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# Digital transformation of the socio-economic system: prospects for digitalization in society

## Transformación digital del sistema socioeconómico: perspectivas de digitalización en la sociedad

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### Contents



**ABSTRACT:**
The main trends of the socio-economic system transformation are discussed in the research. It has been found out that digitalization affects not only the country's economy, but also changes social relations. It has been shown that global digitalization reduces the digital divide between different population groups. In our research, we have identified the main digital differences at the international level and at the level of our country. We have demonstrated that free Internet access can be regarded as a factor increasing the vulnerability of the country and its dependence on global world trends.
**Keywords:** digitalization, globalization, the Internet, information and communication technologies, transformation of the socio-economic system.

**RESUMEN:**
Las principales tendencias de la transformación del sistema socioeconómico se discuten en la investigación. Se ha descubierto que la digitalización no sólo afecta a la economía del país, sino que también cambia las relaciones sociales. Se ha demostrado que la digitalización global reduce la brecha digital entre los diferentes grupos de población. En nuestra investigación, hemos identificado las principales diferencias digitales a nivel internacional y a nivel de nuestro país. Hemos demostrado que el acceso gratuito a Internet puede considerarse como un factor que aumenta la vulnerabilidad del país y su dependencia de las tendencias mundiales.
**Palabras clave**: digitalización, globalización, Internet, tecnologías de la información y la comunicación, transformación del sistema socioeconómico.

# 1. Introduction

Global digitalization has changed not only the economic, but also the social vision of the world. The digital era is determined by continuous flows of data containing information, knowledge, ideas and innovations. Having completed industrialization, developed countries are successfully digitalizing their economies. They are rapidly developing innovative technologies where artificial intelligence, automation and digital platforms prevail. Digitalization is traditionally regarded as a positive characteristic of society development. However, digitalization has penetrated so deeply into all spheres of public life that there is a question whether human rights to privacy and anonymity may be infringed (Antikainen et al., 2018).

At the current development stage, it is already possible to assess the advantages and disadvantages of digitalization, as well as to assert that it will be impossible to effectively manage the state and its economy without the active implementation of the latest developments in computer science, radio electronics, communications and telecommunications. Digitalization contributes to the reduction of poverty and the digital divide between people of all social groups and various social elevators.

The concepts of "digital technologies" and "digital economy" were introduced into the scientific dictionary due to the technological changes of the 21st century regarding the "merging" of telecommunication, information and communication technologies and innovations.

Currently, digital technologies are transforming the relations between economic actors in energy, construction, banking, transportation, retail trade, education, healthcare, the media and security.

The complexity of public institutions of development and relations, which are often based on modern digital technologies, causes an exponential increase in data flows and highlights the issue of the digital economy formation (Rachinger et al., 2018). It is the current processes that make it possible to put on the agenda the creation of a new economy type, in which the implementation of innovations in the economy and social life is accelerated by the production, processing, storage, transmission and the use of a growing data volume.

# 2. Literature review

Modern scientific literature defines digitalization as an integral component of the modern global economy which contributes to a more rational resource management (Antikainen et al., 2018), optimization of business management models (Rachinger et al., 2018) and structural changes (Heavin & Power, 2018). It also makes technological processes more complicated, accelerates innovation cycles (Latos et al., 2018) and improves supply chain management (Srai & Lorentz, 2019). Digitalization leads to the internationalization of industries and startups (Neubert, 2018), as well as the creation of production ecosystems (Alcácer & Cruz-Machado, 2019).

The European Foundation for the Improvement of Living and Working Conditions report summarizes that the introduction of digital technologies is characterized by unjustified optimism, inappropriate pessimism and a misunderstanding of processes (Eurofound, 2018). In general, digital economy is characterized by production flexibility, easy access to information, zero marginal cost and potentially serious consequences. These indicators can already be observed in advanced digital industries - the IT industry, the wider communications and leisure industries.

The EU countries regarded digitalization as the main driver of competitiveness, economic development and employment growth. As a result, this issue is addressed in a number of EU initiatives, in particular:

- Industrial policy for the globalisation era, Digital Agenda for Europe, the Innovation Union (New Digital Economy, 2011);

- The Entrepreneurship 2020 Action Plan (2013);

- The Small Business Act for Europe (2008) (OECD Digital Economy Papers, 2019);

- Adapting e-business policies in a changing environment: the lessons of the Go Digital initiative and the challenges ahead (2003) (The Infrastructure Needs of the Digital Economy, 2019).

