

## Digital Transformation: Background, Trends, Risks, and Threats

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**Abstract.** The modern world economy is characterised by the use of digital technologies as one of the factors of economic growth. Digital transformation creates new opportunities for development, but at the same time there are risks and threats to conventional economies. Therefore, the study of digital transformation is becoming particularly relevant. The purpose of this study was to reveal the essence of the term “digital transformation”, highlight its advantages and disadvantages, and analyse the process of digitalisation of the economy of Ukraine. During theoretical exploration, the following methods of scientific cognition were used: analysis, synthesis, observation, generalisation, classification. Theoretical assumptions were tested using analytical materials. Based on the analysis, conclusions were drawn, and practical recommendations were developed. In theoretical research, the differences between the terms “digitalisation” and “digitisation” were investigated. The main prerequisites for the spread of digital technologies are highlighted: the development of the physical infrastructure of internet access in the world, the growth of the number of internet users; the development of e-commerce; the development of the country’s IT industry; the improvement of the national e-government system. It was established that the main obstacles to the digital transformation of Ukrainian society are factors formed in the political, economic, technological, and psychological spheres. The dynamics of indices used to assess the spread of digital technologies is analysed: the e-Participation Index and the e-Governance Development Index. It was established that recently there has been a positive trend in them. The main advantages of implementing digital technologies were systematised. At the state level, the positive impact is manifested in improving the quality of life of the population; the level of productivity of public labour; reducing the share of hard work; preserving health and extending human life expectancy; simplifying access to information. The positive impact of digital technologies on the business environment is manifested in reducing the cost of selling products, searching and processing information, making transactions, launching and promoting goods to the market, the duration of the business cycle; inventing innovative technologies and switching to the production of innovative products. The advantages for individuals are to reduce the cost of internet services and transactions, simplify access to educational, entertainment and information resources. The main risks and threats created by the digital transformation of society are described: technological, economic, political, social, legal, and personal. The practical significance of the results obtained lies in the possibility of identifying and neutralising risks and threats of digitalisation

**Keywords:** digital economy, digitalisation, risks of the economy digitalisation, e-Participation Index, e-Governance Development Index

### Introduction

The development of the country’s economy, its place in the global economic space, and its competitiveness depend on its technological development. Today, neither the availability of natural or financial resources, nor location or other advantages are the main factors of development. It is the ability to generate the latest technologies and access to them that determine the country’s place in the global economic space. The countries that are capable of generating the latest technologies (industrialised countries) are the richest and most influential. The ability to develop, introduce, and implement high-tech products is the basis for stimulating economic growth, the basis for ensuring the country’s economic independence and innovative security.

Modern society is increasingly dependent on technology. New technologies create opportunities in the economic, social, energy, medical, and other areas. The dependence of society on technology is also manifested in the fact that the main changes in the socio-political life of individual countries

are associated with changes in technological ways and their consequences. This state of affairs creates new opportunities and challenges for Ukraine.

The beginning of the 21<sup>st</sup> century was marked by the formation of a new model of social relations based on the use of digital technologies. If the right vector of further development is chosen promptly, the country will benefit – as a result of the introduction of technological and digital innovations, which will gradually develop, improve, and spread to all sectors of the economy. Under such conditions, the transition to a new model of economic development based on the use of digital technologies and intellectual human potential is almost the only opportunity for Ukraine to take its rightful place in the world economy. The specific feature of the modern transition to a new technological way is the rapid increase in digital gaps. This creates the danger of further falling behind the leading technologically and economically developed countries of the world.

#### Suggested Citation

**Article’s History:** Received: 25.03.2022 Revised: 23.04.2022 Accepted: 24.05.2022

Revak, I.O., & Gren, R.T. (2022). Digital transformation: Background, trends, risks, and threats. *Social and Legal Studios*, 5(2), 61-67.

