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Alla Cherep

PROSPECTS FOR THE DEVELOPMENT OF THE STATE ECONOMY THROUGH ITS DIGITAL TRANSFORMATION AFTER THE RUSSIAN-UKRAINIAN WAR IN THE PANDEMIC OF COVID-19

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The theoretical and scientific-applied provisions presented in the monograph will be useful for researchers, teachers, graduate students, applicants for higher education, and is intended for decision-makers in companies, non-profit organizations and government.
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ABSTRACT

The relevance of the scientific research of the monograph lies in the fact that that in conditions of variability of factors of the external environment, instability of the internal environment, intensifying competition, there is a deterioration of indicators of financial and economic activity. In addition, in the conditions of martial law, many industrial enterprises faced the problem of loss of sales markets, suppliers of raw materials and materials, the issue of logistics became more complicated. However, industrial enterprises are gradually resuming their activities, starting to work, and an important aspect is financing and attraction of investment capital, which will allow to intensify work, to solve problems with the search for raw materials, supplies. It is determined that investment activity will allow to intensify the innovative development of enterprises, since in the current conditions there is a transition to the use of non-cash forms of payments, improvement of websites, automation of many production processes and transition to work in a remote format.

The use of the improved mechanism will make it possible to develop a plan for the activation of investment and innovation activities, to form measures for the restoration of these types of activities, as well as directions for the improvement of investment and innovation activities in the long term, which will contribute to the increase, change in the level of financial and economic security, and their restoration. Ways to intensify investment and innovation activities and improve them in today's conditions are proposed. It has been determined that the use of the proposed ways will allow not only to intensify investment and innovation activities, but also to improve financial and economic security, which will guarantee the stability of the functioning of industrial enterprises. It has been proven that the innovative way of development is a guarantee of ensuring security, successful operation of enterprises and improvement of the country's economy in the conditions of digital transformation. The use of investments for the introduction of innovations at industrial enterprises makes it possible to increase the level of their financial and economic security, which will affect competitiveness and strengthen competitive positions in the foreign market.

KEYWORDS

Digitization, pandemic COVID-19, Russian-Ukrainian war, digital HR, economic growth, indicators of financial and economic security, indices of the digital economy, personnel management, adaptation to changes, economy, innovation, business, digital transformation, public-private partnership, development, strategies.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CIRCLE OF READERS AND SCOPE OF APPLICATION

The theoretical and scientific-applied provisions presented in the monograph will be useful for researchers, teachers, graduate students, applicants for higher education, and is intended for decision-makers in companies, non-profit organizations and government.

The practical significance of those obtained in the monograph lies in the fact that the proposed scientific and practical recommendations and conclusions can be used to form and implement decision-making models for solving such problems.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

INTRODUCTION

Digital economy (new economy based on data and digital technologies) is a multifactor phenomenon and a stage of development that affects almost all aspects of political, social and economic life, reform giving digital technologies an advantage over analog ones. The digital economy creates added value and worthiness for relevant means of living, industrial processes, products and services.

Viewing digital technologies is the basis of Ukraine prosperity, ensuring a high level of competitiveness. Consequently, the research topic is actual and timely.

External and internal threats can affect the economic development and welfare of a nation. The GDP development trends are the basis for analyzing the changes that occur according to various evaluation criteria, and therefore this may affect the formation of state policy in the financial and economic sphere. Security risks remain a determining factor in assessing the prospects for further development of Ukraine's economy. However, the most significant risk is the duration and intensity of active hostilities. Conditions for sustainable economic development are created through the introduction of digital technologies, especially in the face of constant changes and challenges in the country. International rankings assess the level of digital development of countries and have become an important tool for comparing the achievements and weaknesses of digital initiatives. The article identifies the relationship between the level of development of the country's economy and the digital development indices E-Government Development Index and IMD World Digital Competitiveness Ranking, and concludes that there is a direct relationship between them. The development of financial technologies in Ukraine continues even in the context of the Russian-Ukrainian war, which demonstrates the importance of this sector for the country's economic development. Today, the use of digital technologies and the promotion of the country's digital development is not only a strategic necessity, but also a key factor in ensuring its competitiveness in the international arena. The development of the digital economy is a critical factor for the country's recovery and development, both in times of war and in the period of post-war recovery.

The relevance of the scientific research of the monograph lies in the fact that that in conditions of variability of factors of the external environment, instability of the internal environment, intensifying competition, there is a deterioration of indicators of financial and economic activity. In addition, in the conditions of martial law, many industrial enterprises faced the problem of loss of sales markets, suppliers of raw materials and materials, the issue of logistics became more complicated. However, industrial enterprises are gradually resuming their activities, starting to work, and an important aspect is financing and attraction of investment capital, which will allow to intensify work, to solve problems with the search for raw materials, supplies. It is determined that investment activity will allow to intensify the innovative development of enterprises, since in the current conditions there is a transition to the use of non-cash forms of payments, improvement of websites, automation of many production processes and transition to work in a remote format.

The use of the improved mechanism will make it possible to develop a plan for the activation of investment and innovation activities, to form measures for the restoration of these types of activities, as well as directions for the improvement of investment and innovation activities in the long term, which will contribute to the increase, change in the level of financial and economic security, and their restoration. Ways to intensify investment and innovation activities and improve them in today's conditions are proposed. It has been determined that the use of the proposed ways will allow not only to intensify investment and innovation activities, but also to improve financial and economic security, which will guarantee the stability of the functioning of industrial enterprises. It has been proven that the innovative way of development is a guarantee of ensuring security, successful operation of enterprises and improvement of the country's economy in the conditions of digital transformation. The use of investments for the introduction of innovations at industrial enterprises makes it possible to increase the level of their financial and economic security, which will affect competitiveness and strengthen competitive positions in the foreign market.

The problematic issues of public-private partnership (PPP) are investigated. An author's statement of the partnership concept and public-private partnership essence is proposed, which, unlike existing concepts, require the development of socio-economic processes based on the achievement of strategic goals and responsibilities. Proposals regarding the innovative direction of the public-private partnership in terms of the mechanism of a bivalent nature have been made.

In the monograph based on the analysis of the integration of European management practices in digital transformation in Ukraine, the authors propose practical recommendations and strategic directions for further development and modernization of the digital sector of the Ukrainian economy to enhance its competitiveness and innovation potential in the international market.

The relevance of digital HR research emerges as a core element of personnel management in present-day organizations, particularly against the background of constant changes in the labor market and technological innovations. The purpose of the monograph is to determine the theoretical and practical aspects of digital HR as a core element of personnel management in organizations under the conditions of rapid changes.

Research objectives:

1) to analyze digital HR as an issue of priority for organizations and an important feature of change management;

2) to determine digital HR as a powerful lever of efficiency, competitiveness and optimization of human resource management;

3) to develop trends for the development and of digital HR improvement as a core element of personnel management under the conditions of rapid changes.

The monograph analyzes essential aspects of the introduction of digital technologies in the field of personnel management, such as the use of artificial intelligence, data analytics, online tools and platforms for personnel development, automation of routine processes. The role of digital HR in supporting adaptive work environments, effective communication of remote teams and ensuring data security in contemporary organizations has been analyzed. This subject matter illustrates

the importance and openings of using digital tools in the field of personnel management to achieve success and competitiveness in the constantly changing environment. An important aspect of the analysis is to investigate the issues that organizations are confronted with in the process of introducing digital HR.

It has been proven that these issues may include: non-availability of adequate infrastructure and personnel competence; data security issues; insufficient technology integration; the necessity to modify the corporate culture; investment cost. So as to solve these issues, it is important to develop strategies that take into consideration the specific character of the organization and its needs, to introduce control mechanisms and to evaluate the effectiveness of digital solutions introduced. Strategies for involvement and retaining talents, supporting employee well-being, managing changes, and stimulating innovation have been identified.

PART 1 PRINCIPLES OF ACTIVATION OF INVESTMENT AND INNOVATION ACTIVITIES OF ENTERPRISES

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1.1 THEORETICAL AND METHODOLOGICAL PRINCIPLES OF ACTIVATION OF INVESTMENT AND INNOVATION ACTIVITIES OF ENTERPRISES AS A TOOL FOR ENSURING FINANCIAL AND ECONOMIC SECURITY IN THE CONDITIONS OF DIGITAL TRANSFORMATION OF THE ECONOMY OF UKRAINE

Alla Cherep, Yuliia Ohrenych, Liudmyla Oleynikova

ABSTRACT

At industrial enterprises, a situation has developed leading to a slowdown in investment activity and, accordingly, a deterioration in innovative development. Undoubtedly, enterprises need to attract investment resources in order to improve their financial situation, restore activity indicators and activate innovative development. At the same time, it is expedient to form methods, ways, and tools to activate, increase indicators of investment activity of enterprises, which will contribute to further innovative development. In addition, the stability of investment and innovation activities is a tool for ensuring and increasing the level of financial and economic security of an enterprise and enhancing its competitiveness.

In the context of digital transformation, an important issue is the innovative development of enterprises, the introduction of digital technologies, which also increases the level of security. Therefore, studying the state of investment and innovation activities of industrial enterprises and developing mechanisms to improve it in order to increase economic security is a pressing issue. Along with this, the development of a mechanism for the activation of investment and innovation activities as a tool for ensuring the financial and economic security of industrial enterprises will allow for the formation of measures to restore these types of activities, contribute to increasing the level of financial and economic security and ensure the stability of financial and economic activity.

KEYWORDS

Investment activity, innovative development, industrial enterprises, attracting investment resources, financial situation, investment activation, innovative development activation, digital transformation, financial and economic security.

The problems of increasing the investment activity of enterprises, restoring innovative development, using the development mechanism, and studying the state of investment and innovation activity are studied in the works of the following scholars: D. Aboal [1], P. Garda [1], Yu. Avramenko [2], P. Becko [3], N. Bondarenko [3], S. Vlasyuk [3], M. Kobelianskyi [3], N. Briukhovetska [4], I. Bulieiev [4], N. Burlaka [5], B. Danylyshyn [6], O. Zoria [7], O. Ovcharuk [7], D. Mauer [7],

I. Kipioro[8], N. Ovander [9], M. Rahmouni [10], V. Serebrenikov [11], T. Beridze [11], A. Cherep [11, 15, 17], Z. Baranik [11], N. Lokhman [11], Y. Shvets [11], S. Farace [12], F. Mazzotta [12], W. Hadhri [13], R. Arvanitis [13], H. M'Henni [13], S. Kharchuk [14], O. Cherep [15, 17], Y. Shvets [15], O. Iastremska [16], H. Strokovych [16], O. Dzenis [16], O. Shestakova [16], T. Uman [16], Yu. Ohrenych [17], V. Helman [17], A. Gorbunova [17].

Issues of ensuring the security of enterprises, increasing financial and economic security were studied by: V. Baranova [18], O. Dubynska [19], A. Kovalchuk [20], N. Marusiak [21], N. Bak [21], A. Mekhed [22], Z. Varnalii [22], T. Primorac [23], T. Kozina [23], I. Turčić [23], A. Cherep [24], O. Cherep [24], Y. Ohrenych [24], S. Shynkar [25], Z. Gontar [25], M. Dubyna [25], D. Nasypaiko [25], M. Fleychuk [25].

Along with this, the problem of the implementation of digital technologies has been investigated by the following scholars: N. Andriyiv [26], J. Brodny [27], M. Tutak [27], Zh. Kononenko [28], Ya. Vivtonichenko [28], O. Kononenko [28], V. Makedon [29], O. Baylova [29], Yu. Ohrenych [30], V. Kurdupa [30], E. Samara [31], A. Andronikidis [31], N. Komninos [31], Y. Bakouros [31], Y. Katsoras [31], Qiong Xu [32], Xin Li [32], Yu Dong [32], Fei Guo [32].

However, there is no set of measures and ways to restore investment and innovation activities of industrial enterprises, no mechanism to intensify investment and innovation activities in view of the changing market environment, new trends in business digitalization, as well as tools to increase investment attractiveness, which will ensure the improvement of innovative development and contribute to the strengthening of financial economic security.

The state of life of enterprises, prospects for development largely depend on investment activity, that is, the attraction of financial and material resources in various spheres of activity. Especially in today's conditions, an important issue is finding and obtaining financial support, which will make it possible to establish and organize production, produce new products, introduce new technologies, ensure automation and mechanization of production, renew the worn-out share of fixed assets. All this will ensure establishment of production and economic activity, improvement of financial condition, increase of competitiveness and further development of enterprises.

At the same time, innovation development and intensification of innovation processes at enterprises depend on the level of financial support, i.e. the results of investment activity. Accordingly, the issue of the state of investment and innovation activities of enterprises and the identification of areas for improvement should be considered in a comprehensive manner. Within the framework of innovative development, it is important to introduce digital technologies, which will automate business processes and improve the work of the enterprise. It should be noted that the growth of innovation and investment activity is a prerequisite for the stability of financial and economic security, which will contribute to the development and growth of financial and economic activity. After all, the state of economic security affects financial performance, personnel policy, the state of operational activity and provides protection against threats from the market environment, the formation of measures to ensure the stability of functioning.

1.1 INVESTMENT AND INNOVATION ACTIVITIES OF INDUSTRIAL ENTERPRISES: FEATURES AND CURRENT STATE

According to the Law of Ukraine "On Investment Activity", the following definition of investment activity is formed: "investment activity is a set of practical actions of citizens, legal entities and the state regarding the realization of investments" [33]. According to the Law of Ukraine "On Innovative Activities", the definition of innovative activities is as follows: "innovative activity is an activity aimed at the use and commercialization of the results of scientific research and development, and leads to the release of new competitive goods and services to the market" [34]. The advantage of investment activity for enterprises is attracting investments, forming financial support to improve production and economic activities, and intensifying innovative development. An important feature of innovation activity is the formation of new ideas, development and implementation of new equipment that will ensure the development of enterprises. Thus, investment and innovation activities have a complex impact on the life of enterprises, the state of financial activity, the level of competitiveness, and is also under the constant influence of factors of the internal and external environment.

Based on this, it is expedient to consider the state of investment and innovation activities of Ukrainian enterprises. The importance of research on the state of investment and innovation activity is explained by the fact that its results can determine the advantages and disadvantages of these types of activities, the influence of market environment factors, form recovery measures and make high-quality management decisions that will affect the increase in the competitiveness of enterprises, ensuring financial and economic security. This analysis should begin with the financial support of enterprises, that is, investment activities.

The distribution of capital investments by sources of financing in Ukraine for 2010–2021 is shown in **Fig. 1.1**. From the obtained data, it should be noted that during 2010–2019, the main source of capital investment financing is the own funds of enterprises and organizations, and their share in 2019 compared to 2018 decreased by 0.32 %. Along with this, in 2019, compared to 2018, the following sources of financing capital investments increased: state budget funds increased by 35.16 %; funds from local budgets increased by 12.16 %; bank loans and other loans increased by 49.99 %; the funds of non-resident investors increased by 1.59 times. In general, the share of own funds of enterprises and organizations in the total volume of capital investments was 65.43 % in 2019. It is also worth noting that in 2021–2022, the own funds of enterprises and organizations continue to be the main source of financing for capital investments, and their share in 2021 was 68.59 %. In 2021, compared to 2020, there was an increase in the following sources of capital investment financing: state budget funds increased by 32.96 %; local budget funds increased by 1.49 %; own funds of enterprises and organizations increased by 29.84 %; and household funds for housing construction increased by 38.78 %. However, in 2021, compared to 2020, there was a significant decrease in funds from non-resident investors by 54.95 %.

It is also necessary to analyze the volume of capital investments by types of assets in the industry of Ukraine for 2019–2021. Data in the **Table 1.1** shows that there was a reduction

in the volume of capital investments in industry in 2020 compared to 2019 by 39.68 %. As for the composition of capital investments, in 2020, compared to 2019, by industry, investments in tangible assets decreased by 39.52 %, and the share of investments in intangible assets decreased by 49.34 %.

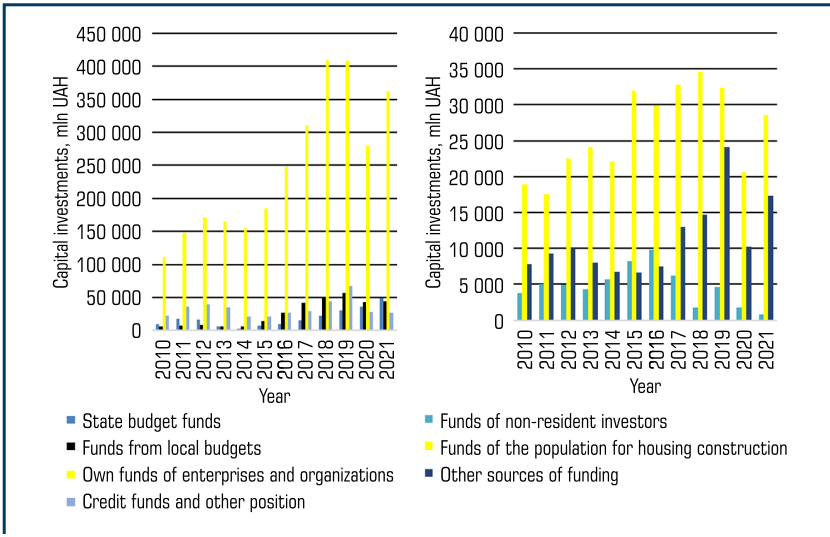

Fig. 1.1 Distribution of capital investments by sources of financing in Ukraine for 2010–2021 (million UAH)
Source: compiled by the author based on [35]

In the structure of investments in tangible assets by industrial enterprises of Ukraine during 2020, there was a reduction in investments in residential buildings (by 87.43 %), engineering structures (by 43.24 %), machines, equipment and inventory (by 35.22 %), vehicles (by 50.36 %), land (by 54.29 %), and there was an increase in investments in long-term biological assets of crop and animal husbandry (by 3.60 %).

