

Digital economy: Trends, challenges, and development prospects

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Abstract. The relevance of the topic is driven by the rapid development of information technologies, which are transforming business models, consumer habits, and methods of conducting economic activities. In a world, where digital technologies are becoming the foundation for innovation and competitiveness, understanding the processes taking place in the digital economy is critically important. The purpose of the article was to systematise the main trends in the development of the digital economy, identify the challenges faced by governments, businesses, and society as a whole, and assess the prospects for digital transformation in various sectors of the economy. To achieve this goal, it was applied a comprehensive analytical method, which included a review of scientific articles, analysis of statistical data, as well as a study of digitalisation practices in different countries. The findings confirmed that the digital economy has significant potential to stimulate economic growth, increase productivity, and create new jobs. However, despite the positive outlook, the article also identified serious challenges, such as inequality in access to digital technologies, cybersecurity issues, and the need to adapt legislation to new market conditions. Additionally, it emphasised that not all countries have equal opportunities to leverage digital technologies, which may lead to increased inequality between them. The article also proposed approaches to forming partnerships between government institutions, businesses, and educational establishments to ensure the successful integration of digital technologies into all areas of life. Key investment areas have been identified, including infrastructure development, raising the level of digital education, and supporting innovation and startups. The practical value of the study lies in the development of recommendations for shaping effective government policies and strategies that can promote the development of the digital economy

Keywords: digital transformation; digital technologies; Internet; social networks; cellular mobile connections

Introduction

The digital economy has become an integral part of the global economic landscape, creating new opportunities and challenges for businesses, governments, and society as a whole. This phenomenon, which encompasses the use of digital technologies to conduct economic activities, includes e-commerce, financial technologies, the platform economy, and other innovative models.

Among the key trends shaping the development of the digital economy are the rapid growth of data volumes, the automation of business processes, and the widespread integration of artificial intelligence. These technologies are not only transforming business

operations, but also reshaping traditional industries, creating new markets and opportunities for entrepreneurship. However, alongside the positive aspects of digital transformation, significant challenges also arise, such as cybersecurity, inequality in access to digital resources, and the need to adapt regulatory frameworks. Businesses and governments are facing the need to find a balance between innovation and ensuring security, privacy, and social responsibility.

The study of the digital economy was conducted by scholars M. Akuliushyna *et al.* (2024), who identified the prospects for the development of the digital economy

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in Ukraine. O. Cherep *et al.* (2024) outlined the advantages and challenges of the digitalisation of Ukraine's economy, researched the essential characteristics, main goals, and tasks of Ukraine's economic digitalisation. The authors highlighted, refined, and characterised the principles of the digital economy, which are becoming *avant-garde* in nature.

The author N.O. Fisunenکو (2023) revealed key aspects of the digital transformation of the national economy in the context of European integration processes from both theoretical and practical perspectives. T.Ya. Gubernat *et al.* (2024) studied the role of the digital economy as a catalyst for the development of small and medium-sized enterprises (SMEs), focusing on aspects of innovation and institutionalisation. They examined key opportunities for SMEs in the context of the digital economy and explored the main aspects of innovation and institutionalisation of the digital economy in the SME sector.

Researchers N.M. Hurzhiy *et al.* (2024) explored the complex interrelationship between digitalisation and consumer habits, highlighting the mechanisms that drive behavioural shifts in online engagement, purchasing models, and brand loyalty. They also analysed companies' strategic responses to the digital challenge, examining, how businesses adapt their marketing approaches, distribution channels, and product innovations to succeed in the digital space.

Scientists O. Koval & O. Lyshak (2024) characterised the digital transformation of the economy under global challenges and analysed the impact of digital transformation on the economy, particularly on business processes and socio-economic systems. They investigated the role of innovative technologies, such as artificial intelligence and blockchain, in transforming traditional industries, while also identifying the advantages of the digital economy and the major challenges related to cybersecurity. V.V. Makedon & A.V. Chabanenko (2022) highlighted the features and distinctive traits of the digital economy's emergence in modern globalised world. The authors explored the dynamics of production, trade, and consumption of digital products and services in the global economy and developed a model of the global IT infrastructure for collecting and storing digital data.

