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DIGITAL ECONOMY – AN ELEMENT OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Abstract. Over the past decades, the world has been rapidly moving towards a new type of economy, where digital technologies are becoming the main tool for its formation. Expanding the role of information technology in the private and public sectors is the basis for the transition to a digital state.

The term «digital economy» (digitaleconomy) was first used relatively recently, in 1995, by an American scientist from the University of Massachusetts, Nicholas Negroponte, to explain to colleagues the advantages of the new economy in comparison with the old one in connection with the intensive development of information and communication technologies. The article deals with the concept of the digital economy, its introduction, and the world experience of structural and institutional support for the development of the digital economy. Special attention is paid to the development and implementation of digital technologies in the economy. Based on the studied material, it was concluded that for the application of modern technologies in all sectors of human life, it is necessary to develop appropriate programs that ensure the effective use of digital technologies.

Key words: digital economy, information technologies, digitalization, efficiency, state program, electronic economy, technologies, digital content, foreign experience, Internet.

Introduction. Now we can hear more and more about the rapidly growing role of advanced technologies and innovations. The world is changing, and economic processes are changing with it. With the help of modern advanced technologies, many companies increase the efficiency of production forces and business processes. All this progress affects the well-being of all sectors and spheres of people's life.

The introduction of new innovative technologies iscarried out both at the global level and at the local level. This leads to the emergence of huge markets for cellular communications, Internet services, the online gaming industry, and others. New technologies have a transformative effect on some aspects of the activities of established economic entities, which mainly consists in replacing analog mechanisms of operation.

The spread of digital technologies over a long period of time determines the trajectory of economic and social development and has repeatedly led to drastic changes in people's lives. The formation of the digital economy is one of the priorities for most of the leading economic countries, including the United States, great Britain, Germany, Japan, and others. As a rule, they are characterized by a long period of implementation of the «digital development agenda» and a succession of priorities - from building a basic information and communication infrastructure to forming a coordinated policy in this area and programs to support the widespread introduction of digital technologies (Tan K.H., Ji G., Lim C.P., Tseng M.-L. Using Big Data to Make Better 2017).

In recent years, another wave of transformation of business and social models has been unfolding, caused by the emergence of a new generation of digital technologies, which, due to their scale and depth of influence, have been called «end - to-end» - artificial intelligence, robotics, the Internet of things, wireless communication technologies, and a number of others. Their implementation is estimated to

increase productivity in companies by 40%. In the near future, it is the effective use of new digital technologies that will determine the international competitiveness of both individual companies and entire countries that form the infrastructure and legal environment for digitalization (Chakpitak N., Maneejuk P., Chanaim S., Sriboonchitta S. 2018).

Literature review. The digital economy will end the dominance of office clerks and other non-material workers and mark the emergence of a new social stratum. The key factor of digital transformation in the activities of market participants is the development of digital culture.

A significant number of scientific papers have recently been devoted to the problems of digitalization of the economy. among them are the works of V. B. Betelin, K. Y. Eremeychuk, G. I. Kudryavtsev, I. V. Sudarushkina, A. A. Kharchenko, E. V. Ustyuzhanina, and others. Among foreign authors, N. Chakpitak, C. P. Martin-Shields, H. Goldstein, M. Pilik, K. H. Tan, and others have contributed to the study of issues related to the digital economy.

For a deep understanding and full awareness of the process of transforming the economy into a digital segment, it is still necessary to determine the phenomenon of «digital economy». Many scientists agree that the very concept of «digital economy» arose in the 90s of the twentieth century. The best ideology of the concept under study in 1995 was designated by Nicholas Negroponte. The digital economy is described by American computer scientists Chakpitak N., Maneejuk P., Chanaim S., Sriboonchitta S. in the form of the following metaphor: the transition from the movement of atoms to the movement of bits.

It is fair to note that a single term has not yet developed. Thus, along with the concept of «digital economy», «electronic economy», «application economy», «new technological way of the world», «creative economy», «API economy» and others are often used. At the same time, it is important to emphasize that the European part of the scientific community is increasingly using the term «digital economy». In turn, the American one tends to be more technologically named – «API economy».

