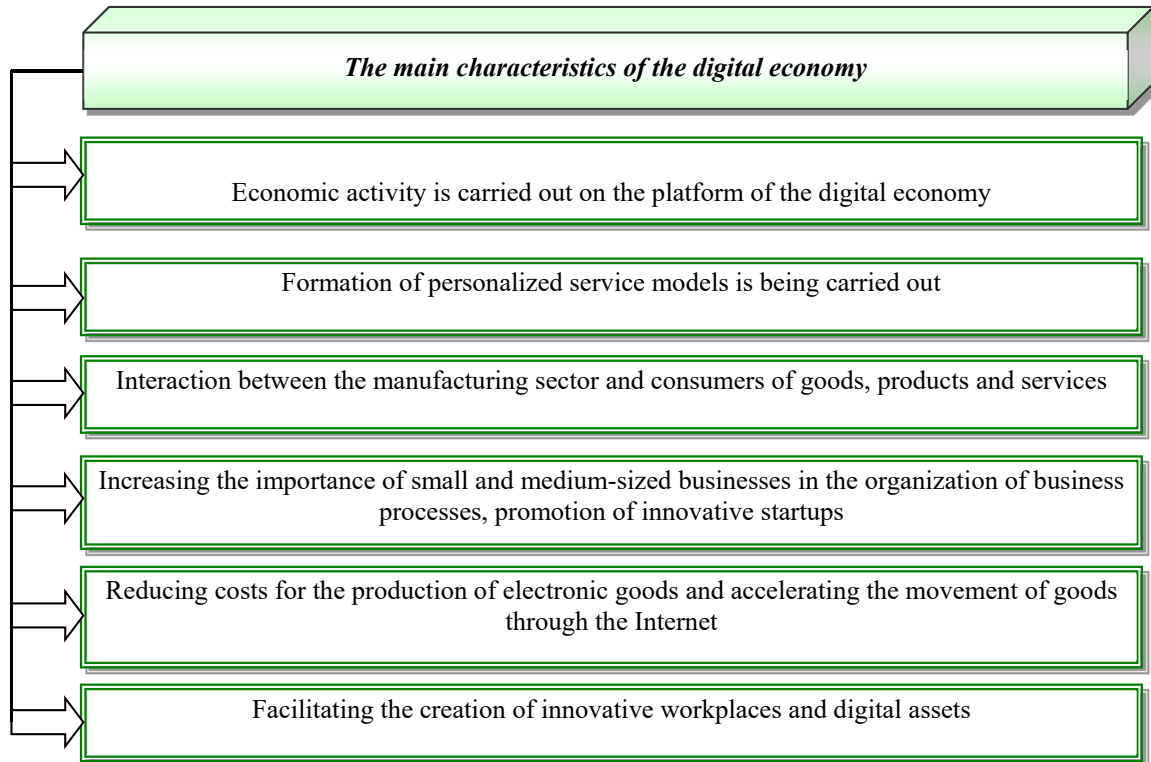


Figure 1. The main characteristics of the digital economy

Source: author own development based on Lopushnyak & Mylyanyk (2019); Hryshyna, Filipishyna et al. (2021)

According to the experience of many countries, the levels of productivity achieved in the country, the use of new technologies, and investment in high-tech production are determining factors in the competitiveness of economically developed countries (Deloitte, 2016). However, factors such as favorable geographical location, provision of natural resources, and low labor costs are secondary in providing competitive advantages. Thus, among the key factors influencing the competitiveness of industry in successful countries are: highly qualified human resources (Germany – 97.4%; USA – 89.5%, Japan – 88.7%), innovation policy and infrastructure (USA – 98.7%, Germany – 93.9%), and reliable logistics infrastructure (Germany – 100%; USA – 90.8%, Japan – 89.9%). According to a study by the World Economic Forum, the Global Competitiveness Report (Schwab, 2019) provides an assessment of the effectiveness of the global economy based on the Global Competitiveness Index 4.0 (GCI 4.0). The following G20 countries are in the top ten: USA (2), Japan (6), Germany (7) and the UK (9).

It should be noted that the opportunities for digital transformation are widely used, which provides the fullest possible potential of digital technologies in all components of business (processes, products and services, approaches to decision-making). At the same time, the presence of technology as such will never be enough for digital transformation (Sosnin, 2021). Therefore, in order for the process of digital transformation to be complete, a well-established system of defined business tasks and data for their digitization is needed. Thus, the digital

transformation reflects the relationship of all three dimensions (defined business task, data availability and information technology).

Given that integration into the European Union is one of the opportunities to overcome technological backwardness for Ukraine, attracting foreign investment and the latest technologies in the modernization of the manufacturing sector is crucial. In this, concepts are determined by the directions of harmonization with digital initiatives, a digital order for Europe (Digital Agenda for Europe), and the Digital Single Market. The following are also important: interoperability and electronic services (e-Services), which provides for Ukraine's accession to the EU Program Interoperability Solutions for European Public Administrations, e-CODEX projects, e-Invoicing, as well as Single Digital Gateway initiatives; and electronic identification (eID), which is the main prerequisite for the introduction of electronic services, e-commerce and electronic interaction of participants in economic relations.

The use of modern digital technologies is an important prerequisite for the successful operation of enterprises and organizations in the field of production and other sectors of the economy, which are rapidly replacing traditional processes with digital interaction. Organizations that welcome change and are ready for it, as well as being able to adapt to more flexible work models, have great potential for success (Pugachevska, 2018). Because digital transformation covers all aspects of business and offers effective ways to improve it along with the development of digital technologies, companies that are ready for innovative change and able to adapt to more flexible work models have every opportunity to improve business results and increase their competitive position (Figure 2).

