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Assessment of the digital transformation of Ukraine's economy: Challenges, opportunities, and strategic prospects

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Abstract. The digital transformation of Ukraine's economy enhances efficiency, competitiveness, and modernisation across key sectors by optimising business processes, developing infrastructure and e-governance, and fostering digital skills among the population. This study aimed to develop a comprehensive system for the digital transformation of Ukraine's economy, considering contemporary challenges, opportunities, and the necessary mechanisms for managing this process. The research methodology was based on an analysis of international experience in implementing digital technologies, an assessment of the economic benefits of digitalisation, and an examination of the impact of technology on the efficiency of public administration and business. The study also included a review of current trends in the digital economy and an assessment of their applicability in Ukraine. The key findings of the study confirmed that the digital transformation of Ukraine's economy creates new opportunities for economic growth, increased productivity, and enhanced competitiveness. The transition to a digital economy in Ukraine should focus on establishing conditions for the development of innovative sectors, reducing dependence on raw material exports, and increasing the added value of products. This priority has been emphasised in the process of developing the national digital transformation strategy, which should include the expansion of digital infrastructure, support for innovative technologies, and the implementation of new digital services in public administration and business. Particular attention has been given to cybersecurity and personal data protection amid the rapid advancement of digital solutions. The practical significance of the study lies in the application of its findings to the development of national digitalisation strategies, which will contribute to economic growth and Ukraine's integration into the global digital economy

Keywords: digital technologies; economic modernisation; e-governance; business innovation; digital infrastructure; cybersecurity; digital skills

Introduction

The transition to a digital economy is not just a technological revolution, but a profound transformation of the very concept of economic development. This process involves radical changes in most traditional areas of activity and the emergence of new ones, thanks to the rapid spread of digital platforms and technologies. A key element of this transition is the increasing role of digital platforms, which are changing the interaction between companies and consumers by creating personalised production chains and the proliferation of additive technologies, which contribute to reducing information asymmetry.

Digital transformation is extremely relevant for Ukraine, as it helps to overcome structural constraints, develop innovation potential and integrate into the global economy. It also ensures transparency and accountability in relations between the state, business and society, which is particularly important in the face of wartime challenges and the need for economic resilience. Thanks to modern technologies, numerous new opportunities are emerging that are transforming the economy.

According to R. Heeks (2017), new digital systems allow individuals and groups to engage in economic activity remotely, adapting their participation to the context of the environment in which they operate. This approach promotes the decentralisation of economic activity. The author emphasised that the development of technologies leads to phenomena such as datafication – the creation of information as a new form of value, digitisation – the conversion of data into digital form, virtualisation – the creation of digital objects and environments, and generativity – the use of technologies in a way that was not originally intended, for example, through reprogramming and recombination. These processes are changing the basic principles of how economic systems function.

Researchers C. Dahlman *et al.* (2016) emphasised that digital innovations are leading to the emergence of new business models. According to their data, companies like Uber, Airbnb, Facebook and Alibaba demonstrate how technologies can create giant platforms that connect supply and demand on a global level, changing traditional approaches to business. According to the researchers, the economic efficiency of such changes is significant: they allow for increased productivity of capital investment and labour, reduce transaction costs and facilitate access to global markets. Ultimately, this ensures the growth of economic competitiveness. The possibility of solving the problem of economic inequality is particularly noteworthy.

N. Beerepoot & B. Lambregts (2015) noted that digital technologies contribute to the global convergence of incomes and a reduction in the gap between countries and regions. Researchers G. Quinones *et al.* (2015) believed that prospects are opening up for the creation of new markets for digital start-ups, which contributes to the development of innovative enterprises and stimulates economic activity in the digital sphere.

According to M. Khaustova (2023), digitalisation is a significant mechanism for economic growth, as technologies can have a positive impact on the efficiency, effectiveness, cost and quality of state economic policy. She explored that digitalisation involves the introduction of digital technologies into all spheres of life – from interpersonal interaction to industrial production, household items, children's toys or clothing. This not only changes the way people interact but also transforms industrial processes, turning them into cyber-physical systems.

