

**G. Alibekova<sup>1</sup>, M. Bapiyeva<sup>2</sup>**<sup>1</sup>Institute of Economics of the Ministry of Education and Science of Kazakhstan, Almaty, Kazakhstan,<sup>2</sup>JSC “National Center of Science and Technology Evaluation”, Almaty, Kazakhstan.

E-mail: g\_alibekova@mail.ru, marinatb@mail.ru

## DIGITALIZATION PROCESSES AND THEIR IMPACT ON THE DEVELOPMENT OF THE REPUBLIC OF KAZAKHSTAN

**Abstract.** The global economy is on its way to digital transformation. The processes of the digital economy are actively continuing in all developed countries, affecting all spheres of life. Numerous studies show a significant dependence of the level of economic development on the indicators of access and use of information and communication technologies (ICT) by enterprises and the public. International organizations are involved in research on maximizing benefits for the growth of the value added of business and society and the potential to minimize losses from digitalization. The analysis of state and interstate program documents, the scientific literature and the most important indices of the development of information and communication technologies and digitalization allows generalizing the main factors of the development of the digital economy:

- high innovation activity in the economy as a fundamental factor determining the potential for generating new ICT solutions;
- infrastructure that provides access and use of ICT by the population of the country (citizens, companies, government services and departments);
- human potential ensuring production, on the one hand, and consumption (use) of new information and communication technologies, on the other hand.

**Keywords:** digitalization, digital economy, digital transformation, information and communication technologies, electronic commerce.

**Introduction.** Increasingly and deeper developing digitalization is one of the strongest trends that are changing the global economy today. The era of digitalization is slowly and surely, and at the same time inevitably, changing the face of the industry, the structure of economies, and the whole way of life and thinking.

The formation and functioning of the knowledge economy is directly dependent on the possibilities of intellectual activity, to obtain a variety of information (exchange), information services and products. The knowledge economy is characterized by an increase in information intensity, which forces ICT to be considered not only as a support, but also as an independent driver of such a model [1].

The World Economic Forum is exploring the possibilities of disclosing the benefits of digitalization, both for society as a whole and for enterprises. Thus, the aggregate value of digital transformation for the economy (both industry and society as a whole) of the UK will be more than 1 trillion. US dollars over the next decade. In particular, 335 billion dollars (13% of GDP in 2015) can bring in just six digital initiatives (e-commerce, related travel services, cross-sourcing, participatory driving, demand and supply platforms in real time, etc.). Four digital initiatives (e-commerce, travel related services, sharing economics, and participatory driving) can attract \$ 54 billion (20% of 2015 GDP) in Danish business and society over the next decade. Digital initiatives such as digital payments, e-commerce, related travel services, the economy of sharing, can bring 1.2 trillion. dollars (40% of 2015 GDP) for industry and society in India over the next decade [2].

For enterprises, digitalization is an opportunity to increase efficiency both by reducing costs and implementing new business models. According to a McKinsey study, companies investing in digital

solutions expect annual growth and cost efficiency increases of 5–10% or more over the next 3-5 years [3]. According to the researchers, the introduction of “end-to-end” digital technologies (technologies of artificial intelligence, robotics, the Internet of things, wireless communications, etc.) can increase labor productivity in companies by 40% [4]. It is obvious that the main effect for enterprises on the development of digitalization is associated precisely with changes in production processes that ensure the reduction of fixed cost [5], achieving higher overall organizational performance and creating competitive advantages equally important for both survival and growth [6]. At the same time, the return on investment in new digital technologies from industry leaders is 2.5 times higher than that of followers [7].

Different countries use different initiatives to develop digitalization and digital transformation of national economies and regions in general.

**Research methodology.** Used such universal research methods as observation, synthesis, analysis, analogy, induction, deduction, abstraction, comparison and analogy. A statistical analysis of the information and communications technology industry was carried out on the basis of data: the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan, the World Bank, the World Economic Forum on the Global Innovation Index and the Global Competitiveness Index.

**Results. Development of ICT industry in Kazakhstan.** A major contribution to the digitization of the economy is made by the telecommunications market and the IT market. The share of the ICT industry in Kazakhstan’s GDP in 2017 was 3.5%. The volumes of both markets are growing annually compared to previous periods. In previous years, the volume of the telecommunications market has always exceeded the volumes of the IT market, and the proportion of shares in the ICT industry has remained at about the same level. However, over the past 3 years, the proportion of shares began to rise in the direction of the IT market, whose share increased from 29% to 37%. The structure of the IT market should be divided into three large segments: equipment, licensed software and IT services. In recent years, the IT market in Kazakhstan has shown a significant growth and in 2017, the market volume in relation to 2016 was 123%. Served this is the increase in the volume of the IT equipment market and the increase in the IT services market. At the same time, the volume of licensed software decreased by 29% compared to last year.

The number of legal entities in the ICT sector is increasing annually, and by the end of 2017, the total number was 5,888 companies, of which 52% work in the area of “Computer programming, consulting and other related services”. In terms of the number of individual entrepreneurs in the ICT industry, the largest number of companies (41%) work in the same sphere, and a large share is occupied (27.5%) by individual entrepreneurs in the field of Repair of computers and communication equipment.

