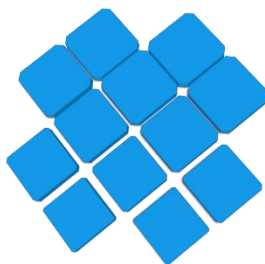




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## WORLD EXPERIENCE OF DIGITAL TRANSFORMATION OF THE ECONOMY: PROSPECTS FOR UKRAINE

*Kiporenko S.*

*assistant of the department of computer science  
and economic cybernetics  
Vinnytsia National Agrarian University,  
Vinnytsia, Ukraine*

### Abstract

The article describes the content of digital transformation as a new economic phenomenon, which implies the transition from the traditional economy to the digital one. Theoretical and practical bases of development of the concept of "digital economy" as the main factor of transformation of economy of the country are investigated, the main characteristics of digital economy are traced. The impact of the digital economy on the formation of internal gross product has been revealed. The advantages and disadvantages of digital transformation of the economy of the countries of the world are highlighted.

It has been determined that the main task of digitization the economy is restructuring production, increasing flexibility and adapting to the volatility of the market environment, which will help to increase the country's competitiveness in the field of digital technologies.

The level of digitalization of Ukraine and the countries of the European Union has been analyzed, the TOP-10 EU countries with the highest level of technological development have been identified. The focus is on a number of global changes that are taking place in society as a result of the introduction of the digitalization process.

The necessity of transformation of the Ukrainian economy has been substantiated and the prospects of development of the Ukrainian digital economy based on the assessment of its current place in the respective rating indexes among other countries are outlined. The Concept of development of the digital economy and society of Ukraine for 2018-2020 is considered. The index of digital competitiveness of Ukraine, scenarios and directions of development of the digital economy are analyzed.

**Keywords:** digital transformation, digitalization, digital economy, business processes, information technologies, technological development, innovations.

**Problem statement.** The modern development of any country is impossible without the use of modern information technologies. In the global economic space there is virtualization of the economy, its transformation into a digital format, change of forms of organization of economic relations, that is, there is a gradual transition to information civilization. In this regard, developed countries of the world are paying increasing attention to the development of the digital

economy.

Digitization of the economy is considered today as a model and strategy of the modern world innovative development of the countries. Intellectual resources, technologies and intangible production are key factors in building the digital economy. In general, digitization of the economy is changing the world and opening up new opportunities for its comprehensive development [1, p. 85].

At the same time, it should be noted that, in addition to the benefits, the latest technologies also lead to new challenges, as the digital economy involves changing the nature and structure of industry markets and their participants. Of the greatest concern are the number of issues related to job creation, the provision of an adequate level of confidentiality, security, socio-economic interaction and justice [2, p. 40].

Therefore, it is advisable to study the conceptual characteristics of the digital economy, as the global digital network is not only a new way, a toolkit for doing business and technology - it is a qualitatively new form of economic relations that functions in an integrated, separate way, transforming all other traditional sectors and sectors of economic activity and forms a fundamentally new international economic environment.

#### Analysis of recent research and publications.

The problems of digital economy development and transformation processes occurring in the world economy and in Ukraine under the influence of digitalization are given considerable attention by Ukrainian and foreign scientists, in particular: Bodrova D.V., Husyeva O.YU., Zhekalov H.I., Karcheva H.T., Kasyanenko D.I., Kolyadenko S.V., Kraus N.M., Kraus K.M., Krynytsya S.O., Kurhuzenkova L.A., Momont T.V., Ohorodnya D.V., Openko V.A., Pizhuk O.I., Putsenteylo P.R., Rudenko M.V., Saukh I.V., Tymoshenko Z.I., Ushkalenko I.M., Khanin I.H., Chmeruk H.H., Shymanska V.V., Shtets' T.F. and other. The works of these scientists have rather ambiguously covered the issues of digital transformation of the economy and digitization in general. However, despite the numerous scientific publications in the field of digitalisation of the economy, the issues of the impact of digital technologies on the development of national and global

economy remain insufficiently explored.

**Goals setting.** Research on the world experience of digital transformation of economy and on the basis of this identification of perspective directions of development of digital economy for Ukraine.

**Presentation of the main material of the research.** Ideas of the "digital economy" emerged in 1994 and were identified by Don Tapscott in his work "Digital Economy: Potential and Dangers in the Age of International Information Networks". According to him, the digital economy is an economy based on digital computer technology [3, p. 29].

Over time (in 2001), Thomas Messenburg identified three major components of this concept, in particular: supportive infrastructure (including hardware and software, telecommunications, networks, etc.); e-business (how business is conducted, any processes that an organization performs through computer networks); e-commerce [4, p. 107].