However, along with the significant advantages of digital transformation, some researchers, in particular N. Gurzhiy *et al.* (2024), have focused on the challenges that

require immediate solutions. One of the key problems was the digital divide – the inequality between those who have access to digital technologies and those who are deprived of it. Despite the growth of connectivity, billions of people in the world remain without access to the Internet, which limits their participation in the digital economy and exacerbates social and economic inequality. This is especially true for lowincome countries where investments in digital infrastructure are insufficient. Overcoming this gap requires comprehensive efforts of governments, businesses and the public, aimed at ensuring universal access to affordable broadband infrastructure, developing digital literacy programs, as well as creating relevant content and services.

It should be taken into account that the digital divide can be exacerbated by shortcomings in digital education, which remains underdeveloped in many countries. Investments in education that provide skills in using digital technologies are critical to reducing this gap. Thus, digital transformation is not only an important component of economic development but also a powerful tool for overcoming socio-economic inequality. For Ukraine, this opens up the possibility of active integration into the global digital economy, stimulates innovative development and ensures the sustainability of the economy in the face of modern challenges.

This study aimed to identify the key mechanisms of digital transformation and its impact on the development of the Ukrainian economy. The scientific novelty of the research lies in the systematisation of the world experience of digitalisation and its adaptation to Ukrainian realities.

Materials and Methods

This study used methods of statistical data analysis, theoretical approaches and comparative analysis to identify trends in the digital transformation of Ukraine's economy. Summarising theoretical approaches, the research focused on the following concepts: the theory of information economy, which studies the role of information as a key resource in the modern economy; the concept of economic convergence, which explains the reduction of the digital divide between countries. The analysis of these approaches allowed for a better understanding of the mechanisms of the impact of digital technologies on the economy.

The main focus was on studying the implementation of digital technologies in key sectors of the economy: industry, finance, education, healthcare and public administration. Special emphasis was placed on the development of digital infrastructure, in particular broadband Internet, mobile communications, the introduction of e-government and the development of digital skills among the population. To assess the digital development of Ukraine, the DESI (Digital Economy and Society Index (DESI) 2022, 2022) index was used, which included such sub-indices as: Human Capital, Integration of Digital Technology, Connectivity and Digital Public Services. This made it possible to determine in which areas Ukraine lags behind, and in which it demonstrates competitiveness, as well as to formulate recommendations for improvement.

To ensure a comprehensive approach, indicators were used that reflect the level of access to broadband Internet, digital literacy, the proportion of businesses that implement IT technologies, the level of innovation in the field of artificial intelligence and big data, the volume of e-commerce, and so on. Additionally, a comparative analysis of the values of the DESI index and its sub-indices for Ukraine and EU countries was carried out. This analysis identified areas where Ukraine lags behind in digital development and outlined priority directions for improving digital infrastructure, enhancing digital literacy, and integrating innovative technologies into business and public administration. The purpose of such a comparison was to identify the strengths and weaknesses of Ukraine's digital development in an international context to form an effective strategy for digital transformation.

The main data sources were the official reports of the State Statistics Service of Ukraine (n.d.a; n.d.b) and Eurostat (n.d.), which provided information on the economic development of countries and the impact of digital technologies on it. In addition, the research was based on materials from international organisations such as the International Monetary Fund (2024) and the World Bank (n.d.), which provided a global perspective on the development of the digital economy. A significant amount of statistical indicators used in the research process was obtained from analytical reports of the Ministry of Digital Transformation of Ukraine (2021; 2023), in particular reports on the level of digital literacy of the population, the development of egovernment, projects on the implementation of digital services. To identify the level of digital transformation of Ukraine compared to the countries of the European Union, a comparative analysis of the DESI index and its sub-indices was used. For this, statistical and analytical information formed by the European Commission (2022; 2024) was used.

Results and Discussion

The transition from a raw material-oriented to a high-tech economy is one of the main goals of Ukraine's digital transformation. This process aims to create conditions for the development of innovative sectors, increase the value added of products and reduce dependence on raw material exports. A key role in this is played by attracting investment in scientific research and development, stimulating innovative activity of enterprises, as well as developing digital infrastructure and improving the skills of the workforce. The goal is not only to increase production volumes but also to improve the structure of GDP by developing high-tech and knowledge-intensive sectors of the economy.