In accordance with the analysis of data on the development of the ICT sector in Kazakhstan, the costs of enterprises for information technology for 2010-2014. increased by 60% in 2014-2018 - almost 30% (table 1). At the same time, the ratio of these costs to GDP tended to decrease, which was due to the lagging rate of industry growth compared with GDP growth rates.

According to the data of 2017, the most expenses for ICT are carried out in the sectors “Wholesale and retail trade; repair of motor vehicles and motorcycles” - 31%, “Information and communications” - 13% and “Mining and quarrying” and “Manufacturing industry” - 8.8% each, “Professional, scientific and

Table 1 – The main indicators of development of the ICT sector of Kazakhstan, 2010-2018

Indicator	2010	2014	2018	Growth rate, %	
				2014/2010	2018/2014
The share of expenditure on information technology in GDP, %	0,68	0,61	0,52	89,7	85,2
The cost of information technology, total, million tenge	147 538,30	237 079,36	305 217,4	160,7	128,7
The share of employees in the field of Information and communication, %	1,35	1,88	1,91	139,2	101,6
The share of IT-specialists among the employed population, %	0,34	0,34	0,43*	100,0	126,5
*Data for 2017.					

technical activities” - 8.4% , “Construction” - 8.0%, “General Government Administration” - 7.2%, “Transport and Storage” - 5.6%, “Healthcare Activities” - 2.6%, “Electricity Supply, Gas Supply , steam and air conditioning” - 1.7%.

In general, the information technology sector is developing ambiguously: against the background of growth in production volumes in the IT sector, net exports are declining, and vice versa (figure 1, 2). This fact can be explained by the fact that the development of production of goods in the IT sector is closely associated with the import of components, raw materials and materials, which once again confirms the need to localize this sector of production within the country.

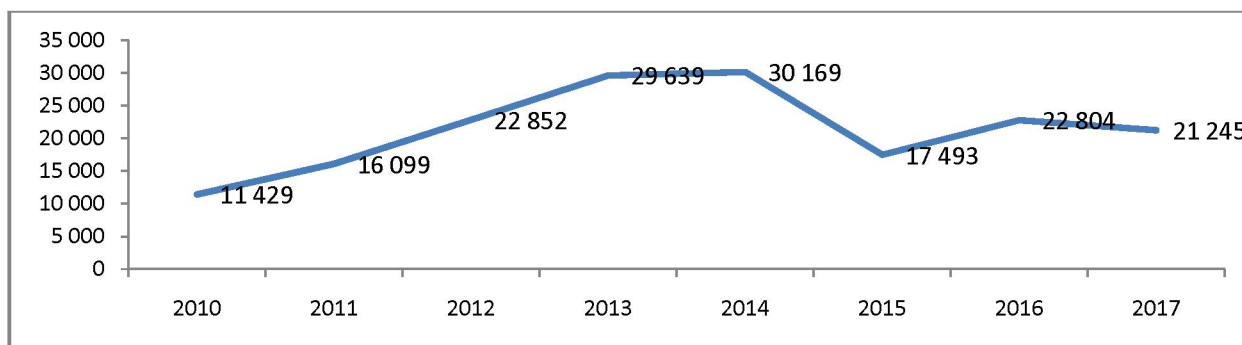


Figure 1 – The volume of industrial production (goods, services) in the ICT sector, million tenge

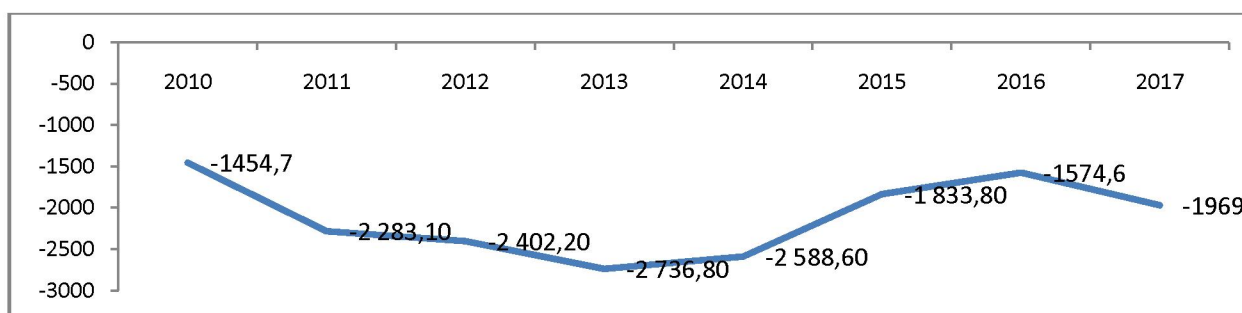


Figure 2 – Net exports of goods in the information and communications technology sector, million \$

Telecommunication equipment dominates both in the structure of exports (28.7%) and in the structure of imports (4.6%) according to 2017. However, the export volume of this product has a clear downward trend (2.5 times in 2013-2017 years). Analysis of changes in the structure of foreign trade leads to the conclusion about doubling the share of exports of ICT goods in foreign trade in the field of ICT (table 2).

