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Features of the development of the modern digital technology market

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Abstract. The modern digital technology market is transforming under the influence of external externalities and internal dynamics of its development. The purpose of the article was to substantiate scientific and practical recommendations on the peculiarities of Ukraine's integration into the global digital technology market and to develop proposals for intensifying these processes. The study used logical, retrospective analysis, the dialectical method, synthesis, classification, grouping and generalisation of data, tabular and graphical methods, the method of scientific abstraction and explication, quantitative and qualitative comparison. The article examined the theoretical foundations of the global digital technology market, namely, the theoretical aspects of the modern service market and its structural elements, methodological approaches to the integration of countries into the global digital technology market. Based on an assessment of the research of leading scholars, it was formed the structure of the modern digital technology market, the structural elements of which are software and hardware, network technologies and telecommunications, Internet services, IT education and training, media and entertainment, social networks and communications, e-commerce, security information technologies, IT consulting and services. Was identified the rapid dynamics of the global IT services market, in particular, in 2016 its volume was USD 0.87 trillion, and in 2024 it will reach USD 1.36 trillion, which is 1.56 times more. Was assessed the role of Ukraine in the global digital technology market, analysed the trends and structure of the global market development, and studied the level of development

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of the Ukrainian digital technology market in the context of globalisation. It is determined that the growth rate of the IT services market in 2016-2021 was quite significant and increased from USD 306.4 million in 2016 to USD 477 million in 2021. The article described the institutional support for the development of the Ukrainian digital technology market in modern conditions and identified the priority areas for Ukraine's integration into the global digital technology market. The practical significance of the study is to identify trends, structure and dynamics of the modern digital technology market in Ukraine and the world, and to focus on developing a system of measures to promote the development of the information and communication technology market

Keywords: informatisation; innovations; global market of information and telecommunication technologies; telecommunications and Internet services; software; global digital competitiveness

Introduction

The digital technologies (DT) market is having a profound impact on society, changing the way of communication, education, work and play, and understanding these changes is important for shaping policies that address the needs of the information society. DTs play a key role in the globalisation of the economy, as they allow enterprises and organisations to do business internationally, and facilitate interaction and information exchange between countries. In addition, the study of the global DT market allows to track innovations and technological trends that are key to ensuring the competitiveness of national and international economies, the transformation of society, and the digitalisation of enterprises. For businesses, it is important to understand how to use digital signage to optimise business processes, attract customers and ensure innovative development. The growing use of technology also requires attention to cybersecurity and personal information protection.

The development of DT requires international cooperation, including the exchange of experience, standards and resources, and the study of the global DT market helps to understand and support this cooperation. A separate area of interest is the growth of the Internet of Things, where the study of the global market for digital signage allows to understand the impact of these technologies on various industries and opens up new opportunities for data collection and processing. In particular, the IoT market determines consumer trends, such as the use of mobile applications, online shopping, streaming services. The study of the global digital signage market is necessary to identify and address the challenges and opportunities arising from the rapid development of technology and its impact on various aspects of society and the economy, which makes this study relevant and sets new tasks in this area.

A large number of Ukrainian and foreign scholars have studied the global transformations of the global digital technology market. Noteworthy, the works of such scholars as O.V. Baula & O.M. Liutak (2022), who focused on the impact of information and communication technologies on increasing the international competitiveness of the world's leading countries. Researchers A.P. Hrinko *et al.* (2022) emphasised that in the modern economy, the digital revolution is taking place at an extremely high speed and volume. This created additional opportunities to ensure and support economic development based on sustainable growth. I. Makarchuk & I. Fedulova (2023), based on the use of analytical tools, proved that the revolutionary development of the economy and society depends on information technology. Accordingly, Ukraine needs to gain a foothold in the global digital economy, especially in the context of limited resources, availability of qualified personnel in this segment, and the ability to increase its competitiveness. D. Rodrigues *et al.* (2023) focused on the sectoral aspects of the development of the digital technology market from the perspective of its impact on the automotive sector, the socialisation of production processes, and their place in ensuring sustainable growth of market players. Describing the developments in this area, the work of J.C. Acosta-Prado & A.A. Tafur-Mendoza (2024) was highlighted, which proved the relationship between DT and sustainable efficiency, which were to take into account not only economic results, but also social impact and environmental care.

Digital technologies play a special role in the public sector. V.P. Camngca *et al.* (2024), focused on this aspect, in particular in developing countries, identified the main problems such as the lack of DT training, digital technologies in the implementation of construction projects, appropriate resources, including financial, and software subscriptions. These problems have led to outsourcing of project specialists, the use of unlicensed software, and a negative impact on all officials, including DT professionals, who change the country and worsen the situation in their country.

Authors M. Albinowski & P. Lewandowski (2024) focused on the relationship between the impact of DT and robots, in particular, and the increase in the share of young and elderly women in certain sectors. The authors' analytical research proved that in the period from 2010 to 2018, the growth of DT capital played a greater role in changes in the results of the intra-sectoral labour market of demographic groups than the introduction of robots.

The work of B. Behera *et al.* (2024) substantiated the direct and indirect effects of DT on the economic growth of developing countries. The main focus was on the

interaction with institutional quality, research and development expenditures, and foreign direct investment. The authors proved that the interaction of DT with financial development and research expenditures is favourable for economic growth. The researchers demonstrated that in order to ensure sustainable growth, transition economies need to increase spending on R&D (research and development) and on DT services, enhance the digitalisation of the financial sector, strengthen institutional quality, and stimulate a favourable investment climate. In turn, R. Law *et al.* (2024) tried to test theoretical postulates in practice and formulate the specifics of using digital technologies in the hospitality sector.

Despite a significant number of developments in this area, foreign and Ukrainian works on the peculiarities of Ukraine's integration into the global digital technology market have not been sufficiently studied due to significant changes and trends in global economic processes. The purpose of the study was to assess the structure of the digital technology market, its features and trends, and its potential, to identify recommendations on the specifics of Ukraine's integration into the global digital technology market and to increase the dynamics of relevant processes from the point of view of ensuring Ukraine's competitiveness.