Digital transformation significantly stimulates economic growth and increases GDP. According to research by K.F.Q. Al-Aloosy *et al.* (2024), it was revealed that digital technologies have a positive impact on productivity and resource management efficiency:

- the use of automation, artificial intelligence and other innovative technologies significantly increases labour

productivity, contributes to improving the efficiency of human resources use, improving the skills of workers and other qualitative characteristics;

- digitalisation promotes the effective management of natural resources;
- digitalisation of financial resources allows for the automation of financial transactions and improvement of financial planning;
- digital technologies also contribute to the optimisation of information resources: cloud computing and big data provide companies with access to important information in real time, which helps to quickly adapt to market changes, improve decision-making and improve the quality of customer service;
- digitalisation plays an important role in increasing energy efficiency. Smart energy management systems analyse and optimise energy distribution in real time, which allows for automatic adjustment of lighting, heating and air conditioning according to actual needs, reducing costs and promoting energy conservation;
- optimisation of the use of capital assets. Thanks to digital technologies, such as the Internet of Things (IoT), enterprises can monitor the condition of equipment in real time, and plan its maintenance or repair, reducing the risks of unforeseen downtime and extending the service life of assets.

The development of the digital economy stimulates the formation of new markets and creates opportunities for the development of new or updated sectors of the economy. This improves the level of competitiveness of the country and stimulates an increase in GDP. The development of the digital economy leads to the development of the labour market, the creation of new jobs and the growth of investment. This also has a positive impact on the volume of GDP (Buzhymska & Zhelikhovska, 2021).

In general, digital transformation has the potential to become an engine for economic growth and GDP growth. However, it is important that this process is carefully designed and implemented taking into account the needs of various sectors of the economy and social aspects. In addition, digital technologies can contribute to the development of innovations and the latest technologies. This, in turn, can lead to the creation of new products and services, which will increase the competitiveness of Ukrainian companies in the global market.

The process of digitalisation, while creating opportunities for new products, technologies and processes, has also presented new challenges for employers and employees. Human capital carriers have gained a new level of freedom and opportunities for self-realisation, and employers have gained access to intellectual resources from around the world. In these circumstances, the digital labour market contributes to the rapid formation of innovative employment. It is also important to emphasise the importance of developing and implementing digital services for citizens, which are aimed at facilitating interaction with government bodies and obtaining various services. This may include electronic services for submitting documents, paying taxes and obtaining various permits. The development of such services will create convenient conditions for citizens to interact with government institutions and will contribute to strengthening trust in the government. In the context of political goals, digital transformation can also contribute to the improvement of electronic voting and electronic identification systems, which will contribute to increasing citizen participation in electoral processes and will ensure the identification and authentication of individuals in the digital environment. No less important is the issue of ensuring digital security and protecting data privacy.

A separate list of goals that are put forward in the process of transition of the economy of Ukraine to a digital economy are social goals, such as improving access to education, health care and other social services (Skliar, 2021; Overchuk *et al.*, 2024):

1. *Education*. Digital technologies can facilitate learning and provide access to education in Ukrainian schools and universities. The introduction of online learning and access to educational materials via the Internet can help create a more accessible and diverse learning environment. This is especially important for pupils and students who have limited access to quality education due to geographical constraints, financial difficulties or other circumstances. This issue has become particularly important during Russia's military aggression.

2. *Health care*. Digital technologies can simplify access to medical services and health care for all citizens. Electronic medical records, telemedicine, mobile health applications and other innovative solutions can help reduce barriers to access to medical services, especially for people living in remote areas or who have limited mobility.

3. *Social services*. Digital technologies can also help simplify access to other social services, such as public services, social assistance and other forms of support. The portalisation of public services, online systems for managing social programmes, as well as electronic accounting and control systems, can contribute to increasing the accessibility and effectiveness of these services.

In general, digital technologies can become a real catalyst for improving access to education, health care and other social services in Ukraine. However, to achieve these goals, it is necessary to take into account various aspects, such as the availability of the Internet and infrastructure, digital literacy of the population, protection of personal data and cybersecurity.

An important element in the formation of a model for evaluating the digital transformation of the Ukrainian economy is the selection of indicators and metrics.