H.V. Nazarova & V.O. Rudenko (2021) studied the etymology and institutional structure of the digital economy, considering it as a system of social, cultural, economic, and technological relationships between the state, business, and citizens functioning in a global information space. Researchers emphasised the extensive use of network technologies that generate digital types and forms of production and delivery of products and services, leading to continuous innovative changes in management methods and technologies aimed at improving the efficiency of socio-economic processes. N. Shveda *et al.* (2024) established the theoretical, conceptual, and practical foundations of digital trans-

formation on the example of Ukraine and developed recommendations for improving the development of digital transformation processes.

The purpose of the article was to systematise the primary trends in the digital economy's evolution, identify key challenges faced by governments, businesses, and society, and evaluate the prospects for digital transformation across various economic sectors.

Materials and Methods

To conduct a comprehensive analysis of the digital economy, its trends, challenges, and prospects for development, this article employed a set of integrated research methods aimed at generating new scientific insights. In the initial phase, a thorough review of existing academic sources, publications, and reports on the digital economy was conducted. This phase allowed for the formation of the theoretical basis of the study and the identification of key areas for analysis. A combined approach was used to collect empirical data, integrating both quantitative and qualitative methods. The quantitative analysis involved processing statistical data on the development of the digital economy, while the qualitative analysis included case studies of specific companies and projects. Data were gathered from open sources such as statistical reports, reports from international organisations, and studies conducted by other researchers. This enabled the conclusions to be supported by both quantitative and qualitative data. The choice of these methods was driven by the need to obtain a comprehensive and in-depth understanding of the development of the digital economy. The combination of quantitative and qualitative approaches allowed for not only a statistical assessment of trends, but also a deeper understanding of the context and motivation of market participants. The experimental base of the study consisted of data obtained from the following sources: official reports from statistical agencies such as Google Marketing Platform (2024), Meta (2024), ByteDance (2024). Data from sources such as LinkedIn (2024), X Business (2024), the World Bank Group (2024), the International Monetary Fund (2024), the OECD (2024), and internal reports from companies like Google LLC, Meta Platforms, Inc., ByteDance Ltd, LinkedIn Corporation, X Corp., and GSMA were also analysed, providing insights into the adoption of digital technologies. The statistical data in the study were collected using various open-source reports and resources, ensuring a comprehensive and detailed analysis. DataReportal (2024) provided information on internet and social media penetration rates in Ukraine, offering insights into the number of active users for platforms like Facebook, YouTube, Instagram, and TikTok, including total users, gender distribution, and growth rates. Meta (2024) presented statistics on user demographics and activity for Facebook and Instagram, revealing trends in audience reach and usage rates over time. Kepios (2024) supplied

data on internet penetration and the growth of online users in Ukraine, emphasising demographic patterns and estimates of the offline population. Ookla (2024) contributed data on internet connection speeds in Ukraine, including median mobile and fixed broadband speeds, showcasing year-over-year improvements. GSMA Intelligence (2024) shared insights on the number of mobile connections in Ukraine, reflecting the prevalence of multi-device usage. Google Marketing Platform (2024) and LinkedIn (2024) provided detailed audience data for YouTube and LinkedIn, focusing on user demographics and potential advertising reach. ByteDance (2024) delivered information on TikTok's user base in Ukraine, emphasising adult users aged 18 and above and growth trends. X Advertising (2024), formerly Twitter, highlighted the expansion of platform usage and audience reach in Ukraine. The study employed significant methodologies for data usage, including quantitative analysis, processing numerical data from the mentioned sources to identify trends and draw comparisons over time. Metrics such as internet penetration, social media adoption, and connection speeds were statistically analysed. User data were categorised by age, gender, and geographic location to examine usage patterns and preferences. Temporal comparisons of metrics were conducted from 2022 to 2024 to assess growth rates and shifts in digital behaviour.

Results and Discussion

The digital economy is a system of economic, social, and cultural activities based on the widespread use of digital technologies, the internet, and data. It encompasses the creation, distribution, and consumption of goods and services through digital platforms and technologies as summarised from various sources and literature.

L.V. Batchenko & O.V. Reva (2023) noted that digital transformation of the economy is a key strategic direction for the development of the country. The introduction of technologies, the Internet of Things, artificial intelligence, and other innovative solutions contributes to increased productivity and competitiveness. Digital solutions are being implemented to enhance the efficiency of all sectors of the economy, used in public administration, and play an important role in society. The challenges and risks associated with digital transformation include cybersecurity issues, changes in organisational culture, and the need for constant technological updates and the introduction of innovations.