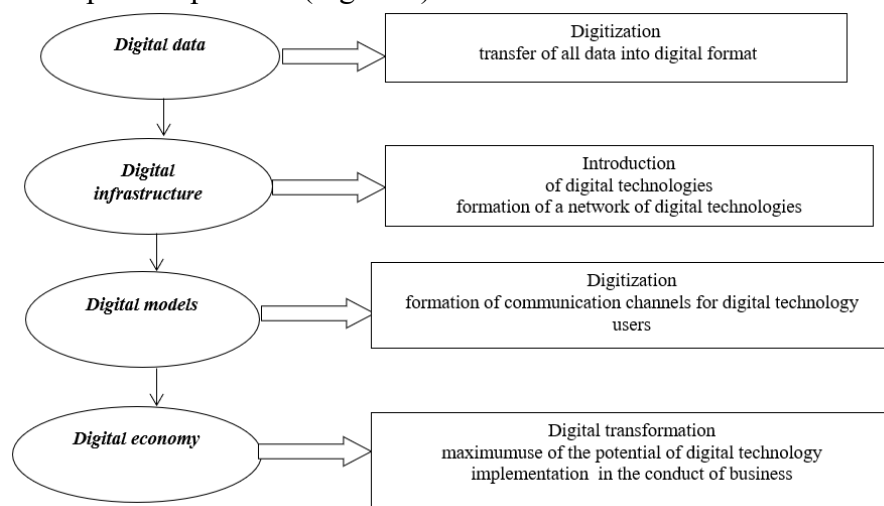


Figure 2. The structure of the digital transformation of business

Source: author own development based on Hryshyna, Filipishyna et al. (2021); Lupak et al. (2020)

The rapid development of information technology is forcing business entities to actively expand their businesses and devote special attention to the development of production networks. The types of digital technologies include: robotics and cybersystems, artificial intelligence, big data, paperless technologies, additive technologies (3D-printing), cloud and fog computing, unmanned and mobile technologies, blockchain, etc. The development of information and communication technologies and digitalization are at the center of this global production network, and provide companies with such competitive advantages as:

- additional value of goods due to quality service;
- high level of relationships with customers and consumers;
- raising the company's image through fast communication with customers;
- price reduction due to automation and implementation of business process digitization;
- transparency of internal and external processes of the enterprise;
- increased loyalty of suppliers, customers, and consumers.

The formation of a model of digital economy development, as one of the effective factors of the penetration of innovations and technologies into competitive branches of the economy, requires the development of the corresponding concept, which should contain methodological and constructive provisions and define its basic purposes, priority directions, functions and implementation mechanisms. Thus, among the main principles of the formation of such a model should be the following: the principle of ensuring the demand for information services and strengthening the information society; the principle of achieving digital transformation of industries by increasing their competitiveness; the principle of strengthening information security and the protection of personal data; the principle of ensuring Ukraine's integration into European and global systems; the principle of stimulating the development of digital infrastructures. It should be noted that the formation and implementation of strategic directions of the development of the digital economy should be based on the implementation of four generalized stages, which will provide information to identify trends in information and communication technologies, assess indicators of the digital economy, develop and justify its strategic directions, etc. (Hryshyna, Pohorielova et al., 2021).

Thus, the digital transformation of enterprises and organizations in various fields of management is a response to the rapid spread of new digital information technologies at both global and regional levels. The main goal of the digital economy is to help improve the living standards of the population through the availability and quality of goods and services produced using modern digital technologies. The rapid growth of social networks, the increasing number of smartphones, the facilitation of broadband Internet access, and the spread of machine learning technologies and artificial intelligence are providing real opportunities for the development of the modern world (Sosnin, 2021). Therefore, it is important to define the principles of digitalization, compliance with which is the basis for the creation and implementation of benefits in the use of digital technologies (Figure 3).

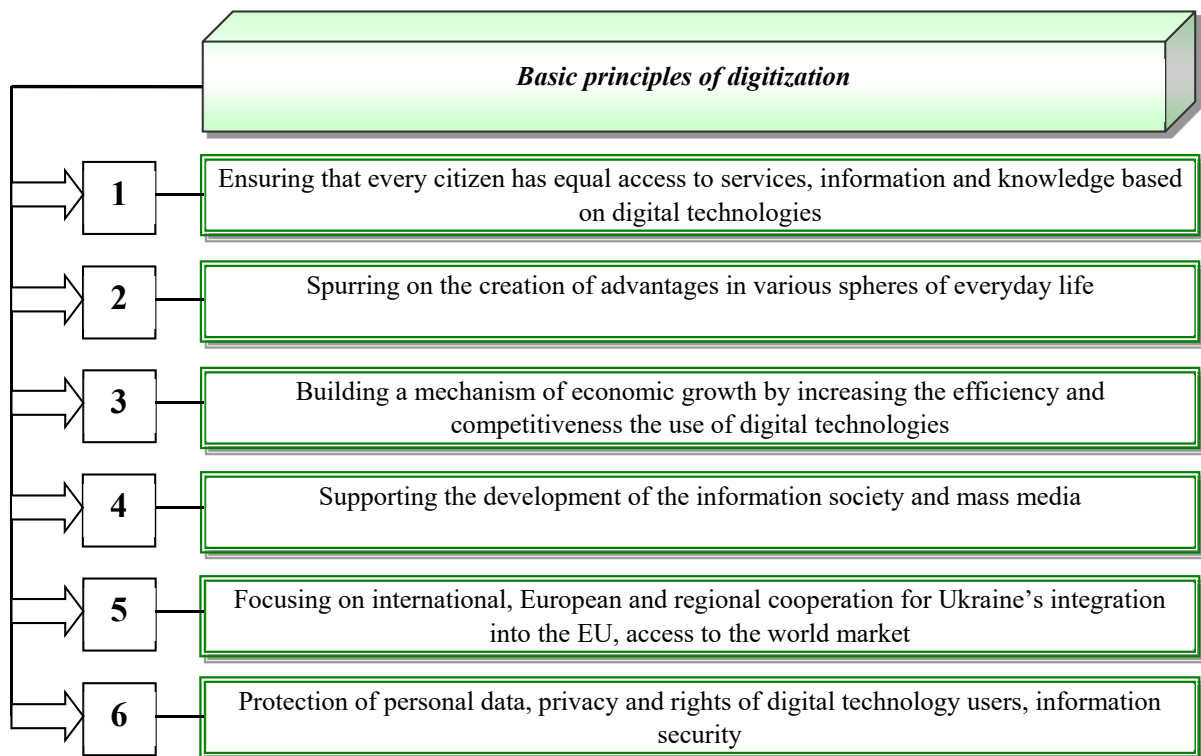


Figure 3. Basic principles of digitalization

Source: author's own development based on Lopushnyak & Mylyanyk (2019); Hryshyna, Pohorielova et al. (2021); Sosnin (2021)