Among investments in intangible assets by industry, there was a reduction in investments in rights to commercial designations, objects of industrial property, copyright and related rights (including entertainment programs and originals of literary and artistic works), patents, licenses, concessions, etc. (by 66.09 %), software and databases (by 34.78 %) in 2020 compared to 2019. By industry sectors, the largest reduction in the volume of capital investments is observed in 2020 compared to 2019 in the mining industry and the development of quarrying (by 34.68 %) and processing industry (by 34.52 %). Therefore, the volume of capital investments in industry decreased, which indicates a slowdown in investment activity in 2020.

● **Table 1.1** Capital investments by types of assets by types of economic activity in 2019–2021 (million UAH)

Indexes	Industry			Mining and quarrying			Manufacturing		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Capital investments	254196	153321	191177	68521	44756	55617	105878	69328	82862
Including:									
1. Investments in tangible assets	249995	151193	186973	67023	44317	54272	104108	67999	81150
of them:									
residential buildings	722	90.7	95.3	c	2.5	5.3	644.4	45.6	69.6
non-residential buildings	17832	11955	14079	2321	1737	1817	13547	9075	10920
engineering structures	104657	59398	76554	31733	22844	30180	13458	12030	12789
machinery, equipment and inventory	105100	68085	79116	25562	16504	16731	64966	40809	49229
vehicles	15062	7477	11915	5680	2273	4972	7624	3748	4716
land	457.3	209.1	673.7	526.9	134.9	104	375.7	189.7	562
long-term biological assets of crop and livestock production	166.5	172.5	162.7	c	–	–	158.6	169.3	158.9
other tangible assets	5997	3805	4378	1656	942.3	461.3	3335	1932	2706
2. Investments in intangible assets	4201	2128	4203	1498	438.4	1345	1770	1329	1712
of them:									
rights to commercial designations, objects of industrial property, copyright and related rights, patents, licenses, concession, etc.	1246	422.5	–	360.2	777.8	–	645.7	398.8	–
software and databases	1788	1166	2318	335.8	263.4	356.6	808.9	589.8	987.2

Note: c – Data are not published in order to ensure compliance with the requirements of the Law of Ukraine on the State Statistics regarding confidentiality of statistical information (primary and secondary blocking of vulnerable values)
Source: compiled by the author based on [35]

Along with the indicators of investment activity, it is necessary to analyse the indicators of innovation activity, namely: the share of innovatively active enterprises in the total number of

industrial enterprises; innovation expenditures. According to **Fig. 1.2**, it can be noted that the indicator of the share of innovatively active enterprises in the total number of industrial enterprises during 2000–2020 had variable dynamics and in 2020 there was an increase. Using the Trend function in Excel, a forecast of the number of innovatively active enterprises for 2021–2024 was made. Given the forecast the indicator of the share of innovatively active enterprises, it is possible to note that in 2022–2024 there will be an increase.

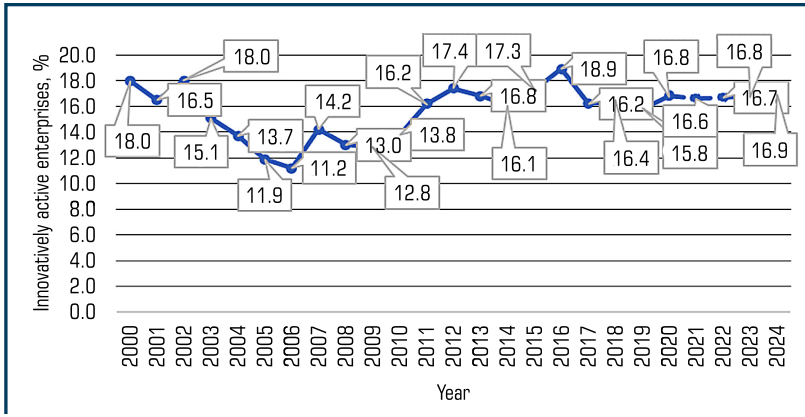

Fig. 1.2 Dynamics of the number of innovatively active enterprises in the total number of industrial enterprises in 2000–2020, forecast for 2021–2024 (%)
Source: compiled by the author based on [35]

As for the indicator of expenditures on innovations by industrial enterprises, in 2020, compared to 2019, there was an increase of 1.31 % (**Fig. 1.3**). In the structure for innovation expenditures of industrial enterprises in 2020, compared to 2019, there was an increase for scientific research and development (R&D) expenditures by 19.44 %, and a decrease other expenditure in innovations (excluding R&D) by 3.37 %. Among the expenses for scientific research and development expenditures at industrial enterprises, R&D performed by own forces (the share was 18.4 % of the total volume of innovation expenditures) and R&D carried out by other enterprises (the share was 5.8 % of the total prevailed the volume of innovation expenditures). Thus, industrial enterprises have seen a revival in innovation activity. With the help of the Trend function in Excel, a forecast of expenditures for innovations of industrial enterprises for 2021–2024 was made, and in 2024, relative to 2023, there will be an increase of 3.71 %. In addition, the structure of innovation expenditures in 2024 compared to 2023 showed the following dynamics: costs for scientific research and development (R&D) increased by 4.53 %; other innovation expenditures (excluding GDR) increased by 3.52 %. The conducted research and received forecast data allow to note that industrial enterprises are setting up innovative activities and attracting investments.

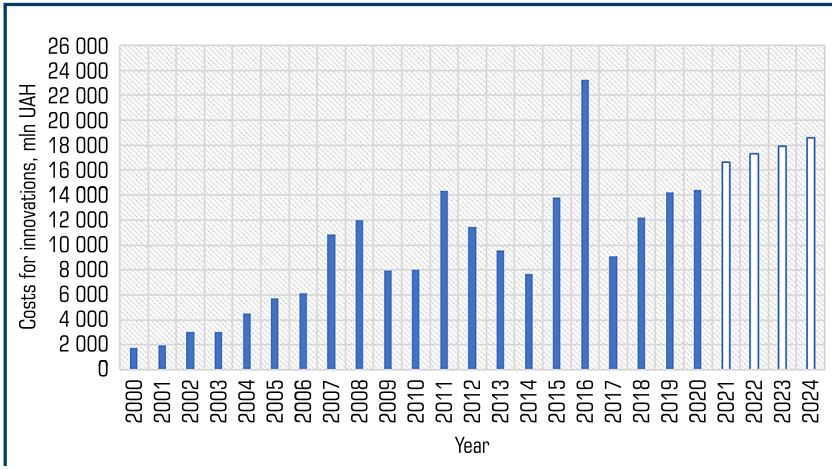

Fig. 1.3 Dynamics of costs for innovations of industrial enterprises in 2000–2020, forecast for 2021–2024. (million UAH)
Source: compiled by the author based on [35]

1.2 FEATURES OF DIGITAL TRANSFORMATION AND THE IMPACT OF INVESTMENT AND INNOVATION ACTIVITIES ON THE FINANCIAL AND ECONOMIC SECURITY OF INDUSTRIAL ENTERPRISES

Having examined the state of investment and innovation activities of Ukrainian enterprises, it is also necessary to study the peculiarities of the use of digital technologies at enterprises and analyze the indicators of the use of information and communication technologies. According to the Concept for the Development of the Digital Economy and Society of Ukraine for 2018–2020 and the approval of the action plan for its implementation, the concept of digitalization is considered as: "a recognized mechanism of economic growth due to the ability of technology to positively influence the efficiency, effectiveness, cost and quality of economic, social and personal activities" [36]. Along with this, the definition of digital technologies is interpreted as: "at the same time a huge market and industry, as well as a platform for the efficiency and competitiveness of all other markets and industries. High-tech production and modernization of industry with the help of information and communication and digital technologies, the scale and pace of digital transformation should become a priority for economic development" [36]. Thus, the use and implementation of information and communication technologies in the work of enterprises plays an important role, promotes digital transformation, improves business processes and ensures innovative development.

Investigating the indicators of the use of information and communication technologies, let's first analyze the indicators of the number of enterprises that carried out electronic trade, the volume

of sold products (goods, services) of enterprises obtained from electronic trade for 2018–2021. During 2021, compared to 2020, there was an increase in the number of enterprises that carried out electronic trade in the processing industry by 6 units, there were no changes at enterprises supplying electricity, gas, steam and air conditioning, at enterprises of water supply; sewerage, waste management was reduced by 1 unit.

According to the indicator of the volume of sold products (goods, services) obtained from electronic trade in 2021, there were changes compared to 2020: processing industry growth by 8.1 %; supply of electricity, gas, steam and air-conditioning growth by 19.0 %; water supply; sewerage, waste management growth by 1.00 %. This allows to note that industrial enterprises are switching to e-commerce, which confirms innovative development, intensification of the implementation of information and communication technologies.

Given the importance of the use of digital technologies and their impact on competitiveness, it is necessary to analyze the indicator of enterprises' access to the Internet, the use of social media by enterprises, and the number of enterprises that purchase cloud computing services. Based on the study of the dynamics of the indicator of the number of enterprises that have access to the Internet for 2018–2022, it should be noted that in 2022, compared to 2021, there was a decrease in the processing industry by 251 units, at enterprises supplying electricity, gas, steam and air conditioning for 27 units, water supply; sewerage, waste management for 28 units (**Table 1.2**). According to forecast data for 2024, relative to 2023, the indicator of the number of enterprises that have access to the Internet had the following dynamics: processing industry – growth by 0.55 %; supply of electricity, gas, steam and air-conditioning – growth by 1.29 %; water supply; sewerage, waste management – growth by 0.28 %.

The indicator of the share of the number of enterprises using social media in the processing industry during 2018–2022 had variable dynamics and the following changes were observed in the structure by types of social media: social networks – a reduction from 24.6 % in 2019 to 23.5 % in 2022; websites or applications (web applications) for sharing multimedia content (content) – reduction from 12.5 % in 2019 to 12.3 % in 2022; blogs or microblogs – a reduction from 6.6 % in 2019 to 6.4 % in 2022. During 2022, relative to 2019, the number of electricity, gas, steam and air conditioning enterprises using social media decreased by 0.5 % and reduction at water supply enterprises; sewerage, waste management accounted for 1.1 %. According to the forecast value of the share of the number of enterprises using social media during 2023–2024, there is a reduction in industrial enterprises.

Declining dynamics are also observed by the indicator of the share of the number of enterprises purchasing cloud computing services, and in 2022, relative to 2021, the following changes occurred: processing industry – a decrease of 0.5 %; supply of electricity, gas, steam and air-conditioning – a reduction of 2.9 %; water supply; sewerage, waste management – reduction by 0.6 % (**Table 1.2**). The forecast of the share of the number of enterprises purchasing cloud computing services based on Trend function in the Excel for 2023-2024 was made, and a decrease is observed in 2024.

● **Table 1.2** Indicators of the use of the Internet, social media, and cloud computing services at enterprises in 2018–2022 and 2023–2024 (forecast)

Indexes	Years	Manufacturing	Electricity, gas, steam and air-conditioning supply	Water supply; sewerage, waste management and remediation activities
Number of enterprises which have access to the internet, units	2018	10878	701	1130
	2019	11089	709	1138
	2021	11323	754	1162
	2022	11072	727	1134
	2023	11277.1	751.85	1150.6
	2024	11339.3	761.55	1153.8
Share of the number of enterprises using social media in the total number of enterprises	2018	28.5	28.1	30.9
	2019	29.4	28.5	32.2
	2022	28.3	28.0	31.1
	2023	28.3	28.0	31.3
	2024	28.2	28.0	31.2
Share of the number of enterprises that purchased cloud computing services of the total number of enterprises	2018	9.3	9.7	7.1
	2019	10	11.6	8.8
	2021	9.9	11.8	7.6
	2022	9.4	8.9	7
	2023	9.7	10.1	7.2
	2024	9.7	9.9	7.1

Source: compiled by the author based on [35]

According to the research results of the state of use of information and communication technologies at enterprises, it should be noted that they contribute to attracting investments, improving the quality of production, innovative development, and increasing indicators of financial and economic activity.

The investment and innovation activities of enterprises have a positive impact on ensuring financial and economic security and its growth. It should be noted that financial and economic security is determined by the state of financial performance indicators of industrial enterprises, namely, the amount of net profit. The study of the dynamics of net profit (loss) at industrial enterprises for 2010–2022 allows to note that the functioning of enterprises was both profitable and unprofitable (**Fig. 1.4**).

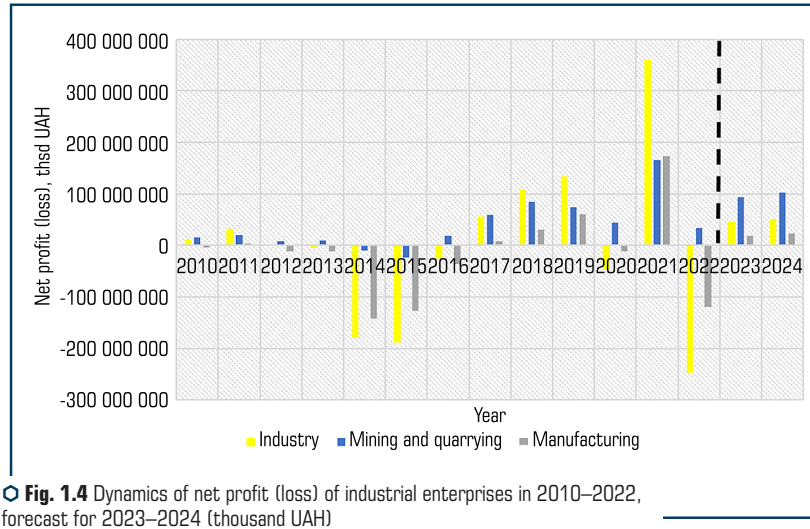

Fig. 1.4 Dynamics of net profit (loss) of industrial enterprises in 2010–2022, forecast for 2023–2024 (thousand UAH)
Source: compiled by the author based on [35]

In particular, the industry of Ukraine made a profit in 2021, but in 2022 the activity is unprofitable, which is due to the predominance of enterprises that suffered a loss. Along with this, the forecasting results for 2023–2024 allow to note that the functioning of the industry will improve, because the net profit is obtained and its growth in 2024 relative to 2023 will be 13.9 %. By types of industry, the following changes took place in 2022 compared to 2021: extractive industry and quarry development – reduction of net profit by 79.7 %; processing industry, supply of electricity, gas, steam and air conditioning, water supply; sewerage, waste management – in 2022, the activity is unprofitable. According to forecast data, there will be an increase in net profit in 2024 compared to 2023 at enterprises of the extractive industry and quarry development (8.4 %), processing industry (25.3 %).

The dynamics of the profitability of operating and total activities of industrial enterprises in Ukraine for 2010–2022 was studied separately (**Fig. 1.5**).

It should be noted that in 2021, there was the largest increase in the profitability of operating activities of the industry and amounted to 11.2 %, as well as the profitability of all activities and amounted to 7.7 %, which allows to note the profitability of the operation. At the same time, in 2022, compared to 2021, there was a sharp decline in the industry's operating profitability by 10.4 % and the level of profitability of all activities in 2022 was –5.4 %. A forecast was also made using the Trend function in Excel for 2023–2024 and it was determined that in 2024, compared to 2023, there will be an increase in the level of operating profitability by 0.2 % and the level of profitability of all activities by 0.2 %. By types of industry, in 2022, compared to 2021,

there was a decrease in the level of operating profitability: mining and quarrying by 25.4 %; manufacturing by 6.7 %; supply of electricity, gas, steam and air conditioning, water supply; sewerage, waste management – the indicator has a negative value. Regarding the indicator of the level of profitability of all activities, during 2022, compared to 2021, there was a reduction in the extractive industry and the development of quarries by 27.1 %, in the processing industry in 2022, the value is negative.