Materials and Methods

In the course of the study, a number of scientific methods were used, which made it possible to draw reasonable conclusions and identify relevant trends in the development of the global and national digital technology market. The application of logical analysis of scientific works on the structure of the elements of the digital technology market made it possible to systematise these elements and conduct an in-depth analysis of their analytical content. The dialectical method identified the key theses of researchers on the impact of the digital technology market on micro-, meso- and macro-level actors, the formation of their interaction at different stages of evolution, taking into account sustainable development and other external influences. The methods of analysis and synthesis made it possible to study the dynamics of Ukraine's digital competitiveness rating by structural elements, to identify trends in the growth of the IT market and institutional tools for regulating the global digital market from the point of view of its functional content. Grouping and generalisation of data, their systematisation in terms of assessing the dynamics of the number of enterprises engaged in e-commerce as a percentage of the total number of enterprises and by industry, made it possible to determine that the largest share in the structure of enterprises engaged in e-commerce in Ukraine is occupied by travel agencies, tour operators, other reservation services and related activities, temporary accommodation, telecommunications, wholesale and retail trade; repair of motor vehicles and motorcycles. Tabular and graphical methods made this possible to visually display the results of the study, quantitatively and qualitatively compare the trends in the development of the global digital technology market and the possibilities of integrating the Ukrainian market into the system of global economic relations.

The research was informed by the scientific works of Ukrainian and foreign scholars and international organisations in the field of digital technologies, including the Institute for Information and Communication Technologies for Development (ICT4D), the International Telecommunication Union (ITU), and the Organisation for Economic Cooperation and Development (OECD). The State Statistics Service of Ukraine (2021) assessed the level of development, dynamics, and structure of the national digital market. The full-scale invasion has made adjustments to the collection of information on Ukrainian entities, which led to an assessment only for 2021 inclusive. The Internet speed rating 2021: Ukraine improved the results by 15 positions (2021) resource made it possible to form a ranking of countries in terms of mobile Internet speed, while the World Economic Forum (2022) and The World Bank (2024) resources provided the basis for an analytical study on the dynamics of the ranking of countries, including Ukraine, according to the inclusive Internet index and its components. Statista (2024a; 2024b), as a global resource of primary information, was used to assess the dynamics of the volume of IT services in the world. The study of the volume of expenditures on information technology in the world in modern conditions was based on Statista (2024b).

Results and Discussion

The development of the services market in 2010-2022 was a complex and dynamic economic segment that included a variety of services provided to consumers and businesses. The theoretical aspects of the modern services market and its structural elements can be viewed in the context of such key concepts and theories as non-physicality and intangibility, as services are non-physical and intangible, which distinguishes them from goods, i.e., services cannot be touched or stored; variability – services can vary depending on the specific conditions of provision and consumption.

As for the modern classification of services, the following features can be distinguished:

- by purpose: division of services into categories according to their purpose, for example, financial services, educational services, medical services;
- by the nature of consumption: distinguishing between services that can be consumed only at the time of provision and those that can be consumed over time;
- by service delivery models: service activities – basic principles and approaches to service delivery, including the development of customer service strategies and process optimisation.

The modern market of services is based on their quality content, in particular, the SERVQUAL model,

which defines the quality of services based on five main dimensions (reliability, responsiveness, competence, profitability and empathy) and the Moment of Truth model, which focuses on key moments when a customer interacts with a service, resulting in his/her opinion about the quality.

The advent of the Internet has transformed information technology. Modern widespread use of the Internet by people, companies and institutions has led to the emergence of a global market for Internet services and increased productivity in technological communications. Digital communication is the most cost-effective form of internal and external communication. Because digital communication is less susceptible to noise or distortion and allows for relatively simple signal manipulation, it is always preferable to analogue. For complex operations, digital electronic circuits are cheaper than analogue electronic circuits. Accordingly, the functions of the digital market, the interdependence of infrastructure and the role of the state are changing, which are key factors for analysing digital power structures and governance forms in empirical comparative studies of digital communication systems (Rojko, 2017). These aspects and theories interact and form a theoretical foundation for understanding the modern service market and its structural elements. The development of this segment of the economy is determined not only by the services themselves, but also by the ways in which they are provided, consumed, and interact with market participants.

One of the most important segments is the digital technology market. The digital technology market includes a large number of components that interact and form this segment. The main components of the digital market are shown in Figure 1. The technological dimension includes DT, as well as enabling technologies that allow people and organisations to get the most out of DT.

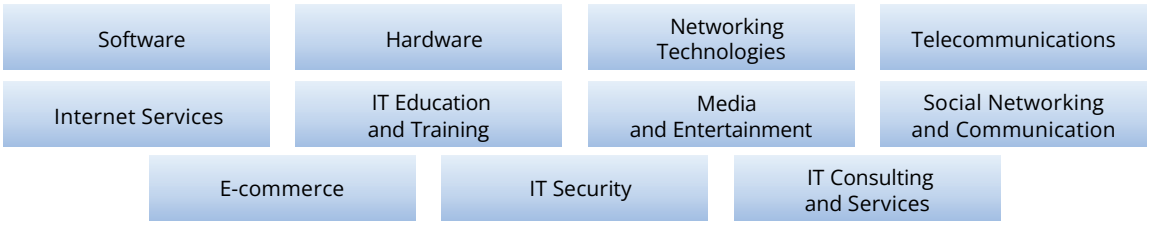

Figure 1. *The main components of the digital technology market*
Source: *compiled by the authors on the basis of M.I. Melnyk (2018), O.M. Liutak et al. (2020), O.M. Pankratova (2021)*

The most important structural elements should be described, in particular software, which includes operating systems, applications, business and consumer applications, websites, mobile applications; hardware and network technologies that connect computers, servers, mobile devices, routers, switches and other physical devices used for data processing and transmission, namely routers, switches, modems, cables, wireless technologies, data transmission technologies that provide connection and exchange of information between the Telecommunications and Internet services integrate mobile and fixed-line telephone services, satellite communications, broadband Internet access, data transmission and other communication technologies, as well as mail services, hosting, cloud computing, streaming services, search engines and other online services. Modern information technology is based on cyber defence systems, antiviruses, firewalls, identification and authentication, encryption and other security measures.

A separate segment is IT consulting, IT education and research and development, which brings together companies that provide consulting services, implementation and support of DT solutions for businesses and organisations, institutions that provide training and skills development in the field of DT, laboratories, companies and universities that research and develop new technologies in the field of DT.

Industries related to the provision of content for the Internet, streaming services, gaming, games and other media content, e-commerce, social media and communications are platforms for communication, information exchange and interaction between users. These components interact and determine the dynamics of the DT market, which is growing rapidly and constantly evolving.

DTs influence social life, strategic decision-making, and macroeconomic growth, which further impacts society by improving infrastructure and living standards. As noted by V.M. Panasyuk (2020), 'informatisation acts as a catalyst for socio-economic development, as modern information technologies play a leading role in the development of innovation, productivity and competitiveness, diversify the economy and stimulate business activity, thereby contributing to improving the living standards of the population'. S.I. Tay *et al.* (2018) pointed out that Industry 4.0 has led to changes in many professions, so the population is obliged to learn new tasks, and is also forced to use high-tech gadgets, which are quickly becoming the most important factor in their work.

