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# СТАНОВЛЕННЯ ЦИФРОВОЇ ЕКОНОМІКИ В УКРАЇНІ, ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ

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#### FORMATION OF THE DIGITAL ECONOMY IN UKRAINE. PROBLEMS AND PROSPECTS

#### Анотація.

В статті досліджується вплив розвитку цифрової економіки на конкурентоспроможність економічних систем та узагальнює тенденції розвитку цифрової економіки в сучасному соціально-економічному середовищі. Розкрито зміст цифрової економіки та її особливості. Проаналізовано рівень розвитку цифрової економіки України та країн Європейського Союзу, обрано країни ЄС з найвищим рівнем технологічного розвитку та рівнем цифровізації економіки.

Термін «цифрова економіка» хоча і використовувався протягом тривалого часу в економічному світі, але не всі його особливості виділені з точки зору теорії економіки, і тим більше, конкретних термінів, які супроводжують її в економічних дослідженнях вчених.

Метою даної роботи є узагальнення понять інформаційних технологій в економіці, тенденцій комп'ютеризації та можливостей, які пропонує ця технологія. В умовах цифрової економіки використання інформаційних технологій надає бізнесу нові можливості для виходу на світові ринки, а також розвивати ділову діяльність в режимі он-лайн.

Встановлено, що використання цифрових технологій у бізнесі дозволить зберігати великий масив даних, аналізувати результати, на основі яких приймати обґрунтовані рішення, які допомагають мінімізувати витрати, максимізувати прибуток та підвищити конкурентоспроможність підприємств. Наведено популярні інформаційні системи та технології, що використовуються у бізнесі.

Наведено перелік новітніх цифрових продуктів та послуг, що використовуються в соціальноекономічному середовищі, розкрито їх зміст. Технологія BlockChain розглядається як одна з найперспективніших технологій в контексті кібербезпеки та підвищення ефективності діяльності суб'єктів господарювання.

#### Abstract.

The research examines the impact of digital economy development on the competitiveness of economic systems, and summarizes the trends of the digital economy in the modern socio-economic environment. The content of the digital economy and its features are revealed. The level of development of the digital economy of Ukraine and the countries of the European Union is analyzed, the EU countries with the highest level of technological development and the level of digitalization of the economy are selected.

The term «digital economy», although used for a long time in economics community, but not all its characteristics have already been highlighted in terms of theory economy, and even more so, the specific terms that accompany it in economic research scientists.

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The aim of this paper is to present the importance of information technology in economy, computerization trends and the opportunities offered by this technology. In the condition of digital economy, the usage of information technology provide businesses with new opportunities to access global markets and also develop business activities on-line.

It is established that the use of digital technologies in business will allow to store a large array of data, analyze the results, based on which to make informed decisions that help minimize costs, maximize profits and increase the competitiveness of enterprises. Popular information systems and technologies used in business are given.

The list of the newest digital products and services used in the socio-economic environment is given, their content is revealed. BlockChain technology is considered as one of the most promising technologies in the context of cybersecurity and increasing the efficiency of business entities.

**Ключові слова:** цифрова економіка, цифровізація, соціально-економічне середовище, глобалізація, цифрові технології.

Key words: digital economy, digitalization, socio-economic environment, globalization, digital technologies.

**Formulation of the problem.** Today, the processes of international economic integration dominate the development of the world economy. In these circumstances, most advanced countries have chosen as a priority vector of digitization.

Digitalization of the economy is one of the main directions of innovative development of economic systems and a tool for creating long-term competitive advantages. However, digitalization processes in Ukraine, unfortunately, are very slow, which leads to a loss of competitive advantage in the international arena.

An important component of the digital transformation of the economy is the service provision of its subsystems, which is carried out on the basis of a platform approach that is able to digitize social, economic and technological processes in the construction of ecosystems.

Literature analysis. Many scientific works of domestic and foreign economists are devoted to the problems of digital economy introduction in the world and in Ukraine. In particular, the following researchers studied digitalization: L. Kit, S. Veretyuk, P. Drucker, S. Kolyadenko, G. Karcheva, K. Schwab, I. Malika, and others. Despite numerous scientific studies on the problems of seeing the concept of digital development, the types of products of this economy and the services that the digital economy produces and provides, remain insufficiently disclosed.