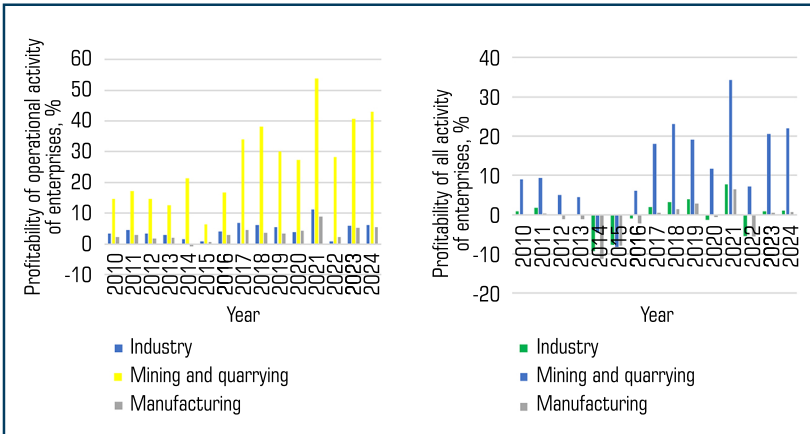

Fig. 1.5 Dynamics profitability of operational activity and of all activity of industrial enterprises in 2010–2022, forecast for 2023–2024 (%)
Source: compiled by the author based on [35]

Taking into account the forecast data for 2023–2024, it should be noted that the indicators had the following dynamics: the level of profitability of operating activities in 2024 relative to 2023 in the extractive industry and quarry development will increase by 2.3 %, in the processing industry by 0 .3 %; the level of profitability of all activities in 2024 compared to 2023 will increase in the mining industry and quarry development by 1.5 %, in the processing industry by 0.3 %.

Given the results of the study, it is advisable to focus on the problems of today, the external environment factors that affect the state of investment and innovation activity, the functioning of enterprises and the level of financial and economic security. In particular, the COVID-19 pandemic and the war in Ukraine have led to a decline in investor confidence, a reduction in investment capital and, as a result, a decrease in the financial support of enterprises. There is also a problem with rising prices for raw materials, materials, energy, and rising inflation, which may lead to a deterioration in the economic situation of enterprises and the country. An important problem is the reduction of production volumes, the suspension of production, which leads to the reduction of available funds, the deterioration of the financial capabilities of enterprises. A significant problem is the decrease

in the level of income of the population, the growth of unemployment, the number of Ukrainian refugees, the departure of the population abroad, which causes a decrease in the purchasing power of society. It should be noted the problem of logistics, which caused the search and formation of new directions for sales of products, supply of raw materials and materials. Also, enterprises faced the problem of lack of their own financial resources and the need to attract credit funds, a decrease in the level of security due to the increased influence of market environment factors, staff turnover, the lack of qualified employees, the rapid development of the innovation market and digitalization processes that take place at foreign enterprises and require an appropriate response.

1.3 DIRECTIONS FOR REVITALIZING INVESTMENT AND INNOVATION ACTIVITIES OF INDUSTRIAL ENTERPRISES AS A TOOL FOR ENSURING FINANCIAL AND ECONOMIC SECURITY

Taking into account the results of the analysis, it is advisable to form a mechanism that will include measures and ways to restore investment and innovation activities of industrial enterprises, taking into account the changing market environment, digitalization of the economy, and will contribute to ensuring financial and economic security, increasing indicators of financial and economic activity.

Given the importance of investment and innovation activity in ensuring financial and economic security, innovative development, and increasing the competitiveness of industrial enterprises, it is necessary to use an improved mechanism for activating investment and innovation activity as a tool for ensuring the financial and economic security of industrial enterprises (**Fig. 1.6**). This mechanism, unlike the existing ones, covers the stages, the implementation of which will allow to formulate and implement a plan for intensifying investment and innovation activities, measures to improve investment and innovation activities in the long term, which will contribute to the recovery, increase the level of financial and economic security by improving business processes, introducing information and communication technologies and affect the efficiency of the functioning of industrial enterprises.

It will make it possible to increase the competitiveness of enterprises, improve the financial situation, and restore performance indicators. Complex use of measures and the specified mechanism will make it possible to improve the state of investment activity of enterprises, which will affect the recovery of innovative development, indicators of financial and economic activity. The implementation of the mentioned mechanism will allow to develop and implement a set of measures to improve investment and innovation activities, which will affect the indicators of operational and financial activities and the state of financial and economic security.

In addition, this mechanism is built on the basis of taking into account the influence of factors of the market environment and makes it possible to form directions for improving investment and innovation activities in the long term. The peculiarity of the mechanism is that it takes into account the specifics of the functioning of industrial enterprises, allows to develop and implement a plan for the activation of investment and innovation activities.

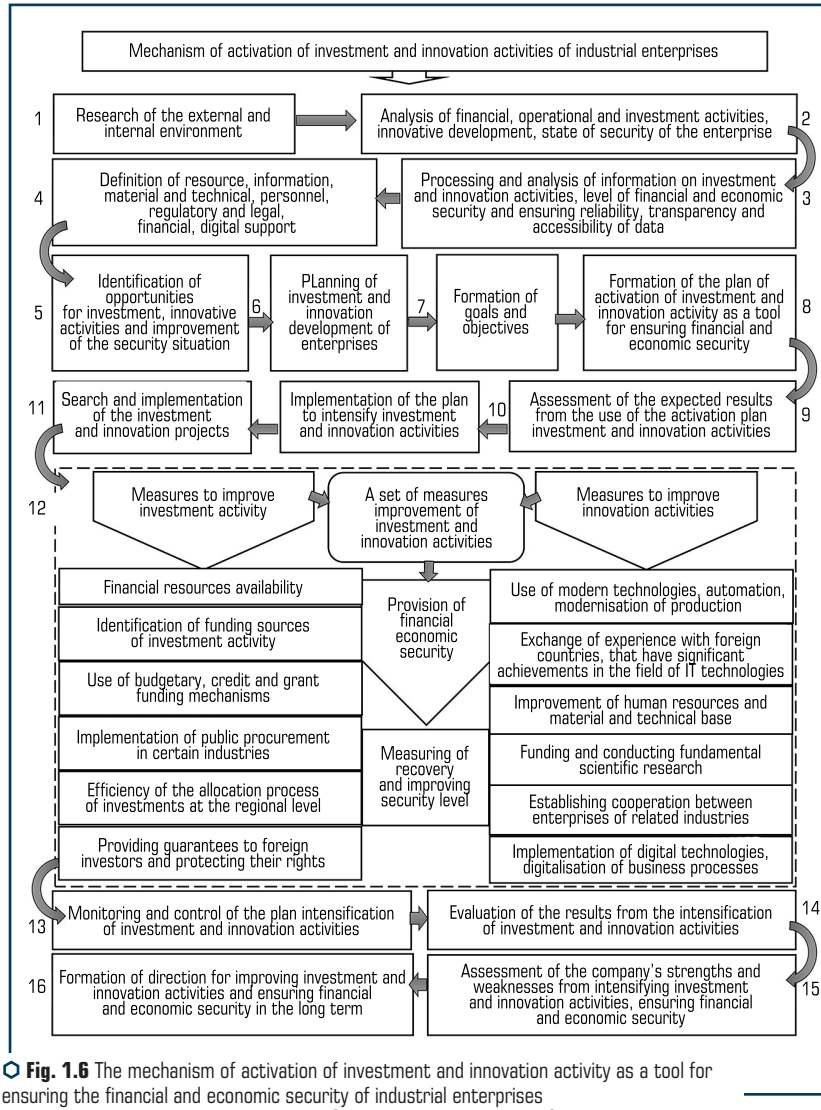

Fig. 1.6 The mechanism of activation of investment and innovation activity as a tool for ensuring the financial and economic security of industrial enterprises
Source: compiled by the author based on [2–5, 7, 8, 18, 19, 20, 22]

In order to improve the investment activity of enterprises, the following measures should be implemented: develop partnerships with foreign countries; establish cooperation, change logistics,

that is, ways of supplying raw materials and selling products; promotion of digitalization of industrial enterprises, introduction of experience, standards of EU countries; attract international assistance in the field of enterprise development; support of the international community in the form of investment attraction; attraction of support from state and local authorities, international financial organizations; reforming the tax system in terms of reducing the tax burden on retained earnings, increasing tax control and identifying cases of tax evasion; use of lending at reduced rates and on favorable terms for large enterprises; continuation of reforms in the field of investment activity at the state level to protect the rights of investors; improvement of antimonopoly legislation and reform of the judicial system; abolition of inefficient procedures for control over the activities of enterprises, excessive restrictions, outdated certification systems, conducting examinations; expanding sales markets by establishing diplomatic cooperation; investment support for the regions of Ukraine; development of the network of state investment projects by allocation of funds from the state and local budgets; export support and protection of Ukrainian business interests on the foreign market; creation of conditions for the arrival of investors after the war; attraction of long-term loans and grants; implementation of government orders in certain industries, such as light industry and engineering for reconstruction, defense needs; restoration of industrial infrastructure in the liberated territories in the direction of reducing the energy consumption of production, improving the quality of production; development of the transport network in the direction of the EU countries and reconstruction of the energy infrastructure; maintaining the interests of own producers; financing investment projects at the local government level.

In order to activate the innovative activity of enterprises, the following measures should be taken: exchange of experience with foreign countries that have significant achievements in the use of modern technologies; preservation of own raw material base and rationalization of use of raw materials, implementation of waste-free production; transition from excessive use of raw materials to saving them, replacing them with other materials; introduction of technologies to reduce emissions into the environment and greening of production; implementation of digital technologies; digitization of business processes and all spheres of activity; development and support of innovative projects in industry; attracting technologies to industrial enterprises; formation of business support programs and individual regions; funding of scientific research at the state level and conducting fundamental scientific research; renewal of industrial enterprises through the introduction, use of modern technologies, renewal of production. An important prerequisite for the establishment of investment and innovation activities of enterprises, the attraction of foreign investors is the stabilization of the political situation, obtaining security guarantees, reforming the economy, and carrying out judicial reform.

The implementation of measures to improve investment and innovation activity will also contribute to the restoration of the state of financial and economic security, which will ensure the stability of financial and economic activity. In addition, in order to increase the level of financial and economic security, the following measures should be identified: rational distribution and use of financial resources; investment attraction; adjustment of production and its automation; use of

digital technologies for data collection, planning, business processes, implementation of software products for operating, financial, investment activities; personnel training, attracting qualified personnel; improvement of the management system, logistics; establishing interaction with suppliers, partners; updating the advertising policy; production of quality products taking into account the needs of customers; implementation of information and communication technologies, for example, creating your own website, setting up access to the Internet, using social media.

In addition, many measures were taken at the state level in 2020–2021 to increase Ukraine's investment attractiveness, in particular: the Law of Ukraine "On Amendments to the Law of Ukraine "On Industrial Parks" and Some Other Legislative Acts of Ukraine on Attracting Investment in the Industrial Sector of the Economy by Stimulating the Creation of Industrial Parks" was signed. In other words, conditions have been created to intensify the attraction of investment capital through the creation of industrial parks [37]; the Law of Ukraine "On State Support for Investment Projects with Significant Investments in Ukraine" was signed, which defines the principles of providing state support for investment projects with significant investments, the specifics of preparing an application and deciding on the feasibility or inexpediency of concluding a special investment agreement, and guarantees the rights of investors with significant investments [38].

As a result of the war in Ukraine, the metallurgical, machine building and chemical industries, which are located in dangerous regions and have long logistics cycles, suffered significant losses. Many light industry, machine building and food production companies moved to the western regions. An important role in improving the performance of enterprises after the situation stabilizes is played by exports, government orders, protection of domestic producers, employment of the unemployed, and availability of loans [39].

In general, some industrial enterprises will be able to fulfil state orders for reconstruction and defence needs, which will allow them to resume their financial and economic activities. After the war is over, international organizations and the state will be the main investors, which will allow enterprises to resume investment activities and gradually intensify their innovative development. All this will facilitate the establishment of cooperation between enterprises and international organizations of the EU countries and increase their competitiveness. Accordingly, the establishment of investment and innovation activities will guarantee innovative development and the introduction of digital technologies, which will help improve financial and economic security. All of this will ensure the stability of financial and economic activities and increase the competitiveness of enterprises.

Establishing investment and innovation activities of industrial enterprises requires security guarantees, stabilization of the political situation, and economic reform. There has been a gradual recovery in production at enterprises in safe regions, but the metallurgical industry and machine building have suffered significant losses. Attracting additional sources of funding, i.e. intensifying investment activity, plays an important role in the resumption of operations. This will help to normalize financial and economic performance, restore production, increase competitiveness and identify areas for development. The formed mechanism for the activation of investment and innovation activity as a tool for ensuring financial and economic security makes it possible to develop and

implement a plan for the activation of these types of activities, measures to increase the efficiency of activities, the level of safety, directions for improvement in the long term, which will affect the efficiency of the functioning of industrial enterprises. In addition, the use of the mechanism at industrial enterprises covers the study of financial, operational, investment activities, innovative development, the state of security, the introduction of information and communication technologies, taking into account the influence of factors of the market environment, which will ensure the activation of investment and innovation activities. Thus, the activation of investment and innovation activity will ensure the improvement and restoration of the state of economic security of enterprises, which will guarantee the efficiency of their functioning.

REFERENCES

1. Aboal, D., Garda, P. (2015). Technological and non-technological innovation and productivity in services vis-à-vis manufacturing sectors. Economics of Innovation and New Technology, 25 (5), 435–454. https://doi.org/10.1080/10438599.2015.1073478
2. Avramenko, Y. (2018). Investment activity as a tool for in creasing of the farm competitivene. Ekonkmika APK, 25 (1), 82–92. Available at: http://nbuv.gov.ua/UJRN/E_apk_2018_1_14
3. Becko, P., Bondarenko, N., Vlasyuk, S., Kobelianskyi, M. (2020). Investment and innovation priorities in the development of regulatory mechanisms of entrepreneurial activity of agricultural production. Ekonomika Ta Derzhava, 3, 88–93. https://doi.org/10.32702/2306-6806.2020.3.88
4. Briukhovetska, N. Yu., Bulieiev, I. P. (2019). Resources and Mechanisms for Investment and Innovation Development of Ukrainian Industrial Enterprises. Bulletin of Economic Science of Ukraine, 1 (36), 11–25.
5. Burlaka, N. (2019). Development of investment activities of enterprises of Ukraine. Investytsiyi: Praktyka ta Dosvid, 8, 37–44. https://doi.org/10.32702/2306-6814.2019.8.37
6. Danylyshyn, B. (2022). Shchodo stanu investytsiinykh protsesiv v ekonomitsi Ukrainy ta shliakhiv yikh aktyvizatsii. LB.ua. Available at: https://lb.ua/blog/bogdan_danylysyn/503439_shchodo_stanu_investitsiynih_protsesiv.html
7. Zoria, O., Ovcharuk, O., Mauer, D. (2021). Theoretical and methodological fundamentals of formation and development of investment and innovation strategy. Black Sea Economic Studies, 62, 37–42. https://doi.org/10.32843/bses.62-6
8. Kipioro, I. M. (2015). Orhanizatsiino-ekonomichnyi mekhanizm rozvytku innovatsiino-investytsiinoi diialnosti silskohospodarskykh pidpryiemstv [PhD Thesis; Uman National University of Horticulture].
9. Ovander, N. L. (2018). Innovation and investment activities of enterprises of Ukraine and Zhytomyr region. Scientific Bulletin of Uzhhorod National University. Series: International Economic Relations and the World Economy, 20 (2), 131–136.