Many academic and research institutions, international organisations and non-profit organisations are interested in studying the integration of countries into the global digital market. Several important institutions and research groups have addressed this issue (Table 1).

Table 1. *Institutions regulating the global digital market*

Name of the institution	Functionality	Aspect of activity in the context of the global digital market
World Bank	Studies and analyses the integration of countries into the global DT market in its research and reports	Investigate the impact of technology on economic development and social aspects
International Telecommunication Union (ITU)	Deals with the technical and regulatory aspects of communications	Conduct research and create reports on the development of DT infrastructure in different countries
Organisation for Economic Co-operation and Development (OECD)	Examines the integration of countries into the global DT market in the context of their economic and technological policies	Analyse innovations and efficiency of technology use
Institute for Information and Communication Technologies for Development (ICT4D)	Groups and institutes specialising in ICT4D	Study the impact of DT on development, including how countries integrate technology into their social and economic systems

Source: *developed by the authors*

In addition to the institutions listed in the table, international scientific and research organisations play an important role, with many universities and research centres conducting their own studies on the integration of countries into the global DT market, assessing technological progress and the impact on the economy and society. These organisations and groups help to monitor and understand trends in the global DT market and develop recommendations for governments and businesses. Assessing the level of a country's integration into the global technology market requires analysing various aspects of the economy, innovation, technological development, and international cooperation. Below are the key criteria that can be taken into account when assessing the level of a country's integration into the global technology market:

- exports and imports of technological goods and services: analysis of exports and imports of technological goods and services allows to assess the country's interaction with other national markets and global supply chains;
- participation in global technology projects: studying the country's participation in international projects, programmes and initiatives in the field of science and technology; number and development of technology start-ups: analysing the number and dynamics of technology start-ups allows to determine the level of the entrepreneurial environment and innovation activity;
- investment in research and development: assessment of the level of investment in research by both internal and foreign investors, development of new technologies and patenting, study of the volume and quality of innovation activity, including the development of new technologies and the number of patents;
- level of education and scientific potential: analysis of the quality and level of scientific research, analysis of the level of qualification of IT specialists and their participation in international projects, availability of high-quality educational and scientific institutions, participation in global technology events and conferences may indicate the country's activity and visibility in the global information and technology community.

These criteria should be analysed in combination, as their interaction determines the country's integration into the global technology market. It is also important to take into account the dynamics of change and adapt integration strategies to new challenges and opportunities. The modern digital technology market has a number of advantages over material and commodity-money exchanges, the key of which is the speed of delivery of goods or instant provision of certain services, including information. In addition, A.V. Stavytska (2017) noted that one of the key advantages of the digital economy is its lower cost (e-books are 25-55% cheaper than printed books), as well as the unlimited lifespan of most digital products, as they do not wear out like physical goods or tangible assets, except for obsolescence.

As of the beginning of October 2022, the global population stood at 7.99 billion, and the number of mobile device users reached 5.48 billion. Moreover, almost 4 out of 5 mobile phones used in 2021-2022 were smartphones. The global mobile user base grew by 170 million over the year, and the number of those using certain mobile phones was 68.6%. During 2021-2022, the number of Internet users grew by 3.5% to 5.07 billion, and 171 million new users in the last 12 months brought global Internet penetration to 63.5% of the world's total population (Key findings of the Global Digital 2023 report, 2023).

Studies by the International Telecommunication Union (2024) and Global mobile trends 2023 (2024) showed that by the end of 2023, more than two-thirds of the world's population will be using the internet – meaning that there will be twice as many people online as offline, giving internet users the status of a "supermajority". However, the analysis for 2019-2022 showed that the growth in the number of users will tend to decrease in the next 5 years, as it has used up its rapid potential during the COVID-19 pandemic.

The IT services and IT outsourcing market actively uses the concept of 'digitalisation' introduced by

computer scientists O.A. Dzhusov & S.S. Apalkov (2017). Digitalisation has affected most of the major spheres of social life, among which economic systems are considered the most widespread. According to O.V. Baula & O.M. Liutak (2022), the share of the information technology market in national GDP increased from 0.9% to 4% by 2019, and 10 companies with a market capitalisation of more than USD 1 billion emerged.

The overall decline in the time people spend online does not necessarily mean that it is becoming less important in their lives. In 2023, a typical global user will already spend more than 40% of their active time online. In addition, many studies show that most people in less developed economies outside of Western countries are unable to use the Internet at work all day. To put this in context, Gartner reports that the global 'knowledge economy' currently employs approximately 1 billion people, compared to the total global workforce of 3.3 billion (Law *et al.*, 2024).

According to S.E. Sardak & A.V. Stavytska (2015), 'there is an annual growth in IT spending in developing countries, in particular Brazil, India, and some countries in the Asia-Pacific region. The growth rate of IT spending is significantly higher than the annual GDP growth rate. The priority factor of using information technology to increase the competitiveness of these countries in the world affects the dynamic development of the IT industry in these countries'. Based on the data analysis, a graph was created to illustrate the distribution of the global IT services market for the period from 2016 to 2021 (Fig. 2).

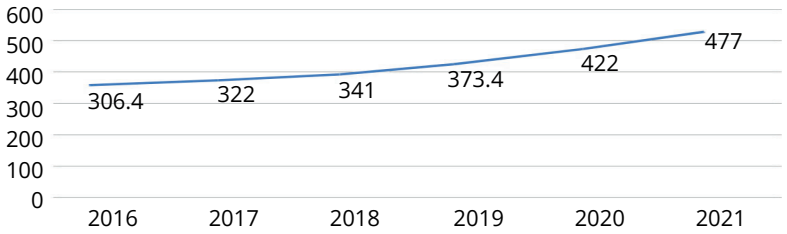

Figure 2. *Growth rates of the IT services market in the world in 2016-2021*
Source: *prepared on the basis of State Statistics Service of Ukraine (2021)*

Assessing the market prospects and key markers of its growth, the experts who say that 70% of companies will use hybrid or multi-cloud technologies, tools and management processes can be cited (Makarchuk & Fedulova, 2023). The introduction of 5G will enable faster network speeds (current 4G LTE network speeds are ten times slower). In the future, more than 50% of user touches will be based on the use of artificial intelligence, and global data creation will increase to more than 180 zettabytes by 2026, up from 64.2 zettabytes in 2020. The compound annual growth rate (CAGR) of the low-code development platforms market is projected to be approximately 30 per cent in 2030 (Tech at the edge: Trends reshaping..., 2023). T.S. Lunova (2022) noted that the main shifts will be about innovation and will develop around personal networks of experts at the edge of the organisation and be supported by capabilities that scale business benefits. In order to identify and build on their competitive advantage, companies need to increase their engagement with networks outside their organisations. This will allow them to identify and invest in promising opportunities.