**The purpose** of the article is to reveal the essence and features of the formation of the digital economy in the context of its impact on the efficiency, competitiveness and development of national and international economies.

**Research results.** The concept of digital economy is complex and multifaceted. In the classical sense, the «digital economy» is a certain activity in which the key factors of production are digital data and their use, which can significantly increase productivity in various economic activities.

The foundation of the digital economy is developed and effectively functioning infrastructure. In the Concept Development of the digital economy and society of Ukraine under the digital infrastructure is understood a set of communications, technologies, products and processes that provide computing, tele-

communications and network capabilities and work on a digital (non-analog) basis.

To date, there is no general opinion in the scientific community as to what is meant by digitization. According to V. Fischuk [1], the "digital economy" is the economy that uses digital technologies and services. Also, terms such as «data economy», «internet economy», «new economy», or «web economy» are often used. Kolyadenko S. [2] considers the digital economy as one based on the production of electronic goods and services by high-tech business structures and the distribution of these products through ecommerce. Cat. L. [3] believes that the digital economy is the transformation of all areas of the economy through the transfer of information resources and knowledge to a computer platform for further use (including, where possible) on this platform. S. Veretyuk interprets the digital economy taking into account its potential - as an unrealized transformation of all spheres of the economy by transferring all information resources and knowledge to a computer platform [4].

In a digital economy, production is transformed in terms of production methods and distribution of goods through digitization of processes. Increasing sales of personal computers and other digital devices, and increasing the proportion of devices connected to the Internet allowed to significantly reduce the cost of attracting participants to online communities, which contributed to the fact that billions of people have become potential participants in the digital economy.

Scientists distinguish three stages of digital transformation [11]:

- digitization the process of converting analog to digital,
  - digitalization the use of digital technologies,
  - digital transformation.

In order to measure the development of the digital economy, the Organization for Economic Cooperation and Development (OECD) developed a system of indicators [6], which determines the following trends:

- the formation of a high-tech sector of the economy;
- investment in research, software development, education costs and auxiliary retraining;

- creation and production of information and communication equipment;
- formation of working zones in the field of science and high technologies;
- data of cooperation between corporations, institutions and research organizations; international cooperation in the field of science and innovation;
- the dynamics of the spread of the internet on the international market.

In general terms, it is possible to note four criteria for analyzing the digital economy, to varying degrees examined by different researchers:

- the criterion associated with the sphere of employment;
  - spatial criterion;
  - technological criterion;
  - economic criterion.

Digital transformation is a unique tool of the digital revolution, with timely and proper use of which domestic companies will be able to reproduce the lost leadership in the new digital economy. To this end, the processes of digital transformation initiated at enterprises should, first of all, be based on a scientifically sound methodology.

Digital technologies save transaction costs, and sometimes minimize them, create new potential, and at the same time new demands and requirements to the market, which speeds up business and production, and thus reduces the life of not only the product but also the company.

Digitization of the economy characterizes the general the state of digital transformations in the process of organization of socio-economic relations in the conditions of three sectoral models of society, which corresponds to domestic realities and includes: citizens (society), business (economy) and state (government).

Digital transformation is the introduction of modern technologies into the business processes of the

enterprise. This approach involves not only the installation of modern hardware or software, but also fundamental changes in approaches to management, corporate culture, external communications. As a result, the productivity of each employee and the level of customer satisfaction increase, and the company gains a reputation as a progressive and modern organization.

Summarizing the existing definitions of the digital economy, we can say that the digital economy is an innovation-oriented dynamic economy based on the active introduction of innovations and information and communication technologies in all economic activities and spheres of society, which increases efficiency and competitiveness of individual companies, economy and living standards.

To determine the level of digitalization of the country's economy, there are a number of common parameters, including Internet coverage, the share of e-commerce in retail trade, the share of society that has digital competencies and receives services from the state online. The International Telecommunication Union determines the Index of Development of Information and Communication Technologies in the Countries of the World, the Index of Development of the Internet in the Countries of the World, and the World Economic Forum determines the Index of Network Readiness.