The evaluation of digitalisation in world practice is based on several indicators and indicators, such as (Gal *et al.*, 2019; Bondarenko *et al.*, 2022):

- broadband access and usage – measures the level of access to and use of broadband Internet in households and businesses;

• digital skills of the population – the level of digital literacy among the population and the number of specialists in the IT field, which indicates the potential of the country or region to adapt to the digital economy;

• e-commerce – indicators of sales and purchases via the Internet, which may include retail online trade and e-commerce;

• IT investments – the volume of investments in information and communication technologies, including infrastructure, software and services;

• innovations in the IT field – the number of patents and research in the field of digital technologies, which reflects innovative activity;

• digital government services – the level of provision of government services in electronic form, including e-government, e-health, e-education, etc.;

• security in the digital space – indicators that reflect the level of cybersecurity and data protection in the digital space;

• digital inclusion – the degree of accessibility of digital technologies for all segments of the population, including vulnerable groups.

There are two main groups of methodologies for evaluating digital transformation (Table 1), which develop a system of indicators that characterise the development of the digital economy and define its main directions. They demonstrate the picture and objectivity of the state of digital transformation and identify specific ways for further development. These indicators can be used to create a comprehensive digitalisation index, which helps to assess the overall level of digital transformation of the economy.

Table 1. Methodologies for assessing digital transformation

Methodologies of global and national institutions	Methodologies proposed by academic researchers
The goal is to assess the overall level of development of the digital economy, technical infrastructure and the readiness of countries for effective business in a digital environment	The goal is a comprehensive assessment of the impact of the digital economy on business processes, markets and infrastructure, taking into account structural and demographic factors
The most common indices are: • Global Competitiveness Index (WEF); • Global Innovation Index (WIPO); • Networked Readiness Index (WEF); • World Digital Competitiveness ranking (IMD); • Digital Economy and Society Index, DESI.	Research directions: • assessment of the impact of digital technologies on labour productivity and resource management efficiency; • digital infrastructure and its impact on economic development; • social aspects of digitalisation; • innovative business models in the digital economy; • e-commerce and new markets; • cybersecurity and data protection; • digitalisation of public administration; • human capital development in the digital economy

Source: compiled by the authors based on data from the T.L. Mesenbourg (2001), M. Olczyk *et al.* (2022), European Commission (2022; 2024), IMD (2022), S. Dutta *et al.* (2023), World Digital Competitiveness ranking (2024)

To comprehensively assess the digital development of Ukraine and EU countries in general and analyse their level of digitalisation, the DESI (Digital Economy and Society Index) indicator was used. This is a composite index developed by the European Commission to assess the digital competitiveness of European Union countries. DESI tracks the progress of EU member states in digital performance in five main areas: digital skills, internet use, integration of digital technologies in business and digital public services. This tool helps identify key areas for investment and improvements in each country's digital sector. It is this indicator that aims to assess the level of implementation of digitalisation and digital development of the countries of the European Union.

To assess the first sub-index, Human Capital, the Digital Skills Indicator (DSI) was used. In Ukraine, the assessment is carried out in four areas: information skills; communication skills; life problem-solving skills; and software skills (Ministry of Digital Transformation of Ukraine, 2021, 2023). Table 2 shows a comparative analysis of the Human Capital sub-index – the average value for EU countries and Ukraine.

Table 2. Human Capital sub-index of the DESI index (comparative analysis), 2021-2023

	At least basic digital skills, % of the population	Digital skills above basic, % of the population	At least basic digital content creation skills, % of the population	Graduates in information and communication technologies (ICT), % of the population
Average value for EU countries	28.5	27.8	68.4	5.0
Ukraine	21.6	38.0	60.2	3.2
Absolute deviation	-6.9	10.2	-8.2	-1.8
Relative deviation	-24.2	36.7	-11.9	-36.0

Source: compiled by the authors based on data from the Ministry of Digital Transformation (2021; 2023), Digital Economy and Society Index (DESI) 2022 (2022)

The analysis has revealed that the proportion of the population in Ukraine with at least basic digital skills is 6.9 percentage points (or 24.2% relatively) lower than the EU average, indicating the need to improve basic digital education in Ukraine. On the other hand, the proportion of the population with digital skills above the basic level in Ukraine is 10.2 percentage points (or 36.7% relatively) higher than the EU average. This could be a positive signal for the country's IT sector, as higher digital skills foster innovation and technological development. The proportion of the population with at least basic content creation skills in Ukraine is 8.2 percentage points (or 11.9% relatively) lower than the EU average. This points to a potential weak spot that requires attention, especially given the growing importance of digital content in the economy and education. Finally, the proportion of ICT graduates in the population of Ukraine is 1.8 percentage points (or 36.0% relatively) lower than the EU average. This highlights the need for increased investment in ICT education and training to prepare more specialists in this field and contribute to the development of the high-tech sector of the economy.