In banking, the speed of digitalization is unprecedented. This implies revolutionary changes in information processing systems of banks, qualification requirements and financial services (Carbó-Valverde, 2017). There is a change in the banking system model, which makes it possible to reduce costs and increase the productivity of financial services. At the same time, digitalization in banking involves the accumulation of intangible capital, which is not always properly evaluated in the capital markets, thereby creating "bubbles", as well as significant problems related to confidentiality, regulation, control, supervision and the inability to ensure equal conditions for all participants of the banking market.

Digitalization is responsible for the fact that modern production is becoming individual. This means that product development is adapted for each client (Paritala et al., 2017). Production includes visualization, production modeling, ergonomic and human factor analysis, holistic approach to product and process design, as well as product design that is sensitive to process limitations and capabilities. Modern production (for example, chemical processing) is impossible without the analysis of data, network systems, artificial intelligence, the Internet of things (IoT), digitalization of business processes, as well as all characteristics of Industry 4.0 (Kockmann et al., 2018).

Digitalization is important for new industries. The development of solar energy contributed to the transition of a traditional analog electrical network to the digital operation mode (Taşaltin, 2019).

A model for the introduction of digital technologies has been developed for high-tech industries (for example, the pharmaceutical industry). However, digitalization of an individual industry is not possible, since digitalization is a complex process combining public procurement of medicines, control of production, supply to pharmacies and hospitals, drug inventory (Chircu et al., 2017). Digitalization of healthcare directly affects the commercialization of high technology in this area. A survey of pharmaceutical, medical and e-health companies in Finland showed that digitalization had a positive impact on commercialization, especially information search and management, various assessments and official actions, the creation of big data and performance standards. However, at the same time it threatened national security due to the possibility of external health care management, deliberate hacker attacks and data diddling (Gbadegeshin, 2019).

Digitalization has penetrated into the socio-cultural sphere. There are two development scenarios for the music industry in the digital age (Bourreau et al., 2008): getting profit through selling content, which requires direct or indirect protection of music files, or through (almost) free distribution of content and sale of additional goods or services. We can say that digitalization negatively affects the music, publishing and cinema industry in connection with piracy and ignoring copyright on books, music, radio, television and cinema (Waldfogel, 2017). On the other hand, digital technologies helped this sphere to reach new target groups. Thus, it expanded the audience of its consumers and reduced costs for introducing new products to the market of music, films, books and television. In addition, given the unpredictable nature of product quality, the growth of new products has led to a significant increase in product quality. Concerns that the consumer welfare would decrease due to the media have not been justified; the opposite scenario has been observed – consumers are ready to pay for the use of media channels.

Digitalization has significantly changed education. In developed countries, a typical school class includes all forms of e-learning and teaching (Mashhadi & Kargozari, 2011). Today, there is a transfer of skills and knowledge through a computer and a network. It means that the forms of presentation of educational material and the formation of skills have been completely changed. Digitalization of education leads to increased demand for education, regardless of age.

Teachers and students use a limited number of digital technologies mainly for assimilation tasks, and the education management system is regarded as the most useful tool (Bond et al., 2018).

Thus, summarizing scientific research, we can conclude that all areas of economic and social life are affected by digitalization.

A "patchwork" approach to the use of digital technologies will not help to obtain significant advantages for the economy and society. Therefore, there is a need for a comprehensive study taking into account domestic features that require systematization, generalization and development of scientific views on the national economy digitalization.

The purpose of our research is to systematize, generalize and develop scientific views on the digitalization of the economy and the social sphere within the framework of basic concepts, as well as to study socio-economic changes and determine their limits and restrictions.

# 3. Research methods

In our research, we used a deduction method to determine global trends in the digitalization of education, an institutional analysis to identify the objects of regulation of public life digitalization, information synthesis methods to indicate the penetration of digitalization in national economies, as well as analysis tools to outline the most common definitions of digitalization found in regulatory sources.

# 4. Research results

The indicators of deep digitalization of public life, the "digital leap" and the transition to a higher technological level of macro-system development (for example, states) can be:

- the ability to develop and implement digital technologies, as well as information and communication technologies, the availability of professional personnel;

- access to appropriate equipment, technologies, technology distribution among citizens and businesses. An additional indicator here is a gradual recovery of domestic demand for technology, market "success stories" in various spheres of life and the economy, the presence of local offices of technology manufacturers, and the distribution of high-tech equipment;

- a sufficient level of system integration of technological products and services: from design to integrated implementations of various technologies, software and hardware;

- creative culture and the ability to generate ideas, as evidenced by the country's position in the Global Innovation Index ranking (Eurofound, 2018).