Table 2 – Dynamics of export share in foreign trade turnover in the ICT industry of Kazakhstan for 2007-2017

Indicator	2007	2009	2011	2013	2015	2017
The volume of foreign trade in the ICT industry, mln. \$	1493,7	1547,2	2224,7	3055,6	2042,4	2133,0
Export share in foreign trade turnover,%	1,9	3,4	2,9	5,2	5,1	3,8

The total volumes of foreign trade in the ICT sector showed an increase until 2014, in 2015 there was a decline of 53%, associated with a general decline in exports and imports of the Republic of Kazakhstan [8].

*Electronic commerce.* As already noted, the enterprises of the industry “Wholesale and retail trade; repair of cars and motorcycles” ranked first in ICT costs (31%). This is due to the development of e-commerce in the field of trade. So, for 2013-2017, the share of e-commerce in the total volume of retail trade increased from 0.5% to 1.2%, the volume of sales of services via the Internet grew 3.7 times (table 3).

Today, the Internet is used by a huge number of people, the emergence and popularization of social networks have completely erased the age and state boundaries of the virtual communication of people [11]. According to Western researchers, by 2040, 95% of purchases will be made online. The experience of foreign countries shows that there is a huge potential for growth in this area. In the field of electronic

Table 3 – Volumes of the e-commerce market in Kazakhstan, 2013-2017

Indicator	2013	2014	2015	2016	2017
The volume of retail trade over the Internet, mln. tenge	28 046	41 263	50 920	78 501	106 918
The share of e-commerce in total retail sales, %	0,5	0,7	0,8	1	1,2
The volume of wholesale trade via the Internet, mln. tenge	52 988	50 818	65 656	67 741	87 249
The share of e-commerce in the total volume of wholesale trade, %	0,4	0,3	0,4	0,4	0,4
The volume of sales of services via the Internet, mln. tenge	71 256	73 488	155 732	226 440	264 523
<i>Note:</i> compiled based on [9, 10].					

commerce, China is leading with a share of 23.7% of national retail trade, the EU countries - 14.8%, the USA - 10.8%, and South Korea - 7.2%.

According to the Ministry of Digital Development, the defense and aerospace industry of the Republic of Kazakhstan, in 2018 the planned indicator of the share of e-commerce was fulfilled and amounted to 2.9%, in 2025 e-commerce will be 24% of retail sales. The number of online shoppers in 2018 amounted to 2.32 million people, by 2025 it could reach 15 million people. This opportunity is planned to be expanded using the transit potential of Kazakhstan between China and Europe [12]. At the same time, experts note the following shortcomings and barriers to the development of e-commerce in Kazakhstan [13]: weak government regulation, lack of competence and awareness, insufficient infrastructure development, cyber security problems, gaps in educational programs of universities.

For the digital transformation of the economy, first of all, recognition of the need for digitalization of socio-economic systems at the state level and the allocation of resources [14], in particular, the consistent development of innovative high-tech industries, the development of information and communication technology infrastructure [5], staffing of digitalization processes.

The international development indices are also based on the evaluation of these parameters. For example, the European Union, which developed the *International Digital Economy and Society Index* (I-DESI), assesses the level of development of the digital economy in countries based on five main factors: the spread of broadband access and communication quality, Internet use, human capital (as far as 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's *Network Readiness Index* measures the level of ICT development by three main groups of parameters: the availability of conditions for ICT development, the willingness of citizens, business and government agencies to use ICT, the level of ICT use in the public, commercial and public sectors. The *Information and Communication Technology Development Index* (ICT Development Index) is calculated according to the methodology of the International Telecommunication Union, a specialized UN agency that defines world ICT standards. The index is calculated on the basis of three groups of sub-indices: access to ICT, use of ICT, ICT skills.

Based on the criteria for digitalization of the economy, determined by these indices, Kazakhstan has developed its own directions for the development of digitalization. In 2013, the state program "Information Kazakhstan-2020" was approved. The goal of the Program is to create conditions for the transition to the information society. The objectives of the Program are: ensuring the effectiveness of the public administration system, ensuring the availability of information and communication infrastructure, creating an information environment for the socio-economic and cultural development of society, developing the national information space. As a result of the Program implementation, in the period from 2013 to 2017, the share of Internet users increased from 63.3% to 78.8%, the computer literacy rate of the population increased from 63.2% to 78.2%, the share of industrial workers who passed computer literacy training increased from 1.4% to 2.7%. However, the share of the ICT sector in GDP grew only slightly, from 3.5% to 3.6%. The share of expenditures on innovations in the field of ICT decreased 5 times (from 0.15% to 0.03%). The level of activity in the field of innovation in the ICT sector in the country decreased from 16.7% to 12.6% [15]. Nevertheless, according to the results of three years of implementation of the state program "Information Kazakhstan 2020", 70% of activities were completed, target indicators were exceeded by 40% [16].



The state program “Digital Kazakhstan”, approved in 2017, aims to consistently develop these processes and eliminate the barriers and gaps existing at this stage. The goal of the Program is to accelerate the development of the economy of the Republic of Kazakhstan and improve the quality of life of the population through the use of digital technologies in the medium term, as well as creating conditions for the transition of Kazakhstan's economy to a fundamentally new development trajectory ensuring the creation of a digital economy of the future in the long term. The program implementation period is 2018-2022. The five main areas of the Program implementation: Digitalization of economic sectors, Transition to a digital state, Implementation of the digital Silk Road, Development of human capital, Creation of an innovation ecosystem. The main objectives of the State Program “Digital Kazakhstan” are: growth of labor productivity in basic sectors of the economy, development of electronic commerce, creation of jobs through digitalization, increasing the volume of electronic public services provided, increasing the number of Internet users, increasing digital literacy of the population, improving Kazakhstan's position in the rating of the EIC GIC on the indicator “Ability to innovate”, an increase in the volume of attracted investments in start-ups, an increase in the Index times Itijah ICT.