Today, however, the term "digital economy" does not have a clear definition in the literature. One of the main reasons for this is the lack of a clear and universal idea of what factors should be taken into account when measuring the digital economy. The rapidly changing nature of technology is also the reason of complicating the definition of the digital economy. Those technologies that businesses and consumers use to accomplish tasks or communication are relevant today, but may be outdated tomorrow. Ideally, defining a digital economy over time can change the nature of what it covers [5, p. 92-93]. So, let's try to generalize the interpretation of the category "digital economy" by Ukrainian and foreign scientists, as well as formulate our own definition of the concept of "digital economy" (Table 1).

Table 1

Approaches to interpreting the definition "digital economy"

№	Author (s), source	Treatment
1	Karcheva G.T. [6, p. 13]	The digital economy is regarded as an innovative dynamic economy based on the active introduction of innovations and information and communication technologies into all types of economic activity and life span of society, which allows to increase the efficiency and competitiveness of individual companies, the economy and the standard of living of the population.
2	Kolyadenko S.V. [4, p. 106-107]	By digital economy, the author understands the production, sales, and delivery of products through computer networks.
3	Kraus N.M. [7, p. 212]	The author emphasizes that the digital economy is based on digital computer technologies, and today it is increasingly intertwined with the traditional economy, making clear delineation more difficult.
4	Putsenteylo P.R.. [8]	By "digital economy", the author understands the result of the transformational effects of new general-purpose information and communication technologies that affect all sectors of the economy and social activity.
5	Tymoshenko Z.I., Kurhuzenkova L.A., Kasyanenko D.I. [9, p. 24]	Digital economy means a system of economic relations based on the use of digital information and communication technologies (DICT), where DICT means the technology of collecting, storing, processing, retrieving, transmitting and presenting data electronically.

Source: generalized by the author based on the processed literature

So, based on generalized interpretations, it can be noted that the concept of "digital economy" understands the focus on computer technology, modern information systems, which allows to increase productivity at enterprises and the standard of living of the population. Although modern Ukrainian and foreign scholars identify the digital economy with the traditional, it is a completely opposite concept, with almost no common features.

The main purpose of digitalization of the economy is to determine the restructuring of production, increase of flexibility and adaptation to changes of market conditions, which will provide increase of the state's competitiveness in the world of digital technologies [10, p. 62]. At the same time, according to Shtets T.F., the purpose of digitalization of the economy is the evolution, transition to a new level of technological and technological development of economic systems and development of industrial relations on the basis of active use and introduction of technical and technological, digital means of communication and technologies in order to ensure a new level. socio-economic development [11, p. 93].

An interesting phenomenon (in the transition phase) is digital transformation. In addition to their superficial understanding of how processes are transmitted to the Internet, as a representation of something in the web environment, there is a need to focus, for example, on creating special services that empower people, on new approaches to creating business processes using ICT, and Internet, new models of production and service, new models of management. Digital transformations are changing entire sectors of the

economy. Take for example e-commerce or online banking. They (at least not yet) did not completely dismantle the traditional forms, but "stripped" off the lion's share of activity and significantly influenced the existing structures (shops and banks), forced them to change, to be more sophisticated.

Digital transformation is not an automation in its current sense. They embrace automation (at a whole new level) and involve the creation of other forms of organization and models of operating processes based on ICT (digital technologies), which leads to the formation of new approaches in business. Examples include sharing and digital production (industry platforms) with direct access to the market. While digital transformations are mostly considered business-related (for reorganization, creation of new business models, optimization, performance management, product transformation and change in customer interaction), however, as the experience of developed and even many developing countries, they can well be applied in the study of national and world economy development [12, p. 42].

The process of digital transformation of the economy is based on the generalization of available practical experience and is formulated in the form of basic provisions, circumstances, requirements and practices that underlie it, that is, a set of generally recognized rules that serve as the foundation (a prerequisite) for the implementation of the above-mentioned process of life in the subjects management. The basic principles of digitization of economy and society are presented in fig. 1.