It is necessary to stimulate domestic consumption markets, the introduction and production of digital technologies, as well as to develop the vision of economy transformation from the traditional type into the more efficient digital one. It is also important to identify priority steps to introduce appropriate incentives and create conditions for digitalization in the real economy sector, where citizens acquire digital competencies.

We believe that the most promising areas of digitalization are the following:

### *Bridging the digital divide through the development of digital infrastructures*

The main goal of the development of digital infrastructures is to ensure that all citizens (including socially disadvantaged population groups) regardless of their location or place of living can use digital opportunities without any technical, organizational and financial restrictions or difficulties (Carbó-Valverde, 2017). In order to bridge the digital divide and create the foundations of a digital economy, states should focus on the development of digital infrastructures, such as broadband fixed telecommunications infrastructure and mobile telecommunications infrastructure, digital television infrastructure, radio and technology infrastructure for the IoT projects, computing, virtualization and data storage (cloud and fog), cybersecurity infrastructure, specialized infrastructures. Soft digital infrastructures are still important for the digital economy development, in particular, identification infrastructure, open data infrastructure, blockchain technology infrastructure, electronic payment and transaction infrastructure, infrastructure of e-commerce and online interaction of business entities, government services infrastructure (e-government), life support infrastructure (medicine, education, public safety, transport, etc.).

Particular attention to ensure broadband Internet access should be given to rural areas. This will provide new opportunities to the regions (education of children, modern medical services, e-commerce) and transfer the advantages of the city to the village. The Internet creates new opportunities for rural communities in economic and social development. The implementation of integrated digitalization tools will bridge the digital divide in the areas remote from the centers of economic life and provide an additional impetus to the development and well-being of rural residents. The digitalization of villages will also support the development of agriculture and employment. It will reduce the migration of rural residents to cities.

### *The development of digital competencies*

The driving force of the digital economy is human capital – knowledge, talents, skills, abilities, experience and intelligence of people. In connection with the rapid introduction of digital technologies, the formation of digital skills of citizens is particularly important. Online and other technologies help citizens to more effectively get knowledge and skills in many fields (for example, learning languages, subjects, mastering professions). The number of jobs requiring ICT and digital literacy is rapidly increasing and the ability to use these technologies is becoming the main staffing requirement (Latos et al., 2018).

The creation of favorable conditions and the search for appropriate models of public-private partnership with operators of non-formal digital education and support for their regional development can contribute to the growth of private investment in this area. This will significantly expand the ability of citizens in cities and especially in rural areas to get the appropriate digital skills, occupations, etc.

One of the important tasks is updating the state classifier of occupations, that is, the development and approval of the list of digital occupations based on the actual requirements of the labor market and digital trends followed by the development of a program for their implementation in specialized educational institutions.

### *Implementation of the "digital workplace" concept*

In the digital economy, jobs are no longer tied to physical places. They become digital, virtual and mobile. This means that there is no need for a permanent employee at the workplace. The concept of "digital workplace" is becoming extremely popular in the business environment and is positively perceived by the vast majority of workers who like flexible working hours, the ability to work at home, on vacation or from any geographic location with the Internet access. A digital workplace also contributes to flexible performance of official duties by state employees, stimulates their cooperation and interaction, supports decentralized and mobility ecosystems, offers a choice of

technologies for work (Bourreau et al., 2008). The benefits of digital workplaces are reduced hardware and office space costs.

### *Digitalization of the real sector of the economy*

This is the main element of the digital economy and a determining growth factor of the economy as a whole, as well as the digital industry itself, in particular, as a technology manufacturer. In many sectors, digital technologies are the foundation of marketing and production strategies. Their transformative power changes traditional business models, production chains and processes leading to the emergence of new products and services, platforms and innovations. It is important to create conditions and appropriate information marketing and fiscal incentives in order to significantly transform enterprises, small and medium-sized businesses, as well as the industry. Digital technologies should be accessible both from the point of view of organizational and technological access to the corresponding digital infrastructures, and from the financial and economic point of view, that is, through the creation of tools that will encourage business digitalization. The result of such activities will be the modernization of the economy, its recovery and competitiveness.

### *Education*

The digitalization of education is implemented through:

- the creation of educational resources and digital platforms supporting interactive and multimedia content to be widely accessed by educational institutions and students, including through the use of tools to automate the basic processes of educational institutions;

- the development and implementation of innovative computer, multimedia and computer-oriented teaching aids and equipment for creating a digital learning environment (multimedia classes, STEM research centers, laboratories, inclusive classes, blended learning classes);

- providing broadband Internet access for pupils and students in all educational institutions;

- the development of a full-fledged distance form of education with the use of cognitive and multimedia technologies.