Today, digital transformations are one of the main factors in the growth of the global economy, and in the next 5–10 years even greater rates are expected. At the same time, we can observe a direct increase in the productivity of companies due to their use of digital technologies, and there are a number of indirect benefits of digitalization, including new demand for innovative goods and services, new quality and value, time savings and more. With this in mind, consider the main features of the process of economic transformation, including:

- the knowledge economy, which, in addition to traditional economic factors such as labor, capital and land, includes knowledge. This is beginning to take a leading position among other economic variables in the process of creating competitive advantages of the company and the formation of the value of the product and/or service;
- the rapid development of information technology has led to the rapid transformation of knowledge into the public good, maintaining a competitive advantage for a short period. In the knowledge economy, competitive advantage is formed not through knowledge, but through the ability to quickly create this unique knowledge;
- the importance of knowledge in general is characterized by its availability, expanding opportunities for use and creation based on the use of innovations and information technologies;
- network relations create new conditions for cooperation between companies, which leads to increased attractiveness of the network to meet consumer needs, as well as creating competition within the network between its representatives.

It should be noted that the factors of digital economic development should be considered in two groups: external and internal (Figure 4). The presented factors of the digital economy play both a positive and negative role in ensuring the development of information and communication technologies, intellectual production, the digitalization of the economy, etc. Such factors are complementary and interdependent.

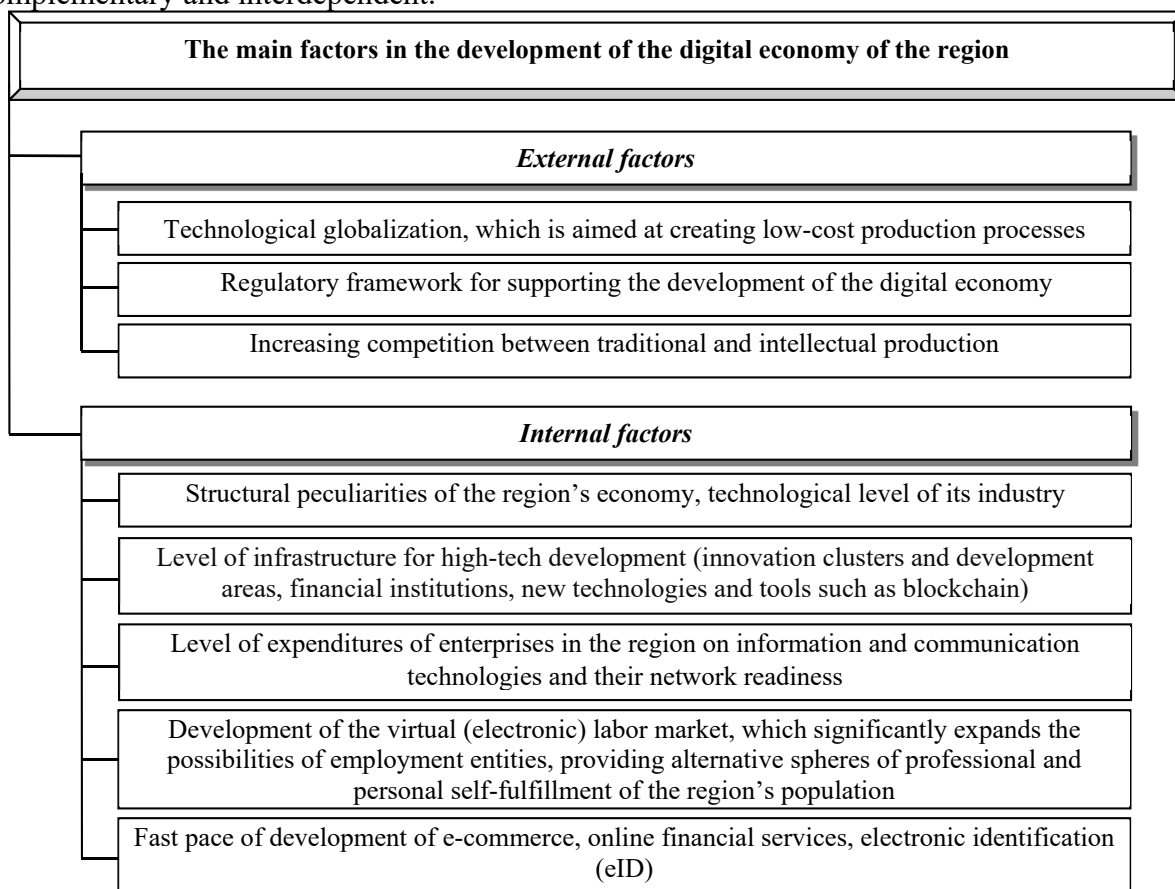


Figure 4. The main factors of digital economy development in the region

Source: author own development based on Lopushnyak & Mylyanyk (2019), Pugachevska (2018)

Creating the foundations of the digital economy in Ukraine has acquired the status of a national task of the development of the country and its regions, as evidenced by a number of legislative acts in support of digital transformation, so the level of regulatory framework for digitalization is an important factor.

To develop the digital economy in Ukraine, a number of legislative acts have already been approved, including the Law of Ukraine “On Electronic Commerce” (2017); “On Telecommunications” (2003); “On Electronic Digital Signature” (2017); “On Payment Systems and Funds Transfer in Ukraine”; “On Financial Services and state regulation of financial services markets” approved the Strategy for the Development of the Information Society in Ukraine; and “The Concept of Development of the Digital Economy and Society of Ukraine for 2018–2020” (2018). One of the most important documents on the development of the digital economy is the “Concept of development of the digital economy and society of Ukraine for 2018–2020,” in which digitalization is the saturation of the physical world with electronic-digital devices, tools, systems and electronic communication between them, which actually enables the integrated interaction of the virtual and the physical, i.e., creates a cyberphysical space (Order of the Cabinet of Ministers of Ukraine, 2018). The concept notes that digital technologies are defined as “a huge market and industry, as well as a platform for efficiency and competitiveness of all other markets and industries.” In addition, consider other legislation related to the digital economy:

1. The state strategy of regional development for the period up to 2020 (Resolution of the Cabinet of Ministers of Ukraine No.385 of August 6, 2014) aims to promote the level of competitiveness of regions, and ensuring the development of urban infrastructure includes:

- the expansion of transport, information and communication links of cities as centers of economic growth with less developed adjacent territories;
- support for the integrative role of cities as centers of comprehensive development by providing access via the Internet to services of museums, theaters, libraries, medical centers, universities, etc.;
- providing consumers of telecommunications services with guaranteed quality in accordance with standards, increasing the list of services based on modern information and communication technologies and scientific developments, etc. (Order of the Cabinet of Ministers of Ukraine, 2013).