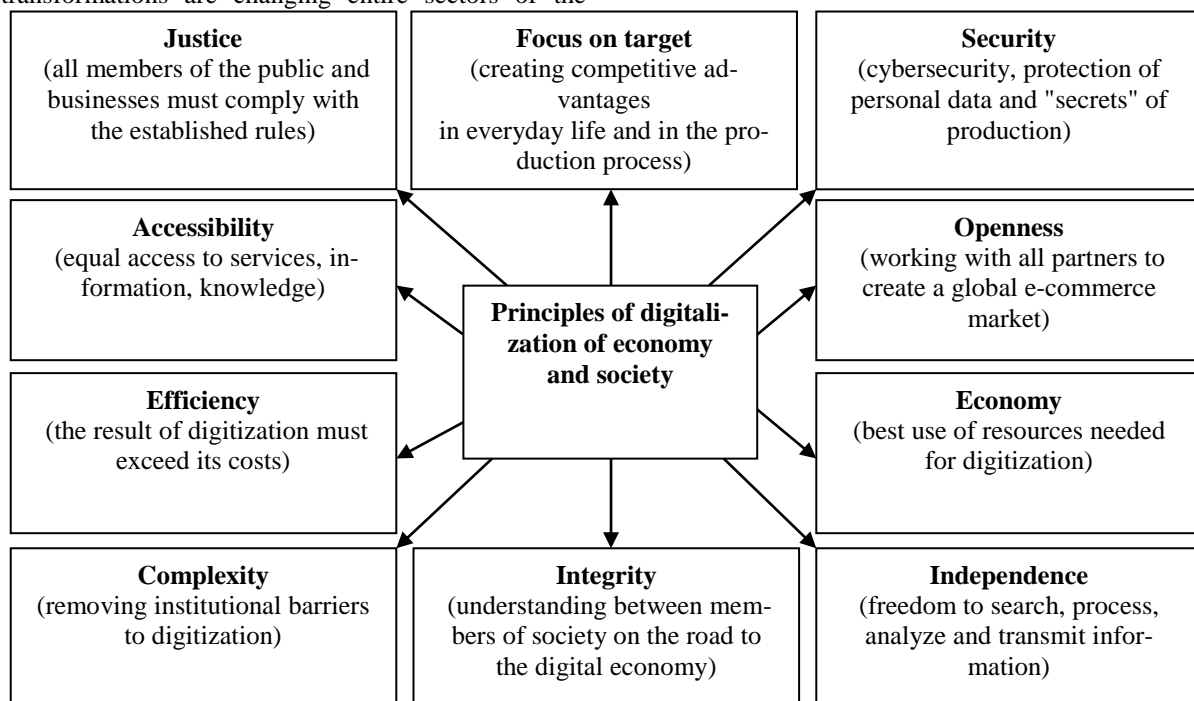


Fig. 1. Principles of digitalization of economy and society

Source: Based on data [10, p.64].

The importance of the digital economy is confirmed by the annual growth of the segment in the GDP of countries by almost 20%, in developed countries this figure is about 7%. The positives of a coun-

try's transition to a new economic model can be assessed by the experience of countries such as Sweden, Korea, Estonia, Ireland and Israel. The direct result of the transition to the e-economy is 20% of GDP over

five years. The UK is the model for the development of the digital economy - the share of the figure in the country's GDP is 12.4%, while the average for the G20 countries is 5.3% [13, p. 26].

In the leading countries of the world, the annual amount of investment in the digitalization of the economy already amounts to about one trillion dollars a year. By 2020, the economies of the leading countries will spend almost 15 trillion \$ USA on digitization. For example, in Germany, the digitalization of industry was defined in 2013 by the Digital Economy Transition Program. Its main purpose is to create industries exclusively on a digital basis for overcoming possible

economic crises of the 21st century.

One of the leaders of the European economy, carry out the process of digitization of both production and non-production sphere, in particular, fully robotic: production line of the Porsche factory, warehouses of trade company Amazon, unmanned minibus, exoskeletons, gloves ProGlove, Internet- banking, etc. [14, p. 164].

For the development of digital technologies and their penetration into the economy and public life, not only accessibility (both technological and price) to the Internet, but also its bandwidth (Table 2) is of great importance.

Table 2

Mobile and fixed bandwidth ratings of the world Internet Connection in 2018

Mobile Internet			Fixed broadband internet access		
Rating	Country	Internet Speed (download Mbps)	Rating	Country	Internet Speed (download Mbps)
1	Norway	63,13	1	Singapore	189,38
2	Qatar	63,00	2	Iceland	147,13
3	United Arab Emirates	56,05	3	Hong Kong (SAR)	139,58
4	Australia	53,51	4	Romania	107,42
5	Singapore	53,18	5	South Korea	103,51
6	Iceland	52,56	6	United States	100,07
7	Netherlands	52,37	7	Hungary	99,20
8	Canada	51,46	8	Luxembourg	96,96
9	Belgium	48,70	9	Switzerland	94,56
10	Luxembourg	48,64	10	Macau (SAR)	92,05
71	Brazil	19,67	43	Czech Republic	40,58
72	Tunisia	18,84	44	Russia	39,72
<b>73</b>	<b>Ukraine</b>	<b>18,38</b>	<b>45</b>	<b>Ukraine</b>	<b>37,47</b>
74	Malaysia	18,28	46	Austria	36,71
75	Russia	18,14	47	Italy	36,48
119	Ghana	6,55	125	Mozambique	6,36
120	Bosnia and Herzegovina	6,52	126	Lebanon	6,06
121	Afghanistan	5,35	127	Egypt	5,76
122	Libya	5,28	128	Venezuela	4,13

Source: Based on data [15].