The ICT Development Index (IDI) takes into account 11 indicators for three groups, such as access to ICT, use of ICT, ICT skills, and is designed to monitor the development of IT in countries, their positioning in the global IT market [5].

Thus, the IDI rating in 2017 is led by Iceland (Table 1). It is followed by two countries in the Asia-Pacific region and six countries in Europe, where for many years there has been a high level of investment in this industry.

IDI rating (2013-2017)

Table 1.

			IDI	raung (2	2013-201	')				
Country	2013		2014		2015		2016		2017	
	rating	index	rating	index	rating	index	rating	index	rating	index
Iceland	3	8,36	4	8,64	3	8,86	2	8,78	1	8,98
South Korea	1	8,57	2	8,85	1	8,93	1	8,8	2	8,85
Switzerland	13	7,78	13	8,11	7	8,56	4	8,66	3	8,74
Denmark	4	8,35	1	8,86	2	8,88	3	8,68	4	8,71
UK	8	7,98	5	8,5	4	8,72	5	8,53	5	8,65
•••										
•••										
Ukraine	68	4,64	73	5,15	79	5,23	72	6,45	79	5,62

Source: http://www.itu.int/net4/ITU-D/idi/2017/index.html

As we can see, Ukraine in 2017 took 79th place with a rating of 5.62 points, compared to 2013 - 68th place. Given the presented in table. 1 data can be concluded that in Ukraine there is a growth of «digital

divide» due to a significant lag in the development of digital technologies from this indicator of developed countries.



Fig. 1. Dynamics of change in the rating of the index of development of information and communication technologies of Ukraine in 2013-2017.

According to the value of the DESI index, in 2017 the leaders in the development of digital technologies among the European Union are Denmark,

Finland, Sweden, the Netherlands, Luxembourg, Belgium, Great Britain, Ireland, Estonia, Austria (Fig. 2).

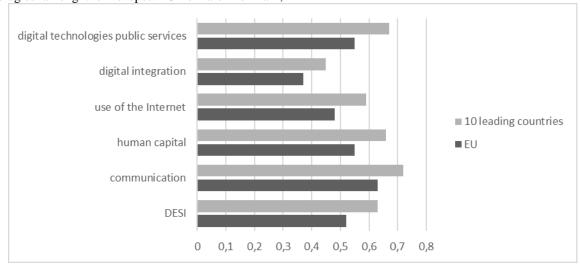


Fig. 2. DESI index for the EU and 10 leading countries in the development of the digital economy Source: developed according to the source [6].

According to the rating of the World Economic Forum (WEF) on technological development, Ukraine in 2016-2017 took only 85th place among other countries. Analyzing some components of the use of ICT,

Ukraine has significantly worsened its position compared to the previous year (Fig. 3).

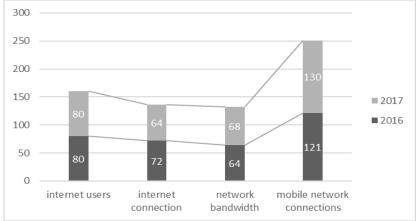


Fig. 3. WEF rating of Ukraine by components of ICT use in 2016-2017.

Source: developed according to the source [6].

Innovations controlled by data, the latest business modifications and digital applications have an impact not only on the science of this field, but also on the government itself, where these innovations are developed and introduced. Policy actions to support digital innovation tend to focus on innovation networks, access to finance and (secondary) application of information, but pay less attention to investments in ICT, knowledge-based capital and data considerations.

The information and communication technology (ICT) sector is an important factor in the development of the digital economy and society.

The benefits of information technology trends mostly seen in:

- reducing the cost of production, travel, materials, marketing and distribution;
- increase the value chain management and improving internal functioning;
- construction of the markets and more advanced service to customers;

- gaining competitive skills and speed when performing transactions;

In fact, digitalization dictates new conditions in working with customers. Breakthroughs in science and economics make it possible to use artificial intelligence widely, from software to discover new drugs to algorithms that identify our cultural interests and predict our behavior.