10. Rahmouni, M. (2013). Innovativeness of Exporting firms in a Developing Country: The Case of Tunisia. Economics Bulletin, AccessEcon, 33 (2), 914–930. Available at: https://ideas.repec.org/a/ebl/ecbull/eb-12-00359.html
11. Serebrenikov, V., Beridze, T., Cherep, A., Baranik, Z., Lokhman, N., Shvets, Y. (2021). Economic and mathematical analysis of impact investment on efficiency of the enterprise. Financial and Credit Activity Problems of Theory and Practice, 4 (35), 287–294. https://doi.org/10.18371/fcaptp.v4i35.222106
12. Farace, S., Mazzotta, F. (2015). The effect of human capital and networks on knowledge and innovation in SMEs. Journal of Innovation Economics & Management, 16 (1), 39–71. https://doi.org/10.3917/jie.016.0039
13. Hadhri, W., Arvanitis, R., M'Henni, H. (2016). Determinants of innovation activities in small and open economies: the Lebanese business sector. Journal of Innovation Economics & Management, 21 (3), 77–107. https://doi.org/10.3917/jie.021.0077
14. Kharchuk, S. (2020). State of investment activity of enterprises of Ukraine in conditions of economic instability. Ekonomika ta Derzhava, 1, 66–72. https://doi.org/10.32702/2306-6806.2020.1.66
15. Cherep, A., Cherep, O., Shvets, Y. (2018). Theoretical and methodological backgrounds of the innovation activity model's development in the machine-building enterprises using economic mechanism. Financial and Credit Activity Problems of Theory and Practice, 2 (25), 375–384. https://doi.org/10.18371/fcaptp.v2i25.136560
16. Iastremska, O., Strokovych, H., Dzenis, O., Shestakova, O., Uman, T. (2019). Investment and innovative development of industrial enterprises as the basis for the technological singularity. Problems and Perspectives in Management, 17 (3), 477–491. https://doi.org/10.21511/ppm.17(3).2019.38
17. Cherep, O., Cherep, A., Ohrenych, Y., Helman, V., Gorbunova, A. (2024). Improvement of the management mechanism of the strategy of innovative activities of enterprises. Financial and Credit Activity Problems of Theory and Practice, 1 (54), 471–484. https://doi.org/10.55643/fcaptp.1.54.2024.4295
18. Baranova, V. V. (2017). Financial and economic security in ensuring the economic security of the national economy. Uzhorod National University Herald. Series: International Economic Relations and World Economy, 14 (1), 206–209.
19. Dubynska, O. (2021). Determination of the level of financial and economic security on the basis of analysis of the financial statements of the enterprise. Taurida Scientific Herald. Series: Economics, 5, 112–122. https://doi.org/10.32851/2708-0366/2021.5.14
20. Kovalchuk, A. M. (2020). Finansovo-ekonomichna bezpeka pidpryiemstva v konteksti adaptatsii do vyklykiv tsyfrovoho seredovyshcha. Economics Bulletin, 3, 152–159. https://doi.org/10.33271/ebdut/71.152
21. Marusiak, N., Bak, N. (2022). Financial security of the enterprise and threats of its loss in the modern economic environment. Ekonomika ta Derzhava, 2, 109–113. https://doi.org/10.32702/2306-6806.2022.2.109

22. Mekhed, A., Varnalii, Z. (2021). Financial security of enterprises in the digital economy. Socio-Economic Relations in the Digital Society, 3 (42), 55–61. https://doi.org/10.18371/2221-755x3(42)2021253524
23. Primorac, T., Kozina, T., Turčić, I. (2018). Economic security of enterprises. Poslovna Izvrsnost – Business Excellence, 2, 167–175. https://doi.org/10.22598/pi-be/2018.12.2.167
24. Cherep, A., Cherep, O., Ohrenych, Y. (2022). Improving the scientific and methodical approach to assessing the impact of factors on the use of the mechanism for forming a strategy for anti-crisis management of operational activities of industrial enterprises in crisis conditions. Financial and Credit Activity Problems of Theory and Practice, 1 (42), 134–144. https://doi.org/10.55643/fcaptp.1.42.2022.3681
25. Shynkar, S., Gontar, Z., Dubyna, M., Nasypaiko, D., Fleychuk, M. (2020). Assessment of economic security of enterprises: theoretical and methodological aspects. Business: Theory and Practice, 21 (1), 261–271. https://doi.org/10.3846/btp.2020.11573
26. Andriyiv, N. (2022). Digital transformation of the enterprise: theoretical basis. Efektyvna Ekonomika, 4. https://doi.org/10.32702/2307-2105-2022.4.79
27. Brodny, J., Tutak, M. (2022). The Level of Digitization of Small, Medium and Large Enterprises in the Central and Eastern European Countries and Its Relationship with Economic Parameters. Journal of Open Innovation: Technology, Market, and Complexity, 8 (3), 113. https://doi.org/10.3390/joitmc8030113
28. Kononenko Zh. A., Vivtonichenko Ya. V., Kononenko O. A. (2023). The Development of Entrepreneurial Activity in the Context of the Formation of Digital Economic Policy. Problems of Modern Transformations. Series: Economics and Management, 8. https://doi.org/10.54929/2786-5738-2023-8-04-03
29. Makedon, V., Baylova, O. (2023). Planning and organizing the implementation of digital technologies in the activities of industrial enterprises. Scientific Bulletin of Kherson State University. Series Economic Sciences, 47, 16–26. https://doi.org/10.32999/ksu2307-8030/2023-47-3
30. Ohrenych, Yu. O., Kurdupa, V. S. (2023). Digitalization as a factor of development and improvement of the competitiveness of enterprises in a changing market environment. Financial Strategies of Innovative Economic Development, 57 (1), 14–21. https://doi.org/10.26661/2414-0287-2023-1-57-02
31. Samara, E., Andronikidis, A., Komninos, N., Bakouros, Y., Katsoras, E. (2022). The Role of Digital Technologies for Regional Development: a System Dynamics Analysis. Journal of the Knowledge Economy, 14 (3), 2215–2237. https://doi.org/10.1007/s13132-022-00951-w
32. Xu, Q., Li, X., Dong, Y., Guo, F. (2023). Digitization and green innovation: how does digitization affect enterprises' green technology innovation? Journal of Environmental Planning and Management, 1–30. https://doi.org/10.1080/09640568.2023.2285729
33. Pro investytsiinu diialnist (1991). Zakon Ukrainy No. 1560–XII. 18.09.1991. Available at: https://zakon.rada.gov.ua/laws/show/1560-12#Text

34. Pro innovatsiinu diialnist (2002). Zakon Ukrainy No. 40-IV. 04.07.2002. Available at: https://zakon.rada.gov.ua/laws/show/40-15#Text
35. State Statistics Service of Ukraine. Available at: http://www.ukrstat.gov.ua/
36. Pro skhvalennia Kontseptsii rozvytku tsyfrovoi ekonomiky ta suspilstva Ukrainy na 2018-2020 roky ta zatverdzhennia planu zakhodiv shchodo yii realizatsii (2018). Rozporiadzhennia Kabinetu Ministriv Ukrainy No. 67-r. 17.01.2018. Available at: https://zakon.rada.gov.ua/laws/show/67-2018-%D1%80
37. Pro vnesennia zmin do Zakonu Ukrainy "Pro industrialni parky" ta deiakykh inshykh zakonodavchykh aktiv Ukrainy shchodo zaluchennia investytsii u promyslovyi sektor ekonomiky shliakhom stymuliuvannia stvorennia industrialnykh parkiv (2021). Zakon Ukrainy No. 1710–IX. 07.09.2021. Available at: https://zakon.rada.gov.ua/laws/show/1710-20#Text
38. Pro derzhavnu pidtrymku investytsiinykh proektiv iz znachnymy investytsiiamy v Ukraini (2020). Zakon Ukrainy No. 1116–IX. 12.2020. Available at: https://zakon.rada.gov.ua/laws/show/1116-20#Text
39. Ukraina 2022. Yak ne vtratyty svii shans staty sylnoiu derzhavoiu (2023). Ukrainskyi Instytut Maibutnoho. Available at: https://uifuture.org/publications/ukrayina-2022-yak-ne-vtratyty-svij-shans-staty-sylnoyu-derzhavoyu/

PART 2

CURRENT STATE OF THE DIGITAL TRANSFORMATION OF THE ECONOMY MAKING USE OF EUROPEAN EXPERIENCE DURING THE PANDEMIC COVID-19 AND THE RUSSIAN-UKRAINIAN WAR

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2.1 REVIEW OF PRACTICAL EXPERIENCE IN THE USE OF DIGITAL TECHNOLOGIES IN EUROPE

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ABSTRACT

In the contemporary world, digital technologies set new directions for societal development and exert influence across all spheres of human life. The European experience in implementing and utilizing digital technologies serves as a crucial source of knowledge and innovation that can be harnessed to enhance efficiency across various domains. The rapid pace of digitization in Europe renders the investigation and analysis of practical experience in the use of digital technologies in Europe a pertinent task for identifying the advantages and challenges unfolding before the Ukrainian economy.

The aim of this monograph is to conduct a comprehensive analysis of practical experience in the use of digital technologies in Europe, with the goal of identifying key aspects that may be relevant to digitization in Ukraine.

The study not only analyzes the implementation of digital technologies in various sectors but also their impact on the economy, social sphere, and lifestyle of the European population. The research examines the history of digital technology implementation in Europe, reviews key periods and significant events in this process, and investigates practical experience in the use of digital technologies across different sectors of European society. The impact of digital technologies on the economy and social sphere of Europe is assessed, important effects and changes in the population's way of life are analyzed. Challenges and prospects for the development of digital technologies in Europe are identified, and adaptation to changes in society is considered. Knowledge about the effective use of digital technologies in Europe is systematized, and opportunities for their application in present-day Ukraine are identified.

KEYWORDS

Digital technologies, societal development, european experience, digitization, Ukrainian economy, digital transformation, competitiveness, sustainable development, practical experience, challenges and opportunities.

Recent research and publications from both foreign and domestic scholars, such as P.-J. Dittrich [1], H. Dregos, B. Zhurakovsky [2], N. Karpyshyn [3], N. Levytska [4], S. Polischuk [5], B. Tripathy [6], among others [7–47], highlight a series of key trends and challenges emerging with the implementation of digital technologies in Europe. A detailed analysis of the available literature provides a deeper understanding of the current state of affairs in digital

development and indicates opportunities for further research. In light of the dynamic development of digital transformation in Europe, the investigation and analysis of practical experience in the use of digital technologies acquire particular significance for countries seeking to adapt effectively to modern challenges and ensure their continued development. The European context may serve as a valuable source of learning and inspiration for the Ukrainian economy, aiding in the identification of successful strategies and best practices. Additionally, studying Europe's experience will contribute to understanding the challenges and opportunities arising from the rapid development of the digital sector, enabling Ukraine to maximize the potential of digital technologies for enhancing competitiveness and sustainable development.

2.1.1 MAIN CONCEPTS AND DEFINITIONS OF DIGITAL TECHNOLOGIES

Digitization is an integral part of modern technical and social progress, defining new opportunities and directions for development. Let's define the key concepts and terms associated with digitization [2].

Digital technologies encompass a set of methods and tools for processing, transmitting, and storing information in digital form. This field consists of key components such as software, hardware, communication technologies, and other innovative approaches [48].

Software is a collection of instructions and programs that control the operation of computers and other digital devices. Software is used in various fields, including business, science, education, and entertainment [49].

Hardware refers to specific physical components such as computers, phones, servers, and other devices used to process and transmit information. Hardware is widely utilized in industry, scientific research, medicine, and many other fields.

Communication technologies comprise data transmission and communication systems, such as the Internet, mobile communication, satellite networks, and other wireless technologies [50].

Digital technologies are essential components of modern society, creating new opportunities and challenges, defining technology development directions, and exerting a significant influence on various aspects of our lives, from economics to education and medicine. Therefore, in addition to stable key components, digitization creates conditions for the development of innovative technological concepts such as:

Artificial Intelligence (AI) – algorithms and computer systems for performing tasks that typically require human intelligence. It includes machine learning, natural language processing, and robotics.

Internet of Things (IoT) – connects physical objects equipped with sensors to interact with each other through a network. Objects can transmit data and perform actions based on the received information [2].

Blockchain – a distributed database that uses cryptography to create sequentially ordered blocks. Each block contains a certain amount of data and a reference to the previous block, making it secure and tamper-proof.

Cyber-Physical Systems (CPS) integrate physical objects with intelligent algorithms and interact with the environment through networks. This combination of physical objects and embedded computers can be used in automobiles, energy management systems, medical monitoring systems, and more [2].

Big Data and Analytics – involve processing and analyzing large volumes of data, whether structured or unstructured. Analytics enables extracting valuable insights and forecasts from this data [6].

These technological concepts converge and interact, forming innovative ecosystems for the development of digital society and economy.

Digital technologies influence economics, politics, culture, and other aspects of societal life. Understanding these interrelationships helps identify key challenges and opportunities they create for national economic development.

The modern world is experiencing a true revolution in digital technologies, defining a new stage of development. The speed of changes and their impact are impressive.

Artificial intelligence is becoming not only a term but also a reality for many fields, from business and medicine to everyday use. This opens up not only new opportunities but also raises questions of ethics and security for society.

The Internet of Things is no longer an abstract concept but is being integrated into everyday life. From connected devices in homes to "smart" city systems, IoT becomes an indispensable part of life.

Blockchain, initially associated with cryptocurrencies, becomes a technology that can change approaches to data security and provide decentralized asset exchange.

Big Data analysis allows obtaining valuable knowledge from accumulated information flows, assisting in making informed strategic decisions.

These trends indicate not only a wide range of innovations but also constant change, requiring society to be flexible and ready to implement innovative approaches. For Ukraine, this is not just a challenge but also an opportunity to transform modern society by leveraging advanced global experience in digital technologies.

2.1.2 HISTORY OF DIGITAL TECHNOLOGY IMPLEMENTATION IN EUROPE

The history of implementing digital technologies in Europe is a complex chain of events and decisions that have shaped the current state of the information society on the continent. By examining key periods and defining moments, it is possible to identify stages of development of digital technologies in this region.

The Dawn of the Digital Era (1940s–1980s). The initial steps towards digital technology in Europe were associated with the emergence of the first computers and the development of telecommunications technologies in the mid-20th century. During this period, the first computer centers and networks emerged, facilitating information exchange and the advancement of computing technology [48].

The Era of Personal Computers (1980s–2000s). With the introduction of personal computers and operating systems such as MS-DOS and Windows, digital technologies became accessible to a wide range of users. This period was marked by the integration of computers into both home environments and work processes.

The Growth of the Internet and Several Standardization Attempts (1990s–2010s). The expansion of the Internet in the 1990s played a pivotal role in changing the way people interact and exchange information. The emergence of the World Wide Web and the proliferation of brands such as Google and Amazon defined a new stage in the development of the digital ecosystem.

Digital Transformation and Innovation (2010s–2020s). The contemporary period is characterized by active digital transformation across all sectors of society. The development of computing technology, the implementation of artificial intelligence, the expansion of the Internet of Things, and other innovations define new opportunities and challenges for European countries [48].

Europe plays a significant role in the global information space. On one hand, it sets strategies and norms in the field of digital technologies, while on the other hand, it adapts to the challenges of globalization and competition in the global innovation market.

By examining the history of implementing digital technologies in Europe, it is possible to identify trends and strategies that may be useful for other regions, particularly for Ukraine, which is seeking its own path to a digital future. Europe's practical experience in this context encompasses a wide range of initiatives and innovations, shaping not only technical solutions but also societal and economic transformations.

2.1.3 PRACTICAL EXPERIENCE OF DIGITAL TECHNOLOGY UTILIZATION IN EUROPE

In the European economy, digital technologies are being implemented to enhance production efficiency and foster the development of new industries. The utilization of the Industrial Internet of Things (IIoT) in manufacturing optimizes production processes and enhances product quality. Artificial intelligence finds applications in demand forecasting, supply chain management, and addressing complex business challenges [50].

In the healthcare sector, digital technologies are shaping new approaches to diagnosis and treatment. Electronic medical records, telemedicine, and big data analytics improve the quality of medical services and enable more effective healthcare system management.

In the field of education, digital technologies are used to create interactive learning materials, support distance learning, and develop educational platforms. The integration of the Internet of Things into the educational process stimulates the development of technical skills among students and contributes to their readiness for the challenges of the digital society.

Additionally, significant attention is given to digital art and cultural spheres. Interactive exhibitions, virtual reality usage, and audiovisual technologies expand the boundaries of traditional art and provide new opportunities for creativity and artistic perception.

By examining Europe's practical experience in digitalization development, it can be concluded that digital technologies have become not only a driving force for technical progress but also a key tool for addressing social, economic, and cultural challenges. Europe's experience underscores the importance of integrating digital innovations into all aspects of society to create a sustainable and competitive future [51].

Digital technologies are implemented across various sectors and industries in Europe, bringing significant benefits and revolutionizing traditional approaches. The practical experience of using digital technologies in Europe is characterized by their widespread integration in the following key areas:

1. Industry and Manufacturing.

The industrial and manufacturing sector in Europe is adopting digital technologies to optimize processes, increase productivity, and foster innovation. An illustrative example of practical application of digital technologies in this sector in Europe is Industry 4.0 and production management systems. In Industry 4.0, manufacturing becomes digitized, integrating physical and digital aspects. Through the utilization of sensors, IoT, and analytics, enterprises can track and optimize production processes in real-time. In Germany, industrial enterprises are actively embracing the concept of Industry 4.0, which involves the utilization of the Internet of Things (IoT), machine learning, and data analytics to optimize production processes. Bosch, for instance, employs digital technologies to establish a "smart factory" where automated systems monitor and optimize production lines [1].

Innovative examples also include digital twins and virtual reality. Creating digital replicas of real objects and processes enables their virtual representation and analysis, facilitating debugging of production lines, modeling of new constructions, and personnel training.

Automation and robotics are extensively employed in industry and manufacturing. Robots and automated systems are utilized for monotonous tasks, enhancing efficiency, and reducing costs. The application of IoT allows remote monitoring and management of equipment. Sensors and connectivity facilitate data collection regarding the condition of machinery and devices, enabling scheduled maintenance and avoiding breakdowns. In Sweden and Finland, major enterprises in the automotive industry, such as Volvo and KONE, utilize robotics for vehicle and escalator manufacturing, thereby enhancing the efficiency and accuracy of production processes.

The use of blockchain technologies enables the creation of trusted and transparent supply chains, improving product tracking, enhancing trust among participants, and enabling more efficient inventory management.

Additionally, examples of digitization in enterprises include analytics and forecasting through artificial intelligence (AI), aiding manufacturing companies in demand prediction, inventory management, production plan optimization, and decision-making support. Companies in Germany utilize data analytics and AI technologies to optimize product design and production processes to ensure high quality and production speed.

Energy efficiency and environmental sustainability are crucial aspects in European manufacturing. Digital technologies are employed for monitoring and optimizing energy usage, reducing emissions, and creating environmentally friendly production processes. In the Netherlands and

Germany, companies utilize intelligent systems to measure and optimize energy consumption, helping to reduce costs and minimize negative environmental impacts.