There are already more than 9,000 fully automated industries in the United States. There are 870 industrial robots per 10 thousand manufacturing jobs in the USA, 400 in Japan, 270 in South Korea, 32 in China. In Ukraine, the same figure does not exceed 3. According to the European Commission, the digital economy is estimated at 2.3 trillion euro in the group of countries of the G-20 and makes about 8% of GDP. The share of the digital economy in the GDP of Ukraine in 2018 was 4% of GDP, which is 2-3 times lower than the US, European and Chinese indicators [14, p. 164].

A positive example of the digital transformation of the economy may also be the experience of developed countries such as Singapore, the United Kingdom, the United States, but even more instructive is

the experience of China, which uses a tipping point to catch up with and surpass leaders with one "digital leap". So, automation of dispatching control of taxi parks is automation, not "digitization," but Uber, which provides this service without owning a single machine, is an example of the digital economy. A computer at a bank's operator's desk is automation, and the way to issue a credit card and credit online without a visit to the bank, 24 hours 7 days a week, deciding on a loan based on an analysis of user actions online is already digital economy [16, p. 62].

According to the calculations of scientists, the countries that formed the "digital elite" of the world were Norway, Sweden, Switzerland, Denmark, Finland, Singapore, United Kingdom, South Korea, Hong Kong and the United States (Fig. 2).

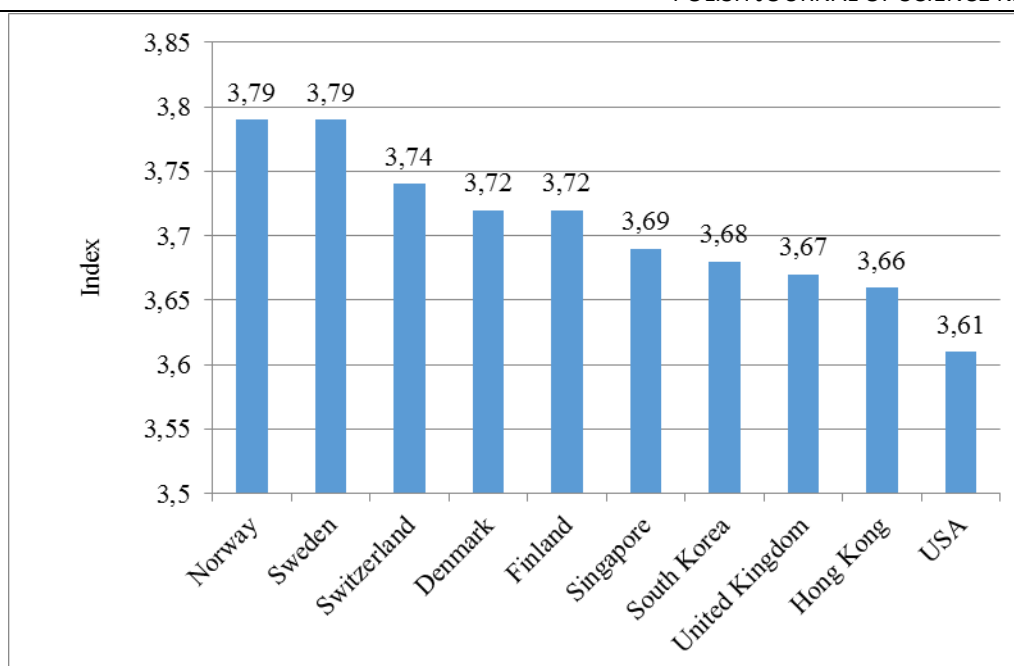


Fig. 2. Managing the Digital Economy Leadership Countries by Digital Evolution Index

Source: [15].

These countries are characterized by high levels and rapid growth of the digital economy. In particular, the US has created the Institute for Digital Production and Innovative Design, which is one of the largest centers of digital economy in the world today.