The internet and digital platforms allow companies and consumers to operate on a global scale, regardless of geographical boundaries. This facilitates market expansion and creates new opportunities for international collaboration. The digital economy stimulates innovation development. New technologies, such as artificial intelligence, blockchain, the Internet of Things (IoT), big data, and cloud computing, transform traditional business practices and create new industries.

In the digital economy, technological and business changes occur much more rapidly than in the traditional economy. The emergence of new technologies and solutions required companies and workers to quickly adapt to new conditions. Thanks to digital technologies, processes such as management, production, and distribution of products and services become more decentralised. This enables the growth of small and medium-sized enterprises, independent of physical infrastructure.

One of the key structural units of the digital economy is platforms that connect producers and consumers (e.g., marketplaces, social networks, rental and exchange services). It significantly alters traditional business models. An increase in the number of platform users enhances its value for both new and existing users. This phenomenon is known as the network effect and is an important factor in the success of many digital companies (e.g., Facebook, Uber, Amazon).

Digital technologies allow for the automation of most processes, particularly in the areas of production, logistics, marketing, and customer service. This increases labour productivity, but simultaneously raises concerns about employment and the need for workforce retraining. A significant feature of the digital economy is the continuous access to goods, services, and information via the internet. This enables businesses and consumers to conduct transactions anytime and anywhere.

The relationship between the digital economy and cybersecurity, including threats and protection strategies, was studied. The research highlighted the diversity and complexity of attacks on digital infrastructure, proving that implementing proactive security measures can reduce risks and enhance data confidentiality (Vdovichen *et al.*, 2024). Since data is the foundation of the digital economy, protecting information, ensuring privacy, and addressing cybersecurity have become key tasks. There is a growing need for new approaches to risk management. These features not only change traditional business models, but also require a reassessment of the roles of governments, businesses, and society in the context of rapid technological advancement.

The impact measurement of the level of digitalisation remains a methodologically unresolved task. There are a significant number of different methodological approaches to determining the extent and level of digitalisation. This indicated that the phase of forming the digital economy is still incomplete and hinders statistically reliable research on the processes related to it (Vyshnevskiy, 2020). D. Kotelevets (2022) analysed key indicators that characterise the national economy's readiness for digitalisation, such as the number and structure of enterprises with Internet access, businesses with their own websites, and those using chat services to communicate with customers. It is worth to analyse the overall state of digital technologies in Ukraine in 2024 (Fig. 1).

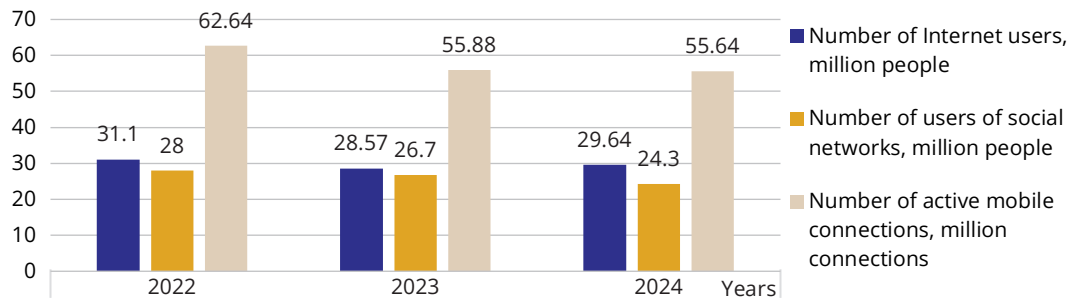


Figure 1. Analysis of digital technology usage in Ukraine

Source: developed by the author based on DataReportal (2024)

According to DataReportal, at the beginning of 2024, there were 29.64 million internet users in Ukraine, accounting for 79.2% of the population. The number of social media users reached 24.30 million in January 2024, representing 64.9% of the total population. Ukraine had 55.64 million active mobile connections at the start of 2024, exceeding the population by 148.7%.

At the beginning of 2023, there were 28.57 million internet users in Ukraine, with a penetration rate of 79.2%. In January 2023, there were 26.70 million social media users, equivalent to 74.0% of the total population. At the start of 2023, there were 55.88 million active mobile connections in Ukraine, which equated to 154.9% of the total population. In January 2022, there were 31.10 million internet users in Ukraine, and the internet penetration rate at the beginning of 2022 was 71.8% of the total population. In January 2022, there were 28.00 million social media users in Ukraine, representing 64.6% of the total population. As of the beginning of 2022, there were 62.64 million mobile connections in Ukraine, equivalent to 144.6% of the total population.