The Internet of Things should not be viewed as a separate part of the architecture, but as a complex system of global data transmission, storage and analysis. Huawei holds an important position in one segment of this structure, but in 2024, companies from high-income countries, in particular the United States, will dominate. Three large companies – Amazon, Microsoft, and Alphabet-Google – have taken advantage of their advantage to become leaders in software and cloud services. These three giants account for 38% of total R&D expenditure and 34% of net sales revenue for 321 companies in the G2500 software and services sector. Huawei is the only high-tech Chinese company with a significant global market share outside of China (Kireev, 2019).

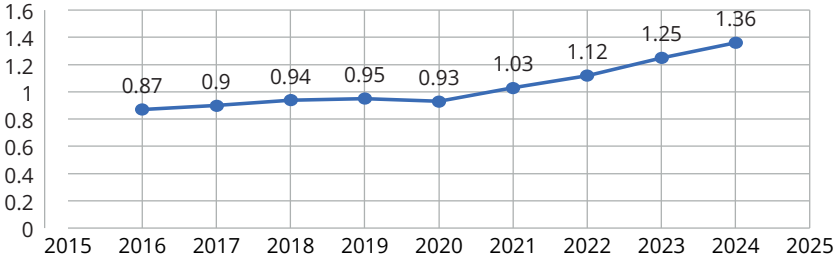

Figure 3. *Volume of IT services in the world, USD trillion*
Source: *prepared on the basis of Statista (2024a)*

Assessing the current trends in the global IT services market (Fig. 3), the significant dynamics: in 2016, its volume was USD 0.87 trillion, and in 2024 it will be USD 1.36 trillion, which was 1.56 times more can be seen.

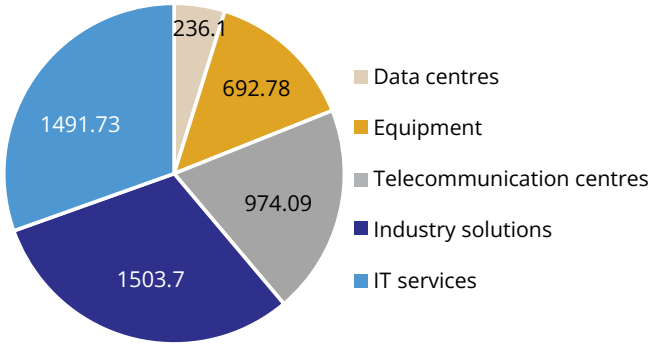

Figure 4. *Global IT spending in 2023, USD billion*
Source: *prepared on the basis of Statista (2024b)*

The structure of expenditures in the IT market is characterised by the dominant role of telecommunications services (35-37% of the market) and IT services (28-29%) (Fig. 4). Companies specialising in cloud technologies have either not lost any capitalisation or increased it even during the recession experienced in many countries. In 2020, amid the spread of the coronavirus and the introduction of distance learning and the transfer of employees to online work, there was an increase in demand for a number of information and communication services, including cloud services. This was expected, as both the private sector and businesses needed resources and technologies to organise remote work, including the deployment of virtual workplaces in the clouds, the introduction of video conferencing.

Analysing the geographical features of the global digital technology market, it is worth noting the dynamic state of this segment in the system of international economic relations, which is constantly changing, just as the leaders may differ in different periods and with different indicators. Nevertheless, some countries have traditionally been leaders in this area, in particular: The United States of America is considered a leader in the field of DH, with Silicon Valley being a global centre for technology and innovation; China is becoming an important player in the global DT market, with large technology companies such as Alibaba, Tencent, and Huawei already making significant contributions to the industry; India is known for its role in software and information technology, with many international IT companies choosing India to open their development centres; Singapore is noted as a global technology hub, attracting companies and technology entrepreneurs from around the world. Sweden is one of the leading countries in the development of DH, with a large number of innovative technology companies; South Korea is known for high-speed Internet connections and technological advances, particularly in electronics manufacturing; the Netherlands is one of the countries in Europe that is noted for its development of DH, especially in the field of e-commerce and data. Israel is known for its vibrant innovation scene and large number of tech start-ups; Germany is noted for its high-tech manufacturing and research; Taiwan is an important electronics and technology producer and is known for companies specialising in microchips and other electronic components.

In telecommunications equipment, Huawei controls approximately one-third of the global market, while the top five companies account for two-thirds. The value chain in these sectors is also highly consolidated. One company (Cisco) has about half of the global telecoms router and switch market.

When assessing the future potential of the global digital market, it is worth considering research by leading organisations that states that by 2028, the global market for cloud microservices platforms will generate revenue of USD 4.2 billion, up from USD 952 million in 2020. One of the leading corporations in this segment, GitHub, has more than 200 million code repositories and is projected to have 100 million software developers by 2025. Almost 90% of developers already use APIs. Software developed by companies on cloud service platforms, open source repositories, and in the Software as a Service (SaaS) model will grow by 27.5 per cent between 2021 and 2028 (Kireev, 2019).

"The development of the digitalisation of the economy is facilitated by measures to develop new legislation in the information and communication technologies sector in Ukraine, discussion and adoption of new strategies for digital transformation aimed at using blockchain, cloud technologies, the Internet, etc." (Poberezhets & Makarevych, 2017). The thesis that Ukraine is actively developing the information and communication services sector and increasing its integration into this segment of the global services market is supported by the growing share of computer services in Ukraine's total exports of services. Assessing the trends, a significant increase

in the share of computer services in the country's total exports, especially in 2019-2021 can be noted. A key driver of such dramatic changes was the global pandemic, which led to the intensification of the development of this segment, the search for specialists in different countries, and offers to use their services remotely. The regression equation with a high correlation coefficient confirms this trend (Fig. 5).