Within the EU 2020 strategy, one of the major development initiatives has been the Digital Single Market Strategy (Digital Agenda for Europe) program to support the digital economy. The program contains a list of 100 concrete actions for the development of the digital single market, trust and security of users of online transactions, enhancement of electronic skills, use of information technologies for solving social problems, stimulation of research and innovation [17, p. 57].

Institutional and legal registration of the development of the digital economy in Ukraine began in 2013, when the Cabinet of Ministers of Ukraine issued an order "On approval of the strategy of development of the information society in Ukraine". In June 2015, Ukraine joined the Declaration of the first meeting of the EU's Eastern Partnership Ministers on Digital Economy. The next step was the development of the conceptual framework for the Digital Agenda for 2020, which identified key tasks, priority areas, initiatives and projects for the digitization of Ukraine over the next three years. In 2017, the Law of Ukraine "On Electronic Trust Services" was adopted (in essence, it is a technical translation of the European Regulation on eIDAS Regulation).

On January 17, 2018, the government approved

the Concept for the Development of the Digital Economy and Society of Ukraine for 2018-2020 and approved a plan of measures for its implementation [18]. The main purpose of the document was the implementation of Digital Agenda 2020 (Digital Strategy) initiatives to remove barriers to Ukraine's digital transformation in the most promising areas. The strategy was based on stimulating the economy and attracting investment, overcoming digital inequalities, deepening cooperation with the EU in the digital sphere, and building up the country's innovation infrastructure and digital transformation. It is envisaged the development of digital infrastructure as a basis for the digital economy, digitization of the real sector through the creation of "digital workplace", "smart factories", etc., as well as basic spheres of life, development of digital literacy of the population [17, p. 57].

The digital economy strategy presented by the Ukrainian government envisages the transition from a resource-efficient economy to high-tech production with efficient processes and an increase in GDP growth through the introduction of ICT. It focuses on two aspects: first, the development of digital infrastructure, which is the broadband Internet, and second, the digitization of education and the promotion of digital transformations in the fields of education, medicine, ecology, cashless economics, infrastructure, transport, public security, etc.

The Digital Agenda for Ukraine 2020 offers two scenarios for the development of the digital economy (Fig. 3).



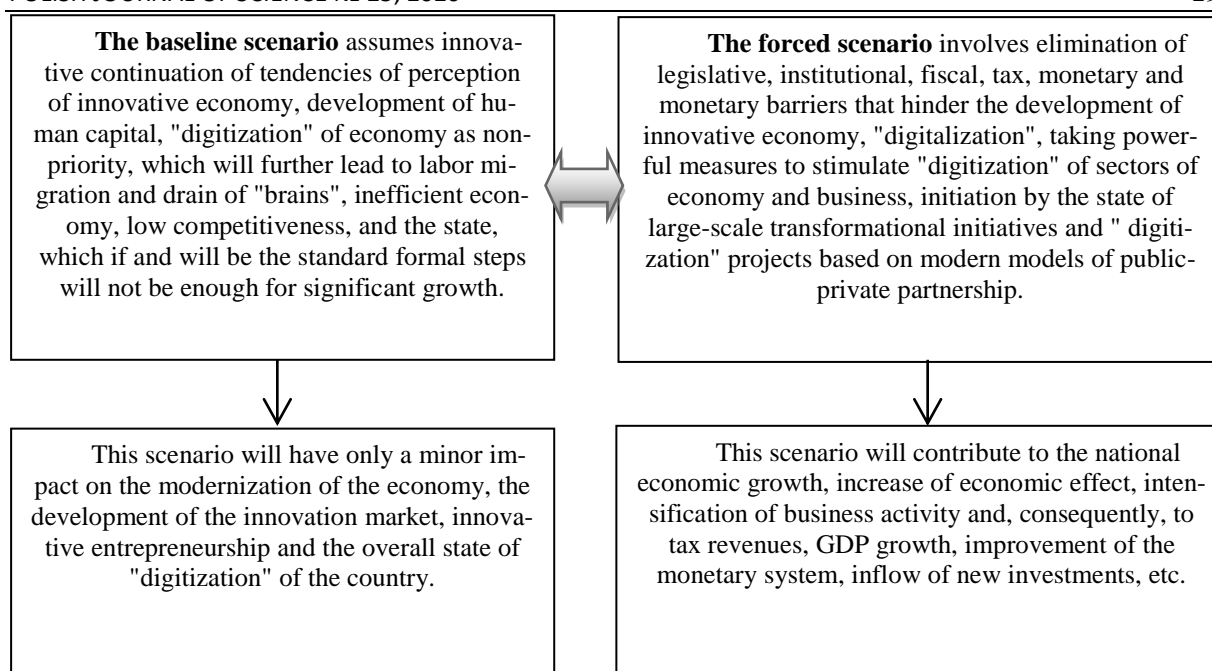


Fig. 3. Scenarios for development of the digital economy in Ukraine

Source: [19].