Thus, the analysis of state and interstate program documents, scientific literature and the most important indices of the development of information and communication technologies and digitalization allows to summarize the main factors of the development of the digital economy:

- high innovation activity in the economy as a fundamental factor determining the potential for generating new ICT solutions;
- infrastructure that provides access and use of ICT by the population of the country (citizens, companies, government services and departments);
- human potential ensuring production, on the one hand, and consumption (use) of new information and communication technologies, on the other hand.

*ICT infrastructure development.* Ensuring ubiquitous access to ICT opportunities is one of the tasks that were set back in 2000 by the leaders of the G8 countries and should be addressed to achieve the Millennium Development Goals. At the jubilee session of the UN in 2015, the leaders of the countries again recognized and confirmed that “the spread of ICT can have a powerful positive impact as a tool for sustainable (world) development”. Since 2015, developed and developing countries are moving to the next stage of regulation and development of the digital environment, focused on improving the efficiency of ICT application and digitization of all aspects of the life of the state, business and society [17].

In addition to manpower with relevant analytical, computational and methodological skills, an ICT infrastructure with high bandwidth is also needed to comprehend information that is rapidly growing [18].

ICT infrastructure is a set of basic information services, computing systems, data storage and transmission systems, which is the basis for the operation of any information services [19]. Analysis of the level of ICT infrastructure development includes the following sub-indicators: the level of development of information and communication technologies, network readiness, the level of development of telephone communications, the level of development of the Internet, the level of development of e-government [20].

The relative efficiency of the ICT infrastructure is reflected partly in such indicators as: the number of Internet users, the Internet bandwidth, the number of fixed and mobile broadband subscribers to the Internet, mobile cellular communications. These indicators are monitored in the ICT implementation parameter of the Global Competitiveness Index (GIC).

A comparative analysis of these GIK indicators (in comparison with countries such as Turkey and Korea) shows Kazakhstan's leading position in comparison with Turkey in almost all parameters (figure 3). In turn, Korea leads in this group in all indicators, except for the indicator “Mobile cellular subscribers”, in which Kazakhstan's position is 2.5 times higher than Korea's and 5 times higher than Turkey's.

Comparative analysis of the level of ICT infrastructure development is also possible on the basis of the analysis of indicators of the Information and Communication Technologies sub-index of the Global Innovation Index (figure 4). So, despite the fact that Turkey is ahead of Kazakhstan by 24 points according to the rating in the GII, in terms of ICT development indicators, such as Access to ICT, Use of ICT, Government's Online Services, Kazakhstan is 15-33 points ahead.

This situation is particularly related to the fact that the government of Kazakhstan is doing a lot of work in terms of introducing digital technologies. This includes the indicators of programs adopted in the 90s and in the early 2000s for accelerated industrial-innovative development, the formation of an

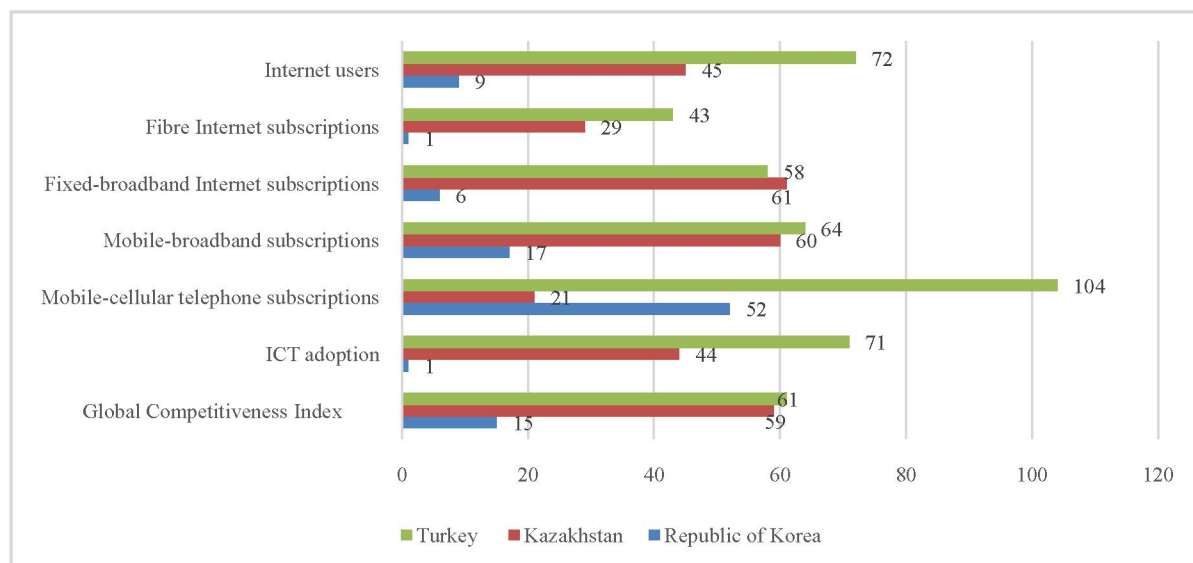


Figure 3 – Country rankings in the Global Competitiveness Index, ICT Implementation sub-index and its sub-indicators, 2017