The development of artificial intelligence (AI) is becoming increasingly important for enterprises in the modern world. European countries are not left behind in this trend, and the utilization of AI in enterprises becomes a key factor in enhancing their competitiveness and efficiency. Information regarding the use of artificial intelligence in enterprises in European countries is provided in **Table 2.1** [52].

Therefore, the overview of artificial intelligence (AI) utilization in enterprises across European countries reflects the relevance of employing this technology. Some countries, which already boast a high level of innovative development, actively implement AI to optimize business processes and enhance productivity.

Other countries may lag in this process due to various factors such as inadequate infrastructure or limited access to AI experts. However, the overall trend indicates that artificial intelligence is becoming a necessary component of business strategy to achieve success in competitive environments.

Practical experience in the use of digital technologies in industry and manufacturing in Europe demonstrates that these innovations largely contribute to efficiency, competitiveness, and sustainable development.

Table 2.1 Businesses using AI technologies

Countries	2021	2023	Growth
1	2	3	4
Belgium	7.6	8	5.26
Bulgaria	10.3	13.8	33.98
Czech Republic	3.3	3.6	9.09
Denmark	4.5	5.9	31.11
Germany	23.9	15.2	–36.40
Estonia	10.6	11.6	9.43
Ireland	2.8	5.2	85.71
Greece	7.9	8	1.27
Spain	2.6	4	53.85
France	7.7	9.2	19.48
Croatia	6.7	5.9	–11.94
Italy	8.7	7.9	–9.20
Cyprus	6.2	5	–19.35
Latvia	2.6	4.7	80.77
Lithuania	3.7	4.5	21.62
Luxembourg	4.5	4.9	8.89

● **Continuation of Table 2.1**

1	2	3	4
Hungary	13	14.4	10.77
Malta	3	3.7	23.33
Netherlands	10.2	13.2	29.41
Austria	13.1	13.4	2.29
Poland	8.8	10.8	22.73
Portugal	2.9	3.7	27.59
Romania	7.2	7.9	9.72
Slovenia	1.4	1.5	7.14
Slovakia	11.7	11.4	–2.56
Finland	5.2	7	34.62
Sweden	5.8	15.1	160.34
Norway	9.9	10.4	5.05
Bosnia and Herzegovina	2.1	5.3	152.38
Montenegro	3.3	5.6	69.70
Serbia	0.9	1.8	100.00
Turkey	2.7	5.5	103.70

2. Healthcare.

The healthcare sector in Europe actively employs digital technologies to improve diagnosis, treatment, and organization of medical services. Let's consider examples of practical implementation of digital innovations in this sector [53].

Utilization of Electronic Medical Records (EMR) and Electronic Health Record Systems. In European countries, traditional paper medical records are being replaced by Electronic Medical Records, enabling physicians to efficiently store and retrieve patient information. Creating digital systems for information exchange among different hospitals and medical facilities facilitates the work of medical personnel and improves the storage and transmission of patient data.

Development of Health Mobile Applications. Mobile applications for health tracking, treatment adherence, and healthy living are being developed. Such applications provide patients access to their medical data and allow communication with medical personnel.

Implementation of Online Consultations. Online consultations allow remote consultations. Patients can receive consultations, and doctors can remotely monitor patients' conditions.

Utilization of Artificial Intelligence Algorithms for Image and Data Analysis. Employing AI algorithms for image and data analysis enables more accurate and faster disease diagnosis, reducing the risk of errors and ensuring quicker treatment initiation.

Development of Digital Platforms for Population Health Analysis and Management. Developing digital platforms for analyzing and managing population health allows governments and healthcare organizations to take effective measures for disease prevention and improving public health.

Usage of Big Data for Medical Research. Collecting and analyzing large volumes of patient data allows scientists and researchers to gain new insights and develop more effective methods for treatment and disease prevention.

Digital technologies in European healthcare accelerate the adoption of innovations, improving access to medical services and enhancing the quality of healthcare delivery.

3. Education and Training.

The field of education and training in Europe actively integrates digital technologies to enhance learning processes, access to information, and the development of student skills. Let's consider examples of practical use of digital innovations in this sector [39].

Let's examine the number of graduates from higher education institutions (HEIs) in European countries and their involvement in the field of Information and Communication Technologies (ICT). Information about the total number of graduates, as well as those specializing in the ICT sector, reflects the level of interest and development in this field in different countries, as shown in **Table 2.2** [52].

The total number of university graduates and graduates specializing in ICT varies significantly from country to country. There are countries with a high proportion of ICT graduates, such as Norway and Sweden, where the proportion of ICT graduates exceeds 60 %. At the same time, other countries, such as Cyprus and North Macedonia, demonstrate low participation in this field. Analyzing such differences can serve as a basis for further research and implementation of measures to increase interest in the ICT sector in various European countries.

The use of electronic learning platforms and learning management systems, such as Moodle or Blackboard, allows students and teachers to interact through virtual classrooms, assignments, and online resources.

The development of Massive Open Online Courses (MOOCs) provides an opportunity for a large number of students to access high-quality online courses from leading universities worldwide.

The application of virtual and mixed reality allows for the creation of immersive learning environments for realistic study of subjects, including medicine, engineering, and others.

The use of adaptive technologies, which analyze student feedback and adapt learning materials to meet the needs of individual learners.

Electronic platforms for testing and assessment enable teachers to quickly receive results and provide convenient analysis of student performance.

The use of e-books and interactive materials stimulates student interest, allowing them to study material in an engaging and interactive format.

The creation of educational games and simulations promotes active learning and develops problem-solving skills and critical thinking.

Expanding learning opportunities for those who cannot physically attend classes through the development of remote learning programs and virtual universities.

Table 2.2 Overview of the proportion of ICT graduates in European countries

Countries	HEI Graduates	HEI Graduates in ICT	Proportion of ICT Graduates
Belgium	124 601	3 469	2.78
Bulgaria	47 284	2 335	4.94
Czech Republic	67 367	3 720	5.52
Germany	84 651	4 804	5.68
Estonia	646 785	32 699	5.06
Ireland	9 615	975	10.14
Greece	97 172	7 777	8.00
Spain	81 746	2 895	3.54
France	536 826	25 757	4.80
Croatia	883 975	31 271	3.54
Italy	34 673	1 679	4.84
Cyprus	458 913	6 897	1.50
Latvia	12 912	361	2.80
Lithuania	14 707	730	4.96
Luxembourg	23 620	1 107	4.69
Hungary	2 123	158	7.44
Malta	71 480	4 075	5.70
Netherlands	5 597	368	6.57
Austria	180 046	6 721	3.73
Poland	90 063	4 331	4.81
Portugal	403 602	16 564	4.10
Romania	90 920	2 292	2.52
Slovenia	131 534	9 054	6.88
Slovakia	16 663	747	4.48
Finland	39 514	1 737	4.40
Sweden	59 901	4 541	7.58
Iceland	88 465	4 895	5.53
Norway	5 235	3 469	66.27
Switzerland	97 218	2 915	3.00
North Macedonia	4 617	245	5.31
Albania	9 930	638	6.42
Serbia	41 395	3174	7.67
Turkey	1167119	25905	2.22

The use of technologies for teaching individuals with special needs, ensuring accessibility of materials and tools.

Digital technologies not only facilitate access to knowledge but also transform the learning process itself, providing innovative and efficient teaching methods.

4. Finance and Financial Technologies (FinTech).

The financial sector in Europe actively utilizes digital technologies to enhance financial services, ensure security, and foster innovation. Let's consider examples of practical implementation of digital innovations in this field [54].

In Europe, the use of mobile payment systems and mobile banks has become commonplace. For instance, in Sweden, the Cashless Sweden initiative enables the population to go cashless and conduct payments solely through mobile devices. The popularity of such services is supported by a high level of technological literacy and widespread adoption of contactless technologies.

European Union countries explore the possibilities of using digital currencies and blockchain technologies in the financial system. For example, Switzerland is recognized as a "crypto valley" due to active blockchain project development and an attractive legal framework for cryptocurrency companies.

Financial institutions employ algorithmic analysis and artificial intelligence to make investment decisions and manage portfolios. In the UK, companies providing these technologies assist investors in managing risks and provide more accurate forecasts of market trends.

Estonia utilizes blockchain technology to establish e-citizenship and ensure the security of electronic identifiers, making financial operations and interactions with government authorities more efficient and secure.

London is acknowledged as the global hub of FinTech, where startups actively develop innovative products and services. For instance, Revolut, a British FinTech startup, offers international financial services through a mobile app that utilizes smart technologies to optimize currency operations [55].

Banks in Germany and the Netherlands utilize chatbots and intelligent systems to provide customers with information about account status, transactions, and payments, making customer service more efficient and convenient.

In Sweden and Norway, platforms for digital investments enable small investors to manage their portfolios and invest in various assets through online interfaces.

In Finland and the Netherlands, banks utilize biometric technologies (fingerprints, facial recognition) to confirm identity and ensure the security of financial transactions.

In the Netherlands and Switzerland, companies use electronic records for financial reporting and tax compliance, facilitating business operations and promoting financial transparency.

These examples demonstrate the diversity and innovativeness of using digital technologies in the financial sector of Europe.

5. Art and Culture.

In the realm of art and culture, digital technologies are expanding the boundaries of traditional expression and fostering creative interaction. The use of virtual reality, audiovisual technologies, and interactive exhibitions allows for the creation of new art forms and provides access to cultural

treasures in an online format. Let's explore examples of the experience of digitization in the field of art and culture.

In France and Italy, virtual museums and galleries are becoming increasingly popular. For instance, the Louvre in Paris offers visitors the opportunity to view collections online and utilize augmented reality to enhance their experiences.

In the Netherlands and Germany, artists are creating interactive exhibitions where visitors can interact with artworks using modern technologies such as sensors, virtual reality, and projections.

In the UK, digital projects are being implemented for the preservation and restoration of cultural heritage, such as the use of 3D scanning to document architectural monuments and details.

In Norway, artists are using artificial intelligence to generate new works of art; algorithms analyze styles and techniques to create unique compositions.

In Sweden, online platforms are evolving where artists and creators can showcase their works, interact with viewers, and even receive financial support.

In the Netherlands, theaters are incorporating virtual reality technologies to create unique and immersive performances.

In Germany and Spain, cultural events are being broadcasted online to make them accessible to audiences even under limitations or remotely.

In Switzerland, digital research is being conducted in the field of socio-cultural development, utilizing data analytics to study demand and trends in the cultural sphere.

In Italy, interactive games and applications are being created to promote cultural education among youth and stimulate interest in the arts.

Cultural institutions in Ireland and Scotland are partnering with technology companies to create innovative multimedia exhibitions and virtual events.

These examples demonstrate how digital technologies are expanding the possibilities in the field of art and culture in Europe, providing new forms of interaction and experiences for audiences [56].

Thus, the sectors where digital technologies are most applied in Europe are defined by a wide range of challenges and opportunities they have brought to various spheres of life. This practical experience serves as a valuable source of information for the development and improvement of strategies for using digital innovations in other countries, including Ukraine.

In Europe, various projects and initiatives aimed at developing the digital society and creating a conducive ecosystem for the implementation of digital technologies are actively being implemented. These initiatives cover various aspects of life and the economy and are aimed at stimulating innovation and enhancing digital literacy. Let's consider examples of projects and initiatives aimed at the development of the digital society.

Digital Europe. This initiative, launched by the European Commission, aims to create a digital single market and support innovation in the field of digital technologies. Its goal is to provide high-speed, secure, and convenient access to digital products and services for citizens, businesses, and the public sector [54].

Declaration on Artificial Intelligence (AI). The European Commission is also actively developing a strategy in the field of artificial intelligence. The AI declaration provides mechanisms and principles for creating an ethical and safe environment for the development and use of artificial intelligence in various sectors, including healthcare, transportation, and manufacturing.

Digital Consumer Strategy. This strategy aims to protect consumer rights in the digital environment and increase their trust in digital products and services. This includes regulatory and standardization measures that contribute to ensuring the high quality and safety of digital goods and services.

Horizon Europe. The Horizon Europe program is the largest European research and innovation program, which also includes components aimed at digital technologies. It funds projects and research aimed at creating advanced technologies and developing digital innovations. Launched to replace "Horizon 2020", it covers the period from 2021 to 2027. The program consists of three pillars: "Excellent Science", "Global Challenges", and "Innovations in Europe". Horizon Europe is intended to support scientific discoveries, solve global problems, and promote innovation. Key principles include open access to knowledge, increased role of innovation, and global cooperation in the scientific field.

Electronic Identification and Services (eIDAS). This initiative aims to create a single internet space for secure electronic identification and cross-border electronic services in Europe. It supports electronic identification, electronic signatures, and other digital tools for convenient and secure interaction between citizens and businesses.

These projects and initiatives not only contribute to the development of the digital society in Europe but also indicate directions and strategies that can be useful for other countries, including Ukraine, in their efforts towards digital transformation.

2.1.4 THE IMPACT OF DIGITAL TECHNOLOGIES ON THE ECONOMY AND SOCIAL SPHERE OF EUROPE

The implementation of digital technologies not only determines the competitiveness of countries but also affects the quality of life of citizens, the education system, healthcare, and cultural practices. In this context, it is important to conduct a thorough analysis of the impact of digital technologies on the economy and social sphere of Europe, considering their advantages, challenges, and prospects.

The impact of digital technologies on the economy of Europe can be seen through the increase in efficiency and competitiveness of the business sector. The implementation of digital innovations significantly influences various aspects of enterprise functioning and contributes to the creation of a modern and flexible business environment. The main aspects of the effectiveness of using digital technologies in business in Europe include:

1. Automation and optimization of production processes. Digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics enable enterprises to automate and optimize production processes (**Table 2.3**). This leads to cost reduction, increased productivity, and improved product quality [47].

Table 2.3 Use of social networks by type, internet advertising, and enterprise size class

Country	From 10 to 249 persons employed	10 persons employed or more	250 persons employed or more
Belgium	60.2	60.9	86.0
Bulgaria	78.7	79.3	95.9
Czech Republic	37.4	38.0	61.7
Denmark	82.1	82.5	95.8
Germany	59.8	60.7	87.7
Estonia	53.5	54.3	85.5
Ireland	73.1	73.6	88.2
Greece	60.7	60.8	66.4
Spain	62.8	63.7	92.6
France	66.1	66.8	90.0
Croatia	50.1	50.9	76.0
Italy	56.8	57.3	81.4
Cyprus	79.6	79.9	95.0
Latvia	54.4	55.3	94.2
Lithuania	55.7	56.6	88.5
Luxembourg	69.1	70.0	94.1
Hungary	46.9	47.8	83.2
Malta	86.9	87.1	96.4
Netherlands	78.5	78.9	90.6
Austria	69.1	69.7	91.1
Poland	46.4	47.6	81.1
Portugal	60.5	82.5	85.0
Romania	39.8	40.5	61.2
Slovenia	55.8	56.8	91.9
Slovakia	45.8	46.8	71.3
Finland	80.4	81.1	98.7
Sweden	79.8	80.3	94.1
Norway	82.7	82.9	91.8
Bosnia and Herzegovina	60.1	60.5	70.2
Montenegro	60.4	61.0	83.8
Serbia	53.9	54.6	70.5
Turkey	39.4	40.2	70.8

2. Digital marketing and e-commerce. Digital technologies play a key role in the development of e-commerce and digital marketing. Modern businesses utilize social networks, analytics, personalized advertising, and other tools to attract and retain customers, expand markets, and increase sales [52].

The use of social media is becoming increasingly widespread among businesses in all European countries, regardless of their size. Social media has become an important communication and marketing tool, helping companies attract and engage with customers while maintaining their brand.

However, it is worth noting that medium and large enterprises typically show more active interest in using social media compared to small businesses. This may be due to the greater resources and capabilities of such enterprises to create and sustain an active online presence. Small businesses may face limitations in resources and knowledge, which complicates their activity on social media platforms.

Overall, the use of social media reflects modern trends in business, where active online presence becomes a key factor for success for businesses of any size.

3. Changes in business models are also being driven by digital technologies, prompting a reevaluation of traditional business models. The adoption of cloud-based services, subscription models, and payment systems is revolutionizing how companies offer and consume products and services. An overview of the use of cloud technologies in European enterprises is provided in **Table 2.4**.

Overall, the use of cloud technologies in enterprises is becoming increasingly widespread and integral to business infrastructure. Most European countries demonstrate an increasing adoption of cloud technologies, indicating their popularity and effectiveness in the business environment. However, significant differences in the adoption of cloud technologies among countries should be noted. These variations may be attributed to different factors such as technology availability, economic development, and readiness of enterprises for digital transformation.

In general, the use of cloud technologies in European enterprises represents a promising direction for enhancing efficiency, flexibility, and innovation in the modern business environment.