The concept is a short-term and initial tool for developing and stimulating the domestic consumption, introduction and production of digital technologies, contains a vision of the transformation of the economy from traditional (analog) to effective digital, identifies the first steps to implement appropriate incentives and create the conditions for digitalization in the real sector of the economy, education, medicine, ecology, etc., challenges and tools for digital infrastructure development, citizens' acquisition of digital competencies, and identifies critical areas of digitization projects and state [18].

Currently, 35% of the rural population, as well as 53% of schools and 99% of Ukrainian healthcare facilities do not have broadband Internet access, but can be improved through a range of public-private partnership projects that will achieve 80% broadband Internet coverage over the broadband network. several years as part of a new strategy [20, p. 56].

In 2018, Ukraine ranked 50th in the GCI rating. Ukraine has an affordable fixed and mobile broadband for its residents, and the penetration rate is below the world average. Positive is also the increase in the subscription to MBB, the speed of penetration of computer household appliances and smartphones. This reflects the growing demand for services, better and more connectivity. The EU has included Ukraine in its European Investment Plan for the Digital Economy. Investments in digital infrastructure will allow Ukraine to catch up with other European countries. In this regard, it is important to develop our fiber-optic networks and next-generation high-speed wireless applications [21].

According to the State Statistics Service of Ukraine, as of January 1, 2019 [22], 26 million people are using the Internet in Ukraine, that is, subscribers of mobile and wired connections. For comparison, in 2017 there were 23.6 million subscribers in Ukraine. In addition, for almost a year, Ukrainians have been able to use mobile 4G internet.

According to the State Statistics Service of Ukraine, as of January 1, 2019 [22], 26 million people are using the Internet in Ukraine, that is, subscribers of mobile and wired connections. For comparison, in 2017 there were 23.6 million subscribers in Ukraine. In addition, for almost a year, Ukrainians have been able to use mobile 4G internet. As of 2018, 7 out of 10 households are connected to high-speed Internet. 70-80% of the territory of Ukraine is covered by the Internet. And the annual amount of private investment in digital infrastructure is \$ 3 billion. [17, p. 57].

Regarding the basic principles of the use of digital technologies by business, the IT industry came in 2nd place in the Ukrainian export of services and accounts for 20% of the total value of services. For comparison, in the structure of exports to the UK, for example, more than 50% - exports of IT services. The information technology industry accounts for over 3% of Ukraine's GDP. According to the NBU, the IT industry has brought \$ 1.5 billion to the Ukrainian economy in the first half of 2018 export revenue. This is 29% more than in 2017. Employment in the industry has grown by 30,000 in 2018. According to the results of 2018, the revenue of the IT services market is \$ 3.6 billion, and the number of IT specialists is more than 120 thousand people with an average level of remuneration of \$ 1.8-2 thousand per month. According to the results of 2018, the revenue of the IT services market is \$ 3.6 billion, and the number of IT specialists is more than 120 thousand people with an average level of remuneration of \$ 1.8-2 thousand. month. In addition, in 2018, there were 12 Ukrainian and international companies with offices in Ukraine in the "TOP-500 Top IT Developers World Rankings", while in 2017 there were only 8 [17, p. 57-58].

Informatization of the society can increase the investment attractiveness of the state and economic potential. In particular, increasing the number of services that can be provided online reduces the level of corruption in the country, raises the level of openness

of the services provided and the transparency of the work of state structures. The benefits of the digital economy can also be attributed to lower prices for goods, their availability and wide variety, saving time and human resources as a workforce, and at the same time virtually "infinity" of goods electronically [17, p. 58].

At the same time, it is worth noting that studies by the Swiss IMD Business School have shown that Ukraine's digital competitiveness remains relatively low. The World Digital Competitiveness Ranking (IMD) measures the country's ability to implement and explore digital technologies that are transforming the practice, business models and society at large. It is based on 50 criteria, most of which are based on statistics and survey results. The first category includes information on the costs of research and development

in this area, the speed of broadband Internet and more. There are 63 places in the rating, which are assigned to the aggregate result, which was shown in 3 categories: "Knowledge" - countries are ranked in the order of decreasing quality of education, science; "Technology" - here, experts allocate countries according to the state of Internet and communication technologies, financial capital in the IT industry, as well as the regulatory environment; "Readiness for the future" - top positions are given to countries with a high level of readiness to use digital transformation. According to the report, over the year Ukraine has shown a slight improvement in the Knowledge (from 45 to 39) and Technology (from 62 to 61) categories. Indicators of the category "Readiness for the future" remained unchanged (Table 3) [23, p. 236-237].