The analysis of the data in Figure 1 allowed to conclude that the usage of digital technologies among the population of Ukraine showed a tendency to decrease. This was linked to the overall decline in the population. However, in 2024, the number of internet users increased by 1.07 million individuals. For further analysis of digitalisation, it's important to note that as of January 2024, Ukraine's population stood at 37.42 million people. Demographic statistics revealed that 54.3% of the population are women, while 45.7% are men. Additionally, 70.2% of Ukraine's population resided in urban centers, whereas 29.8% live in rural areas. The median age of the Ukrainian population was 44.3 years. According to Kepios (2024), in January 2024, the number of internet users in Ukraine increased by 1.1 million individuals (+3.7%) compared to the beginning of 2023. The internet penetration rate reached 79.2%, but approximately 7.78 million people still remained offline. Data from Ookla (2024) indicated that the median mobile internet speed was 24.83 Mbps, representing a 121% increase from the previous year. Fixed internet connections in Ukraine demonstrated a speed of 73.68 Mbps, which is a 22.5% rise over the year.

It worth to examine the usage of social platforms among Ukrainians. According to DataReportal (2024), in January 2024, there were 24.30 million active social media users in Ukraine. A total of 82% of internet users in Ukraine were active on social platforms. Among social media users, 52.9% were women and 47.1% were men. The increasing number of users on various platforms has had a significant impact on different aspects of people's lives, particularly in the business sector. The rise of social media platforms like Facebook, Instagram, and TikTok has revolutionised communication, creating new ways for people to interact, share information, and express themselves. It has also influenced cultural trends and consumer behaviour by enabling viral content to spread quickly across the globe. Online learning platforms, such as Coursera (2024), Udemy (2024), and educational YouTube channels, have made education more accessible to a broader audience. This has transformed traditional learning methods and allowed people to gain skills and knowledge remotely, catering to diverse learning preferences. Platforms offering telemedicine services have expanded access to healthcare, allowing people to consult with doctors and medical professionals remotely. The growing use of wearable devices and health apps has also empowered individuals to monitor and manage their health more effectively. The business landscape has been profoundly influenced by the growing number of online users. E-commerce platforms such as Amazon and eBay have transformed traditional retail, enabling businesses to reach global markets with ease. As noted by A. Goloborodko & S. Lehominova (2020), these companies closely collaborate with logistics companies.

Digital marketing, driven by platforms like Google, Facebook, and Instagram, has revolutionised, how companies engage with customers. Social media has also become a powerful tool for brand building, customer service, and direct sales. The rise of platforms like LinkedIn (2024) has changed the way professionals network and search for jobs, while freelancing platforms such as Upwork (2024) and Fiverr (2024) have created new opportunities for remote work and gig economy jobs. This shift has redefined career paths, offering flexibility and diverse work options to a larger segment of the population.

Overall, the growing number of users on different platforms has significantly reshaped industries, creating new opportunities and challenges in nearly every aspect of life.

N.S. Tanklevska & V.O. Miroshnychenko (2024) analysed the impact of the digital economy on the financial stability of enterprises, identifying and describing the positive and negative aspects of the functioning of economies under the transformative processes of the digital economy. The authors generated theoretical propositions regarding an effective digital economy mechanism to strengthen the financial stability of enterprises that will be adapted to modern conditions of economic digitalisation.

Digital economy has a significant impact on business and its management. Digital technologies are changing traditional business models, allowing companies to create new products, services, and ways to interact with customers, which contributes to the emergence of new industries such as e-commerce, financial technologies, and sharing platforms. They also enable the automation of many business processes, reducing costs and increasing operational speed, particularly in project management, accounting, logistics, reporting, and business analysis. Through big data analysis, companies can better understand the needs of their customers by offering personalised products and services, which helps improve the customer experience and increase loyalty. Digital technologies also provide businesses with the ability to adapt more quickly to market changes, respond to new challenges and opportunities, including through remote work and flexible production processes. The internet and digital platforms offer the opportunity to enter new markets without physical presence, which expands opportunities for sales and growth, especially for small and medium-sized enterprises. At the same time, managing data security and confidentiality becomes an important part of management strategies, as businesses must integrate measures to protect information and minimise the risks of cyberattacks. The digital economy also fosters innovation, encouraging businesses to implement new technologies such as artificial intelligence, blockchain, and the Internet of Things, which allows them to achieve new levels of efficiency and competitiveness. Thus, digitalisation is transforming business and its management, improving efficiency, flexibility, and opportunities for innovation.