Table 2.4 Use of cloud technologies at European enterprises

Country	2021	2023	Growth
1	2	3	4
Belgium	53	51.7	–2.51
Bulgaria	12.8	17.5	26.86
Czech Republic	43.8	47.2	7.20
Denmark	64.8	69.5	6.76
Germany	41.6	47	11.49
Estonia	57.5	58.6	1.88
Ireland	58.8	63.1	6.81

Continuation of Table 2.4

1	2	3	4
Greece	20.7	23.6	12.29
Spain	30.9	30	–3.00
France	29.4	26.8	–9.70
Croatia	39.2	45.1	13.08
Italy	60.5	61.4	1.47
Cyprus	50.3	52.9	4.91
Latvia	28.5	35.8	20.39
Lithuania	33.6	38.4	12.50
Luxembourg	33.5	37	9.46
Hungary	26.4	44.9	41.20
Malta	57.1	66.7	14.39
Netherlands	64.9	61.2	–6.05
Austria	40.4	46.5	13.12
Poland	28.7	55.7	48.47
Portugal	33.4	37.5	10.93
Romania	14.1	18.4	23.37
Slovenia	42.7	40.2	–6.22
Slovakia	36.1	34.4	–4.94
Finland	75.3	78.3	3.83
Sweden	75.4	71.6	–5.31
Norway	61	17.5	–248.57
Bosnia and Herzegovina	8.9	71.3	87.52
Montenegro	0	20.7	100.00
Serbia	28.9	31.7	8.83
Turkey	10.8	37	70.81

4. Digital technologies foster innovation in businesses by enabling the creation of new products and services. The use of artificial intelligence, blockchain technologies, and other innovations allows companies to enter new markets and meet growing consumer demands.

5. Improving customer service is facilitated by digital technologies, allowing businesses to enhance customer experiences. The use of chatbots, personalized online systems, and other tools ensures convenience and customization in service delivery.

6. Flexibility and remote work are enabled by digital technologies, allowing businesses to create flexible working conditions, including remote work options and the use of remote communication tools. This not only provides greater flexibility for employees but also reduces costs associated with office space and infrastructure.

These factors indicate that effective use of digital technologies has become a key success factor for the business sector in Europe, helping companies adapt to rapid changes in the technological landscape and sustain growth and innovation. A comparative analysis of the effectiveness of digital technology utilization in various business sectors across different European countries is provided in **Table 2.5** [48].

Table 2.5 Efficiency of digital technologies in different business sectors in different European countries

Country	Business sector	Technologies used	Investments, EUR million	Profit, EUR million	Efficiency, %	Results of implementation
Netherlands	Industry	Internet of things, AI	500	1200	240	Extensive automation of production processes
Germany	Finance	Blockchain, fintech	800	1500	187	Increased security and speed of transactions
Sweden	Trade	E-commerce, data analytics	350	800	229	Growth in online sales
France	Transportation	Autonomous cars, routing	600	1000	167	Minimizing costs and improving transportation logistics
Italy	Food industry	Smart manufacturing processes, IoT	400	700	175	Improved product quality and safety
Switzerland	Education	Electronic learning platforms	200	500	250	Improving accessibility and quality of education

Thus, data on investments and revenue confirm the significant impact of digital technologies on business efficiency in various sectors and countries of Europe. Through digital innovations, companies can not only optimize their production processes and increase productivity but also generate substantial profits. For instance, investments in digital technologies such as IoT, AI, and big data analytics can lead to cost reduction in production, consequently boosting company profits.

The influence of digital innovations on socio-cultural aspects in Europe manifests in various spheres of life, including interpersonal interactions, cultural practices, and social structures. The implementation of digital technologies shapes new communication methods, fosters cultural

expression, and induces changes in social relationships. Key socio-cultural aspects of digital innovation implementation in Europe include:

1. Communication and interaction. Digital technologies transform the way people communicate and interact. Social networks, messaging apps, and other online platforms provide new opportunities for communication and information exchange, leading to the formation of virtual communities and cultural exchange.

2. Changes in the work environment. The adoption of digital innovations leads to changes in the work environment and work schedule organization. The development of remote technologies and flexible work schedules opens up opportunities for remote work, influencing the work-life balance.

3. Access to information and education. Digital technologies provide quick and easy access to information and educational resources. This facilitates self-education and development, as well as reduces the digital divide between different social groups [57].

4. Cultural transformation. Digital innovations impact cultural expressions and creativity. The application of virtual reality, augmented reality, and other technologies expands opportunities for creating and perceiving art, music, and other cultural expressions.

5. Changes in social interactions. Virtual communities and online platforms for idea exchange can affect social interactions. This can bring about both positive changes and challenges related to issues of privacy, cyberbullying, and other ethical aspects.

6. Ethical issues and privacy. The increasing use of digital technologies raises questions about ethics and privacy. The collection and processing of large volumes of data, the use of artificial intelligence, and other technologies require careful consideration of ethical issues and personal data protection.

7. Preservation of cultural heritage. Digital technologies can be used to preserve and disseminate cultural heritage. Reproduction and virtualization of historical objects, languages, and traditions contribute to the preservation of cultural diversity.

Supporting and developing socio-cultural aspects of digital innovation implementation are crucial for creating technologies and strategies that address society's needs and values, promoting sustainable and harmonious development.

Let's examine in **Table 2.6** the engagement of European countries in the use of digital technologies, such as internet access, social media usage, flexible work schedules, remote work, online education, and the use of virtual reality in culture [52].

Analyzing the data presented in Table 2.6, conclusions can be drawn that countries such as Norway and the Netherlands exhibit a high level of digital technology utilization in both business and culture. They are characterized by a large number of Internet users, active usage of social media, and extensive application of virtual reality in cultural programs. The utilization of digital technologies in business and culture across Europe is diverse and depends on the cultural and economic peculiarities of each country. These data underscore the importance of adapting digital strategies to the specific conditions of each market.

Table 2.6 Involvement of European countries in the use of digital technologies

Country	Internet usage	Usage of social media in business	Flexible working hours	Remote work	Online education	Use of virtual reality in culture
Netherlands	97	75	68	40	85	60
Sweden	96	70	72	45	80	55
Norway	98	72	75	42	82	58
Finland	94	68	70	38	88	50
United Kingdom	92	80	65	48	75	65
France	89	76	60	35	78	70

2.1.5 CHALLENGES AND PERSPECTIVES OF DIGITAL TECHNOLOGY DEVELOPMENT IN EUROPE

Modern digital technologies are steadily permeating various sectors of the economy and social life, bringing significant changes that society has not previously encountered. The high level of acceptance and integration of digital innovations in Europe presents both great opportunities and important challenges. Understanding these factors is crucial for determining optimal development and adaptation strategies to the new digital paradigm. Europe, although advanced in digital development, also faces its unique set of challenges and issues [4].

There is a risk of deep digital divide in Europe between different regions and social groups. Failure to address this divide may lead to the exclusion of certain population groups and limit their ability to benefit from digital technologies.

With the increasing use of digital technologies, cybersecurity threats are also growing. Attacks on computer systems, data theft, and other cybercrimes can harm the economy and erode trust in digital services.

The increase in data collection and processing raises questions about privacy and ethics. There is a need to improve legislation regulating the use of personal data and ensure adequate protection.

Unconscious use of digital technologies can lead to social exclusion. Insufficient digital literacy in certain population groups may hinder full participation in the digital society.

The rapid pace of development of digital technologies poses a challenge to regulators in terms of creating and implementing an effective regulatory environment. Insufficient flexibility may hinder innovation, while excessive flexibility may pose risks to consumers and businesses.

It is necessary to increase investments in research and development of new technologies, such as artificial intelligence, quantum computing, and others, to ensure Europe's competitiveness in the global market [5].

There is a need to seek compromise in legislation among different countries of the European Union to create a common regulatory environment that fosters the development of digital technologies and the creation of a unified digital ecosystem.

The increasing use of digital technologies leads to higher energy consumption and emissions. The development of environmentally friendly technologies and measures becomes critical for reducing the negative impact on the environment.

Europe faces the challenge of effectively addressing these problems and challenges to ensure sustainable and balanced development of the digital society.

Forecasting the further development of digital technologies in Europe takes into account many factors, such as innovativeness, socioeconomic aspects, and global trends. Several key forecasts and prospects include:

1. Growth of Artificial Intelligence (AI). Further growth in the use of artificial intelligence is expected in various fields, including industry, healthcare, finance, and education. The development of machine learning algorithms and deep learning will improve analytics and enable more informed decision-making.

2. Development of the Internet of Things (IoT). A large number of real-time connected devices will contribute to the growth of the Internet of Things. The application of IoT in industry, transportation, healthcare, and household management will address efficiency and comfort issues [2].

3. Cyber-Physical Systems. The development of cyber-physical systems, which integrate the physical and digital worlds, will enable the creation of intelligent and automated environments such as smart factories, smart cities, and smart transportation.

4. Expansion of 5G Networks. The deployment of 5G technologies in communication will support higher data transmission speeds and connectivity of a large number of devices. This will impact the development of new services and applications such as virtual reality and the Internet of Things.

5. Electromobility and Green Technologies. Increasing the use of electric vehicles and green technologies will address energy efficiency and emissions reduction issues. The development of renewable energy sources and energy storage will be a key direction.

6. Expansion of E-commerce. E-commerce will continue to grow, providing consumers with more convenience and choice. Innovations in digital payment systems and the use of blockchain technology will enhance consumer trust.

7. Focus on Cyber-Physical Networks and Complex Systems. The development of cyber-physical network technologies and the integration of complex systems that combine various technologies will form the basis for creating intelligent and flexible environments.

8. Increasing Digital Literacy. Focus on improving the level of digital literacy among the population is necessary for all segments of society to fully utilize digital opportunities.

These forecasts indicate that the development of digital technologies in Europe will contribute to the creation of a more innovative, efficient, and sustainable society. However, success will depend on effectively addressing problems and implementing efficient development strategies. Let's consider the use of digital technologies in European countries, covering key aspects such as the use of artificial intelligence (AI), the Internet of Things (IoT), 5G network coverage, the level of digital literacy, the number of electric vehicles, and the use of digital commerce in **Table 2.7** [58].

Table 2.7 The use of digital technologies in European countries

Country	AI use (2018), %	AI use (2023), %	IoT use (2018), %	IoT use (2023), %	5G coverage, %	Level of digital literacy	Number of electric vehicles, thousand	Digital Commerce, %
Netherlands	70	85	50	75	60	High	150	80
Germany	65	80	55	75	50	High	200	75
Sweden	75	90	60	80	70	High	100	85
Norway	80	90	65	85	80	High	80	90
Finland	70	85	60	80	70	High	50	80
France	60	75	50	70	40	High	180	70

Analyzing the data presented in **Table 2.7**, it can be concluded that significant growth in the use of artificial intelligence and the Internet of Things has been observed in all the countries considered over the past five years. The highest levels of usage are recorded in Norway and Sweden. Norway and Sweden also stand out for their high coverage of 5G networks, indicating an active role in the implementation of advanced telecommunications technologies. All the countries examined have a high level of digital literacy, indicating widespread dissemination and use of digital technologies among the population. Norway stands out with the highest number of electric vehicles, indicating a high level of acceptance and use of green technologies in transportation. The use of digital commerce is quite common in all countries, but Sweden stands out with the highest indicator in this aspect. Comparing countries, it can be seen that Norway and Sweden typically lead in many aspects of digital technology usage, while France and Germany have also achieved significant success but require further development in some areas, such as 5G network coverage and the use of electric vehicles.

2.1.6 RECOMMENDATIONS FOR APPLYING THE EXPERIENCE IN UKRAINE

Implementation of best practices in the use of digital technologies from Europe in the Ukrainian context can contribute to sustainable development and modernization of society:

1. Development of IT infrastructure in Ukraine, through the adaptation of best practices from Europe, is an important stage aimed at effective implementation and optimization of digital technologies. European experience in this field can serve not only as a source of learning but also as guidance for creating strategies and policies to improve IT infrastructure in Ukraine. To achieve this, the following tasks can be undertaken:

Expand broadband Internet. Adopt programs and initiatives from European countries aimed at ensuring comprehensive and accessible Internet for all segments of the population. It is important to stimulate the development of broadband coverage in critical areas such as rural regions [53].

Implement educational programs and initiatives to increase the level of digital literacy among the population. Use European approaches to integrate digital technologies into the educational process to ensure competency in the use of modern tools.

Consider European models of support for startups and IT companies. Create a favorable business environment, investment funds, and mentorship support to stimulate the development of innovative IT projects.

Adopt European standards in cybersecurity and data protection. Develop an effective cybersecurity system and implement state-of-the-art methods to ensure security in the information space.

Adapting Europe's best practices in the development of IT infrastructure in Ukraine aims to create an efficient, accessible, and innovative information environment that will contribute to economic growth and improve the quality of life for citizens.

2. Development of Digital Literacy and Education. Digital literacy is becoming a crucial skill in the era of information technology, and the integration of digital technologies into the educational system is a strategic task for the country's development. Europe already has significant experience in this direction, which can be valuable for Ukraine [53].

At the European Union level, there are initiatives aimed at supporting digital literacy and education. Programs such as the "European Declaration of Digital Competences for Citizens" and projects like "Erasmus+" facilitate the exchange of experience and the development of innovative teaching approaches.

Adapting European experience in Ukraine can be a key step in addressing challenges such as limited access to technology and insufficient training of pedagogical staff. However, this also opens opportunities for implementing innovative teaching methods and interactive learning tools. To adapt the European experience of using digital technologies in education to the conditions of the Ukrainian socio-economic environment in the field of digital literacy and education, the following tasks can be performed:

Development and implementation of modern educational programs. Develop modern, adapted-to-Ukrainian-realities educational programs on digital literacy for school students and university students. Implement these programs into the education system, ensuring their practicality and relevance.

Teacher training and professional development. Provide training sessions and seminars for teachers on mastering digital technologies and teaching methods. Create a system of incentives for teachers who actively incorporate digital methods into the educational process.

Creation of accessible electronic resources. Develop and implement digital learning platforms and resources accessible to all segments of the population. Ensure linguistic and cultural adaptation of electronic resources.

Ensuring access to digital technologies. Implement measures to ensure equal access to digital education for all segments of the population, including rural and remote areas. Ensure the availability of necessary devices and internet connections for students.

Adapting practical experience in the use of digital technologies in Europe in the field of digital literacy and education in Ukraine involves implementing the aforementioned measures to improve the level of literacy and qualification of the population in the field of digital technologies.

3. Promoting Innovation Development. European experience in the use of digital innovations is one of the most advanced and influential models in this direction. By analyzing the best practices of using digital technologies in Europe, effective approaches and strategies can be identified for the Ukrainian socio-economic environment.

Creation of innovative infrastructure. Analyze the best European practices in creating and managing innovation centers, technoparks, and incubators to identify effective models. Identify the advantages and challenges of adapting these models to Ukrainian conditions, taking into account regional differences and the institutional environment [59].

Financial support for innovation. Systematic review of European funding instruments for start-ups and innovative projects. Develop mechanisms of grants, investments, and tax incentives aimed at supporting promising innovative ideas of Ukrainian companies.

Business-academia collaboration. In-depth analysis of European models of collaboration between industry and research institutions. Develop mechanisms that facilitate the transformation of scientific developments into innovative products and services in the Ukrainian market.

Stimulating technological transitions. Compare Europe's strategies for transitioning to high-tech sectors. Develop programs and measures to support Ukrainian companies in transitioning to digital technologies, green energy, and innovative sectors.

Development of an innovative culture. Conduct an analysis of European initiatives to increase innovation awareness and culture. Implement educational and cultural initiatives such as hackathons, innovation forums, and startup events.

International cooperation and adoption of European standards. Study European approaches to international cooperation in the field of innovation and technological development. Engage in partnerships with European organizations for knowledge exchange and adoption of European standards in innovation.

Transitioning from European experience to Ukrainian realities may face several challenges, such as financial instability, inadequate infrastructure, and insufficient population education. However, it also opens opportunities for creating new solutions and strategies optimized for Ukraine's conditions.

4. Cybersecurity. Digital technologies bring great potential to all areas of our lives, but along with them comes an increased cybersecurity threat. European experience in cybersecurity is an important source of knowledge that can be successfully adapted to the conditions of the Ukrainian socio-economic environment.

In Europe, digital technologies are used in various fields, including finance, healthcare, industry, and government services. The application of artificial intelligence, the Internet of Things, and other innovative solutions creates new challenges for cybersecurity, and Ukrainian society can leverage European experience to address these challenges.

Europe is actively developing projects and strategies in the field of cybersecurity. For example, the European Union has identified cybersecurity as a priority in its Digital Strategy. This includes the

development of technological solutions, legal mechanisms, and cooperation between countries. Ukraine can adopt the best practices from these strategies to improve its own cybersecurity situation.

Adapting European experience to the conditions of Ukraine requires addressing certain challenges, such as the lack of coordination between different sectors, an unstable legal framework, and the need to raise public awareness.

Adapting European experience in the use of digital technologies to the conditions of the Ukrainian socio-economic environment is an important task, especially in the context of cybersecurity. The path to success lies in careful study and adoption of Europe's best practices, tailored to the specific needs and challenges of Ukrainian society. Collaborative work and knowledge exchange between countries can contribute to raising the level of cybersecurity both in Europe and in Ukraine.

5. E-Governance. E-governance has become an integral part of state development and improvement of collaboration between the government and citizens. In Europe, there is already significant experience in implementing digital tools in the administrative process, and this experience can be successfully adapted to Ukrainian conditions.