The digital vector of development changes the approach to doing business, as well as the system of challenges regarding the information technologies used: marketing, sales and service management systems; telephony and messengers; document management and personnel management systems; accounting systems and many other enterprise applications. Table 2 presents digital technologies, products and services that are currently considered innovative trends in the modern socio-economic environment.

Digital technologies as innovative trends of the modern socio-economic environment

Table 2.

Digital technologies as innovative trends of the modern socio-economic environment						
Type of product / service	General characteristics of the product / service of the digital economy					
BlockChain	Blockchain was designed as part of a very specific task, namely - how to build a decentralized (without a single control center) financial system, the correctness of which could be verified by anyone. Based on this, we can define a blockchain as a way to store and reconcile a database, a copy of which is available to each participant.					
Digital marketing	Digital Marketing is a set of promotion tools that involve digital channels. Internet marketing has evolved into digital marketing, which uses comprehensive methods of on-line strategy, website development and mobile applications, creative and copywriting, contextual advertising and SMM, as well as other interactive products. The most popular forms of digital channels: search promotion; contextual and teaser advertising; media and banner; promotion on social media and blogs; creation of mobile applications for smartphones, tablets and other media; viral advertising.					
CRM&BPM	CRM - sales system: ready-made processes for managing all types of transactions. Bpm'online CRM combines the capabilities of a customer relationship management (CRM) system and a business process management system (BPM). This is the first application solution developed on the bpm'online platform.					
Grid-технології	Grid computing is a geographically distributed infrastructure that combines many different types that a user can access from anywhere, regardless of where they are located. Grid provides a collective distributed mode of access to resources and related services within globally distributed organizations (enterprises that share global resources, databases, specialized software).					
Digital insurance	Digital strategy in insurance is not only Internet sales, but the transformation of the whole business in the direction of working with an electronic policy. Digital insurance allows insurance companies to reduce costs, increase the speed of customer service. Consumers have the opportunity to receive timely updates on changes in the company's insurance policy. Digitalization provides standardization and improves the quality of responses and services provided. A significant advantage of Digital Insurance is the presence of social networks, which helps to improve the quality of service and establish a close relationship between the insurance company and the client.					
ePrescription	ePrescription (electronic prescription) is carried out on the basis of 3 procedures: eCapture - formation of an electronic prescription by a doctor of a medical institution; eTransfer - confidential transfer of an electronic prescription to a pharmacy; eDispensation - data transfer from the pharmacy back to the medical institution, confirmation.					
TeleHealth	«Digital» technologies for the provision of remote medical services and support for doctors.					

Source: [7]

Modern information systems and technologies are able not only to fully meet the requirements of production

agrosystems, but also act as an important prerequisite for their development.

Note that the benefits of digital technology should be sought not in the immediate reduction of costs and increase the economic efficiency of agricultural enterprises, but in finding the most optimal information technology for business process management, which ensures coordination of management and effective achievement of strategic and operational goals.

Digitization technologies make it possible to organize the most personalized interaction, which is preferred by most customers. Digital communication channels, uniqueness, artificial intelligence, robotics - all this we are already dealing with in our daily lives. For example, the digital transformation of banks could not do without chatbots, and pharmaceuticals are actively using modern mobile devices.

Particular attention should be paid to Block-Chain-technology, because according to the developers, this technology eliminates theft, fraud, property rights violations and more. The information stored in BlockChain cannot be lost. It stays there forever. In addition, BlockChain saves not only the final state, but also all previous states. Therefore, everyone can check the correctness of the final state, listing the facts from the beginning. The fact that this technology is invulnerable to criminals makes it a priority area of study.

BlockChain works with a complex encryption system (keys). Each block has its own unique key. The inability to «break the chain», i.e., to make changes to the block or add a block among others - is ensured by the fact that the codes (hashes) of the previous and next blocks are interconnected and making changes to one block immediately makes it and all other blocks invalid, which is automatically displayed on the screen.