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For Ukraine, supporting its technological level is a strategic purpose, since it is the basis for economic development, income growth, and ensuring economic independence and security. Therefore, to prevent social, economic, and political crises, it is critical to ensure digital transformation of the economy. For this, it is necessary to ensure the internal development of information and communication technologies and create a need for digital technologies among consumers. The issue of digital transformation is quite widely discussed at the state and regional levels, and at the levels of individual business entities, but there is still no unified approach to the essence of the term “digital transformation”. Bolton notes that “digital transformation marks a radical reinterpretation of how an organisation uses technology, people, and processes to fundamentally change business performance. Digital transformation is usually considered a set of state-of-the-art tools and processes used to solve business problems and satisfy customers” [1]. Digital transformation concerns not only the economic sphere. Digital technologies have penetrated into various spheres of society’s life: education, medicine, science, art, and governance. Digital transformation has covered all spheres of public life, changing existing business models, the way products are produced and sold, knowledge and training, communication and information transmission. The scale of “digital change” gives grounds to assert the digital transformation of society.

Digital transformation, like any transformation, poses many dangers. Firstly, the low level of innovation potential of the economy of Ukraine is concerning, along with the lack of need for Ukrainian enterprises to develop and implement digital technologies. Secondly, like any transformation, the digital transformation of society is associated with changes in established ties and the natural rejection of changes by certain segments of the population. Thirdly, the transition to a new technological way of life is associated with the “death” of existing business models, a decrease in the level of profitability of conventional industries and areas of activity.

*The purpose of this study was to substantiate the essence of the term “digital transformation” and the prerequisites for digitalisation of society, to identify the risks and threats arising as a result of the introduction of digital technologies in various spheres of society.*

### Literature Review

The spread of digital technologies and their impact on certain aspects of public life have been the subject of research by many scientists. Certain aspects of the spread of digital technologies, their introduction into various spheres of society’s life, and the formation of the “digital economy” were the subject of research by both Ukrainian and foreign scientists. S. Brennen and D. Kreiss [2] conducted a theoretical study of the term “digitalisation”, identified the features and formulated the differences between “digitisation” (the process of digitising analogue data into digital format) and “digitalisation” (the process of introducing digital technologies by various institutions, enterprises, the use of computer technologies). The authors noted that “digitalisation” is impossible without preliminary implementation of “digitisation”. Dividing digital transformation into two consecutive stages simplifies the understanding of digital transformation.

Based on the research of S. Brennen and D. Kreiss, R. Bukh and R. Heeks developed a model of the digital economy, which consists of three levels: digital sector (telecommunications,

software, computer technology production, information and telecommunications technologies); digital economy (IT sector, digital services, etc.); digitalised economy (network business, e-commerce, digital economy) [3].

V.P. Vyshnevskiy and S.I. Kniaziev [4] investigated the digital economy and potential opportunities for its development in Ukraine. The authors conducted a thorough investigation of digitalisation processes, their impact on economic development and assessed the transformational potential of digital transformation of the economy. Vyshnevskiy and Kniaziev define the properties of the information and communication technologies sector, legal and economic prerequisites for their development. The researchers revealed the problems of transition from traditional to digital business, identified the factors of influence of digitalisation processes on the final results of economic activity, and proposed principles for assessing the transformational potential of the digital economy.

O. Brechko justified the determinants of digital transformation of the national economy in the context of its balanced, competitive development. The author identified the prerequisites for digital transformation, including the following: development of the physical infrastructure of internet access; growth in the number of internet users; development of e-commerce; development of the country’s IT industry; improvement of the national e-government system [5]. Furthermore, Brechko outlined the main obstacles to digitalisation and highlighted the challenges and threats to the development of transformation processes.

In her research, O.I. Pizhuk revealed the conceptual foundations of Industry 4.0, which are implemented based on digital technologies. The author identified digital technologies as a determinant of economic transformation, developed a methodology for assessing the level of digital transformation and carried out a rating assessment of Ukraine using international indices of digital transformation of the economy. An essential achievement of the author is the formation of a vision for the successful implementation of the “breakthrough” strategy in the context of digital transformation of the economy of Ukraine, built using the tools of Goldratt’s constraint theory [6].