### *Healthcare*

The digitalization of medicine is a vital for the development of the sector and the effective provision of medical services. Digital medicine ensures the interaction between patients, medical workers and institutions using information and communication and digital technologies (Gbadegeshin, 2019). The transition of medical workflow to electronic format is one of the priorities of digital medicine. The development of a full-fledged digital medical platform is an important step towards the digitalization of medical and related services, as well as the interaction of operators in this field.

A digital medical platform is a dynamic set of systematically organized electronic data on the health status of an individual patient, which provides information exchange between departments, as well as confidentiality and security of information storage. The introduction of telesystems to provide remote medical services to citizens and support doctors in rural areas is still an important element of the digital medicine development.

Medicine is being transformed: periodic diagnostics is taking place online, the Internet of things allows using sensors to continuously monitor human health, the operators of medical and related services become participants in digital platforms. All this affects the quality, efficiency and functionality of the medical care system.

### *Tourism*

A modern tourist needs access to digital infrastructures: from telecommunication networks to non-cash payments. The need of tourists, especially young people, to travel and keep in touch with their business partners, relatives or friends is an important condition for choosing tourist routes. It has become one of the main drivers of digital transformations of world tourism. The development of fast and accessible Internet networks in transportation systems, along tourist routes, in nature reserves, at cultural sites, in leisure and recreation centers provides the full realization of the tourist attractiveness of the areas. Digital technologies help cities to fully use their tourism potential and create new opportunities for its growth (Heavin & Power, 2018).

Other important tourism digitalization initiatives are the creation of tourist websites with content localized to the needs of tourists; collection and analysis of statistics in real time using the Internet of Things technologies and large and open data; creation of virtual tours, 3D-modeling,

installation of webcams at tourist facilities, introduction of QR codes, RFID tags, non-cash payment system; implementation of loyalty programs and tourist electronic cards; creation of travel mobile applications (with route maps, audio guides, geolocation), electronic tickets at tourist sites and leisure facilities; digitalization of museums (electronic multilingual catalogs, virtual and augmented reality, audio guides and electronic guides).

### *E-democracy*

Digital technologies provide new opportunities to attract citizens to participate in social and political processes. Traditional democratic processes (offline) can be transferred into digital. The forms of the e-democracy development are e-parliament, e-voting, e-justice, e-mediation (pre-trial settlement of disputes), e-referendum, e-consultations, e-petitions, electronic political campaigns and polls. But the most important area is electronic voting. This is the simplest form of e-democracy, but its implementation brings a number of political and organizational challenges. In addition, it is this form that is gradually being introduced in various countries, thereby forming international practice.

*Providing voters with electronic means of voting is a matter of optimizing electoral technologies*

Voting via the Internet facilitates access to the procedure for a significantly large number of citizens, increases the overall efficiency of obtaining voting results and makes it possible to vote remotely (New Digital Economy, 2011). The creation of an electronic voting program will attract a larger number of citizens, especially young people, improve the representation and quality of elections, as well as reduce possible falsification of results.

### *Ecology and environmental protection*

Digital technologies have a significant potential to improve the environmental situation, reduce industrial emissions and facilitate the transition of real businesses to the principles of sustainable development.

The priority initiatives are:

- the creation of a national system of independent environmental monitoring and assessment of the natural ecosystems and the atmosphere;

- the creation of electronic registers of natural resources in order to provide information to state institutions and citizens during the discussion and decision-making on natural resources management, early prevention, quick response and recovery in case of emergency;

- the development of a state analytical system integrated into the European online Shared Ecology Infrastructure System (OECD Digital Economy Papers, 2019) in order to analyze short-term and long-term trends in biodiversity, environmental pollution, weather conditions and the development of unique ecosystems, as well as to plan joint measures to prevent negative changes;

-promoting the creation of digital mobile applications for environmental "patrolling" of natural resources with the possibility of notifying law enforcement authorities about illegal activities (pollution, poaching, logging, illegal landfills).

### *In-city life support*

The smart city concept is a model of the city using digital technologies to solve the current problems of the city, its sustainable development and comfortable life of citizens.

In order to implement the smart city concept and its scaling, a methodological base is required. The base includes:

- the development of a national road map for the digital transformation of cities as a basis for the formation of relevant urban road maps and support for urban digitalization projects;

-the creation of a national platform, which is a catalog of smart city solutions based on the experience of the European smart city platform (Kockmann et al., 2018). Thus, different cities will have equal possibilities of the design, development and implementation of relevant projects;

-the introduction of international standards for the smart city management (ISO-37120, ISO-37101);

- the targeted state support for the development of innovative ecosystems in cities and the involvement of citizens in the development of smart city solutions.