Table 2
Shows the characteristics of BlockChain-technology in view of its key features of use, as well as disadvantages.

vantages.							
Key features of the blockchain	Disadvantages of the blockchain						
Efficiency and reliability. The circuit records only the transactions that have been checked and guarantees protection against failures and hash substitution (transaction recording function, encoder)	Blockchain involves the use of powerful computer technology, which increases the cost of re-equipment and cuts off a significant number of potential users.						
Unlimited chain of blocks. Theoretically, the chain can be supplemented indefinitely, which stimulates the analogy of a blockchain with a supercomputer	Lack of legislative regulation of the blockchain. There are no established standards and levels of compliance. Until the technology reaches a certain framework, it will significantly limit its implementation.						
Openness. Information on transactions, concluded agreements and contracts is stored in free access. However, it is impossible to change them - just review.	"51% attack" - if more than half of the power will belong to one device, the integrity of the circuit is violated.						
Lack of center. Equality and branching of the system makes its breaking and damage almost impossible. Each individual participant is an independent server.	Each operation is irreversible, so if the transaction was even erroneous, it is impossible to change and return it.						

Source: [8]

Implementing BlockChain in business processes requires significant knowledge in many areas, such as security, law, decentralized management, and organizations that choose to use BlockChain will be forced to completely change their historical structure, whose traditional business processes do not correspond to the very idea of BlockChain. also, trying to integrate BlockChain into outdated value and system streams, face a loss of investment, or find that the technology doesn't suit them. At the same time, the presence of BlockChain in the service or service ensures that there is no interference in the process and results. The guarantee of invariability of data is given by a special method of their storage. It stipulates that if the information is replaced or deleted, the rest of the entries in the blockchain will also need to be changed, as each subsequent block refers to the previous one.

Apparently, there is no single vision for Block-Chain technology, but the use of BlockChain has its advantages for the government: this technology facili-

tates the process of digitizing documents and access to public services. For example, IBM is working with the US Food and Drug Administration (FDA) and the Center for Disease Prevention on the possible use of BlockChain in this area. Congressional Blockchain Caucus, launched in 2016, is working to gather information on BlockChain projects. This data is needed so that in the future, people can securely verify their identity online, make online payments (such as tax payments), and track supply chains.

The general pattern of digital economy projects is the focus on a specific consumer and the comprehensive use of information as a driving resource, taking into account the specific features of a particular consumer in a particular place, and the global use of digital transformations of real business processes. Thus, these digital projects are characterized by very specific circumstances of their implementation in a particular place and only with the accumulation of economically positive results can become the subject of standardiza-

tion and other regulations. Another feature of building a tree of goals of transformation is the implementation, maturity of opportunities and their completeness at the present stage of certain digital projects and accounting for risks in their implementation.

Digital conversions are a challenge - countries that have reached the highest level of digital maturity have had to deal with complex cultural, organizational, and technical challenges, and only taking all these factors into account has made these transformations successful. In order to become today's digital leaders in specific areas of the economy, it is necessary to identify priority digital projects that are implemented by specific organizational teams. Digital teams need to focus on three key functional activities, namely: developing a digital strategy, managing digital activities through their national companies, and turning their digital performance into an operational advantage [9].

The main problem in the development of the digital economy in Ukraine today is the lack of a systematic state policy in this area. Ukraine is the only country in Europe without its own «digital» vision. Virtually all EU countries have already approved and are implementing their own «digital agendas», or «digital strategies», but we have only the project «Digital Agenda of Ukraine - 2020», which provides a strategic goal - to close the technological gap between Ukraine and developed countries. It should be noted that Ukraine corresponds to the average value of the Eastern Partnership countries only in some areas. while digitalization of the country will contribute to economic growth and its transformation from raw materials to digital, eradicate corruption through transparency of electronic systems and Ukraine's integration into the EU Digital Single Market.