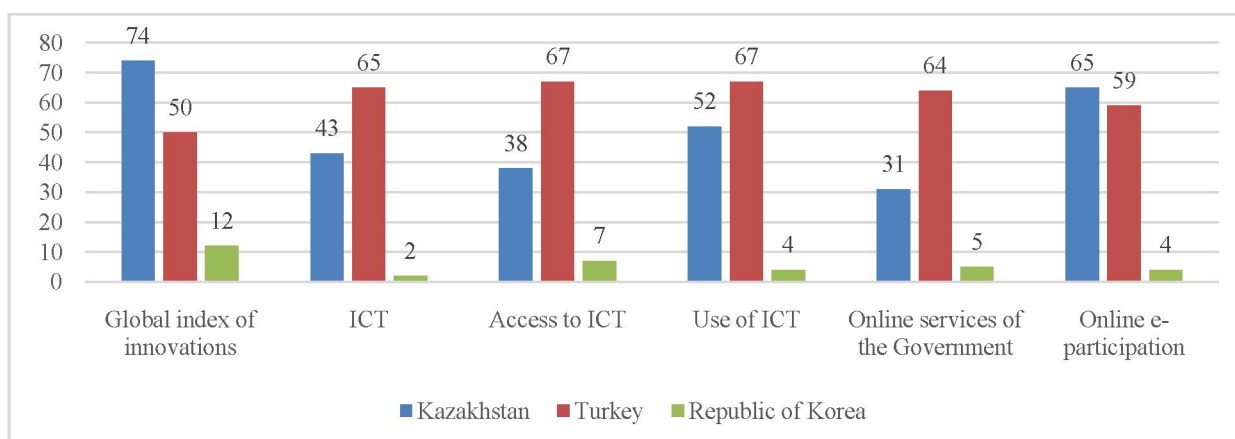


Figure 4 – Indicators of the Information and Communication Technologies sub-index of the Global Innovation Index for three countries, 2018

“e-government”, the creation of an FEZ, the launch of the Astana Hub international technology park, the opening of scientific innovation hub in Central Asia. The data of the Statistics Committee of the Republic of Kazakhstan on the transition to the information society, increasing the digital literacy of the population by age and by region show that there are positive developments in the field of digitalization. For example, the share of Internet users from 6 to 74 years has increased by almost 30% over the past 7 years [21].

However, the ICT sub-index in the GII of Kazakhstan has been steadily decreasing: over the past 5 years, the country has shifted by 20 positions, from 23rd to 43rd place, whereas, for example, Turkey has risen by 15 points (figure 5).

In terms of the ICT sub-index across Kazakhstan, there is a slight increase: from 65.76 to 67.13 (by 2%) over the period from 2013 to 2018. It is assumed that the decline in the position of Kazakhstan on this sub-index in the GII ranking was due to external factors. In Turkey, the growth of this indicator is significant and amounts to 190%, which naturally reflected in the increase of Turkey’s position by 15 points. The Republic of Korea lost one position, losing to the leadership of Great Britain.

The analysis shows that the loss of positions in this sub-index of both Kazakhstan and the Republic of Korea is due to the deterioration of the Online participation indicator (figure 6). Thus, the Electronic Participation Index for Kazakhstan decreased from 94.74 to 59.32 (by 37.4%), and for Korea - from 100 to 96.61 (by 3.5%).

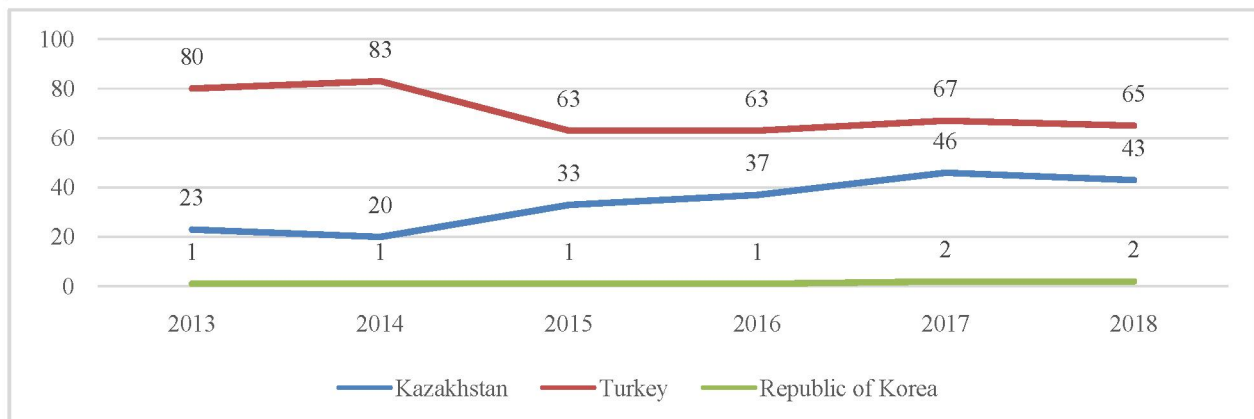


Figure 5 – Dynamics of ICT indicator in the ranking of the Global Innovation Index for 2013-2018