2. The “Ukraine 2020” strategy of sustainable development (Decree of the President of Ukraine No. 5 of January 12, 2015), which provides for the implementation of 62 reforms and development programs of the state in four vectors, among which are:

- the vector of development – telecommunication infrastructure reform;
- the vector of security – e-government program;
- the vector of pride – the development of information society and media.

3. The Memorandum on the Establishment of the Ukrainian National Digital Coalition “Digital Transformation Coalition” (concluded on September 5, 2019), aimed at a transparent partnership between digital transformation actors, promotes the development of digital skills in Member States working together to implement digital transformation, the development of the digital economy and the improvement of digital skills at the national, regional or local levels. Such digital coalitions have been formed in 23 European countries. The Ukrainian National Digital Coalition includes 46 public and private institutions and organizations. The activities of the Digital Transformation Coalition will be aimed at consolidating and coordinating the initiatives and efforts of all partners in the field of digital development and the integration of Ukraine into the European digital space.

It should be noted that some relations concerning the use of information and communication technologies are regulated by other acts of legislation, among which the main ones are:

- The Economic Code of Ukraine, the articles of which enshrine the provisions on mandatory disclosure of state and municipal enterprises, companies controlled by the state or local government, and information about their activities by posting it on its own website or on the official website of the subject of management of state/municipal property, which performs the functions of enterprise management.
- The Civil Code of Ukraine, the provisions of which allow the display of information in electronic form; conducting a transaction in electronic form, which is one of the modifications of the written form; the display of work in publicly available electronic information systems; and the possibility of the electronic form of calculations.
- The Tax Code, which provides for the use of electronic resources in the field of taxation; the provision of electronic digital signature services; the organization of the introduction of electronic services for business entities as one of the functions of controlling bodies; control over the observance by business entities of the obligatory requirements established by the legislation on ensuring the possibility of settlements for goods (services) with the use of electronic means of payment, etc.
- The Law of Ukraine “On e-commerce” (2015), which defines the organizational and legal framework for e-commerce in Ukraine, establishes the procedure for electronic transactions using information and telecommunications systems, and defines the rights and responsibilities of participants in e-commerce. The essence of the concept of e-commerce is defined as “a relationship aimed at making a profit arising from transactions for the acquisition, change or termination of civil rights and obligations, carried out remotely using information and telecommunications systems, resulting in participants in such relations have rights and responsibilities of a property nature.”
- The Law of Ukraine “On electronic documents and electronic documents circulation” (2003), which regulates relations arising in the process of creating, sending, transmitting, receiving, storing, processing, using and destroying electronic documents.
- The Law of Ukraine “On electronic digital signature” (2017), which determines the legal status of electronic digital signatures and regulates the relations that arise when using an electronic digital signature.
- The Law of Ukraine “On electronic trust services” (2017), which defines: the legal and organizational principles of providing electronic trust services, including cross-border; the rights and obligations of subjects of legal relations in the field of electronic trust services; and the procedure for state supervision (control) over compliance with the requirements of legislation in the field of electronic trust services.

In Ukraine, in order to optimize the system of central executive bodies, the Cabinet of Ministers established the Ministry of Digital Transformation of Ukraine, reorganizing the State Agency for e-Government. According to the Regulation “On the Ministry of Digital Transformation of Ukraine,” the Ministry is the central certification body in the field of electronic trust services, ensuring the formation and implementation of state policy in the field of digitalization, digital development, digital economy, digital innovation, e-government and e-democracy, and the development of the IT industry. This agency will address the development of national electronic information resources, the development of broadband Internet access and telecommunications infrastructure, and e-commerce and business. Another area of the agency’s work will be the provision of electronic and administrative services, as well as electronic trust services and electronic identification. In addition, the Ministry of Education covers the development of the IT industry, develops regulatory and technical documentation on digital transformation, and coordinates the activities of executive bodies related to cooperation with the EU’s Digital Single Market. In February 2020, the “Action” public digital application appeared in the public domain, which provides the opportunity to receive public services online, along with a list of the top 50 services for which most applications are expected to be digitized during 2020 (FOP

registration, E-baby, services for carriers and builders, services for car owners, etc.; see public services website Diia, <https://diia.gov.ua>).

Thus, we can conclude that the development of digital technologies is represented in government programs, especially those related to public services, small and medium enterprises, the consumer market, health care, the creation of information and analytical systems, and more. However, the regulatory framework for regulating the process of building the digital economy in Ukraine is underdeveloped – in particular, the legislative coverage of issues related to the digital economy is extremely superficial. The nature of the interaction of the participants in this process has not been determined, which hinders the formation of legislation in other areas, including strategic planning documents.

An important role is played by the activities of the Ministry of Digital Transformation of Ukraine, among the achievements of which are:

- the creation of a portal of public services and the “Action” mobile application;
- the launch of the “Action Digital Education” educational online platform and the release of educational series on the development of digital skills;
- the promotion of the Action City initiative;
- activities in the release and distribution of radio frequencies in the range of 800–900 MHz to increase the coverage of the country with access to the Internet using 4G and 5G technologies;
- the introduction of SmartID technology and the introduction of the “eBaby” service;
- conducting multi-stakeholder consultations for decision-making involving the public and business;
- promoting the development of the cryptocurrency market, blockchain technologies and artificial intelligence;
- the development of a draft Strategy for Ukraine’s integration into the EU Digital Single Market;
- the improvement of some provisions of the Association Agreement between Ukraine and the EU on the integration of Ukraine into the internal market of telecommunications services of the European Union.