To the development of Ukraine's digital economy, the government needs to invest in broadband Internet: ensuring access to high-speed internet across all regions, including rural areas. Additionally, it should establish the infrastructure for storing and processing large volumes of data, enabling companies to leverage information effectively. To accelerate the development of the digital economy, several steps need to be taken. This includes developing IT training programmes by introducing specialised courses and training in universities and vocational institutions to prepare professionals in

digital technologies. Scholarships and grants for students, as well as financial support programmes for individuals pursuing degrees in information technology, can also be proposed. Another step involves creating incubators and accelerators to support startups in developing business ideas and entering the market. Providing financial backing for scientific research in technology and innovation is equally important.

Collaboration with the government, business sector, and education should focus on establishing partnerships between universities and companies to develop joint internship programmes, facilitating the integration of young professionals into the business sector. Additionally, initiatives uniting the efforts of the state and the private sector should be organised to address urgent digitalisation challenges. Reducing administrative barriers, such as streamlining online business registration processes, will promote the growth of e-commerce. The development of payment systems is also vital in the digitalisation process, as the implementation of new payment technologies, such as mobile payment systems, can enhance the convenience of online shopping.

Investments in cybersecurity are crucial, providing companies and government institutions with resources to protect against cyber threats and implementing training programmes to prepare information security specialists. Financial incentives for companies, such as tax breaks and grants for enterprises adopting new technologies and automation, are also necessary. In the sphere of international relations, attracting international investments by creating favourable conditions for foreign investors can help secure additional resources for the development of the digital economy. These proposals could form the foundation for a digital economy strategy aimed at enhancing the country's competitiveness and improving the quality of life for its citizens.

The digital economy has a number of key features that distinguish it from the traditional economy. As noted by P.L. Hrynko (2020), the legal regulation of activities in the field of the internet economy began with the adoption of the Law of Ukraine "On the National Program of Informatisation" in 1998. The legislative framework for the organisational and legal principles of electronic commerce in Ukraine was established with the Law of Ukraine "On Electronic Commerce", adopted in 2015. This law, in addition to defining key terms, established the procedures for business entities' actions, when using information and telecommunications systems and outlined the rights and obligations of participants in electronic commerce relations.

The foundation of the digital economy is data and its utilisation. Digital technologies enable the collection, storage, analysis, and processing of vast amounts of data, which fosters the development of new business models and enhances management efficiency. Different authors interpreted the concept of the digital economy in different ways. A. Mazaraki *et al.* (2020) wrote that

the digitalisation of Ukraine's economy is a key driver for enhancing the competitiveness of its sectors and industries, improving citizens' well-being, developing the labour market, fostering new industries, and creating new products, properties, and values. It represented the only correct path for Ukraine's economic growth, the formation of competitive advantages, and the development of innovative entrepreneurship in the global digital environment.

I. Radionova & O. Akulov (2023) substantiated scientific tools that allowed them to clarify the definition of "digital economy". L.I. Fedulova & L.M. Yemelienko (2020) argued that the phenomenon of the concept of "digital economy", in its generalised form, was considered as a system of social, economic, and technological relations between the state, the business community, and citizens. This system operated in the global information space through the widespread use of networked digital technologies, leading to continuous innovative changes aimed at improving the efficiency of socio-economic processes.

The authors H.V. Nazarova & V.O. Rudenko (2021) stated that the concept of the digital economy was distinguished by different authors based on the following characteristics: an economic system characterised by the integration of digital technologies for the collection, storage, processing, transformation, and transmission of information across all sectors of activity; a set of economic activities, such as industries within the national economy involved in the production and trade of digital goods and services in a virtual environment; a complex combination of various elements (technical, infrastructural, organisational, software, regulatory, and legislative), serving as a complement to the real economy, focused on sustainable economic development.