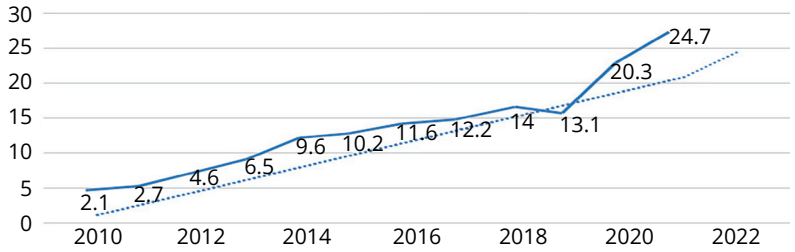

Figure 5. *Evaluation of the dynamics of the share of computer services in total exports of services of Ukraine in 2010-2021*
Source: *prepared on the basis of State Statistics Service of Ukraine (2021)*

"According to the World Bank, in 2021, the share of computer, communication and other services in the world was 54% of exports of commercial services, while in Ukraine this figure was 68%, in France – 54%, in Germany – 60%, in China – 56%, and in Poland – 57%. In 2021, the share of high-tech exports as a percentage of industrial exports was 20% globally (22% in 2020), 5% in Ukraine, 22% in France, 15% in Germany, 9% in Poland, and 30% in China. In 2020, the share of digital technology exports as a percentage of total exports of goods in the world reached 14.3% (12.7% in 2019), in Ukraine this figure was 0.7%, in France – 3.8%, Germany – 5.1%, Poland – 7.2%, China – 27.1%" (Camngca *et al.*, 2024).

Another factor in assessing the level of development of the digital technology market in Ukraine is the availability and use of Internet communications by both ordinary citizens and professional specialists in this segment. The first Internet users in Ukraine appeared in the Soviet era. In 1990, a project was implemented to create the first access nodes to the network that ran through Moscow to Finland, and support for the Ukrainian part of the ".ua" domain was launched. Initially, it was supported unofficially and informally, and on 1 December 1992, it was delegated to Ukraine. In 2022, the number of Ukrainian Internet users was almost 30 million, or about 67% of the country's population (Fig. 6).

As can be seen from Figure 6, since 1995, the growth rate of this indicator has been impressive, in fact, the number of Internet users has doubled every 5 years, in 2020-2022, the indicator tended to grow, but it did not exceed 1-2% per year.

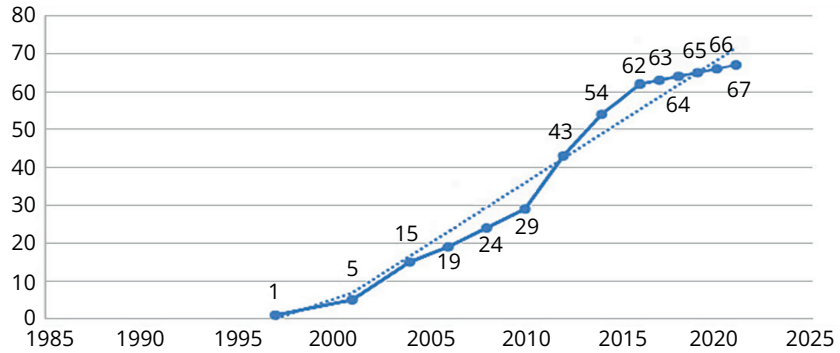

Figure 6. *Share of Internet users among the adult population of Ukraine, %*
Source: *prepared on the basis of State Statistics Service of Ukraine (2021)*

It was found that the main reasons for this phenomenon were the maximum satisfaction of the demand of those wishing (age group under 50) to access the Internet by providers of broadband and mobile coverage and the lack of demand from the older population, which does not use these types of services. Another indicator that characterises the level of development of digital technologies in Ukraine is the number of enterprises engaged in e-commerce (Fig. 7). In terms of quantitative content, the largest weight was given to such sectors as wholesale and retail trade, where the total number of enterprises for the analysed period correlated in the range of 914 units in 2018 and 931 units in 2021, processing industry (673-690 units),

respectively, machine building; production of furniture, other products, repair and installation of machinery and equipment (196-204 units), information and telecommunications (204-210 units) (Fig. 8).

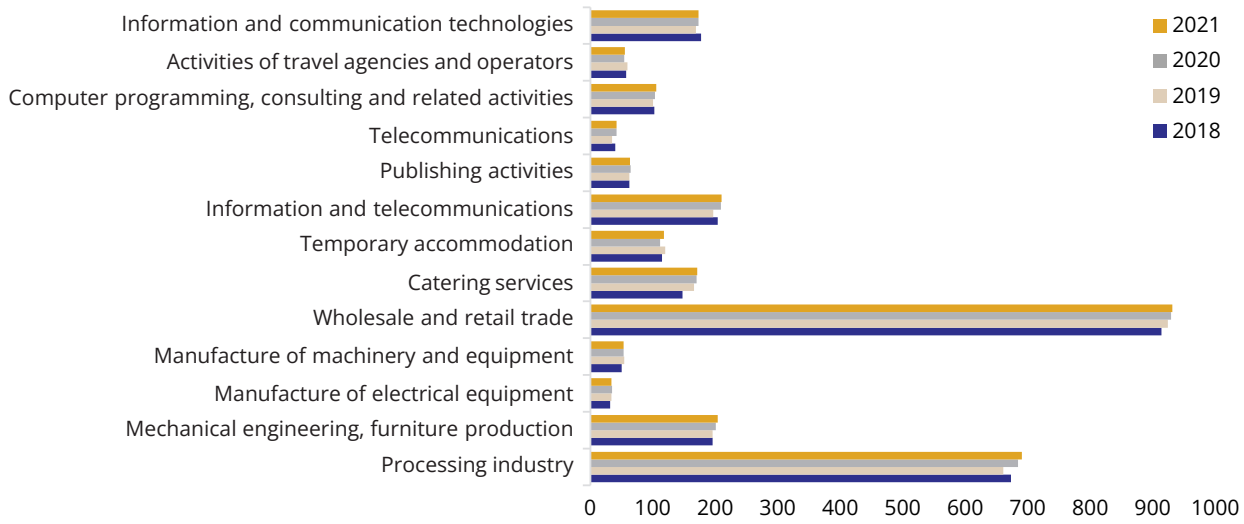

Figure 7. *Dynamics of the number of enterprises engaged in e-commerce in 2018-2021 by industry*
Source: *prepared on the basis of State Statistics Service of Ukraine (2021)*