An important external factor of influence is the signing of the Memorandum on the development of mutually beneficial cooperation in the field of digital transformation between the Ministry of Economy of Ukraine and FIIAPP (the EU4DigitalUA project). The EU4DigitalUA project is the EU’s largest bilateral eGovernment and digital technology program in any partner country. This project consists of several sections, including: Government Interaction and Digital Infrastructure, Institutional Capacity Building, Communication and Public Information, Electronic Services Development, Cybersecurity, and Data Protection. Such cooperation will contribute to the provision of automated information exchange, the training of highly qualified specialists in the digital field, and the development of communications and support for digital change in Ukraine as a whole.

The introduction of e-government is an important precondition for the development of the digital economy in Ukraine in the integration of the digital market into the single digital space of the European Union. The creation of the Diia online public services portal has become one of the government’s most popular measures in the field of digital environment development in Ukraine. One of the main goals of the Ministry of Digital Transformation in the context of using the portal is to digitize 100% of the services provided by the state by 2024. The portal already provides a significant number of public services online and the online registration of various types of certificates, licenses, permits, assistance, as well as other online registration services, etc. To receive a service on the Action portal (<https://plan2.diia.gov.ua>), users must have an electronic signature, and can also log in using the id.gov.ua service. The state IT company Diia is digitizing services on the Action portal, and is engaged in support of services.

Among the factors of activation of the digital economy should be noted the implementation of a pilot project for the introduction of e-TTN (electronic consignment note) in Ukraine. This project aims to optimize the design of transportation by taking advantage of the electronic consignment note through the API (application programming interface, through which one computer program can interact with another). The necessary regulatory framework has already been adopted for the project implementation. The project will serve as a step in harmonizing Ukrainian legislation with European standards and will promote the creation of digital transport corridors with EU countries (Association Agreement, 2014).

Another important factor in the digital economy is the proliferation of platforms. Over the last decade, many digital platforms have emerged around the world that use data-driven business models to transform emerging sectors of the economy. Digital platforms act as mechanisms that allow different participants to interact online. Some global digital platforms have gained strong market positions in certain segments. For example, around 90% of the Internet search engine market is owned by Google. Facebook accounts for two-thirds of the global social media market, and its platform is the most popular among social networks in more than 90% of countries. Almost 40% of the world's retail online sales are through Amazon's network, and its subsidiary Amazon Web Service accounts for about the same share of the global cloud infrastructure market (Pishchulina, 2020).

It is important to note the comprehensiveness of digital platforms, which ensures their ability to transcend borders and spread their influence to any country and territory. Through the Internet, they can operate anywhere in the world, regardless of the location of servers. An example of such use of digital technologies is the activity of Uber, which at one time became the most influential participant in the market of taxi services in many countries around the world; in the field of trade – eBay, Alibaba; in the travel industry – Booking.com, Anyway Anywayanyday.com, and others.

In Ukraine, much attention is paid to the development of digital platforms by the Ministry of Digital Transformation (<https://thedigital.gov.ua/>). In particular, among the large-scale initiatives should be noted the development of entrepreneurship, which has an online and offline component. Regarding the latter, in different regions of Ukraine consulting zones will open for entrepreneurs, where they can receive professional advice on business development. An online platform – “360 Tech Ecosystem Overview” – has been created for business information regarding IT companies, people, investors and the entire technological ecosystem of Ukraine in general. The information collected here contains data on the current development of IT companies, founders, officials and managers, classification of companies by industry, investment and financing, mergers and acquisitions, latest news and industry trends. Collecting and structuring information about the entire IT ecosystem, including universities, startup accelerators, technohubs and all technology industries, will open new opportunities for the market and allow all participants in the ecosystem to cooperate and develop more effectively (Pishchulina, 2020).

In the business environment, the digital age means that many dynamic digital platforms are actively developing and are a strategic resource for maintaining competitive advantage in its constant change. Interacting with suppliers, consumers and other participants, economic entities create their own digital platforms that promote the implementation of selected business models and are a prerequisite for the formation and maintenance of competitive advantage, control and coordination of internal development (Pugachevska, 2018). Thus, the digital platform is a software product that provides access to and rapid exchange of information for all actors in economic relations.

Thus, the introduction of digital technologies in all spheres of economic activity, as part of the fourth industrial revolution, is manifested in a set of changes that result in the formation of new economic phenomena:

- the digital consumer, who uses social, mobile, analytical and cloud technologies;
- the digital enterprise that uses information and communication technologies to optimize the cost of corporate functions to establish cooperation in the enterprise to increase productivity and business efficiency;
- a new wave of digital operations, where companies are restructuring their businesses using artificial intelligence, robotics, industrial Internet of Things, etc.

The key indicators of the country's readiness for digitalization include the four most important factors: the level of digitalization of the economy; digital coverage of households; digital gaps; and the intensity of state participation in digitalization (Pishchulina, 2020). According to the reporting data of the National Commission for State Regulation of Communications and Informatization (NCCIR), in the first half of 2021 compared to the same period last year, the telecommunications services market developed rapidly (Table 1). Thus, the volume of services provided increased by 17.2% and reached a peak value of UAH 49,570.7 million. The highest growth rates were observed in the segment of fixed access to the Internet, which increased by 2,113.9 million UAH – around 33.5%.

Table 1. Structure of revenues from telecom services, UAH mln.

Source: State Statistics Service of Ukraine (www.ukrstat.gov.ua)

Services	Period		
	February 1, 2020	February 1, 2021	Change
Mobile phone communication	22,175.2	25,755.6	+3,580.4 (16.1%)
Phone call activated	2,228.5	2,123.0	-105.5 (-4.73%)
FIXED access to the Internet	6,305.1	8,419.0	+2,113.9 (33.5%)
Other services	3,914.0	4,273.1	+359.1 (9.2%)
<i>Total</i>	<i>34,623.8</i>	<i>40,570.7</i>	<i>+5,946.9 (17.2%)</i>

According to the report of the World Economic Forum (for 2019), Ukraine ranked 60th among 100 countries of the world according to the level of development of technology and innovations, which led to the inclusion of Ukraine in the group of inferior countries (Department of Foreign Economic Policy, 2019). At the same time, the neighboring countries (Russia, Belarus, Poland, Romania, Ukraine) have significantly higher ratings and are far ahead. Unfortunately, after the collapse of the Soviet Union, Ukraine was not able to multiply its industrial base as the basis for the development of digital technologies, the Internet, and the fourth industrial revolution. The loss of the leading industrial sectors caused disproportions in the industrial sector of the national economy. For example, in 1992–2020 the share of manufacturing in Ukraine's GDP dropped from 44.6% to 11.20%, which is half as much as in the countries with average incomes (19.6%).