According to Kharchenko A. A., Konyukhov V. Yu. to date, the very concept of «digital economy» is still not fully established. This concept can include anything, including such areas as high-tech manufacturing, software, computer technology, as well as many other modern things, including the provision of electronic services and various Internet services together with Internet messengers.

Russian economist V. Katasonov believes that the Russian hype around the topic of «digital economy» is quite common «companionship». Another hobby.

The digital economy is the activity of economic entities, for which the main factor of production is data in digital form and the processing of large amounts of information. Using the results of this data analysis significantly increases the efficiency of various types of production and services provided.

In theoretical terms, it is also interesting to consider the dual approach to the essence of the concept of the digital economy, formulated by Professor RM Meshcheryakov, which is as follows:

- classic – when the digital economy is considered as an economy based on digital technologies in the field of electronic goods and services (telemedicine, distance learning, media content sales, etc);
- advanced-as an economic production using digital technologies, including the chain of goods and services provided with their help (logistics, Internet of things, industry 4.0, smart factory, fifth-generation communication networks, engineering services, prototyping, etc.).

Based on the theory of F. In our opinion, it is more correct to speak about the digital economy than about the digital segment of it. In fact, the various methods of production are closely related to each other – the most advanced depend on the state of the most primitive and Vice versa.

Material and Methods. The term «digital economy» is very young. By all accounts, it was introduced in 1995 by the American computer scientist N. Negroponte from the Massachusetts University of technology [Urmantseva A., 2017; Mitin S., 2017, etc.]. The concept of «digital economy» received international recognition in 2016, after the release of the world Bank report «Digital dividends» [World development report, 2016]. Prior to this, other terms were used to refer to economic relations arising from and around the use of new information and communication technologies, including «information economy», «e-economy», etc. For example, the OECD produced research materials on the Internet economy, but after 2013 switched to a new term (WEF (2018), Digital Transformation Initiative.. WEF (2018), Digital Transformation Initiative).

We can agree that the phrase «digital economy» sounds better than other terms, i.e. it is mor«winning» (more «beautiful») from a linguistic point of view. Some scientists have noticed that recently terms in science come from journalism. And this is not accidental – the expressiveness of the concepts used means a lot for the dissemination and popularization of the ideas behind them.

International practice has not yet developed a harmonized definition of the digital economy. In most foreign sources, when describing the digital economy,

the focus is on technologies and changes in the ways economic agents interact with them. This may include either specific types of technologies or certain forms of changes in economic processes. Often, the definition of the digital economy is replaced by a list of areas of its influence on the economy and social sphere.

Examples of definitions of the digital economy abroad are presented below (Table 1):

Table 1 – Definitions of the digital economy*

Digital economy	A global network of economic and social activities supported by platforms such as the Internet, as well as mobile and sensor networks [Australian Government, 2009]
	A new way of economy based on knowledge and digital technologies, which creates new digital skills and opportunities for society, business and the state [world Bank, 2016a].
	An economy based on digital technologies, but we understand it more as the implementation of business operations in markets based on the Internet and the world wide web [British Computer Society, 2013].
	A complex structure consisting of several levels / layers connected by an almost infinite and constantly growing number of nodes [European Parliament, 2015].
	Digital technology-based markets that facilitate trade in goods and services via e-Commerce on the Internet [Fayyaz, 2018].
	An economy that can provide high-quality ICT infrastructure and mobilize the capabilities of information and communication technologies for the benefit of consumers, businesses, and the state [the Economist, 2014].
	A form of economic activity that results from a billion examples of networking between people, businesses, devices, data, and processes. The basis of the digital economy is Hyper-connectivity, i.e. the growing interconnectedness of people, organizations and machines, formed by the Internet, mobile technologies and the Internet of things [Deloitte, 2019].
	The digital economy is characterized by its reliance on intangible assets, massive use of data, widespread adoption of multi-stakeholder business models, and the complexity of determining the jurisdiction where value creation occurs [OECD, 2015a].
	The digital economy is the main source of growth. This will encourage competition, investment and innovation, which will lead to better services, greater choice for consumers, and the creation of new jobs [European Commission, 2018a].
	An economy in which, thanks to the development of digital technologies, there is an increase in labor productivity, the competitiveness of companies, reducing production costs, creating new jobs, reducing poverty and social inequality [world Bank, 2016b].
	*Note: Digital economy, European Commission, 2014.