As for foreign researchers, their research is applied in nature. Thus, G.N. Kutsuri, S.S. Kamberdieva, V.K.H. Dede-gkaev et al. investigate the influence of digital technologies on the standard of living of people [7]. O. Fokina, S. Barinov consider digital technologies as a specific factor of economic growth [8]. The impact of digital technologies on business and innovation implementation, as well as the new opportunities they create for business, was the subject of research by P. Davies [9]. Agreeing with the opinion of A. Purnomo, T. Susanti, E. Rosyidah et al., the authors of this paper note that the positive impact of the economy digitalisation is obvious, but on the other hand, the risks and challenges of using the digital economy, threats to the development of a novel model of the economic sector are also inevitable [10].

Therefore, there is a relevant problem of investigating the key factors of digital transformation of society, its positive consequences and advantages arising as a result of digitalisation for the state, business entities, and each person, as well as identifying and systematising the risks and threats that digital transformation generates in various spheres – political, technological, economic, legal, and social. The problem of assessing the spread of digital technologies needs to be solved.

## Materials and Methods

Upon authoring this paper, general and special methods of scientific cognition were used to solve the tasks set. To cover the essence of the term “digital transformation”, the following methods of scientific cognition were used: analysis and synthesis, induction and deduction, abstraction, generalisation, modelling, analogy. The use of the observation method allowed highlighting the advantages of digitalisation of society, identifying risks and threats to economic security. Classification and systematisation methods were also used to identify threats to economic security. Upon evaluating the factual material, economic statistics methods were used, namely statistical observation, the grouping method, and the method of summarising indicators. Using the above methods, the collection of primary statistical material was organised, all the facts collected as a result of mass statistical observation were systematised, the interrelations and scales of the phenomena under study were revealed, and the regularities of their development were found. To summarise the obtained statistical data and visualise them, the graphical method was used to build diagrams and graphs.

## Results and Discussion

### *Results of theoretical intelligence*

Digital transformation is discussed by government officials at various levels and is the subject of research by scientists. Despite the relevance of digitalisation, there is still no unified approach to understanding the term “digital transformation”. Research on existing approaches has shown that with the evolution of digital technologies, the understanding of the term “digital transformation” has also changed. If at the initial stages “digital transformation” was identified with digitisation of data (transformation of data in conventional forms into digital ones), then with the spread of digital technologies, the meaning of this concept has considerably expanded. There are two approaches to understanding the essence of the term “digital transformation”.

According to the first approach, the digital transformation involves three stages:

- digitisation – the process of transition from analogue to digital waveform;
- digitalisation – the process of digitising economic relations and processes using digital technologies that provide innovative opportunities for creating value and generating income;
- digital transformation – an in-depth transformation of business processes, competencies, business models to fully use the capabilities of digital technologies and their impact on the activities of enterprises, their customers, and the state of markets [4, p. 37].

The second approach considers digital transformation as the implementation of two consecutive stages: digitisation and digitalisation. Notably, in some English-language scientific publications, the term “digitisation” and “digitalisation” are used interchangeably. However, the conducted etymological study showed that there is a fundamental difference between them. Digitisation – the process of conversion of analogue data (images, video, and text materials) into digital form; while digitalisation – introduction or increase in the use of digital and computer technologies by organisations in a particular industry, country, etc. [2].

Having considered both approaches, the authors of this study disagree with the proponents of the first approach

regarding the use of the term “digital transformation”. The authors believe that the use of this term in this sense is erroneous. The term “transformation” means a change, transformation of the type, form, essential properties, etc. of something [11]. Therefore, it is inappropriate to single out a separate stage – digital transformation – in the transformation process.

Presently, digital transformation is spreading to various sectors of the economy, social sphere, education, etc. The pace of the spread of digital technologies and their penetration into various spheres of human life are influenced by various factors, among which it is necessary to single out the growth in demand for innovative “digital products”, the transformation of the value system in society, the change in conventional business models and consumer service models; development of legislative support for the development of the digital economy.