Under the conditions of the third industrial revolution and the beginning of its fourth era, the competitiveness of the country is determined not only by the size of gross domestic product or export volume, but by the amount of surplus value created in the industrial sector, as well as the position of the country in the global markets of surplus value. According to the methodology of the State Statistics Service of Ukraine, Gross Value Added (GVA) is calculated as the difference between output and consumption. This includes primary revenues generated by production participants. Wholesale and retail trade have the largest share in the structure of the GDP, which accounts for approximately one part, and the share of this industry was 14.5% in 2010, 13.7% in 2017, and 13.2% in 2018. The processing industry occupies the same share of GDP (16.2% in 2010, 7% in 2017, 11.6% in 2018). The share of agriculture in the structure of GDP significantly changed: from 7.4% in 2010 to 10.1% in 2018 (Table 2). Unfortunately, activities in the field of information and telecommunications in the structure of the Airborne Forces have some of the lowest values: in 2010 – 3.0%, in 2017 – 3.7%, in 2018 – 3.9%.

Table 2. Characteristics of the main types of economic activities in Ukraine*Source: State Statistics Service of Ukraine (<http://www.ukrstat.gov.ua/>)*

Type of economic activity	Structure of gross added value, %		Number of legal entities, units		Use of information and communication technologies in enterprises, %			
	2018	2019	2018	2019	had access to the Internet, %		bought cloud computing services, %	
					2018	2019	2018	2019
Processing industry	13.6	12.6	63,309	67,078	90.0	89.5	9.3	10.0
Agriculture, forestry and fisheries	12.0	10.4	65,185	67,906	86.3	84.4	8.6	8.9
Supply of electricity, gas, steam and air conditioning	3.7	3.7	4,015	5,318	93.2	92.3	9.7	11.6
Wholesale and retail trade; repair motor vehicles and motorcycles	15.6	15.4	210,534	242,334	88.1	86.1	11.3	11.5
Transport, warehousing, postal and courier services	7.5	7.7	26,604	29,099	87.8	87.9	7.5	8.1
Information and telecommunications	4.6	5.3	25,468	28,185	90.0	89.2	15.4	17.5
Professional, scientific and technical services	3.8	4.1	57,875	62,833	88.4	87.2	13.1	13.6

It should be noted that the level of digitization of the Ukrainian economy varies greatly between different sectors. In particular, in such spheres as financial services, telecommunication services and logistics, domestic enterprises widely use the achievements of information technologies. However, in most types of industrial production the intensity of the use of digital technologies, automation, and robotization is very low, which, in turn, actualizes the task of the innovative development of Ukrainian industrial enterprises. The acceleration of innovation development is based on the implementation of the following digital technologies that contribute to the formation of new business models (Sosnin, 2021; Pishchulina, 2020):

- digital banking, which involves using mobile add-ons with special digital coding;
- Internet solutions, which will allow the computerization of various systems and their full automation through the use of the Internet;
- the digitalization of business and production processes on the basis of using innovative developments in the field of informatization;
- blockchain, which is based on innovative ways of accelerating information transfer and locking it into certain types of internal protocols of information systems, and others.

One of the criteria for assessing digital nervousness is broadband access to the Internet (WLAN), a basic service that allows the use of other digital capabilities (Ukrinform, 2020). In Ukraine, the problem in practice is the presence of the digital divide, i.e., a situation where the availability of broadband access varies considerably in large cities and small villages (Figure 5). Thus, in urban areas the number of points of digital access to the Internet is 6.12 million units, which is 76.8% of the total value of this indicator, while rural areas account for only 23.2%. At the same time, it should be noted that in small towns and villages willingness to enter the market of information services is much less, as it is not profitable for the operator to work with a small number of potential subscribers and small revenues. Thus, investing money in the formation of IT infrastructure in rural areas in most cases is not economically viable.

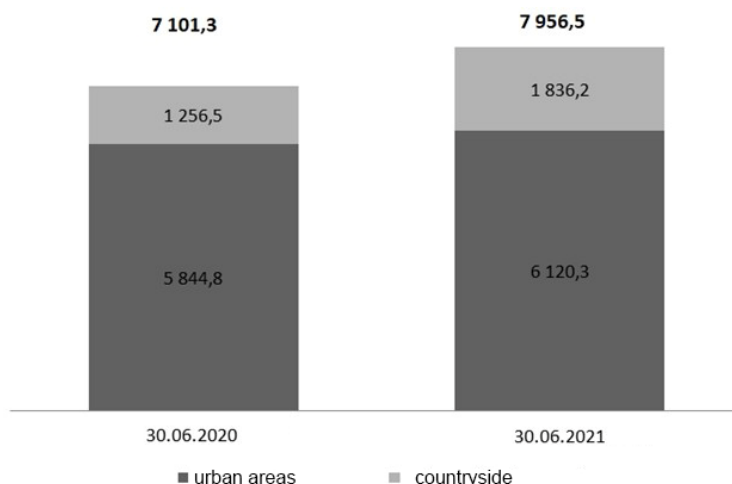


Figure 5. The number of points of physical access to the Internet in the distribution of areas, thousand units

Source: State Statistics Service of Ukraine (<http://www.ukrstat.gov.ua/>)

According to data from the NCCIM, the regions with the most mobile connections as of June 30, 2021 are Kyiv, Kyiv region, Chernihiv, Odessa, Mykolaiv, and Kherson, where this indicator ranges from 82 to 65 units (Table 3). At the same time, only 11% of the population lives in the capital region, a significant part of which falls on large cities. The most remote in this segment are the Transcarpathian region (35 cases) and the Chernivtsi region (33 cases). Thus, the gap in access to the Internet by regions of Ukraine is more than 3-fold, indicating the different possibilities for the population of the country to use information technology and leading to social inequality and economic disproportionality.