The analysis shows that there are key areas in Ukraine that require attention and investment. This concerns basic digital education, raising the level of digital skills among the general population and increasing the number of graduates in the field of ICT. Improving these aspects can contribute to the use of opportunities in the digital economy and stimulate the technological development of the country.

The DESI sub-index "Internet Connectivity" determines the supply and demand of fixed and mobile broadband and contains the following indicators (Table 3).

Table 3. Internet Connectivity sub-index of the DESI index (comparative analysis), 2021-2023

	Total coverage of fixed broadband	At least 100 Mbps reception of fixed broadband	Fast broadband coverage	5G coverage	Mobile broadband penetration
Average value for EU countries	78.7	84.1	97.4	45.7	87.6
Ukraine	79.3	46	66	0	68
Absolute deviation	0.6	-38.1	-31.4	-45.7	-19.6
Relative deviation	0.8	-45.3	-32.2	-100.0	-22.4

Source: compiled by the author based on data from the Digital Economy and Society Index (DESI) 2022 (2022), Ministry of Digital Transformation (2021; 2023)

The analysis shows that while Ukraine has slightly higher overall fixed broadband coverage than the EU average, access to high-speed internet, including 5G networks, is significantly lagging. This indicates the need to improve infrastructure for both fixed and mobile broadband. The analysis confirms the presence of significant challenges for Ukraine in the development of broadband and mobile internet, especially in the context of high-speed internet and 5G technology. Despite relatively good overall coverage of fixed broadband, there is a clear need for investment in infrastructure and technology to improve the quality and speed of internet access, as well as to introduce 5G networks.

The next DESI sub-index, "Integration of Digital Technologies", measures the parameters of business digitalisation and e-commerce, in particular the implementation of digital technologies by businesses from the most basic to the advanced level. Table 4 shows a comparative analysis of the sub-index "Integration of Digital Technologies" – the average value for EU countries and Ukraine.

Table 4. Integration of Digital Technologies sub-index of the DESI index (comparative analysis), 2021-2023

	SMEs with at least a basic level of digital intensity	Share of enterprises using cloud technologies	Share of enterprises conducting "big data" analysis	Share of enterprises using artificial intelligence technology	Share of enterprises engaged in e-commerce
Average value for EU countries	56.0	36.7	13.9	7.9	21.3
Ukraine	29	10	13	3	4.8
Absolute deviation	-27.0	-26.7	-0.9	-4.9	-16.5
Relative deviation	-48.2	-72.8	-6.5	-62.0	-77.5

Source: compiled by the author based on data from the Digital Economy and Society Index (DESI) 2022 (2022), State Statistics Service of Ukraine (2022a; 2022b); Ministry of Digital Transformation (2021; 2023)

The analysis shows that the level of digitalisation of enterprises in Ukraine is significantly behind the EU average, especially in the implementation of basic digital technologies, cloud solutions and e-commerce. At the same time, the use of big data in business processes in Ukraine is at a level close to the EU average, which indicates the potential for further development of digital innovations.

The data indicate significant difficulties faced by Ukrainian enterprises in the process of digitalisation. Although there are some positive results in the analysis of big

data, in general, there is a significant lag behind the European average in the implementation of cloud technologies, artificial intelligence and e-commerce. This emphasises the need to strengthen efforts to support the digital transformation of small and medium-sized enterprises in Ukraine to increase their competitiveness and promote their integration into the global economy.

The DESI sub-index "E-Government" assesses the digitalisation of government activities and is used to measure the readiness of public administration bodies to use ICT to provide high-quality information services to the public and businesses. Table 5 shows a comparative analysis of the subindex "E-Government" – the average value for EU countries and Ukraine.

Table 5. E-Government sub-index of the DESI index (comparative analysis), 2021-2023

	Online Services Index	Human Capital Index	Telecommunications Infrastructure Index	E-Government Index
Average value for EU countries	0.82	0.90	0.83	0.86
Ukraine	0.81	0.87	0.73	0.80
Absolute deviation	-0.01	-0.03	-0.1	-0.06
Relative deviation	-1.2	-3.3	-12.0	-7.0

Source: compiled by the author based on data from the E-Government Development Index (n.d.)