Researcher M.V. Rudenko (2020) emphasised that the differentiation of authors' understanding of the multifaceted definition of the category "digitalisation" was examined from four perspectives: the state, scientists, practitioners (entrepreneurs), and society. This approach enabled the distinction of the concept's interpretation based on its area of application, the category of individuals providing the definitions, and the ultimate goals for which the definitions are provided.

Conclusions

Therefore, the digital economy represents a new economic paradigm based on the use of digital technologies for the creation, exchange, and consumption of goods and services. It encompasses a wide range of activities, including e-commerce, financial technologies, business process automation, and innovative solutions that impact various aspects of life.

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The data highlighted significant trends in digital technology usage in Ukraine, with internet and social media adoption continuing to grow despite a decline in population. As of early 2024, internet penetration reached 79.2%, and social media usage stood at 64.9% of the population, demonstrating widespread digital engagement. Facebook, YouTube, Instagram, and TikTok remained dominant platforms, with notable increases in user numbers, especially on TikTok, which saw a 26.6% growth from 2023 to 2024. The growth in mobile connections, which exceeded the population by 148.7%, further underscored the increasing reliance on mobile devices. Overall, Ukraine's digital landscape showed continued expansion in both internet access and social media participation, even amid demographic challenges.

The development of the internet, mobile technologies, big data, and artificial intelligence will transform the ways businesses operate, and how consumers interact with producers. Digitalisation will enable cost reductions, improve management processes, and facilitate quicker responses to market changes. The digital economy will open up new opportunities for the emergence of startups and business models that previously did not exist.

Increased investment in digital technologies will foster the creation of new markets and industries. The digital economy will allow enterprises to access international markets, lowering entry barriers. Through the advancement of digital services, citizens will gain access to new opportunities, such as online education, telemedicine, and e-services. Moreover, the digital economy can serve as a vital tool in addressing challenges such as economic crises and global pandemics, thanks to the flexibility and adaptability of digital solutions.

The digital economy not only transforms business and society, but also opens new horizons for innovation and sustainable development. To realise its maximum potential, it is essential to actively implement effective government policies, stimulate investment, and promote education in digital technologies. Therefore, the right strategies and efforts can ensure the stable development of the digital economy in Ukraine.

Future research on Ukraine's digital economy should focus on areas such as the impact of digital technologies on business models, socio-economic disparities in digital access, government policies, the effects of AI and automation on labour markets, cybersecurity and data privacy, and the role of digital technologies in sustainability.

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Conflict of Interest

None.

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Цифрова економіка: тенденції, виклики та перспективи розвитку

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Анотація. Актуальність теми зумовлена стрімким розвитком інформаційних технологій, які трансформують бізнес-моделі, споживчі звички та методи ведення економічної діяльності. У світі, де цифрові технології стають основою інновацій та конкурентоспроможності, розуміння процесів, що відбуваються в цифровій економіці, є критично важливим. Метою статті було систематизувати основні тенденції розвитку цифрової економіки, визначити виклики, з якими стикаються уряди, бізнес і суспільство в цілому, та оцінити перспективи цифрової трансформації в різних секторах економіки. Для досягнення цієї мети було застосовано комплексний аналітичний метод, який включав огляд наукових статей, аналіз статистичних даних, а також вивчення практик цифровізації в різних країнах. Результати дослідження підтвердили, що цифрова економіка має значний потенціал для стимулювання економічного зростання, підвищення продуктивності та створення нових робочих місць. Однак, незважаючи на позитивні перспективи, стаття також виявила серйозні виклики, такі як нерівність у доступі до цифрових технологій, проблеми кібербезпеки та необхідність адаптації законодавства до нових умов ринку. Крім того, було наголошено, що не всі країни мають рівні можливості для використання цифрових технологій, що може призвести до зростання нерівності між ними. У статті також запропоновано підходи до формування партнерств між урядовими установами, бізнесом та освітніми закладами для забезпечення успішної інтеграції цифрових технологій у всі сфери життя. Визначено ключові напрямки інвестицій, включаючи розвиток інфраструктури, підвищення рівня цифрової освіти, а також підтримку інновацій та стартапів. Практична цінність дослідження полягає в розробці рекомендацій щодо формування ефективної державної політики та стратегій, які можуть сприяти розвитку цифрової економіки.

Ключові слова: цифрова трансформація; цифрові технології; Інтернет; соціальні мережі; мобільні зв'язки