The prerequisites for the spread of digital technologies include the development of the physical infrastructure of Internet access in the world, the growth of the number of Internet users; the development of e-commerce; the development of the country’s IT industry; the improvement of the national e-government system [5].

The main obstacles to the digital transformation of Ukrainian society are factors that have formed in its various spheres – political, economic, technological, psychological, etc. Digital transformation took place simultaneously with the formation of Ukrainian statehood, and therefore the digitisation took place in the absence of standards for the use of digital technologies, incomplete regulatory support for relations in this area, programmes to encourage the creation and use of digital technologies, and a lack of funds for national financial support for digitisation. A substantial obstacle to the spread of digital technologies is their high cost. In such a situation, the country is forced to buy foreign technologies and developments or encourage its own domestic scientific research. Both the first and second options require substantial financial investments and time to implement them.

Technological factors also hinder the introduction of digital technologies in the production sector, namely: underdevelopment of digital infrastructure, slow pace of spread of high-quality Internet coverage, low level of protection of digital technologies from external interference, lack of developments that would consider the technological features of each industry, dependence on developments of foreign countries. An important tool for the spread of digital technologies is the Internet network. To assess a country’s readiness for digital transformation, the Network Readiness Index is used – a comprehensive indicator that characterises the level of development of information and communication technologies and the network economy in countries around the world. Based on the results of the assessment of this indicator in 2020, Ukraine ranked 64th in the world with a value of 49.43 [12].

Personal and psychological obstacles also arise on the way to digitalisation: unwillingness to change the form of work, study, constantly improve skills, lack of understanding of the digital transformation and their advantages.

### *Analysis of the digital economy development*

The development of the digital economy in Ukraine is proceeding at a slow pace, as evidenced by the low share of GDP produced in this area. The share of the digital economy

in Ukraine is only 3% (only 2.6 billion USD). In the IMF's digital competitiveness rating based on the results of 2019, Ukraine ranked 60<sup>th</sup> among 63 countries in Europe, the Middle East, and Africa [13]. At the international level, two indicators are used to characterise the level of digital technology spread – the e-Participation Index and the e-Governance Development Index. The e-Governance Development Index (EGDI) is used to assess the readiness and capacity of the national

administration to use information and communication technologies. The EGDI index is a complex indicator that combines three sub-indices – online services, telecommunications infrastructure, and human capital. It is used to measure the readiness of governments to use information and communication technologies to provide high-quality information and public services to the population, businesses and apply them in the work of the authorities themselves [14].