The use of the blockchain reveals the newest opportunities in numerous spheres, including in the economic sector, in education, the Internet, by reducing the price of transactions, simplifying accounting and providing performance obligations through smart contracts. Its capabilities will largely depend on the solution of technical problems and socio-political challenges such as the provision of the use of laws and the protection of order in the absence of any intermediary or the achievement of an accurate representation of how and to whom the legal responsibility lies in the case Damage to systems based on the blockchain [9].

To successfully shape the digital economy and bridge the «digital divide», it is necessary to focus on the development of some effectively functioning components [10]:

- 1) developed digital infrastructure that will provide new quality and coverage of the territory of Ukraine with broadband Internet, and especially remote settlements, business and social infrastructure, many of which are in the so-called digital divide;
- 2) formation of an effective system of identification, protection of personal data, trust services, which are the primary elements of the so-called soft infrastructure:
- 3) development of applications and services, such as «smart city» and «digitalization of education», which are important components of «Industry 4.0.»

and relate to those areas of life (industry, public safety, medicine, ecology, transport, etc.) that are still in analog format;

- 4) development of highly qualified human capital, which meets the requirements that form new technologies for human possession of specific skills and competencies for full integration into the digital space;
- 5) protection of intellectual property, which is a key factor influencing the motivation to create creative ideas, the possibility of obtaining commercial profit and guarantees the protection of their intellectual work;
- 6) relevant «digital» legislation, which should define and consolidate the digital rights of citizens, define the principles of digitalization, ensure the adoption of an action plan to eliminate legislative, institutional, tax barriers and stimulate the digitalization of economic sectors.

Thus, the analysis of the use of ICT in Ukraine showed a growing «digital divide», a significant lag of Ukraine in the development of digital technologies compared to EU countries.

Conclusions. Today, the digital economy is an effective basis for the development of public administration, economy, business, social sphere and society as a whole. Looking at the digital technologies that exist in the socio-economic space, the digital economy is also a matter of national security, competition of domestic enterprises regardless of their size, the country's position on the world stage in the long run.

Digital economy allows to increase the potential of the enterprise, in particular in the search for non-standard new ideas for the development of new advertising or a new product name through communication with consumers. Consumers are always ready to take an active part in such events, because as a reward they will see their idea realized. The most common goals that motivate users to participate in events organized by businesses are:

- self-realization by participating in online activities, certain individuals gain a sense of need and self-realization, especially when they are marked in some way or listen to their advice;
- search for a new job today quite often international companies attract new employees based on the results of competitions, completed tasks;
- disclosure of own potential solving the tasks offered by a certain company, crowdsourcing participants have the opportunity to increase their creativity, find new ones professional qualities;
- satisfaction of ambitions individual contestants may pursue the goal of being better and thus satisfy their own psychological needs.

The priority task for the formation of Ukraine's digital economy is to work with the domestic market, effective public policy, mechanisms to stimulate the digital economy, and a key initiative - the formation of consumers' motivations and needs for «digital technologies». At the same time, it should be noted that the digitalization of the economy can enable real sectors of the economy to quickly find ways out of the crisis in which it found itself as a result of imperfect

management of the entity, or problems with production and provision of goods and services.

Powerful, perspective digital infrastructure is designed to provide access to digital technologies (connectivity) and conditionally includes the following key components:

- fixed telecommunication infrastructure (main, distribution and local networks, points traffic exchange, etc.);
- mobile telecommunication infrastructure (3G, 4G, 5G, radio and satellite technologies, WIFI, etc.);
- digital television infrastructure (terrestrial, cable, satellite);
- radio infrastructure (long range frequency, unlicensed frequencies) for Internet of Things projects (sensors, sensors, etc.);
- infrastructure of data processing and storage centers (so-called cloud or virtualized infrastructure);
  - cybersecurity infrastructure;
- specialized infrastructures (special networks, video surveillance, related engineering systems).

The development of the digital economy in Ukraine is impossible without the regulatory framework, strategy for the development of the digital economy, including the classical one. At the same time, no less important, and perhaps even a major factor, is the formation of professional skills, basic computer literacy, as well as preparation for a professional career, promoting lifelong learning.

Thus, in the digital economy, domestic enterprises should pay attention to capacity building through more active communication with consumers by means of Internet technologies.

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