Ukraine demonstrates a relatively small lag in the online services and human capital indices, which may indicate the country's strengths in these areas. However, there is a noticeable lag in the *telecommunications infrastructure and e-government indices, which requires attention to achieve greater competitiveness at the international level*. In particular, significant efforts are needed to modernise the telecommunications infrastructure, which can have a positive impact on the overall level of digital transformation in the country.

The results of the study indicate the significant potential of digital transformation of the Ukrainian economy, which corresponds to the general trends highlighted in the articles of many scientists. However, the literature review reveals both common aspects and differences in the approaches and findings of various researchers. The study by P. Gal *et al.* (2019) confirmed that digital technologies are a driving force of economic growth through increased labour productivity and optimised resource use. The current research is consistent with their findings, particularly in terms of increased productivity through automation and the use of artificial intelligence. The study of E. Zavyalova & D. Sokolov (2022) also emphasise the role of digitalisation in improving the skills of workers, which confirms given results of the growth of digital skills among the Ukrainian population, which even exceed the average indicators of EU countries in certain areas.

However, the results of the current study show that the level of integration of digital technologies among enterprises in Ukraine (10% use of cloud technologies) is significantly behind the EU indicators. D.L. Stone *et al.* (2015) noted that in developed economies, digital tools are actively integrated into small and medium-sized businesses, which contributes to increasing their competitiveness. The absence of a similar effect in Ukraine indicates barriers related to the low level of investment and insufficient digital education of entrepreneurs. B. van Ark (2016) focused on the importance of cybersecurity in the digital economy, pointing out that an insufficient level of data protection hinders the introduction of the latest technologies in many countries. Current research has only superficially touched on security aspects, as in Ukraine this direction remains secondary due to problems with basic infrastructure.

The research by K.O. Buzhymska & M.V. Zhelikhovska (2021) confirmed that investments in scientific research and development are critical for the transition to a high-tech economy. Results in the current study also emphasise the importance of these investments, however, the level of funding in this area in Ukraine is only 0.5% of GDP, which is significantly less than the European average.

V. Overchuk *et al.* (2024) emphasised the importance of digital education to ensure sustainable economic development. In this aspect, current research found that the level of basic digital skills among the population of Ukraine is 24.2% lower than the EU average. However, the proportion of the population with higher digital skills is greater, which indicates a positive potential for the development of the IT sector in the country.

In their article, K. Tantawi *et al.* (2024) note that high-speed internet access is the basis for the successful digitalisation of the economy. Given analysis in the current study confirms this view, showing that only 46% of Ukrainians have access to high-speed internet, which is significantly behind the EU indicators (84.1%). The lack of 5G coverage compared to the EU average of 45.7% further exacerbates the situation. T. Gumennykova *et al.* (2023) explored the impact of digital technologies on access to social services, emphasising the importance of e-government. Current results showed that the index of online services in Ukraine (0.81) almost corresponds to the EU average (0.82), which indicates progress in this area.

Researchers D. Munandar *et al.* (2024) in their studies emphasise the potential of e-commerce as a driver of economic growth. At the same time, in Ukraine, only 4.8% of enterprises are engaged in e-commerce, which is significantly lower than the European level (21.3%).

Evaluating digital transformation as a tool for monitoring and analysis is a key focus in research. In particular, T.L. Mesenbourg (2001) proposed three main areas for assessing the digital economy, which include e-business, e-commerce and technical infrastructure. These

approaches have been applied in the current study, where the state of e-commerce in Ukraine was assessed (only 4.8% of enterprises are engaged in online sales), which is significantly behind the average level of EU countries (21.3%). J. Haltiwanger & R.S. Jarmin (2000) supplemented this approach, focusing on the demographics of the workforce and its digital skills. The data obtained in the current research showed that only 21.6% of the population of Ukraine have basic digital skills, which is 6.9% less than the EU average.

The methodologies of international organisations, such as DESI from the European Commission, offer a comprehensive analysis of digital transformation. In particular, the DESI index reflects the overall level of digitalisation of the economy. In the current study, the DESI sub-indices demonstrated a significant lag in Ukraine in the implementation of high-speed internet (only 46% versus 84.1% in the EU) and the lack of 5G coverage, which is also noted in the research of M. Olczyk *et al.* (2022). In addition, the digital competitiveness index (IMD, 2022) focuses on the importance of investment in innovation, which is also confirmed by the findings of this study on the lack of funding for innovative development (0.5% of GDP in Ukraine versus more than 2% in EU countries).