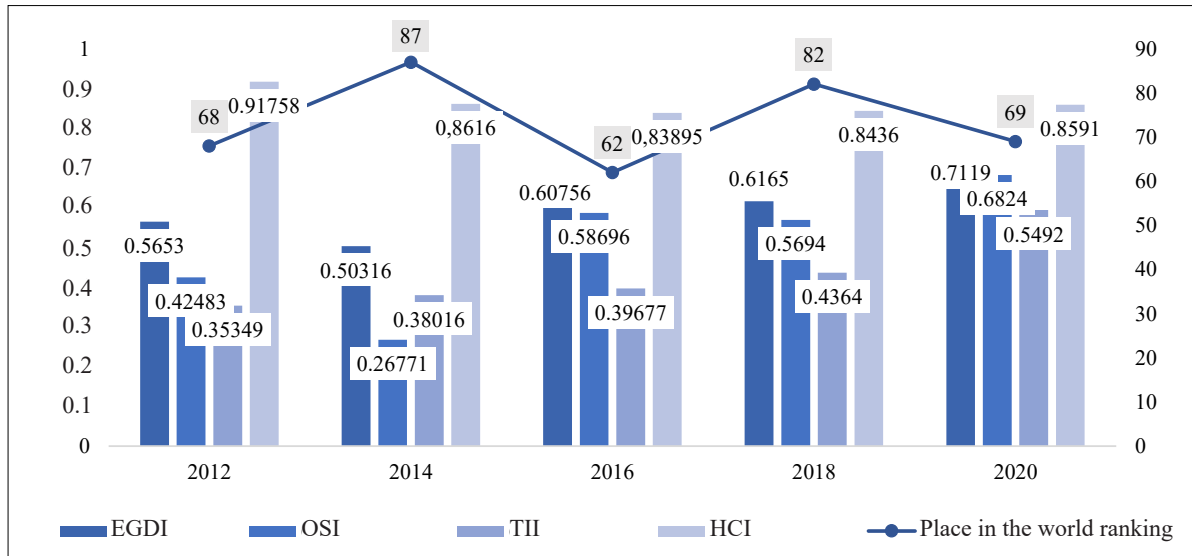


Figure 1. The EDGI of Ukraine and place in the world ranking during 2012-2020

Source: compiled by the author based on [15]

The EGDI is based on three sub-indices:

- OSI (*Online Service Index*) – calculated by UNDESA;
- TII (*Telecommunication Infrastructure Index*) – calculated by the ITU;
- HCI (*Human Capital Index*) – calculated by UNESCO together with UNDP [16].

Even though the value of the EDGI is growing annually, Ukraine's place in the world ranking is low. According to the results of 2020, Germany is the leader in the introduction of information and communication technologies in administrative activities, with an index value of 0.9758. Among Ukraine's closest neighbours, the Republic of Poland has the highest index value – 0.8531.

Unlike the EDGI, the e-Participation Index (EPI) focuses on expanding the provision of interactive electronic

services to the population, which is used by the UN to better review the problem. The EPI includes three components that reflect the completeness of the implementation of individual factors of electronic participation:

- electronic (e-)information – a component that makes provision for the involvement of citizens by providing them with government information with or without the right of access to information;
- electronic (e-)consulting – involvement of citizens in the form of their contributions to the discussion of national policy and services;
- electronic (e-)decision-making – expanding the rights and opportunities of citizens by jointly designing options for political decisions, products, services, and conditions for their provision [14].

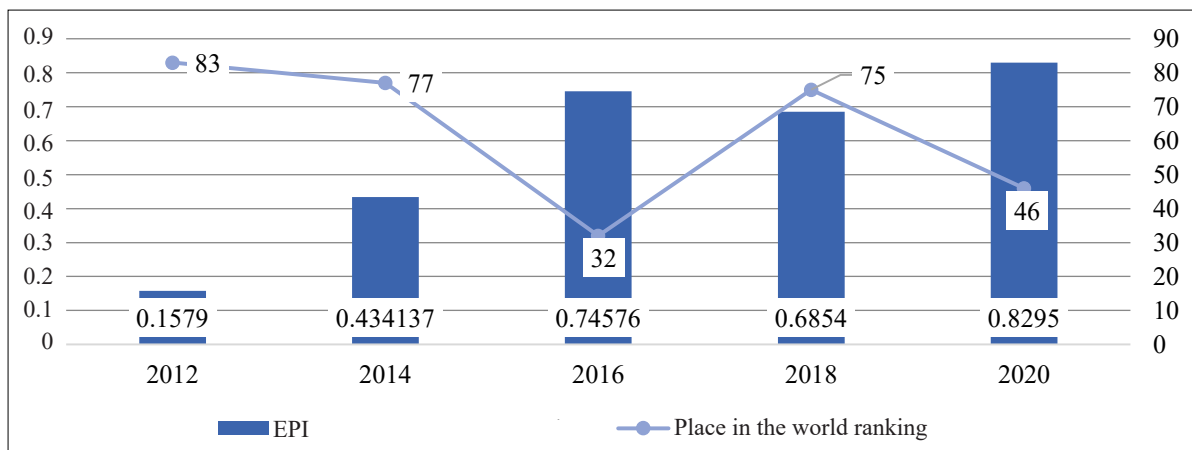


Figure 2. The EPI and Ukraine's place in the world ranking during 2012-2020

Source: compiled by the authors based on [15; 17]

There is substantial progress towards digitalisation of the public sphere and the provision of public services to the population. Thus, in 2020, Ukraine took 46<sup>th</sup> place in the world ranking, which is 29 positions higher than in 2018. The leaders of this rating are Estonia, South Korea, the United States, Japan, and New Zealand. The outlined trends in changes in the EPI allow hoping for Ukraine's ascent to the top 20 countries of the rating in 2022.