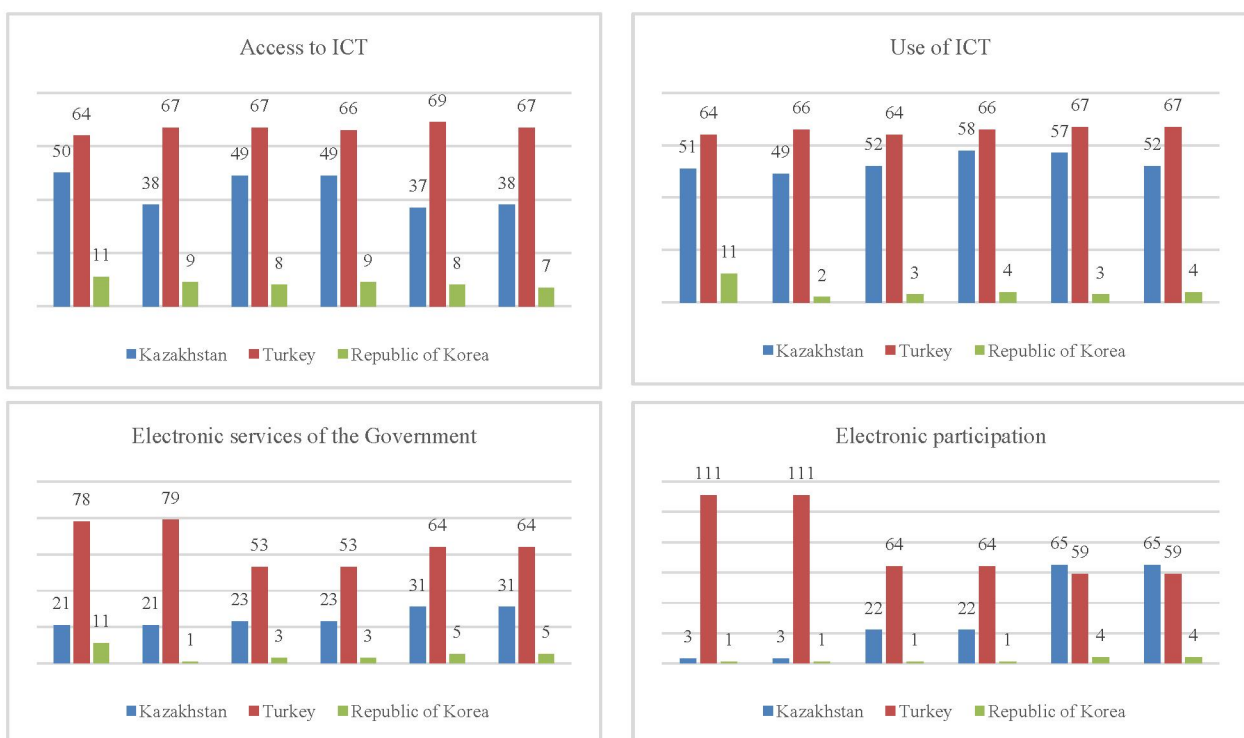


Figure 6 – Dynamics of ranking of indicators of the ICT subindex of the Global Innovation Index for three countries, 2013-2018

The e-Participation Index is a supplement to the e-Government Index, calculated by the UN. The index reflects the development of active communication services between citizens and the state. Promoting citizen participation is the cornerstone of socially inclusive governance. The goal of e-participation development initiatives should be to improve the access of citizens to information and public services, promoting participation in public decision-making that affects the well-being of society in general and individuals in particular.

Thus, ICT infrastructure is the basis for achieving the goal of reaching as many people as possible with digital technologies, that is, it is about providing universal, sustainable, ubiquitous and affordable access to ICT for all. The development of ICT infrastructure - the main technology platform that provides people and organizations with access to a wide range of ICT services and government services provided in electronic form, is one of the most important strategic directions for the development of the information society [22].

**Conclusion.** Although the digital economy is not an industry, it has begun to play a large role in the entire economy. In Kazakhstan, as well as in all developed and developing countries, the paramount importance is attached to the important and difficult task of transforming the economy, without which long-term development is impossible. The transition to digitalization of the economy involves complex changes both at the company level and at the state level, which requires joint efforts at all levels.

**Г. Алибекова<sup>1</sup>, М. Бапиева<sup>2</sup>**

<sup>1</sup>Қазақстан Республикасы білім және ғылым министрлігінің экономика институты, Алматы, Қазақстан,

<sup>2</sup>«Ұлттық мемлекеттік ғылыми-техникалық сараптама орталығы» АҚ, Алматы, Қазақстан.