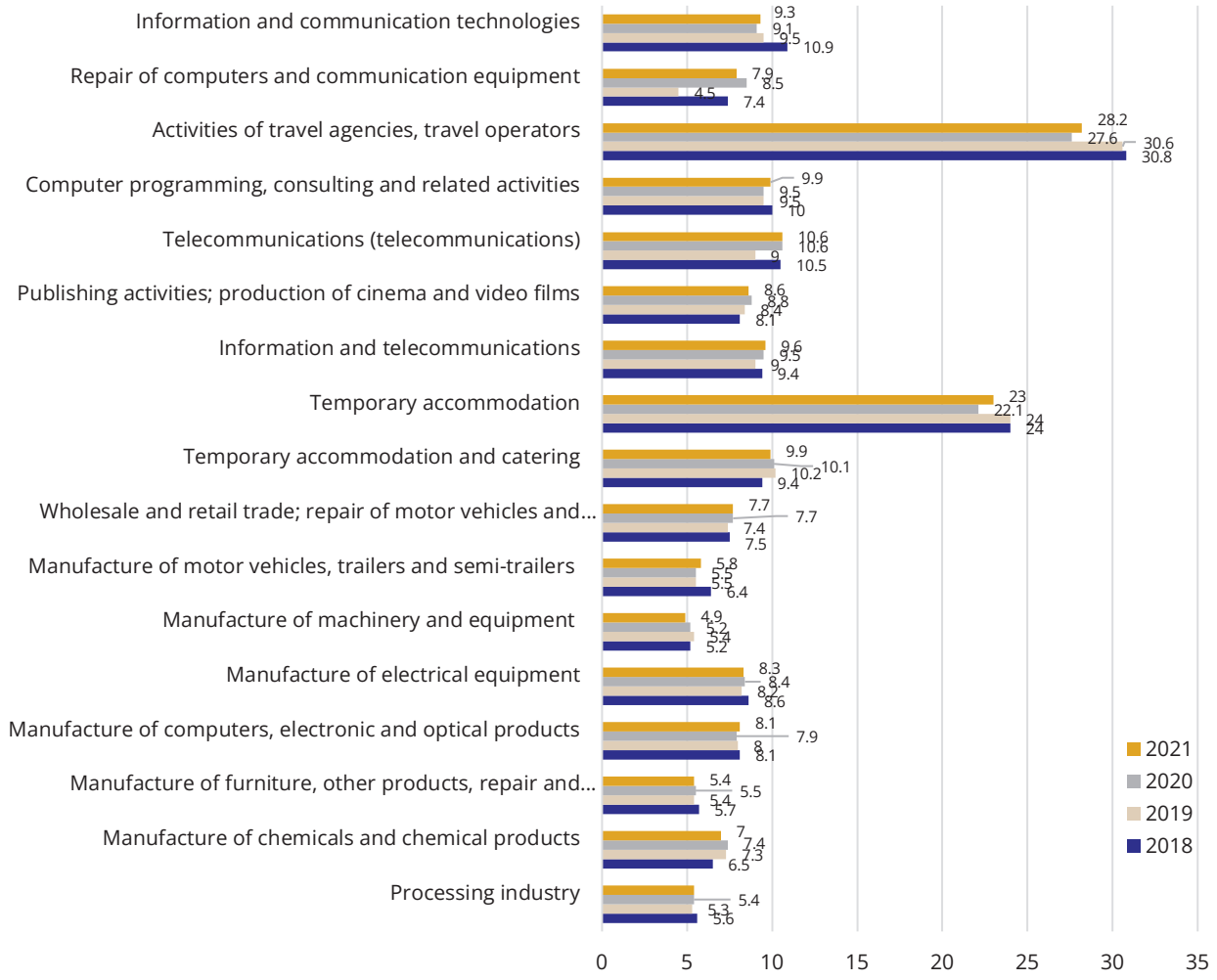

Figure 8. *Dynamics of the number of enterprises engaged in e-commerce in % of the total number of enterprises*
Source: *prepared on the basis of State Statistics Service of Ukraine (2021)*

Analysing Figure 8, it is worth noting that the largest share in the structure of enterprises engaged in e-commerce is occupied by travel agencies, tour operators, other reservation services and related activities (28.2% in 2021), temporary accommodation (23%), telecommunications (10%), wholesale and retail trade; repair of motor vehicles and motorcycles (7.7%).

Ukraine has created the preconditions for the development of the digital technology sector, including a market-based framework for development, adequate education for producers and consumers, an appropriate level of income that creates effective demand, developed infrastructure, and prices and profits that ensure expanded reproduction and stable interest from a wide range of investors. In addition, Ukraine has a competitive market environment regulated by the state, which stimulates the development of scientific and technological progress, in particular in the sectors of information technology, telecommunications and related services.

The priority tasks in the field of digital technologies in Ukraine are to develop a system of measures to stimulate the development of the market for communication and information processing technologies, introduce mechanisms of public-private partnership in the field of information technologies, increase the investment attractiveness of the electronic communications sector, and ensure the development of the infrastructure of the digital technologies market in Ukraine and its integration into global information networks.

In general, the analysis of the level of development of the digital technology market in Ukraine showed a high level of development of this segment, the availability of potential both in the field of network use and access to it, and in terms of human resources, as Ukraine is a significant market player in terms of providing high-quality personnel for the global market.

One of the main indicators that can be used to study the level of a country's integration into the global digital market is the Global Digital Competitiveness Index, which has been conducted by the Institute of Management (IMD) since 2017. "The study assesses the speed of technological transformations taking place in countries, thereby helping to shape government policy decisions in the field of competitiveness of the national economy, as well as strategic business decisions. In 2020, the study covered 63 countries, each of which was assessed based on an analysis of 50 indicators in three main areas". "Knowledge" as an indicator related to intangible infrastructure reflects the process of digital transformation through the discovery, awareness and learning of new technologies. "Technology" is an indicator that can assess the overall context that enables the introduction and development of digital technologies, including technological regulation, the availability of capital for investment in technological infrastructure. "Future readiness" are indicators that assess the level of technology adoption by governments, businesses, and society as a whole (Tech at the edge: Trends reshaping..., 2022).

It should be noted that the rankings were based on the results of the selection of reliable data and surveys in 2019-2020, which made it quite difficult to track and identify the impact of COVID-19. No further surveys were conducted due to the lack of demand and the growing development of the global IT market. In the Global Digital Competitiveness Report 2020, The United States of America once again topped the global digital competitiveness ranking, followed by Singapore (2nd place). As for the third place, Denmark overtook Sweden (4th place) and took 3rd place in the 2020 ranking. Hong Kong moved up three places to take 5th place, and Switzerland dropped one place to take 6th place in the ranking (IMD Global Competitiveness..., 2020). Assessing Ukraine's position in the global digital competitiveness ranking, the following indicators are worth considering (Fig. 9).