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# 5. Discussion

The development of national digital infrastructures should be monitored by the state. It is important to determine priority projects for large-scale digital transformations in such areas as public safety, education, healthcare, tourism, e-democracy, ecology and environmental protection, urban life, non-cash payments, harmonization with European and world scientific initiatives, public administration.

The list should be permanently supplemented by new areas, initiatives and projects. The implementation of projects in these areas will require managerial, organizational and financial resources from the state, business and society (Srai & Lorentz, 2019).

The integration of digital technologies in production processes or the digitalization of industry, is a priority of the state industrial policy. The state policy to stimulate the development of industry 4.0 should be implemented in three directions (Ozdogan et al., 2017):

• the creation of infrastructure of industry 4.0 - industrial parks, industry technology centers, etc .;

• the access to capital to create new innovative industries;

• the development of digital skills for training personnel capable of working with industry 4.0 technologies.

In order to use the potential of industry 4.0, it is important to introduce the following initiatives:

- a continuous analysis and research of industrial sectors in order to assess competitiveness and development prospects. This can be done by the involvement of research agencies, the definition of growth drivers, the organization of communication of results. The research results should be used to further plan and reduce the risks of potential investors (Neubert, 2018);

- the introduction of modern industry information technologies, or an educational program to transfer the best global practices of the IT sector to industrial sectors of the economy. Today, industrial sectors lag significantly behind the trends, technologies and capabilities of the digital market. The introduction of modern information technologies in industry will lead to the creation of joint competent groups – the representatives of digital IT industries, on the one hand, and the industry, on the other, focused on cooperation and the development of new products and services (Paritala et al., 2017);

-engineering clusters. Powerful developers in industrial engineering can dramatically affect industrial innovation, research and development, as well as export marketing (Heavin & Power, 2018). Food and processing industries, metallurgical engineering and agriculture are the most capacious for the widespread introduction of industrial engineering;

- industry “road maps” of digital transformations. The creation of “road maps” of digital transformations includes the search, development and implementation of initiatives to digitalize industrial sub-sectors. For many sectors, this is a plan to recover, increase competitiveness, and in some cases return to the real economic environment. The competitive advantages of the industry and production of individual countries should be based on the creation of high value added of goods and services, quality management of supply chains and efficient use of resources (The Infrastructure Needs of the Digital Economy, 2019).

# 6. Conclusions

Digitalization requires new forms of partnership and cooperation of various spheres at all levels of the economy and society:

- digitalization should provide every citizen with equal access to the services of information and knowledge provided on the basis of information, communication and digital technologies. The creation of digital infrastructures is the main factor of expanding citizens' access to the global information environment and knowledge. In 2011, the UN recognized free access to the Internet to be a fundamental human right – a digital right.

- Digitalization should be aimed at the creation of benefits in various spheres of life, which include improved quality of health and education services, creation of new jobs, development of entrepreneurship, agriculture and transport, protection of the environment and natural resources management.

- Digitalization should be carried out through the economic growth by increasing the efficiency, productivity and competitiveness of the use of digital technologies, which implies the digital transformation of economic sectors, areas of activity, as well as the acquisition of new competitive qualities and properties.

- Digitalization should contribute to the development of the information society and the media. Creating content in accordance with national or regional needs contributes to social, cultural and economic development, as well as strengthens the information society and democracy principles.

- Digitalization should be focused on international, European and regional cooperation. Conscious and full-fledged implementation of information, communication and digital technologies leads to the integration into global systems and infrastructures.

- Digitalization should be accompanied by increased public safety. Information security, cybersecurity, protection of personal data, privacy and rights of users, strengthening and protecting trust in cyberspace are the prerequisites for simultaneous digital development and corresponding prevention, elimination and high-quality management of associated risks.

- Digitalization as an object of focus and integrated public administration. The main objectives of the state towards digitalization are to correct the shortcomings of market mechanisms, overcome institutional and legislative barriers, attract relevant investments, stimulate the development of digital infrastructures, create needs for the use of digital technologies by the population and develop the corresponding digital competencies necessary for digital entrepreneurship.

The implementation of these projects is the basis for strengthening state competitiveness. However, simultaneous digitalization which is not controlled at the regulatory level, the lack of domestic software, hardware and development projects can affect national security. The most dangerous cross-border and political threats to the state's information security have been studied for a long time within the framework of the information war problem. Therefore, digitalization projects should be considered in the context of ensuring information security at various levels of public life.

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