In Ukraine, the number of Internet users tends to stabilize (Official site of the Main Department of Statistics of Ukraine 2021). Beginning in 2015, the number of users is fluctuating within the range of 21–22 million. At the same time, taking into account the decrease in the total population of Ukraine, Internet penetration for this period has increased substantially and as of June 2021, is at an average of 68.6% (the number of Internet users per 100 inhabitants). The total number of Internet users in villages and towns with populations under 100,000 increased by 6.7%, and the number of Internet users in towns with populations over 100,000 is 75% (Table 3).

Table 3. Number of Internet subscribers by region as of June 1, 2020, thousand people

Source: State Statistics Service of Ukraine (<http://www.ukrstat.gov.ua/>)

	Number of Internet subscribers	Among them – private users
Ukraine	28,787.6	25,683.8
Cherkasy Oblast	74.5	65.1
Chernihiv Oblast	75.5	67.3
Chernivtsi Oblast	68.4	64.5
Dnipropetrovsk Oblast	264.5	248.5
Donetsk Oblast	171.2	161.9
Ivano-Frankivsk Oblast	404.6	360.2
Kharkiv Oblast	178.7	157.4
Kherson Oblast	91.8	81.9

Khmelnytskyi Oblast	80.7	71.2
Kirovohrad Oblast	65.1	59.6
Kyiv Oblast	154.3	146.9
Luhansk Oblast	41.6	37.4
Lviv Oblast	241.5	208.7
Mykolaiv Oblast	161.6	155.4
Odessa Oblast	1,103.5	1,016.2
Poltava Oblast	156.9	143.6
Rivne Oblast	62.6	56.1
Sumy Oblast	79.9	72.4
Ternopil Oblast	108.0	100.5
Vinnitsya Oblast	106.5	95.7
Volyn Oblast	62.7	56.6
Zakarpattia Oblast	69.2	62.9
Zaporizhzhia Oblast	153.3	140.6
Zhytomyr Oblast	99.6	92.7
Kyiv	1,842.5	1,717.1

The level of development of the digital economy is influenced by interregional disparities in the income of the population of individual regions. According to statistical data, the Ukrainian economy is characterized by nervousness in the level of average wages and unemployment in the regions (Table 4). This income differentiation indicates that the place of residence of an employee is a key factor in the individual labor supply and, accordingly, a factor that determines the level of their wages. Despite this, the main changes in the labor market caused by digitalization are similar for all regions. Companies with a higher level of human capital have more opportunities to be included in the digital economy. Regions where this is especially true include Kyiv (179,302 UAH per person), Dnipropetrovsk Oblast (92,083), Zaporizhzhia Oblast (81,949), Odessa Oblast (80,164), Kyiv Oblast (79,263) and Poltava Oblast (77,547).

Table 4. Income and expenditures of the population by regions in the 20th century

Source: State Statistics Service of Ukraine (<http://www.ukrstat.gov.ua/>)

	Revenues, million UAH	Actual income			Costs, million UAH
		million UAH	per person, UAH	real, % to 2019	
Ukraine	3,972,428	3,062,229	73,355	102.6	3,989,445
Cherkasy Oblast	96,063	76,154	64,254	103.6	105,475
Chernihiv Oblast	79,700	63,894	64,933	103.5	82,711
Chernivtsi Oblast	60,893	48,439	53,875	106.0	70,975
Dnipropetrovsk Oblast	368,017	290,917	92,083	100.1	355,885
Donetsk Oblast	218,593	171,479	41,662	100.1	162,263
Ivano-Frankivsk Oblast	103,547	82,252	60,276	102.8	104,782
Kharkiv Oblast	263,887	193,742	73,218	105.8	304,360
Kherson Oblast	79,508	64,480	63,073	104.8	85,103
Khmelnytskyi Oblast	101,280	80,978	64,824	105.6	110,937
Kirovohrad Oblast	74,126	58,813	63,472	104.7	77,656
Kyiv Oblast	189,875	141,469	79,263	102.0	248,808

Luhansk Oblast	69,737	56,864	26,714	103.5	52,190
Lviv Oblast	230,602	178,224	71,150	102.1	240,254
Mykolaiv Oblast	95,579	76,081	68,289	101.8	95,191
Odessa Oblast	248,022	190,206	80,164	104.1	257,155
Poltava Oblast	133,086	106,960	77,547	103.0	135,010
Rivne Oblast	85,701	67,677	58,814	101.6	89,110
Sumy Oblast	93,008	75,448	71,117	103.9	86,631
Ternopil Oblast	72,520	57,493	55,570	106.9	74,553
Vinnitsya Oblast	135,047	108,674	70,691	106.1	136,770
Volyn Oblast	74,204	58,267	56,603	100.6	77,576
Zakarpattia Oblast	81,318	63,943	51,073	102.4	93,153
Zaporizhzhia Oblast	170,770	137,429	81,949	104.8	167,533
Zhytomyr Oblast	99,682	80,752	67,187	104.2	100,681
Kyiv	747,663	531,594	179,302	100.3	674,683

An important condition for the development of the digital economy is the formation of the modern labor market, when the requirements for education and professional skills are increasing, the rules for hiring employees are changing, and the flexibility and mobility of personnel are increasing. On the other hand, the rapid development of digital technology directly affects the quality of life of the population, contributes to the economic efficiency of business and government, and encourages the expansion of new forms of organization of work. Under the influence of information technologies, the digital market is formed, the main characteristics of which are its global nature and the interaction between the employer and the staff on a digital platform in the remote work mode (Lopushnyak & Mylyanyk, 2019).

The Cabinet of Ministers of Ukraine (Order of March 3, 2021. No. 167-p), in the Concept of Digital Competence Development, states that in today's conditions "There is a need to ensure that society is ready for such processes, that it has mastered key combinations of knowledge, skills, skills, ways of thinking, views, and other personal qualities in the field of information and communication technologies (digital competence)" (Order of the Cabinet of Ministers of Ukraine, 2021). In this case, digital competence is understood as a system of knowledge, skills, habits, ways of thinking, and other personal qualities in the field of information and communication and digital technologies, which reflects the ability of a person to successfully carry out professional, further educational activities with the use of appropriate technologies. The experience of successful countries shows that the acquisition of digital competences positively influences the development of the economy and the increase in competitive advantages. In 2018, the European Parliament and the Council of the European Union approved the Framework Program of new key competencies for lifelong learning, which considers digital competence as one of the eight key competencies for the full-fledged life and activity of EU citizens (Association Agreement, 2014).