Table 3

Ukraine's position on the digital competitiveness rating by major components (2014-2018)

Indicator/ Years	2014	2015	2016	2017	2018
Overall rating	50	59	59	60	58
Knowledge	29	40	44	45	39
Talent	46	55	58	57	55
Training & education	4	15	20	26	22
Scientific concentration	42	39	45	45	40
Technology	58	60	60	62	61
Regulatory framework	47	55	55	56	54
Capital	56	60	60	62	61
Technological framework	58	60	58	60	57
Future readiness	58	61	61	61	61
Future readiness	58	60	60	58	53
Business agility	42	58	59	56	53
IT integration	58	61	60	60	61

Source: [24].

However, the important role of digitization as a way of modernizing the Ukrainian economy does not preclude its major problems (Fig. 4).

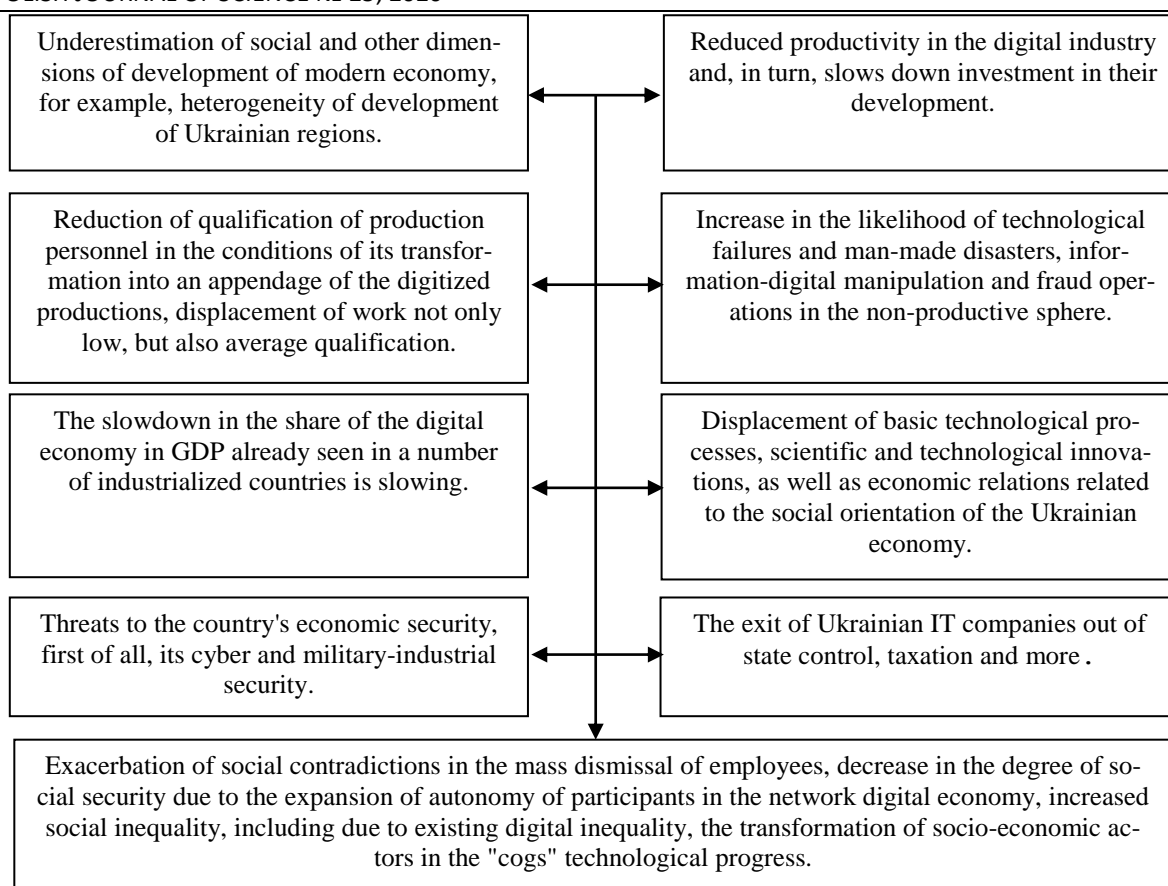


Fig. 4. The main problems of digital transformation of the Ukrainian economy

Source: generalized by the author

Thus, there is a real danger of the absolute transformation of the digital transformation process, which is not strong after the economic crises and political turmoil in the Ukrainian economy.