### **ЦИФРЛАУ ПРОЦЕСТЕРІ ЖӘНЕ ОЛАРДЫҢ ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ЭКОНОМИКАСЫН ДАМУДАҒЫ ӘСЕРІ**

**Аннотация.** Жаһандық экономика цифрлық трансформацияға апарар жолда тұр. Цифрлық экономика процестері өмірдің барлық саласын орап, барлық дамыған елдерде белсенді жалғасып келеді. Көптеген зерттеулер экономикалық даму деңгейінің кәсіпорындар мен тұрғындардың ақпараттық-коммуникациялық технологияларға (АКТ) қолжiмдігі мен пайдалану көрсеткіштеріне елеулі түрде тәуелді екенін көрсетуде. Бизнес пен қоғамның қосымша құнын өсіру және цифрлаудан келетін ысыраптарды барынша азайту әлеуеті үшін, халықаралық ұйымдар барынша көп пайда табу туралы зерттеулерге тартылған. Мемлекеттік және мемлекетаралық программалық құжаттарды, ғылыми әдебиеттің және ақпараттық-коммуникациялық технологиялар мен цифрлаудың ең маңызды даму индекстерін талдау цифрлық экономиканың негізгі даму факторларын жинақтап қорытуға мүмкіндік береді:

- жаңа АКТ-шешімдерді тудыру әлеуетін негіздеуші болатын іргелі фактор ретінде экономикадағы жоғары инновациялық белсенділік;

- елдегі тұрғындардың (азаматтар, компаниялар, мемлекеттік қызметтер мен ведомстволар) АКТ-қа қолжетімін және пайдалануын қамтамасыз ететін инфрақұрылым;

- жаңа ақпараттық-коммуникациялық технологияларды, бір жағынан, өндіруді, екінші жағынан, тұтынуды (пайдалануды) қамтамасыз ететін адами әлеует.

**Түйін сөздер:** цифрлау, цифрлық экономика, цифрлық трансформация, ақпараттық-коммуникациялық технологиялар, электрондық сауда.

**Г. Алибекова<sup>1</sup>, М. Бапиева<sup>2</sup>**

<sup>1</sup>Институт экономики Министерства образования и науки Республики Казахстан, Алматы, Казахстан,

<sup>2</sup>АО «Национальный центр государственной научно-технической экспертизы», Алматы, Казахстан

### **ПРОЦЕССЫ ЦИФРОВИЗАЦИИ И ИХ ВЛИЯНИЕ НА РАЗВИТИЕ ЭКОНОМИКИ РЕСПУБЛИКИ КАЗАХСТАН**

**Аннотация.** Глобальная экономика находится на пути к цифровой трансформации. Процессы цифровой экономики активно продолжают во всех развитых странах, затрагивая все сферы жизни. Многочисленные исследования показывают существенную зависимость уровня экономического развития от показателей доступа и использования информационно-коммуникационных технологий (ИКТ) предприятиями и населением. Международные организации вовлечены в исследования об извлечении максимальных выгод для роста добавленной стоимости бизнеса и общества и потенциала минимизации потерь от цифровизации. Анализ государственных и межгосударственных программных документов, научной литературы и важнейших индексов развития информационно-коммуникационных технологий и цифровизации позволяет обобщить основные факторы развития цифровой экономики:

- высокая инновационная активность в экономике как фундаментальный фактор, обуславливающий потенциал генерации новых ИКТ-решений;

- инфраструктура, обеспечивающая доступ и использование ИКТ населением страны (гражданами, компаниями, государственными службами и ведомствами);

- человеческий потенциал, обеспечивающий производство, с одной стороны, и потребление (использование) новых информационно-коммуникационных технологий, с другой стороны.

**Ключевые слова:** цифровизация, цифровая экономика, цифровая трансформация, информационно-коммуникационные технологии, электронная торговля.



**Information about authors:**

Alibekova G., PhD, Institute of Economics of the Ministry of Education and Science of Kazakhstan, Almaty, Kazakhstan; g\_alibekova@mail.ru; <https://orcid.org/0000-0003-3498-7926>

Bapiyeva M., JSC "National Center of Science and Technology Evaluation", Almaty, Kazakhstan; marinatb@mail.ru; <https://orcid.org/0000-0001-7680-6674>