Therefore, under the conditions of the digital economy, employers impose new requirements on personnel, including initiatives, critical thinking, the ability to solve complex tasks, and the ability to interact with different people and to correctly prioritize (Figure 6).

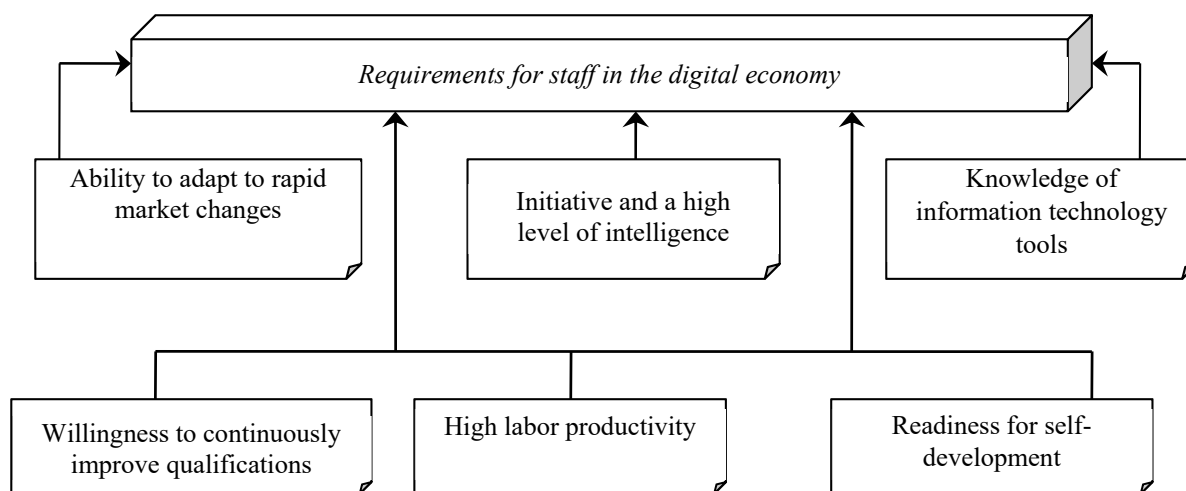


Figure 6. Requirements for the personnel of the company in the conditions of the digital economy

Source: Hryshyna, Pohorielova et al. (2021)

It should be noted that today in Ukraine the number of remote forms of employment is increasing, the implementation of which is carried out through digital communication devices. Digital devices such as computers, tablets, mobile phones, cameras, etc. are means of employment. Digital employment is implemented in two main forms: electronic freelancing and electronic outsourcing (Ukrainian National Platform, 2020). An electronic freelancer performs labor activities remotely using information and communication technologies. Electronic freelancing covers a wide range of economic activities: programming, content creation and translation, marketing research, sales, consulting, financial accounting, administration. Electronic outsourcing is the transfer of part of the business processes to outside organizations using computer programs and the Internet. The greatest impact on the development of outsourcing on a global scale is exhibited such processes as technology, economic and political factors, the introduction of chronic and mobile solutions, etc. According to the Freelancehunt portal (www.freelancehunt.com), in 2018–2020 the largest share of freelancers from Ukraine were engaged in the IT sphere (up to 50%), a smaller part were engaged in design (up to 22%), works with text (up to 20%), marketing (up to 11%), and other activities. Digital platform employees are working in all regions of Ukraine: even without Kyiv, the central region is leading in the share of freelancers together with the south region (21% and 23%, respectively). Workers of digital platforms are also less represented in the Western region (16%). The majority of online employees of digital platforms are located in cities with a population of over 100,000 inhabitants (82%). Among them, the leaders are the most populated cities of Ukraine, such as Kyiv, Kharkiv, Odessa, Dnipro and Lviv, which together account for more than half of freelancers.

Over the past three years, Ukraine ranked fourth among all countries in the world and first among European countries in terms of the number of registered freelancers. According to Forbes, Ukraine was among the top four fastest-growing freelance markets in Q2 2019, growing by 36% compared to the same period in 2018. According to special online services, in 2019 the number of freelancers in Ukraine reached 340,000 employees, among whom most were members of the younger generation (Ukrainian National Platform, 2020). The structure of the Ukrainian freelance market by categories is as follows:

- information technologies (web, mobile & software development), 83%;
- design and creativity, 6%;
- other categories (translation, SMM, sales and marketing, engineering, architecture, etc.), 11% (Top Lead, 2017).

The above data indicate that the current labor market in Ukraine has changed dramatically under the influence of information technology, and this has been followed by a strong scientific and educational base for training competitive IT development specialists.

Conclusions

Thus, an important advantage of the digital economy as compared to the traditional one is the implementation of the possibility of automatic control of the entire economic system and its individual components. This can entail unlimited scaling without loss of efficiency, which will increase the efficiency of the economic management system of the country as a whole, as well as of its individual regions. Therefore, the digital economy is essential for all industries and companies that, under the influence of digital transformation due to technological evolution, are changing their business processes and increasing the productivity and efficiency of using their potential.

Among the most necessary measures to accelerate the processes of digital transformation of the economy in Ukraine are:

- improving the legislative and regulatory framework for the digitalization of the economy;
- popularizing digital technologies among the business community and raising the awareness of businesspeople about the benefits of digital technologies;
- creating state programs for support of cooperation between the public sector and business in the field of digital technology;
- increasing the amount of funding for educational programs on the use of digital technology for various categories of the population;
- forming digital infrastructure and expanding digital platforms in all regions of the country for the purpose of solving digital nervousness among Ukrainian citizens.

At the same time, Ukraine needs to take low-level measures at the state and regional levels, which should be focused on the development of the domestic technological base, expanding the procedure for improving the conduct of individual digital businesses, reducing corruption, and increasing wages. Then, Ukraine will cease to be a supplier of labor force for developed countries, digital migration will decrease, and digital work will provide wide opportunities for domestic IT workers to ensure their competitiveness and ensure a decent standard of living.

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