As can be seen from the examples given, perceptions of the digital economy range from very narrow to extremely broad (Sarycheva A.D., 2019).

For enterprises, digitalization is an opportunity to increase efficiency both by reducing costs and implementing new business models. According to McKinsey research, companies investing in digital solutions expect annual growth and cost efficiency improvements of 5-10% or more over the next 3-5 years. According to scientists, the introduction of «end-to-end» digital technologies (artificial intelligence, robotics, the Internet of things, wireless communications, etc.) can increase productivity in companies by 40%.

Currently, the idea of digital transformation covers the entire world and in many countries, digitalization is a strategic priority for development. It is assumed that in order to fully benefit society, digitalization is not required, but digital transformation.

Digital transformation is a deep transformation of business and organizational activities, processes, competencies and models to fully exploit the changes and opportunities of combining digital technologies and their accelerating impact on society in a strategic and priority manner, taking into account current and future changes. Digital transformation can be implemented at several levels: process, organizational, business, and social.

Unlike digital transformation, digitalization means using digital technologies and data (digitized and initially digital) to generate revenue, improve business, replace/transform business processes (rather than just digitize them), and create a digital business environment that puts digital information in focus.

Scientists distinguish three stages (or three waves) of digitalization:

1. Converting analog content to digital content. This is a technical digitization of analog content and services without fundamental changes in the structure of the industry. This stage can be described briefly as the digitization stage.

2. Separation of devices that have historically been closely related. For example, media services such as music, books, email, and movies can be delivered over different types of networks using multiple devices.

3. Introduction of new products and services. Devices, networks, services, and content that were created for certain purposes are re-mixed for use for other purposes.

At the same time, organizations engaged in digitalization face numerous challenges, mainly related to prioritizing investments and understanding the true value of digital technologies (measurable results and clarity of business cases).

Different countries use different initiatives to promote digitalization and digital transformation of national economies and regions as a whole.

The European Union's «digital Agen-da» program aims to make better use of the potential of information and communication technologies to promote innovation, accelerate economic growth and progress. The main goal of the Program is to create a single digital market to create smart, sustainable and inclusive growth of the EU economy by 2020. The program, in turn, also has seven areas: creating a single digital market, improving compatibility and standards, strengthening online trust and security, promoting fast and ultra-fast Internet access for all, investing in research and innovation in world-class information and communication technologies, promoting digital literacy, skills and inclusiveness.

As a result, six EU countries (Denmark, Sweden, Finland, the Netherlands, Norway, Iceland and Switzerland) are among the «top ten» countries in the digital economy And Society Index. In particular, Denmark ranks first in the EU in this Index and has advantages over other EU countries in a number of indicators. 93% of the Danish population regularly visit the Internet and use various digital services: 88% use e-banking, 82% make purchases online and 71% use e-government services. About a quarter of Danish SMEs sell their products and services over the Internet. Over the past 15 years, the Danish government has implemented several digital growth strategies. They mainly focused on the use of digital technologies as a tool for modernizing processes, services for citizens and businesses, and improving the efficiency of the public sector. The strategy for 2016-2020 is aimed at shaping the future of digital Denmark and ensuring that the public sector can use technological opportunities to increase value added, accelerate growth and improve efficiency, while maintaining citizens ' trust in the digital society (Catlin, T., Scanlan, J., Willmott, P., 2015).

The Republic of Korea ranks 2nd after Denmark in the International digital economy and society index, 2nd in the information and communication technology development Index, and 3rd in the e-government development Index. Korea's information and communication technology sector is a stable pillar of the country's economy and a driving force for innovation, providing a high share of value added and employment; high business spending on research and development in information and communication technologies; a higher proportion of information and communication technologies are patents than in any other OECD country. It is not surprising that Korea is one of the world's top ten exporters of information and communication technology products. Korea also surpasses many OECD countries in fixed and mobile broadband networks with very high fiber penetration (74%) in fixed networks and well-developed mobile broadband. On average, 90% of all people use the Internet and there is a very high level of usage among young people (100%), but there is potential for this level to increase among older people (64%). Korea has an above-OECD average for some uses, such as reading news and creating content, but has the potential to improve the situation for more complex online activities by individuals, such as cloud computing and job search. Similarly, although about 100% of Korean firms have a broadband connection, there is potential for growth in the use of more advanced and performance-enhancing technologies such as customer relationship management, cloud computing, and big data analysis.