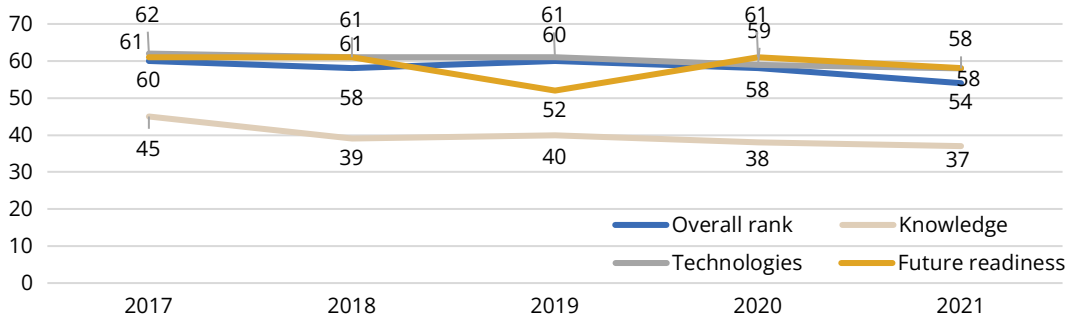

Figure 9. *Ukraine's position in the global digital competitiveness ranking*
Source: *prepared on the basis of Overview of the digital transformation of Ukraine's economy in wartime conditions (October, 2022) (2022)*

The analysis of Figure 9 shows that Ukraine's position in the selected digital competitiveness criteria is fairly stable. Only one of the indicators, Knowledge, saw a significant shift from 45th to 37th place in 2021, which is reflected in the overall rank: the improvement in position was 6 points – from 60th place in 2017 to 54th in 2021.

Another important factor in the country's integration into the international information services market is the global Speedtest index, which includes Internet speed ratings for the world's largest cities and countries. It should be noted that in 2022, Ukraine moved up 15 positions in the global mobile internet speed rating, from 77th place in January 2021 to 62nd place in January 2022, with the average download speed on the mobile network increasing by 10 Mbps: from 19.66 Mbps at the beginning of 2021 to 29.06 Mbps in 2022 (Internet speed rating 2021..., 2021). As of October 2023, Ukraine's position has slipped and is 96th with an average download speed of 24.62. For comparison, it is worthwhile to provide a ranking of countries and the corresponding speed of the given parameter (Table 2). Therefore, it can be noted that the leaders of the ranking are countries such as the UAE, Qatar, Kuwait, China and Macau. They represent the Asian region and are characterised by high mobile internet speeds, which is the key to the development of digital technologies. The closest country to them in Europe, Norway, is 100 Mbit/s behind the leader, and the United States is 160 Mbit/s behind, which indicates the loss of the leading positions of the world's leading countries and the corresponding further technological transformation of the Asian space.

Assessing the trends in the level of Ukraine's integration into the global market of digital services, it should be noted that in 2021, Ukraine was ranked first in Central and Eastern Europe in IT outsourcing according to Outsourcing Journal (2024), and also entered the top 20 countries in the MENA region for offshoring IT development. It is also worth noting that Ukraine is known for both the IT outsourcing industry and the provision of offshore R&D centre services. Therefore, a significant number of countries are interested in obtaining such services, although companies from the US and Western Europe are still regular customers. The main factors that attracted foreign firms to the Ukrainian IT market include a good location, a large number of talented IT specialists, low taxes (5%) and wages, cultural similarities, and high-quality work. The Global Inclusive Internet Index (3I-Index), published by the Economist Intelligence Unit (2024) since 2018, is based on such indicators as availability, which assesses the quality and breadth of available infrastructure for Internet access and the level of Internet use; including the skills of the population that are necessary for cultural and information policy. The corresponding dynamics of the rating and its components for the period 2018-2021 is shown in Figure 10.

Table 2. *Ranking of countries by mobile internet speed*

Place in the ranking	Country name	Value of the indicator, Mbps	Place in the ranking	Country name	Value of the indicator
1	UAE	269.41	51	United Kingdom	47.98
2	Qatar	206.8	55	Azerbaijan	45.70
3	Kuwait	191.74	60	Poland	42.79
4	China	164.14	63	Spain	40.47
5	Macau	155.75	71	Georgia	33.39
6	Norway	146.02	79	Moldova	30.72
7	South Korea	145.25	82	Philippines	28.28
8	Denmark	143.63	92	Mexico	25.15
9	Bulgaria	142.07	95	Indonesia	24.65
10	Ireland	139.52	96	Ukraine	24.62
13	USA	103.69	100	Uzbekistan	23.69
28	India	75.86	142	Cuba	3.33

Source: *prepared on the basis of Speedtest Global Index (2024)*

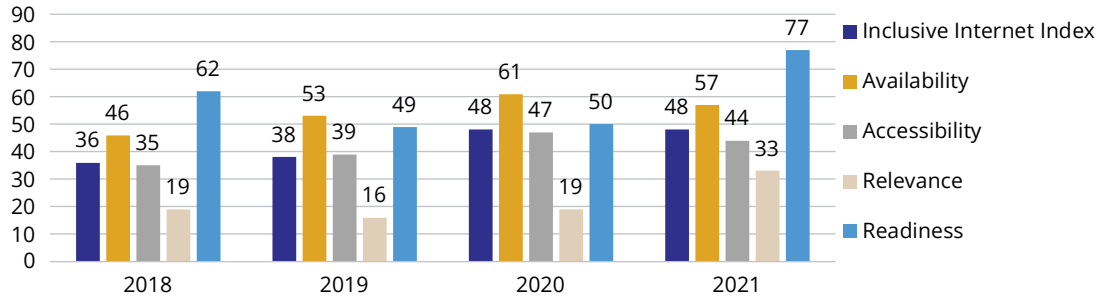

Figure 10. *Dynamics of Ukraine's rating by the Inclusive Internet Index and its components for the period 2018-2021*
Source: *prepared on the basis of World Economic Forum (2022)*

Evaluating the dynamics of Ukraine's ranking in the Inclusive Internet Index, a relative deterioration in its position, in particular in 2018 can be noted. Ukraine was ranked 36th out of 120 countries analysed, and in 2021 it was 48th. It should be noted that Ukraine's low level in the digital competitiveness ranking is due to low indicators of its components, including digital technologies and digital readiness (Fig. 11).