### ***Advantages and disadvantages of society digitalisation***

The spread of digital technologies creates substantial benefits for the state, the business environment, and the population. At the state level, a positive impact is manifested in improving the quality of life of the population; the level of productivity of public labour [18]. Robotisation and automation of production processes reduce the share of hard work of a person, which contributes to the preservation of their health and increases life expectancy. The prevalence of information technologies simplifies access to information, increases people's awareness, and ensures the availability of goods and services.

Digital technologies have also positively affected the business environment. As the "Global Digital IQ 2020" study showed, 5% of the surveyed leading enterprises noted that their position is primarily related to the implementation of digital technologies. 76% of the leading companies receive a considerable benefit from the implementation of digital technologies, and another 17% of respondents expect a prominent increase in profits in the next 3 years [14]. Digitalisation of business helps reduce the cost of selling products, the cost of searching and processing information, making transactions, launching and promoting goods to the market, etc., the duration of the business cycle; the invention of novel technologies and the transition to the production of innovative products aimed at developing technological intelligence.

Everyone also gets tangible benefits from digitalisation. The spread of digital technologies reduces the cost of internet services and transactions, simplifies access to educational, entertainment, and information resources, reduces barriers between consumers and producers of products, creates new areas of employment and new types of professions [19].

However, apart from the obvious advantages, digital transformation (like any transformation) creates risks and threats. Given the nature of the arising risks and threats, they can be divided into two groups – technological threats (related to digital technology itself) and threats arising from the institutional transformation of society.

The essence of technological risks lies in the very nature of digital technologies, which are based on fundamentally novel approaches and resources. Digitalisation involves the introduction of digital technologies into the economic process, radically changing the way products are produced, promoted, and sold. In the "age of digital technologies", Internet of Things technologies, *Big Data* technology, artificial intelligence, brain networks, 3D printing, and augmented reality come to the fore.

Digital technologies are at the stage of active development, and therefore errors, failures, and unauthorised interventions often occur. However, it is not these mistakes that create the main risks. At the same time, Ukrainian enterprises do not have the technological and financial capacity to develop and implement their own digital technologies, while the lion's share of digital technologies is borrowed.

The use of borrowed technologies creates many risks for the Ukrainian economy, and considering the specifics of digital technologies, for the country as a whole:

- dependence on the policies of leading companies in the field of information and communication technologies;
- constant development of technologies contributes to the occurrence of a significant number of errors and shortcomings;
- ability to monitor the activities and data of clients by development companies;
- access to information databases, which contributes to the commission of "industrial espionage", cybercrime, fraudulent attacks, penetration into state information systems.

Another group of risks that digital transformation creates is the risks that arise in any transformation of society:

- destruction of established business models, lack of qualified personnel capable of working according to new algorithms;
- monopolisation of markets by multinational corporations that capable of financing the introduction of the latest digital technologies;
- automation and robotisation of production processes contribute to the release of jobs and an increase in the unemployment rate, which increases the burden on the state;
- digital technologies penetrate a human's personal space, use data, and analyse behaviour that violates established norms of identity protection;
- existing regulations do not govern the entire range of relations arising in a digital society. This contributes to an increase in the number of abuses and scams using digital technologies.