In European Union countries, e-governance is based on principles of efficiency, transparency, and citizen engagement in governing state affairs. This includes electronic services, electronic exchange of information between authorities and citizens, as well as digital decision-making tools [59].

European countries actively implement projects and initiatives for e-governance. For example, initiatives like "Single Digital Gateway" in Poland or "e-Residency" in Estonia are examples of successful initiatives that streamline citizen interaction with government services.

Adapting European experience in e-governance to Ukraine faces challenges such as technical infrastructure, cybersecurity, and citizen literacy. However, this also provides opportunities to create a modern and efficient e-governance system.

Adapting European experience in using digital technologies for e-governance in the conditions of the Ukrainian socio-economic environment is a key stage on the path to reforms and modernization of public administration. Successful implementation of these practices will contribute to the creation of an open, efficient, and citizen-centric government.

6. Cooperation with European Partners. In the era of globalization and rapid technological advancement, collaboration between countries is a crucial element for achieving common goals and exchanging experiences. European countries have already successfully utilized digital technologies for managing international cooperation. Electronic platforms for information exchange, efficient use of online communication tools, and other instruments facilitate effective collaboration and knowledge sharing [59].

The European Union actively develops projects and initiatives aimed at supporting international cooperation. For instance, the "Horizon Europe" program enables researchers and innovators to collaborate and exchange experiences for joint research and development of new technologies.

Adapting European experience in Ukraine requires attention to the specifics of the Ukrainian socio-economic environment. Challenges may include cultural differences, legal peculiarities, and technical constraints. However, successful adaptation opens up opportunities for deepened cooperation and exchange of innovative approaches.

Adapting European experience in using digital technologies for cooperation with European partners in the context of the Ukrainian socio-economic environment is a strategically important task. This will contribute to the development of international relations, exchange of innovations, and creation of a favorable environment for joint advancement.

These recommendations aim to create a favorable environment for the implementation of digital technologies in Ukraine and to maximize their positive impact on the country's socio-economic development.

This study provided a comprehensive overview of the current state of digital technology utilization in Europe and identified opportunities for its adaptation in the Ukrainian context. Through careful analysis of various sectors, projects, initiatives, and challenges faced by European society in the process of digital development, it can be concluded that contemporary European experience demonstrates an impressive wide range of applications of digital technologies in different fields. From industry and healthcare to culture and governance, digital innovations play a crucial role in improving the quality of life and societal development.

In Europe, particular emphasis has been placed on sectors where digital technologies are used in an advanced manner. The financial sector, healthcare, and education are examples where technology integration has significantly improved services and optimized processes.

The implementation of digital technologies has led to significant sociocultural shifts. New communication, work, and learning methods shape a new way of life, but challenges such as cybersecurity and ethics arise.

European experience in using digital technologies has its unique specifics, determined not only by technical aspects but also by cultural, legal, and social factors. Taking these peculiarities into account is key to the successful adaptation of such experience in Ukraine.

Adapting European experience in Ukraine is a promising direction for further development. Understanding and considering the specifics of the Ukrainian socio-economic environment are crucial for the successful integration of digital innovations. Ukraine should focus on strengthening infrastructure, developing human capital, and supporting innovative initiatives to achieve sustainable development. In post-war days, Ukraine needs to actively study and adapt advanced European experience in using digital technologies, relying on its positive aspects and addressing challenges for more effective and sustainable development in the era of digital transformation.

REFERENCES

1. Dittrich, P.-J., Krewer, A. (2018). The European answer to the digital revolution. Jacques Delors Institute Available at: https://www.delorscentre.eu/fileadmin/user_upload/20180920_Evian_Digital-Revolution_Dittrich_Krewer.pdf
2. Zhurakovsky, B. Y., Zeniv, I. O. (2021). Tekhnolohii internetu rechei Kyiv: KPI them. Igor Sikorsky, 271.

3. Karpyshyn, N., Grodsky, S., Vilchynskyi, V. (2023). The European Union on the way to digital transformation: experience for Ukraine. Geopolitics of Ukraine: History and Modernity, 2 (31). https://doi.org/10.24144/2078-1431.2023.2(31).76-86
4. Levytska, N. O. (2019). The current trends development normative-legal regulation digital economy. Juridical Scientific and Electronic Journal, 5, 26–29. https://doi.org/10.32782/2524-0374/2019-5/4
5. Polischuk, S., Rospopchuk, T. (2021). The impact of digitalization on changing business models of enterprises. Economic Bulletin of National Technical University of Ukraine "Kyiv Polytechnical Institute", 18, 199–202. https://doi.org/10.20535/2307-5651.18.2021.231175
6. Tripathy, B., Anuradha, J. (Eds.) (2017). Internet of Things (IoT): TeChnologies, Applications, Challenges and Solutions. Florida: CRC Press, 334. https://doi.org/10.1201/9781315269849
7. Carlsson, C. (2018). Decision analytics – Key to digitalisation. Information Sciences, 460-461, 424–438. https://doi.org/10.1016/j.ins.2017.08.087
8. Cherep, A. V. (2013). Necessity for formation of labour motivation mechanism at enterprises. Actual Problems of Economics, 3 (141), 134–149. Available at: http://nbuv.gov.ua/UJRN/ape_2013_3_15
9. Cherep, A. V. (2013). Interrelation between labour motivation and efficiency indicators of personnel usage. Actual Problems of Economics, 1 (139), 117–123. Available at: http://nbuv.gov.ua/UJRN/ape_2013_1_15
10. Cherep, A., Adamenko, M., Cherep, O., Dashko, I., Korolenko, R., Kornukh, O. (2023). The Influence of the Innovation Potential of Personnel on Strengthening Economic Security of Ukrainian Enterprises in the Post-War Period. Wseas Transactions On Business And Economics, 20, 70–79. https://doi.org/10.37394/23207.2023.20.8
11. Cherep, A., Cherep, O., Dashko, I., Rozhenko, O., Kornukh, O., Matkovskyi, P. (2022). Strengthening Economic Security of Enterprise on the Basis of Investing in Staff Management System. Academy of Strategic Management Journal, 21 (4), 1–9. Available at: https://www.abacademies.org/articles/strengthening-economic-security-of-enterprise-on-the-basis-of-investing-in-staff-management-system.pdf
12. Cherep, A., Voronkova, V., Androsova, O. (2022). Transformational changes in organizational management and human resources in the digital age. Baltic Journal of Economic Studies, 8 (3), 210–219. https://doi.org/10.30525/2256-0742/2022-8-3-210-219
13. Cherep, A., Cherep, A., Babenko, V., Dubynina, S., Lyshchenko, E., Hamova, O. (2021). Impovement Of Cost Formation Methods At Industrial Enterprises Taking Into Account Supply Chains. Studies of Applied Economics, 38 (4). https://doi.org/10.25115/eea.v38i4.4038
14. Cherep, O. H., Babajanov, B. A., Voronkova, V. H. (2022). Digitalization of the economy as a platform for creating new values in a transformational environment. Financial Strategies of Innovative Economic Development, 54 (2), 25–28. https://doi.org/10.26661/2414-0287-2022-2-54-04

15. Cherep, O., Voronkova, V., Bespalova, S.; Tabachnikov, S. (2023). Motyvatsiia personalu: vid teorii do praktyky stymuliuvannia pratsivnykiv do Zdiisnennia efektyvnoi diialnosti. Prospective Directions of Scientific and Practical Activity. Sherman Oaks: GS Publishing Services, 57–64. https://doi.org/10.51587/9798-9866-95921-2023-011-58-64
16. Cherep, A., Cherep, O., Ohrenych, Y. (2022). Improving the scientific and methodical approach to assessing the impact of factors on the use of the mechanism for forming a strategy for anti-crisis management of operational activities of industrial enterprises in crisis conditions. Financial and Credit Activity Problems of Theory and Practice, 1 (42), 134–144. https://doi.org/10.55643/fcaptp.1.42.2022.3681
17. Cherep, A., Cherep, O., Shvets, Y. (2018). Theoretical and methodological backgrounds of the innovation activity model's development in the machine-building enterprises using economic mechanism. Financial and Credit Activity Problems of Theory and Practice, 2 (25), 375–384. https://doi.org/10.18371/fcaptp.v2i25.136560
18. Cherep, O., Cherep, A., Ohrenych, Y., Helman, V., Gorbunova, A. (2024). Improvement of the management mechanism of the strategy of innovative activities of enterprises. Financial and Credit Activity Problems of Theory and Practice, 1 (54), 471–484. https://doi.org/10.55643/fcaptp.1.54.2024.4295
19. Cherep, A., Voronkova, V., Cherep, O. (2022). Digital transformation of society as a necessary condition for its innovative development. Theory and Practice of Intellectual Property, 2, 68–73. https://doi.org/10.33731/22022.259745
20. Cherniavska, O. V. (2013). Rynok pratsi. Kyiv: "Tsentr uchbovoi. literatury", 522.
21. Colin, N., Landier, A., Mohnen, P., Perrot, A. (2015). Économie numérique. Notes Du Conseil d'analyse Économique, 26 (7), 1–12. https://doi.org/10.3917/ncae.026.0001
22. Pro skhvalennia Kontseptsii zabezpechennia natsionalnoi bezpeky u finansovii sferi (2012). Rozporiadzhennia kabinety ministriv Ukrainy No. 569-p. 15.08.2012. Availble at: https://zakon.rada.gov.ua/laws/show/569-2012- %D1 %80#Text
23. Kontseptsiia finansovoi bezpeky Ukrainy. Availble at: https://ufin.com.ua/koncepcia/008.doc
24. Spivpratsia Mintsyfry i Nokia: kompaniia nadaie Ukraini 5000 WiFi Beacons (2023). Ministerstvo tsyfrovoi transformatsii Ukrainy. Available at: https://thedigital.gov.ua/news/spivpratsya-mintsifri-i-nokia-kompaniya-nadae-ukraini-5-000-wi-fi-routeriv Last accessed: 01.03.2024
25. Indeks spryiniattia koruptsii – 2023 (2024). Available at: https://ti-ukraine.org/research/indeks-spryjnyattya-koruptsiyi-2023/ Last accessed: 01.03.2024
26. Council Directive 2001/55/EC of 20 July 2001 on minimum standards for giving temporary protection in the event of a mass influx of displaced persons and on measures promoting a balance of efforts between Member States in receiving such persons and bearing the consequences thereof (2001). EUR-lex. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32001L0055 Last accessed: 31.01.2024

27. Aktualni vyklyky ta zahrozy ekonomichnii bezpetsi Ukrainy v umovakh voiennoho stanu (2023). National Institute for Strategic Studies (NISS), 16. Available at: https://niss.gov.ua/sites/default/files/2023-05/executive-summary_ecsecurity_2023_gotovee-1.pdf
28. Cybersecurity Ventures Report on Cybercrime (2023). Information portal eSentire. Available at: https://www.esentire.com/cybersecurity-fundamentals-defined/glossary/cybersecurity-ventures-report-on-cybercrime
29. Danilian, O. H., Dzeban, O. P., Kalynovskyi, Y. Y. (2023). Digital Man as a Product of Information Society. Cogito, 15 (1), 142–159. Available at: https://cogito.ucdc.ro/COGITO_MARTIE_2023.pdf
30. Danilian, O. H., Dzeban, O. P., Kalynovskyi, Y. Y. (2022). Social Instability as a Global Trend of the Modern World. Cogito, 14 (3), 141–162. Available at: https://cogito.ucdc.ro/COGITO_SEPTEMBER_2022.pdf
31. Danylina, S. O. (2022). Ukraine's labor market in the conditions of digitalization and martial status. the Russian-Ukrainian war (2014–2022): historical, political, cultural-educational, religious, economic, and legal aspects, 80–86. https://doi.org/10.30525/978-9934-26-223-4-11
32. Danylyshyn, B. (2022). Shchodo stanu investytsiinykh protsesiv v ekonomitsi Ukrainy ta shliakhiv yikh aktyvizatsii. LB.ua. Available at: https://lb.ua/blog/bogdan_danylysyn/503439_shchodo_stanu_investitsiynih_protsesiv.html
33. Dashko, I., Mykhailichenko, L. (2023). Digitalization of the economy in the conditions of the Covid-19 pandemic as a strategic platform for the development of the state economy. Economy and Society, 47. https://doi.org/10.32782/2524-0072/2023-47-63
34. Dashko, I., Mykhailichenko, L. (2024). Modern approaches and peculiarities of personnel management under martial law. Economy and Society, 59. https://doi.org/10.32782/2524-0072/2024-59-81
35. Dashko, I., Cherep, O., Mykhailichenko, L. (2022). Socio-economic assessment of population protection activities in the direction of population employment regulation. Economic Scope, 182, 111–115. https://doi.org/10.32782/2224-6282/182-17
36. Dashko, I., Cherep, O., Mykhailichenko, L. (2023). Efficiency of the use of workforce at Ukrainian enterprises in the war and post-war periods. Herald of Khmelnytskyi National University. Economic Sciences, 322 (5), 57–64. https://doi.org/10.31891/2307-5740-2023-322-5-8
37. Rogers, D. L. (2023). The Digital Transformation Roadmap. Davidrogers.digital. Available at: https://davidrogers.digital/digital-transformation-roadmap/
38. Dedicated Public-Private Partnership Units. A Survey of Institutional and Governance Structures (2010). OECD. https://doi.org/10.1787/9789264064843-en
39. Digital Transformation in the EU 2035 A Glimpse into the Future. Available at: https://www2.deloitte.com/content/dam/Deloitte/de/Documents/strategy/deloitte-future-of-digital-transformation-eu-2035.pdf
40. Demohrafichna ta sotsialna statystyka. Naselennia ta mihratsiia (2020). Available at: http://www.ukrstat.gov.ua/operativ/menu/menu_u/ds.htm Last accessed: 30.01.2024

41. State Statistics Service of Ukraine. Available at: http://www.ukrstat.gov.ua/
42. Analitychna ta statystychna informatsiia. Derzhavna sluzhba zainiatosti Ukrainy. Available at: https://www.dcz.gov.ua/analitics/view Last accessed: 30.01.2024
43. Derzhavne rehuliuvannia rynku pratsi v Ukraini. Available at: http://www.geograf.com.ua/geoinfocentre/20-human-geography-ukraine-world/738-derzhavne-regulyuvannya-rinku-pratsi-v-ukrajini Last accessed: 02.02.2024
44. Digital Economy and Society Index (DESI) 2021 (2021). Available at: https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2021
45. Tsyfrova ekonomika: yak tobi sluzhytsia? ZN.ua Available at: https://zn.ua/ukr/macrolevel/cifrova-ekonomika-yak-tobi-sluzhitsya-326706_.html Last accessed: 01.03.2024
46. Garnier, A. (2022). Digital RH: transformation numérique de la fonction ressources humaines. Available at: https://www.wayden.fr/digital-rh-la-transformation-numerique-de-la-fonction-ressources-humaines/
47. Vovk, V. (2020). Digital Transformations in the Economy: World Experience and Opportunities for Ukraine. Sciences of Europe, 4 (51/51), 15–24. Available at: http://repository.vsau.org/card.php?lang=uk&id=25125
48. Digitalisation challenges for Europe (2019). Visits and Publications. Unit EESC-2019-35-EN, European Union. Available at: https://www.eesc.europa.eu/sites/default/files/files/qe-01-19-295-en-n.pdf
49. What is Industry 4.0 – the Industrial Internet of Things (IIoT). Available at: https://www.epicor.com/en-us/blog/technology-and-data/what-is-industry-4-0/
50. Europe 2020. A European strategy for smart, sustainable and inclusive growth. Available at: https://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf
51. Huru, D., Paraschiv, A. M., Şanta, A.-M. I. (2021). Digitalisation and Competition in the European Union. Resilience and Economic Intelligence Through Digitalization and Big Data Analytics, 267–276. https://doi.org/10.2478/9788366675704-027
52. Digitalisation in Europe (2023). Eurostat. Available at: https://ec.europa.eu/eurostat/web/interactive-publications/digitalisation-2023
53. EU4Digital: supporting digital economy and society in the Eastern Partnership. Bi-annual Report No. 2. Available at: https://eufordigital.eu/wp-content/uploads/2024/01/EU4Digital-Phase-II-Bi-annual-report-No_2.pdf
54. Digitalisation in Europe 2022–2023. Evidence from the EIB Investment Survey, European Investment Bank. Available at: https://www.eib.org/attachments/lucalli/20230112_digitalisation_in_europe_2022_2023_en.pdf
55. Europe 2030: A digital powerhouse. 20 solutions to boost European tech leadership and resilience Available at: https://cdn.digitaleurope.org/uploads/2023/11/DIGITALEUROPE-EUROPE-2030-A-DIGITAL-POWERHOUSE.pdf

56. Fostering digital skills development in Eastern Partner countries (2023). OECD. Available at: https://eufordigital.eu/wp-content/uploads/2023/12/OECD-Fostering-digital-skills-development-in-Eastern-Partner-countries-Salome-Will-.pdf
57. Measuring the Information Society Report. Statistical reports. Volume 2 (2018). ICT Country Profiles. Available at: https://www.itu.int/en/ITU-D/Statistics/Pages/publications/misr2018.aspx
58. The digital decade (2023). European Commission 2959/SP532. Available at: https://europa.eu/eurobarometer/surveys/detail/2959
59. EU4Digital: supporting digital economy and society in the Eastern Partnership. Available at: https://eufordigital.eu/wp-content/uploads/2023/12/EU4Digital_Mapping-and-Diagnosis-of-the-Start-up-Ecosystem-in-the-EaP.pdf

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2.2 UKRAINIAN LABOR MARKET IN THE CONTEXT OF DIGITALIZATION, THE COVID-19 PANDEMIC AND MARTIAL LAW

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ABSTRACT

Many Ukrainians lost their jobs at the beginning of the Covid-19 pandemic and during the full-scale war. At the moment, some of them physically have no place to work due to the occupation of Ukrainian territories by the Russian Federation, and many simply fled their cities from the bombing, leaving their homes and places of work behind. And now the number of workers and entrepreneurs who are actually out of work is in the millions. Obviously, some of the temporarily unemployed will find new jobs abroad or in Western Ukraine, and some businesses will adapt to the new conditions to some extent, thus providing employment. Without retraining, most unemployed people will not be able to maintain their social and income level.