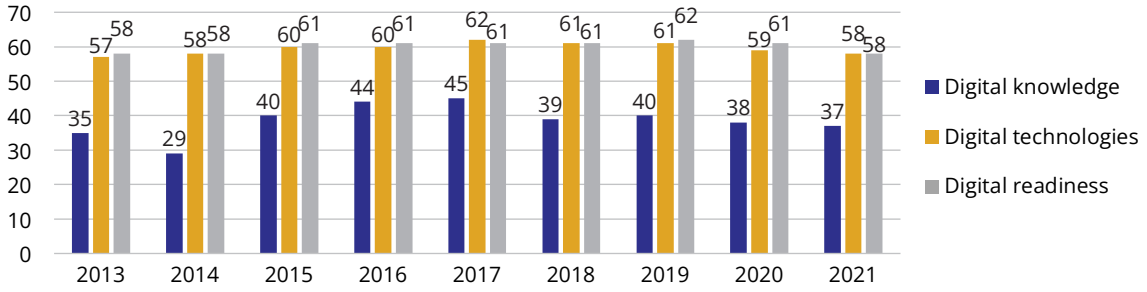

Figure 11. *Dynamics of Ukraine's digital competitiveness rating in 2013-2021*
Source: *prepared on the basis of V.Ye. Haustova et al. (2022)*

In 2022-2024, the information and communications technology industry will remain one of the leading areas of the country's economic potential, which was least affected by the hostilities due to the diversification of the workforce and the territorial fragmentation of production processes. It is through the significant potential based on human resources in the field of digital technologies that Ukraine can be expected to quickly integrate into the system of global economic relations, restore and help increase the competitiveness of the Ukrainian economy in the post-war period.

The integration of countries into the global digital market requires the active participation of public authorities in the development of modern strategies for the development and functioning of the digital economy. The key areas of transformation in this context may include: improving institutional support for all informatisation and digitalisation processes, including regulatory support for these processes and policy-making on global digital platforms; introducing tools for the rapid development of digital industries and businesses through the availability of digital technologies and stimulating the economy by attracting investment; increasing digital inclusion by ensuring equal access to digital technologies for all social groups to digital technologies and opportunities, as well as the promotion of digital literacy among the population.

The role of DT in the socio-economic development of countries can be viewed through a multidimensional framework based on the dimensions that influence socio-economic progress: politics, business, technology and society. This framework builds on several previous models, but is more general in context and focus, as it encompasses all DHs, not just some of them, and applies to all economies and regions, not just less developed ones. It can be argued that development occurs in both underdeveloped and highly developed economies, although the effects of specific factors may differ in intensity and direction. However, the general concepts and relationships remain relevant and important.

Conclusions

The dynamic development of the digital technology sector in 2000-2020 has changed the world by increasing the impact of globalisation and liberalisation on business and the competitive position of each economy in the global market. Such developments have prompted researchers to study the link between development and economic growth, with the number of Internet users, mobile phone subscribers and exports of digital goods becoming key factors that positively affect economic growth in transition economies. In Ukraine, the share of Internet users reached 68%. This value is not high compared to the leaders of the information competitiveness ranking, where this indicator is 100%. The government should promote Internet penetration and its use in everyday life and business as the first and most important step towards deeper integration into the global digital market. Increasing the use of digital technologies, especially the Internet, can contribute to economic growth, the diffusion of technology and innovation, the use of e-government and e-commerce, improved decision-making efficiency in firms, households and the economy as a whole, increased demand, lower production costs, and the transformation of the structure of the economy and foreign trade. The use of digital technologies will help bring Ukraine closer to the economic, technological and organisational practices and standards of EU member states, contributing to balanced regional development and improving Ukraine's competitive position in the global market.

In line with global trends, Ukraine has formed the preconditions for the development of digital technologies that can become the basis for increasing competitiveness in the post-war reconstruction. The key structural elements should be the formation of market-based principles for the development of information and telecommunications services, developed infrastructure, and increased solvency of the population, which will ensure expanded reproduction and stable interest of

a wide range of investors. However, according to analytical observations, the structure of Ukraine's IT sector in 2024 lags far behind global standards and is mostly represented by software products and Internet services. Thus, the priority tasks in the field of digital technologies in Ukraine include: developing measures to stimulate the development of the information and communication technologies market; introducing mechanisms of public-private partnership in the field of communication and information processing technologies; increasing the investment attractiveness of the computer network sector; and ensuring the development of the infrastructure of the electronic communications market in Ukraine and its integration into global information networks. Further research on the development of the digital technology market should focus on finding ways to increase the efficiency of the national economy by intensifying the production and introduction of new IT goods and services by increasing the competitiveness of existing computer and information systems.

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None.

Conflict of Interest

None.

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Особливості розвитку сучасного ринку цифрових технологій

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Анотація. Сучасний ринок цифрових технологій трансформується під впливом зовнішніх екстерналій та внутрішньої динаміки його розвитку. Метою статті було обґрунтування науково-практичних рекомендацій щодо особливостей інтеграції України у світовий ринок цифрових технологій та розробка пропозицій щодо активізації окреслених процесів. В дослідженні було використано логічний, ретроспективний аналіз, діалектичний метод, синтез, класифікація, групування та узагальнення даних, табличні та графічні методи, метод наукової абстракції та експлікації, кількісне та якісне порівняння. У статті досліджено теоретичні основи світового ринку цифрових технологій, а саме: розглянуто теоретичні аспекти сучасного ринку послуг та його структурних елементів, методичні підходи щодо інтеграції країн у глобальний ринок цифрових технологій. На підставі оцінки досліджень провідних науковців сформовано структуру сучасного ринку цифрових технологій, структурними елементами якого є програмне та апаратне забезпечення, мережеві технології та телекомунікації, інтернет-послуги, ІТ-освіта та навчання, медіа та розваги, соціальні мережі та комунікації, електронна комерція, інформаційні технології безпеки, ІТ-консалтинг та послуги. Визначено стрімку динаміку розвитку світового ринку ІТ-послуг, зокрема у 2016 році його обсяг становив 0,87 трлн. дол., а в 2024 році – 1,36 трлн. дол., що більше в 1,56 рази. Оцінено роль України на глобальному ринку цифрових технологій, проаналізовано тенденції та структуру розвитку світового ринку, а також досліджено рівень розвитку українського ринку цифрових технологій в умовах глобалізації. Визначено, що темпи зростання ринку ІТ-послуг у період за 2016-2021 роки були достатньо значними і зросли з 306,4 млн. дол. у 2016 році до 477 млн. дол. у 2021 році. Охарактеризовано інституційне забезпечення розвитку ринку цифрових технологій України в сучасних умовах та визначено пріоритетні напрями інтеграції України у глобальний ринок цифрових технологій. Практичне зазначення дослідження полягає у визначенні тенденцій, структури та динаміки розвитку сучасного ринку цифрових технологій в Україні та світі, акценті щодо розробки системи заходів сприяння розвитку ринку інформаційно-комунікаційних технологій

Ключові слова: інформатизація; інновації; світовий ринок інформаційних та телекомунікаційних технологій; телекомунікації та інтернет-послуги; програмне забезпечення; глобальна цифрова конкурентоспроможність