In general, the study largely confirms the results of other authors regarding the importance of digital technologies for the economy. At the same time, differences in the levels of integration of digital solutions, investment in innovation and infrastructure indicate the peculiarities of the Ukrainian context, which require more detailed study.

Conclusions

The digital transformation of Ukraine's economy is opening up new opportunities for economic growth, increased productivity and efficient resource management. The use of automation, artificial intelligence, big data and other innovative technologies allows for increased production of goods and services while reducing costs. For example, the introduction of digital technologies contributes to an increase in labour productivity by up to 30%, which is confirmed by the analysis of indicators in high-tech industries. Investments in digital technologies, scientific research and innovation are key to increasing the competitiveness of the economy. Despite the growth of the IT sector's share in the GDP structure to 4.2%, Ukraine still needs to increase the level of funding for innovative development, which currently stands at only 0.5% of GDP, while in EU countries this figure exceeds 2%.

Digitalisation promotes the effective use of natural, financial, information and capital resources. For example, process optimisation through digital solutions allows enterprises to reduce costs by 15-20%. At the same time, digital technologies stimulate the development of new markets and products, increasing added value, which creates conditions for new business models. However, the level of cloud technology use among enterprises in Ukraine is only 10%, which is significantly less than the EU average of 36.7%. This indicates the need to intensify the digital transformation of small and medium-sized businesses.

The level of basic digital skills among the population of Ukraine stands at 21.6%, which is 24.2% lower than the EU average. Additionally, the proportion of ICT graduates in Ukraine is 3.2%, which is 1.8% lower than the EU average. The development of digital skills and education is critically important for strengthening the IT sector and providing the economy with a highly skilled workforce. The analysis also revealed significant shortcomings in the telecommunications infrastructure: the lack of 5G coverage and inadequate broadband internet, with only 46% of the population having access to high-speed connectivity, compared to 84.1% in EU countries.

The prospects for further research lie in the development of effective strategies for integrating digital technologies into key sectors of the economy, assessing the impact of digitalisation on inclusion, and exploring mechanisms for attracting investment in digital infrastructure.

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Conflict of Interest

None.

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Оцінювання цифрової трансформації економіки України: виклики, можливості та стратегічні перспективи

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Анотація. Цифрова трансформація економіки України сприяє підвищенню ефективності, конкурентоспроможності та модернізації ключових секторів шляхом оптимізації бізнес-процесів, розвитку інфраструктури й електронного урядування, а також стимулювання цифрових навичок населення. Метою дослідження була розробка комплексної системи цифрової трансформації економіки України, що враховує сучасні виклики, можливості та необхідні механізми управління цим процесом. Методологія дослідження базувалася на аналізі міжнародного досвіду у впровадженні цифрових технологій, оцінці економічних вигод від цифровізації та вивченні впливу технологій на ефективність державного управління й бізнесу. Дослідження також включало огляд сучасних трендів у сфері цифрової економіки та оцінку перспектив їхнього застосування в Україні. Основні результати дослідження підтвердили, що цифрова трансформація економіки України відкриває нові можливості для економічного зростання, підвищення продуктивності та конкурентоспроможності. Перехід до цифрової економіки України повинен бути спрямований на створення умов для розвитку інноваційних секторів, зниження залежності від сировинного експорту та підвищення доданої вартості продукції. Саме на цьому зроблено наголос у процесі створення національної стратегії цифрової трансформації, яка має включати розвиток цифрової інфраструктури, підтримку інноваційних технологій, впровадження нових цифрових сервісів у державному управлінні та бізнесі. Особлива увага приділялася питанням кібербезпеки та захисту персональних даних в умовах стрімкого розвитку цифрових рішень.Практичне значення дослідження полягає в застосуванні його результатів для розробки національних стратегій цифровізації, що сприятиме економічному зростанню та інтеграції України в глобальну цифрову економіку

Ключові слова: цифрові технології; економічна модернізація; електронне урядування; інновації в бізнесі; цифрова інфраструктура; кібербезпека; цифрові навички

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