India is the largest economy that provides information and communication technologies with human resources around the world. Despite high growth rates, 50% of India's rural population does not have access to basic telecommunications. The government of India has launched several digital projects to address these issues. In line with the UN sustainable development goals, the Digital India initiative aims to create a digital infrastructure to serve every citizen, including universal access to mobile communications, broadband connections, digital Finance, and digital literacy training for 60 million people in rural areas. In tandem with other reforms, this initiative has elevated India to 39th place in the world economic forum's Global competitiveness index out of

138 countries (Digitization, digitalization and digital transformation: the differences 2020).

For the digital transformation of the economy, first of all, it is necessary to recognize the need to digitalize socio-economic systems at the state level and allocate resources, in particular, the consistent development of innovative knowledge-intensive industries, the development of information and communication technology infrastructure, and personnel support for digitalization processes.

In turn, the European Union, which has developed the international index of digital economy and society (I-DESI), assesses the level of development of the digital economy in countries based on five main factors: the spread of broadband access and the quality of communication, Internet use, human capital (how well residents know how to use network technologies), the integration of digital systems and technologies, and the development of digital services and public services.

The world economic forum network readiness index measures the level of development of information and communication technologies in three main groups of parameters: the availability of conditions for the development of information and communication technologies, the readiness of citizens, businesses and government agencies to use information and communication technologies, and the level of use of information and communication technologies in the public, commercial and public sectors (Кудрявцев Г.И., Скобелев П.О., 2018).

The ICT Development Index is calculated using the methodology of the International telecommunication Union, a specialized unit of the United Nations that defines world standards in the field of information and communication technologies. The index is calculated on the basis of three groups of sub-indices: access to ICT, use of ICT, skills in the field of information and communication technologies.

Results and Discussion. The digital economy is being monitored at both the global and national levels. There are various methods for estimating its scale. The simplest and most common method is to estimate the share of the digital economy in the GDP of countries. In particular, such calculations were made by BCG. According to its data, the share of the digital economy in the GDP of developed countries from 2010 to 2016 increased from 4.3 to 5.5%, and in the GDP of developing countries – from 3.6 to 4.9%. In the G20 countries, this figure has grown from 4.1% to 5.3% over five years. The first place in the share of the digital economy in GDP is taken by the UK-12.4%. The top five also include South Korea (8.0%), China (6.9%), India and Japan (5.6% each). The United States is in sixth place (5.4%), and Germany is in eighth (4.0%). The top ten countries include Mexico, Saudi Arabia and Australia.

Since 2011, BCG has also calculated the e-Intensity index, or index of digitalization of economies. According to the developed methodology, the final indicator is defined as the weighted average of three subindexes, of which 50% is accounted for Internet availability (the degree of infrastructure development, availability and quality of Internet access, fixed and mobile), 25% – for online spending (the amount of online retail and advertising spending) and 25% – for user activity (the weighted average of lower-level subindexes: the activity of companies, consumer activity and government agencies). All subindexes are formed from weighted average values of several parameters. International reports (Gartner, UN E-Government survey, the Global Information Technology Report of the WEF, etc.) are used as data sources.according to the e-Intensity index for 2015, the leaders of the digital economy were Denmark, Luxembourg, Sweden, South Korea, the Netherlands, Norway and the United Kingdom. China was in 35th place, Russia in 39th, and the United States in ninth place.

Finally, Mastercard and the School of law and diplomacy. Fletcher at tufts University (USA, Massachusetts) proposed a method for rating the Digital Evolution Index, which reflects the progress in the development of the digital economy in different countries, as well as the level of integration of the global network in people›s lives. The Digital Evolution Index ranks countries (60 in 2017) on 170 parameters that describe four main factors that determine the pace of digitalization: the level of supply (availability of Internet access and the degree of infrastructure development); consumer demand for digital technologies; institutional environment (government policy, legislation, resources); innovation climate (investment in R&D and digital start-ups).