**REFERENCES**

- [1] Adamova Zeineb Osmanovna. Informazionno-kommunikazionnye tehnologii v postroenii infrastruktury ekonomiki znaniy // Teoria i praktika obshestvennogo razvitiya. 2016. № 4. URL: <https://cyberleninka.ru/article/n/informatsionno-kommunikatsionnye-tehnologii-v-postroenii-infrastruktury-ekonomiki-znaniy> (data obrasheniya: 17.05.2019).
- [2] <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-unlocking-digital-value-to-society-white-paper.pdf>
- [3] Catlin, T., Scanlan, J., Willmott, P., 2015. Raising your Digital Quotient. McKinsey Quarterly, June 2015. [online] Available at: <http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/raising-your-digital-quotient> [Accessed 6 September 2016].
- [4] WEF (2018a). Digital Transformation Initiative. Unlocking \$100 Trillion for Business and Society from Digital Transformation. Executive summary. P. 12. <<http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-executive-summary-20180510.pdf>> (data obrasheniya: 13.03.2019).
- [5] Melnik M.V., Salin V.N. Predposylki effektivnogo razvitiya zifrovoi ekonomiki // Uchet. Analiz. Audit. 2018. N 6. P. 6-16.
- [6] Peppard J., 2016. A Tool for Balancing Your Company's Digital Investments, Harvard Business Review. [online] Available at: <https://hbr.org/2016/10/a-tool-for-balancing-your-companys-digital-investments> [Accessed 10 April 2019]
- [7] [http://www3.weforum.org/docs/DTI\\_Maximizing\\_Return\\_Digital\\_WP.pdf](http://www3.weforum.org/docs/DTI_Maximizing_Return_Digital_WP.pdf)
- [8] Otchet «Razvitie sektora IKT v Respublike Kazakhstan na 2016 god». Versia 2.0. Astana, IKH Zerde.
- [9] Otchet po razvitiu otrasli informazionno-kommunikazionnyh tehnologii v Respublike Kazakhstan, 2019, AO NIH Zerde.
- [10] Otchet po otrasli informazionno-kommunikazionnyh tehnologii v Respublike Kazakhstan // <https://www.zerde.gov.kz/New%20Folder/Otchet%20IKT%20or%2007.03.2018.pdf>
- [11] Kushzhanov N.V., Balginova K.M., Maydangalieva Z.A., Satygaliyeva G.B., Mahammadli Dashqin. The digital Kazakhstan. The development of human resources in education // Bulletin of National academy of sciences of the Republic of Kazakhstan. 2018. Vol. 3, N 376. P. 82-94. <https://doi.org/10.32014/2018.2518-1467.31>
- [12] <https://strategy2050.kz/ru/news/53135/>
- [13] Otchet «Razvitie sektora IKT v Respublike Kazakhstan na 2016 god». Versia 2.0. Astana, IKH Zerde.
- [14] Elena G. Popkova, Yulia V. Ragulina, Aleksei V. Bogoviz, Industry 4.0: Industrial Revolution of the 21st Century. Studies in Systems, Decision and Control (Tom 169), Springer, 2018. - 253 p.
- [15] [http://stat.gov.kz/faces/homePage/homeProgramm.pokazateli?\\_afzLoop=8543507966518220#%40%3F\\_afzLoop%3D8543507966518220%26\\_adf.ctrl-state%3Dbdbw9yko\\_37](http://stat.gov.kz/faces/homePage/homeProgramm.pokazateli?_afzLoop=8543507966518220#%40%3F_afzLoop%3D8543507966518220%26_adf.ctrl-state%3Dbdbw9yko_37)
- [16] <https://strategy2050.kz/ru/news/53135/>
- [17] <http://www.iksmedia.ru/articles/5434122-IKTinfrastruktura-cifrovoj-ekonomik.html#ixzz5o12vXpz0>
- [18] Measuring the Information Society Report 2017. Vol. 1, International Telecommunication Union, Geneva Switzerland // [https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017\\_Volume1.pdf](https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2017/MISR2017_Volume1.pdf)
- [19] Sbrodova N.V., Masharova A.O. (2018) The assessment of the impact of the level of ICT infrastructure development on the standard of living of the region (on the example of Sverdlovsk region) // Rossiyskoe predprinimatelstvo. 19(5). P. 1501-1518. doi: 10.18334/rp.19.5.39049
- [20] [https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=33&cad=rja&uact=8&ved=2ahUKEwils-jSqKLIAhXNxcQBHWrvD5w4HhAWMAJ6BAGAEAI&url=http%3A%2F%2Fstgau.ru%2Fcompany%2Fpersonal%2Fuser%2F10637%2Ffiles%2Felement%2Fhistoryget%2F70880%2F%25D0%259F%25D0%2597%2520%25E2%2584%2596%25203.docx&usq=AOvVaw33C2SawCg\\_mwt4sKo7kfId](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=33&cad=rja&uact=8&ved=2ahUKEwils-jSqKLIAhXNxcQBHWrvD5w4HhAWMAJ6BAGAEAI&url=http%3A%2F%2Fstgau.ru%2Fcompany%2Fpersonal%2Fuser%2F10637%2Ffiles%2Felement%2Fhistoryget%2F70880%2F%25D0%259F%25D0%2597%2520%25E2%2584%2596%25203.docx&usq=AOvVaw33C2SawCg_mwt4sKo7kfId)
- [21] Beisenbayev Olzhas. Digitalizatsiya – prozess transformatsii kazhstanskogo obshestva // <https://strategy2050.kz/ru/news/53135/>
- [22] IKT – infrastruktura v stranah SNG.
- [23] Kassymova G.K., Tokar O.V., Tashcheva A.I., Slepukhina G.V., Gridneva S.V., Bazhenova N.G., Shpakovskaya E.Yu., Arpentieva M.R. Impact of stress on creative human resources and psychological counseling in crises // International journal of education and information technologies. 2019. Vol. 13. P. 26-32.
- [24] Stepanova G.A., Tashcheva A.I., Stepanova O.P., Menshikov P.V., Kassymova G.K., Arpentieva M.R., Tokar O.V. The problem of management and implementation of innovative models of network interaction in inclusive education of persons with disabilities // International journal of education and information technologies. ISSN 2074-1316. 2018. Vol. 12. P. 156-162.
- [25] Kassymova G.K., Stepanova G.A., Stepanova O.P., Menshikov P.V., Arpentieva M.R., Merezchnikov A.P., Kunakovskaya L.A. Self-development management in educational globalization // International journal of education and information technologies. ISSN 2074-1316. 2018. Vol. 12. P. 171-176.
- [26] Stepanova O.P., Gridneva S.V., Menshikov P.V., Kassymova G.K., Tokar O.V., Merezchnikov A.P., Arpentieva M.R. Value-motivational sphere and prospects of the deviant behavior // International journal of education and information technologies. ISSN 2074-1316. 2018. Vol. 12. P. 142-148.