Digital technologies have become the basis for the creation of new products, values, properties, respectively, the basis of gaining competitive advantage in most markets. There is a digital transition from a kind of analog systems and processes of the industrial economy and the information society to the digital economy and the digital society.

**Conclusions.** Summarizing the results of the research, it should be noted that the digital economy forms a share in the GDP structure of the country and, at the same time, through the implementation of digitization processes, directly influences the functioning of all other traditional sectors and spheres of economic life of the country, transforming them from the consuming economy, into a resource-creating economy, delivering new quality of economic reproduction, added value, competitiveness and increasing the effectiveness of socio-economic development.

But in our view, to separate the digital economy from the real is meaningless, since the digital economy is not, in essence, an integral economy, but a part of electronic goods and services.

The analysis showed that the peculiarity of the development of the digital economy in Ukraine is that users and business are far ahead of the state and industry. Ukrainian small and medium-sized businesses are already operating fairly freely on the Internet and are

mainly using digital methods to promote their services. But the state and the big industry in Ukraine have fallen sharply behind. However, a well-balanced implementation of the Digital Economy Convention will allow Ukraine to significantly rise in international IT rankings and, accordingly, significantly improve key indicators of the country's economic development. But for the successful implementation of this concept it is necessary to implement the priority areas that will reduce the main obstacles to digitalization of the country.

The main areas of development of the digital economy in Ukraine include: bridging the digital divide in society through the development of solid digital infrastructures; implementation of a national plan for the development of broadband Internet access; digitization of the real economy by creating industrial parks, providing access to capital for innovative projects and training relevant professionals; implementation of major innovations in the business model, not in technology.

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## АНАЛИЗ ОСНОВНЫХ ПРОБЛЕМ РАЗВИТИЯ НАУКОЕМКОГО ПРОИЗВОДСТВА

*Новосельский Н.К.*

*Сибирский государственный университет науки и технологий имени академика М.Ф. Решетнева, студент*

*Латышенко Г.И.*

*Сибирский государственный университет науки и технологий имени академика М.Ф. Решетнева, доцент*

## ANALYSIS OF THE BASIC PROBLEMS OF DEVELOPMENT OF SCIENTIFIC PRODUCTION

*Novoselsky N.*

*Reshetnev Siberian State University of Science and Technology, student*

*Latyshenko G.*

*Reshetnev Siberian State University of Science and Technology, associate professor*

### Аннотация

Наукоемкие производства развиваются в технически сложной среде, которая требует больших объемов специфической информации и высококвалифицированного обслуживающего и управленческого персонала. Стратегическое управление предприятиями в этих условиях должно быть ориентировано на инновации. В современных экономических условиях инновации становятся ключевым фактором развития, основным средством обеспечения конкурентоспособности, а значит, и выживания отечественных предприятий.

### Abstract

High-tech industries are developing in a technically complex environment, which requires large amounts of specific information and highly qualified service and management personnel. The strategic management of enterprises in these conditions should be focused on innovation. In modern economic conditions, innovation is becoming a key factor in development, the main means of ensuring competitiveness, and hence the survival of domestic enterprises.

**Ключевые слова:** научные исследования и опытно-конструкторские работы (НИОКР), финансирование НИОКР, наукоемкие технологии.

**Keywords:** scientific research and development work (R&D), financing of R&D, high technology.

Актуальность проблемы разработки и расширения наукоемких технологий является значимой для поступательного развития экономики и общества, поскольку они способствуют и обеспечивают повышение жизненного уровня за счет интенсивных факторов: роста производительности труда, снижения относительного уровня потребления и повышения эффективности использования невозможных природных ресурсов.

На современном этапе для экономики важно не только развитие отдельных видов наукоемких технологий, но и создание наукоемких отраслей, формирование и непрерывное совершенствование рынка наукоемких технологий. Наукоемкий сектор экономики представляет собой часть экономической системы, включающую группы отраслей,

выпускающих продукцию, осуществляющих проведение работ и предоставление услуг с использованием последних достижений науки и техники [2].

Развитие научных исследований и опытно-конструкторских работ (НИОКР) влияет на изменение общественной, политической, экономической и технической сфер, что в свою очередь отражается на рынках, на товарах производителей, на характере конкурентной борьбы, что говорит о прямом воздействии НИОКР на развитие и благополучие страны.

Конкурентоспособность конкретной нации зависит от способности ее промышленности вводить новшества и модернизироваться. Развитые страны в настоящий момент находятся на стадии

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