One of the most serious comments on the proposed international methods is the ambiguity of which industries / areas / companies should be considered part of the digital economy. Accordingly, the share of this sector in the GDP of countries is determined differently and a set of indicators is selected. The discrepancy between existing international estimates and the lack of a generally accepted methodology leads to attempts at the national level to measure the level of development of the digital economy as a whole or its individual segments.

Understanding information that is rapidly growing requires a workforce with appropriate analytical, computational, and methodological skills, as well

as a high-throughput information and communication technology infrastructure (Yoo Y., Lyytinen K., 2010).

Taking advantage of advanced information and communication technologies requires appropriate infrastructure, services and skills.

The main advantages of the digital economy:

1) The Expansion of trade. The Internet has allowed small companies to expand and gain a customer base, compete with other manufacturers and take their place in international trade.

2) Increase productivity. IT helps to reduce production costs and, consequently, increase efficiency and productivity in almost all sectors of the economy. For example, parcel delivery company UPS is known for using smart routing algorithms to avoid left turns: this saves time and saves up to 4.5 million liters of gasoline annually.

3) The Development of competition. The market becomes flexible and open for young promising manufacturers, companies quickly appear and develop, without requiring large investment investments (Goldstein H. Editorial, 2017).

4) Creation of new jobs and employment of certain categories of people. For example, people with disabilities, residents of remote regions, or single mothers will be able to work remotely. However, we should not ignore the fact that there is a tendency to reduce existing professions by 40%. It is predicted that in Denmark and Sweden, the leading countries of digitalization, in 2015-2020 the number of new jobs will exceed the number of reduced by 1.6-2.3 million.

5) Improving the quality of public services. The ability to access public services through digital portals improves the quantity, quality and timing of services, and consumers can choose the best products and services at lower prices. Many experts Express concern about whether the digital economy will lead to economic destabilization and whether everyone will grow in prosperity. The digital economy as a new phenomenon largely destroys the old foundations, in particular, automation leads to the fact that some lose their jobs. Among the low-income population, competition for jobs will increase, which will lead to a reduction in nominal incomes and mass unemployment.

It is also necessary to predict possible problems of national security of the country with access to the international level. It is obvious that even the leading countries are not protected from cyber threats Parvainen P., Tihinen M., Kaariainen J., Teppola S. (2017).

The weak point of the digital economy is the lack of a single methodology for assessing the macroeconomic effect, which excludes the possibility of unambiguous calculation of the growth rate or loss of GDP. Proponents of expanding the digital economy assume that in 2015 the share of the digital economy was 2.1% of GDP − this is 1.3 times more than 5 years ago, but 3 times less than that of world leaders. In the UK, for example, the share of the digital economy reached the level of 12.4% of GDP in 2016.

The digital economy is a new model that assumes effective personal service for people, businesses, and things, and is scalable globally for the entire world through the use of information technology, the Internet, and all their properties. For the effective functioning of the digital economy, a number of measures should be taken to reform education and train personnel in areas where the country has entered the world market (antivirus SOFTWARE, social networks) (Danish Agency for Digitisation Organisation, New Digital Strategy 2016-2020).

A number of modern business processes start in the physical economy, then move to the digital economy, then re-connect the physical processes, and complete everything with a finished product or event. With this cyclical operation, the physical and digital economy work in parallel. It is necessary to strengthen protection against cyber threats and increase the stability of all elements of infrastructure, the financial system, public administration and education.

Conclusion. The basis of digitalization of the economy is production. The concept of digital production is a set of tools for optimizing the workflow through software and hardware solutions. To put it quite simply, digitalization is nothing more than a transition from analog to digital. This process involves not only the replacement of production tools, but also the introduction of analytical systems that make production as cost-effective as possible. The digital economy is based on these tools. This is just a new stage of economic development.

The main problem that society may face in implementing digital technologies in the economy will be the effectiveness and timeliness of the programs that are being developed to regulate the relationship of digitalization. But despite this, many countries already have at their disposal newly developed programs that correspond to the digital economy (Pilik M., Juřičkova E., Kwarteng M.A., 2017).