### **Conclusions**

The research conducted in this paper is aimed at identifying the positive and negative consequences of digital transformation of society. While the vast majority of researchers focus on the benefits of digitalisation and its impact on economic development, the authors of this paper identified the risks and threats to economic security arising as a result of digital transformation. Such identification of risks and threats allows not only reducing the adverse impact on the economy, but also improving digital technologies themselves and preparing society for their implementation. The study allowed formulating the following conclusions:

- the spread of digital technologies has become a defining feature of the 21<sup>st</sup> century. Digital technologies have penetrated into various spheres of society's life, which allowed introducing the phrase "digital transformation of society" into discourse;
- the digitalisation is characterised by its global scale. To retain competitiveness and relevance, the state should support the spread of digital technologies. The main obstacles to digital transformation are the lack of domestic developments, underdevelopment of digital infrastructure, low level of protection of digital technologies from external interference, lack of state support;
- the spread of digital technologies creates many advantages for the state, business, and every individual. The main advantages include cheaper transactions, the ability to bring the buyer and seller closer together, free access to educational and cultural services, and reduction of hard human labour;
- digital transformation (like any other transformation) creates many risks and threats in various spheres of society, which can be grouped into two groups: technological threats and threats arising as a result of the institutional transformation

of society. To demonstrate all the benefits of developing the digital economy and minimise the risks created by it, it is necessary to ensure a balanced development of digital technologies, which will be the subject of further research.

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## Цифрова трансформація: передумови, тенденції, ризики та загрози

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**Анотація.** Сучасна світова економіка характеризується використанням цифрових технологій як одного із чинників економічного зростання. Цифрова трансформація створює нові можливості для розвитку, але водночас виникають ризики та загрози для традиційних економік. Тому дослідження цифрової трансформації набуває особливої актуальності. Метою статті є розкриття сутності поняття «цифрова трансформація», виокремлення її переваг та недоліків, проведення аналізу процесу цифровізації української економіки. У процесі здійснення теоретичної розвідки використано такі методи наукового пізнання: аналіз, синтез, спостереження, узагальнення, класифікацію. Теоретичні припущення перевірялись із використанням аналітичних матеріалів. На основі проведеного аналізу зроблено висновки та розроблено практичні рекомендації. Проведено дослідження відмінностей між поняттями «диджиталізація» та «диджитизація». Виокремлено основні передумови поширення цифрових технологій: розвиток фізичної інфраструктури доступу до інтернету у світі, зростання кількості користувачів мережі «Інтернет»; розвиток електронної комерції; розвиток ІТ-галузі країни; вдосконалення національної системи електронного уряду. Встановлено, що основними перепонами на шляху цифрової трансформації українського суспільства є чинники, сформовані у політичній, економічній, технологічній, психологічній сферах. Проаналізовано динаміку індексів, за допомогою яких оцінюють поширення цифрових технологій: Індекс електронної участі та Індекс розвитку електронного урядування. Встановлено, що упродовж останніх років спостерігається їхня позитивна динаміка. Систематизовано основні переваги впровадження цифрових технологій. На державному рівні позитивний вплив проявляється у підвищенні якості життя населення; рівня продуктивності суспільної праці; зменшенні частки важкої праці; збереженню здоров'я та подовженню тривалості життя людини; спрощенню доступу до інформації. Позитивний вплив цифрових технологій на бізнес-середовище проявляється у скороченні витрат на реалізацію продукції, на пошук та обробку інформації, здійснення трансакцій, виведення та просування на ринок товарів, тривалості бізнес-циклу; винайденню нових технологій та переходу до виробництва нових інноваційних продуктів. Перевагами для особи є зниження вартості інтернет-послуг та трансакцій, спрощення доступу до освітніх, розважальних та інформаційних ресурсів. Охарактеризовано основні ризики та загрози, які створює цифрова трансформація суспільства: технологічні, економічні, політичні, соціальні, правові, особистісні. Практичне значення отриманих результатів полягає в можливості виявлення, нейтралізації ризиків та загроз цифровізації

**Ключові слова:** цифрова економіка, диджиталізація, ризики цифровізації економіки, індекс електронної участі, індекс розвитку електронного урядування