A more balanced view is that the digitalization of the economy is not a recipe for all ills and a «well – developed» digital segment is just support for the economy as such. When the effect of digitalization ends (and this inevitably happens), it is necessary to activate the analog economy (How the Republic of

Korea became a world ICT leader). Moreover, digital technologies do not work without setting up relations between economic entities and management in General. Digital changes are not only associated with a lot of technological innovations and organizational changes, but also radically change the corporate culture. Finally, the development of the digital economy largely depends on government policy. This is recognized at the international level, as well as realized (and implemented) in many countries of the world (Martin-Shields C.P., Bodanac N., 2017).

However, implementing a conscious and successful policy requires solving a number of complex theoretical problems related to the phenomenon of the digital economy. First of all, concerning its definition and measurement. As experts rightly point out, the method of evaluating the macroeconomic effect of the digital economy is highly questionable. In fact, the calculation is based on the indicators of companies that develop, manufacture and trade in information and communication technologies, i.e. the share of the information and communication technology sector (development and production of software and hardware for computers, cellular communication services, Internet, etc.) is calculated. This sector develops only technical tools that are used by companies in other industries for operations in the field of electronic Commerce, electronic banking, etc. There is still no universal and reliable method for calculating the added value created by all participants in digital economic activity.

In conclusion, I would like to note that information and communication technologies have played an important role in the formation of a new sphere such as the digital economy. Based on the fact that it is still gaining strength for its large-scale application, it is too early to talk about a defining role in the development of the world economy. For at least 10-15 years, there will be a strong dependence of the digital economy on the traditional one.

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Цифровая экономика – элемент информационно-коммуникационных технологий

Аннотация. За последние десятилетия мир стремительно движется к экономике нового типа, где основным инструментом ее формирования становятся цифровые технологии. Расширение роли информационных технологий в работе частного и государственного секторов является основой для перехода к цифровому государству.

Сам термин «цифровая экономика» (digitaleconomy) впервые был употреблен сравнительно недавно, в 1995 году, американским ученым из Массачусетского университета Николасом Негропонте для разъяснения коллегам преимуществ новой экономики в сравнении со старой в связи с интенсивным развитием информационно-коммуникационных технологий. В статье рассматривается понятие цифровой экономики, ее интрепретация, мировой опыт структурно-институциональной поддержки развития цифровой экономики. Особое внимание уделяется развитию и внедрению в экономику цифровых технологий. На основе изученного материала был сделан вывод о том, что для применения современных технологий во всех отраслях жизнедеятельности людей необходима разработка соответствующих программ, обеспечивающих эффективное использование цифровых технологий.

Ключевые слова: цифровая экономика, информационные технологии, цифровизация, эффективность, государственная программа, электронная экономика, технологии, цифровой контент, зарубежный опыт, интернет.

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Цифрлық экономика – ақпараттық-коммуникациялық технологиялардың элементі

Аңдатпа. Соңғы онжылдықта әлем жаңа үлгідегі экономикаға тез жылжып келеді, онда оны қалыптастырудың негізгі құралы цифрлық технологиялар болып табылады. Жеке және мемлекеттік секторлардың жұмысында ақпараттық технологиялардың рөлін кеңейту цифрлық мемлекетке көшу үшін негіз болып табылады.

«Цифрлық экономика» (digitaleconomy) термині алғаш рет салыстырмалы түрде жақында, 1995 жылы Массачусетс университетінің американдық ғалымы Николас Негропонте ақпараттық-коммуникациялық технологиялардың қарқынды дамуына байланысты ескі экономика артықшылықтарын әріптестеріне түсіндіру үшін қолданды. Мақалада цифрлық экономика ұғымы, оның интерпритациясы, цифрлық экономиканың дамуын құрылымдық-институционалдық қолдаудың әлемдік тәжірибесі қарастырылады. Цифрлық технологияларды дамытуға және экономикаға енгізуге ерекше назар аударылады. Зерттелген материал негізінде қазіргі заманғы технологияларды қолдану үшін, адамдардың тіршілік әрекетінің барлық салаларында цифрлық технологияларды тиімді пайдалануды қамтамасыз ететін тиісті бағдарламаларды әзірлеу қажет екендігі туралы қорытынды жасалды.

Түйін сөздер: цифрлық экономика, ақпараттық технологиялар, цифрландыру, тиімділік, мемлекеттік бағдарлама, электрондық экономика, технологиялар, цифрлық контент, шетелдік тәжірибе, интернет.