In the 21st century, international socio-economic development has acquired new characteristics, including rapid development of technology, innovation and digitalization, the growing importance of the service sector, and accelerating globalization. The transition to the information society in the context of changes in communication technologies and motivation of labor activity implies a serious change in labor relations, the emergence of "long-distance relations" between employees and employers and the intensification of remote work, i.e., it is possible to say that there is a process of decentralization of labor movement in time and place, namely, the process of a flexible labor market is being formed. It can be assumed that the digital economy will eventually increase the share of intellectual labor compared to traditional physical labor, which will make it possible to make greater use of non-remote employment and atypical types of employment that are becoming increasingly in demand.

The most important factor in the development of the knowledge economy is human capital, in particular its creativity and talent, which is expressed in new creative ideas and perspectives. Creative human capital, in turn, is the core of the creative class, a social stratum engaged in science, technology and the arts, whose work results in innovative products and services. So, it is safe to say that the Ukrainian and global labor market will not remain unchanged, and while we used to depend directly on the external environment, today it is the war in Ukraine that is changing the old standards, principles and paradigms on which the economy and labor market functioned.

KEYWORDS

Unemployment, Covid-19 pandemic, war in Ukraine, retraining, socio-economic development, innovation, digitalizatio, digital economy, remote work, flexible labor market, human capital, creative class, labor market transformation.

The problems of labor market development in Ukraine, its system and reforms, aspects of employment and unemployment have been studied by many scholars, including: D. Bohynya, I. Bondar, V. Blyzniuk, M. Vedernikov, M. Voynarenko, V. Gelman, I. Dashko, I. Dekhtyarova, A. Kolot, E. Libanova, I. Petrov, V. Petiukh, O. Pishchulin, A. Cherep, O. Cherep and others, but the labor market in Ukraine requires further research into the conditions of the general economic situation, the annexation of part of the country's territory and military operations, which worsens the functioning of the country's labor market.

In modern conditions, the development of the national economy requires the availability of unused and untapped resources, including labor resources. Economic development can take place precisely in the presence of free labor resources, and if the market is underemployed, development may stop completely or have a slow pace of development.

The main categories that characterize the efficiency of the labor market include: economically active population and economically inactive population (**Fig. 2.1**).

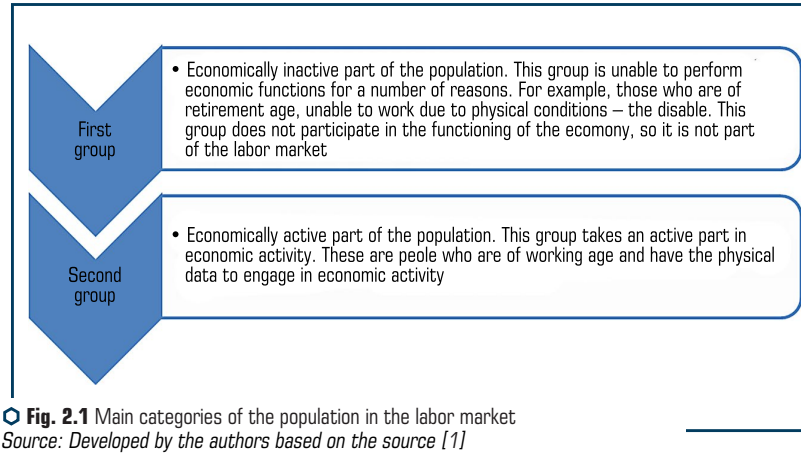

Fig. 2.1 Main categories of the population in the labor market
Source: Developed by the authors based on the source [1]

The second group is distinguished from employment and unemployment in the national economy. The second group is the population involved in the labor market and determines its functioning.

Let's name the factors that influence the functioning of the labor market (**Fig. 2.2**).

One of the main elements of the national economy is the labor market, which determines the functioning and development of the national economy. It should be noted that the labor market is subject to changes due to the influence of many different factors.

For their livelihoods, people are forced to sell their labor and receive remuneration in the form of wages, and this mechanism is the basis of the labor market. Labor is a special commodity that is a combination of spiritual, physical, and intellectual abilities of a person that make up the labor

potential of an individual. The labor of employees is paid for by employers. At any price for labor resources, there is a demand for labor, as well as a supply in the labor market [3].

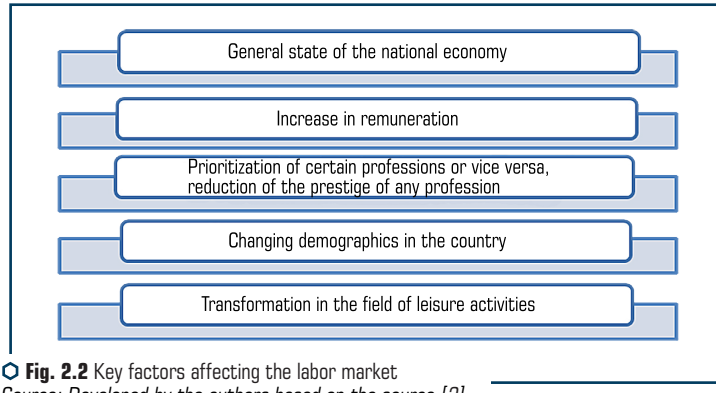

Fig. 2.2 Key factors affecting the labor market
Source: Developed by the authors based on the source [2]

Analyzing the state of the labor market is extremely important at all levels of government – national, regional, and sectoral, including specific enterprises. A number of indicators, for example, reveal the real picture of hidden unemployment and determine the possibility of its transition to an open form through mass layoffs. Of particular importance is the forecasting of "disaster zones", i.e., certain regions of the country where unemployment may become widespread in the near future.

The study of the labor market also involves a systematic analysis of indicators characterizing the socio-professional and socio-demographic characteristics of the unemployed. Of great importance are the characteristics of the unemployed by the duration of their stay in this status.

Labor market studies to a certain extent answer the question of the need for and real possibilities of job creation, as well as prevent the closure of existing jobs, so the analysis of the labor market functioning is closely linked to the analysis of the financial condition of individual enterprises, with an energetic search for sources of additional production financing at the regional and federal levels.

Based on these prerequisites, a number of statistical indicators can be used to analyze the functioning of the Ukrainian labor market. The most important ones include [4]:

– the number of labor resources;
– the number of persons of working age;
– the number of economically active population;
– the number of employed persons in the economy;
– the number of part-time workers on the initiative of the administration;
– the number of job seekers;
– the number of citizens registered with the State Register;
– the number of unemployment benefits issued, etc.

At the present stage, the state's policy in the labor market is carried out in two directions: stimulating demand and shaping labor supply. Both are realized by the state in different forms and ways of influencing the factors that determine the state of supply and demand in the labor market. An analysis of government programs and legal documents shows that the following measures are taken by the state to strengthen the stimulation of labor demand:

– direct wage subsidies or tax cuts for firms that hire representatives of disadvantaged groups with particularly acute structural unemployment;

– stimulating the creation of new jobs in the non-state sector of the economy;

– organization of public works;

– development of small business.

The importance of small business for our country is revealed through the main characteristics that allow it to develop dynamically. These include:

– rapid response to economic conditions;

– solving social issues;

– creation of new jobs;

– counteracting monopoly in the economy; intensification of its structural reorganization.

In general, the policy of labor demand creation involves the modernization of the economy, i.e. the creation of new high-tech jobs in large-scale production and the elimination of inefficient ones.

The primary documents that regulate the labor market in Ukraine are shown in **Fig. 2.3**.

Fig. 2.3 List of documents regulating the labor market in Ukraine
Source: Developed by the authors based on the source [5]

In detailing these documents, it should be noted that in 2012 the Law of Ukraine "On the Law of Ukraine "On Employment" was adopted, which is amended annually to reflect changes in legislation and conditions of socio-economic transformations. The Law regulates certain relations in the field of employment and defines the powers of the authorized body of the region to implement the employment policy.

The law defines a number of measures to improve the competitiveness of persons under the working age in the labor market, establishes additional employment guarantees, and provides social support for unemployment of certain categories of citizens (orphans and children left without parental care). The law regulates the provision of public services and state functions to promote employment. The development and adoption of this Law should be attributed to the creation and improvement of the regulatory framework for employment regulation.

Ukraine has a number of government agencies responsible for supervising and enforcing labor laws, including the State Labor Service and the Ministry of Health. The State Employment Service is responsible for issuing work permits to foreign workers, and the State Migration Service is responsible for issuing temporary residence permits to foreign workers. The Ombudsman of the Verkhovna Rada is the authorized state body in the field of personal data protection.

An important change was the adoption of Law No. 2058 "On Amendments to Certain Laws of Ukraine in order to Remove Obstacles to Attracting Foreign Investment" on May 23, 2017, which entered into force on September 27, 2017 [6].

Another important legislative innovation was the Procedure for State Control over Compliance with Ukrainian Employment Legislation, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 295 dated April 26, 2017. Given the fact that Article 265 of the Labor Code establishes significant fines for violations (up to 320 thousand UAH), Ukrainian employers now pay increased attention to ensuring compliance of their activities with Ukrainian labor legislation.

The Resolution of the Judicial Chamber on Civil Cases of the Supreme Court of Ukraine dated August 9, 2017 [7] provided an important clarification on the issues of dismissal of employees during redundancy. According to the Resolution, if at the time of redundancy the employer does not have any vacant positions corresponding to the education and qualifications of the relevant employee, the employer is not obliged to offer the employee another position and may dismiss him/her.

Thus, based on the analyzed data, it is possible to confidently say that our country does not have an effective instrument for regulating employment, which in turn has a negative impact on the growth of the number of unemployed and the out-migration of part of the population abroad.

The war has changed the conditions and principles under which the labor market operated, moving it into a more uncertain and dangerous phase. In particular, according to a survey conducted by the European Business Association (EBA) among EBA member companies in March 2022, 43 % of companies had financial reserves for several months, 28 % – for 6 months, 17 % – for a year or more, 6 % reported that the company's financial reserves were exhausted. Thus, from the first days of the war, companies tried to optimize costs as much as possible by reducing staff, providing unpaid leave, suspending employment under contracts, reducing salaries, etc. According to a survey by the HR portal grc.ua, The number of people affected by the decline in business activity and unemployment in Ukraine reaches 52 %. Respondents claim that they are either paid the minimum wage or have had it reduced by 30 % or more.

The situation on the labor market will depend on the duration of hostilities and the return of Ukrainian migrants. In April 2022, labor activity began to gradually recover, and the number of

vacancies stopped declining. Thus, on the 100th day of the war, almost 50 % of large EBA member companies resumed their operations; the rest operate with certain restrictions or partially. Businesses are optimizing their operations, with many employees working remotely, some at their workplaces, and some on vacation. The June results of the business activity survey show that the share of companies reporting a decrease in production has decreased from 70.5 % to 44.9 %. However, compared to the pre-war period, 8 % of companies ceased operations and only 12 % of companies operated at full (or high) capacity utilization. According to a study conducted by Gradus Research, from the beginning of the military aggression until March 22, 2022, 86 % of the country's enterprises stopped, reduced or limited their activities, of which 48 % worked partially or almost did not work. Only 13 % of enterprises operated as before, and 6 % of enterprises operated at a higher volume than in pre-war times. During the war, there was a change in the sector as one of the ways to ensure economic stability, among other things: 16 % of the surveyed enterprises changed their sector completely or partially, 21 % are in the process of changing their sector, and 16 % have joined the process of change flow.

The full-scale invasion of Ukraine by the Russian Federation forced 27 % of the population to leave their homes, including 36 % of the population aged 18–24 and 34 % of those aged 25–34. Due to the limited employment opportunities and the change of place of residence, the employment and income situation of workers has deteriorated. In March of this year, 38 % of respondents were unemployed, 57 % were employed, 45 % had a job and were working, and the rest were not working and kept their jobs.

As of March 17, only 17 % of businesses reported 100 % or more employee engagement compared to the pre-war period, and 19 % of businesses engaged 10 % of their employees. The surveys yielded different results: as of March 19, 2022, more than half of Ukrainians who had a job before the war, 53 %, were not working, 22 % were working as usual, 21 % were working remotely or partially, and 2 % had found a new job. Given the problems that negatively affect the well-being of the working population and their families, the economic situation as a result of the war has not changed for only 18 % of the population, has deteriorated for 52 %, and has deteriorated sharply for 28 % [8].

Thus, an important characteristic of the recovery process and the operation of enterprises operating in war is also the social mood, both within the enterprise and in the region where they operate. Work is done by people, and the success of their activities depends on how well they maintain their morale, how united they are and how willing they are to take risks for a common goal, so it is necessary to analyze the Ukrainian labor market, its shortcomings and advantages in more detail.

Ukraine is currently experiencing a shortage of personnel, which was caused both by the development of globalization (massive out-migration of workers due to better opportunities abroad) and by the full-scale war with Russia (part of the population was forced to leave the country due to Russian military actions), so it is possible to suggest starting with an assessment of the overall unemployment rate in Ukraine, which is growing every year, and 2022 was a record year for the number of unemployed Ukrainians (**Fig. 2.4**).

Thus, it is safe to say that it is the war with Russia that has led to a record increase in unemployment in Ukraine, which has not been seen in any crisis period, and the main reason is the destruction of enterprises or bankruptcy, which directly affected the unemployment rate. For example, the Azovstal Iron and Steel Works, which employed about 4,000 people, has been reduced to ruins [9].

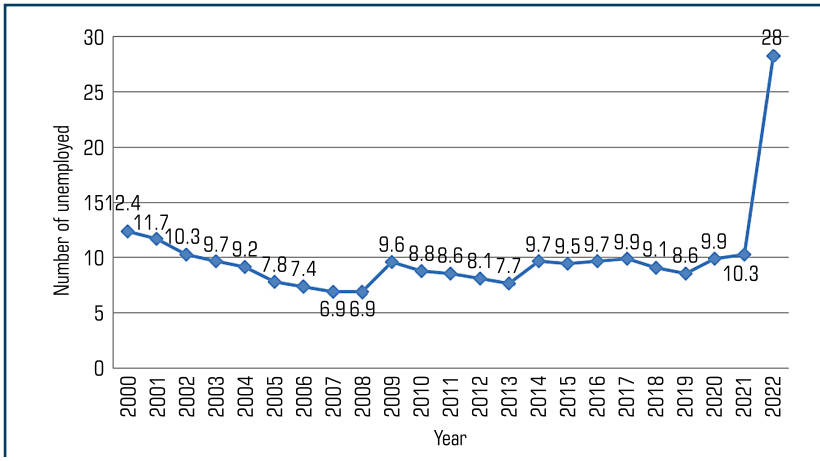

Fig. 2.4 Dynamics of the unemployment rate in Ukraine in 2010–2022
Source: Developed by the authors based on the source [10]

When analyzing the situation on the labor market in Ukraine (**Fig. 2.5** and **2.6**), it should be borne in mind that the current realities of Ukraine's socio-economic development are represented by significant and insufficiently effective structural changes in the economy, the intensification of crisis phenomena and trends in it, which are caused by the military conflict and the displacement of people from the combat zone and the occupied territories.

Labor replacement demand measures the extent to which labor needs to be replaced over a certain period of time. Labor force attrition occurs for various reasons, including retirement as the main reason, followed by a change of job due to a change of profession, temporary withdrawal from the labor market, etc.

The study of the structure of Ukraine's sectoral labor market in 2018–2022 found that in these years, the largest part of the population was employed in wholesale and retail trade; repair of cars and motorcycles (22 %), agriculture, forestry and fisheries (17 %), industry (16 %), and education (9 %). And such sectors as agriculture, industry, trade, education, and healthcare employ the largest share of the economy's workforce.

A significant contribution to the formation of the sectoral pay gap is made by industries that employ the smallest share of workers (financial and insurance activities, real estate operations).

In 2022, the largest number of unemployed people (by type of economic activity of the enterprises where they worked before) was registered in construction, wholesale and retail trade, repair of cars and motorcycles, professional, scientific and technical activities, financial and insurance activities, and education.

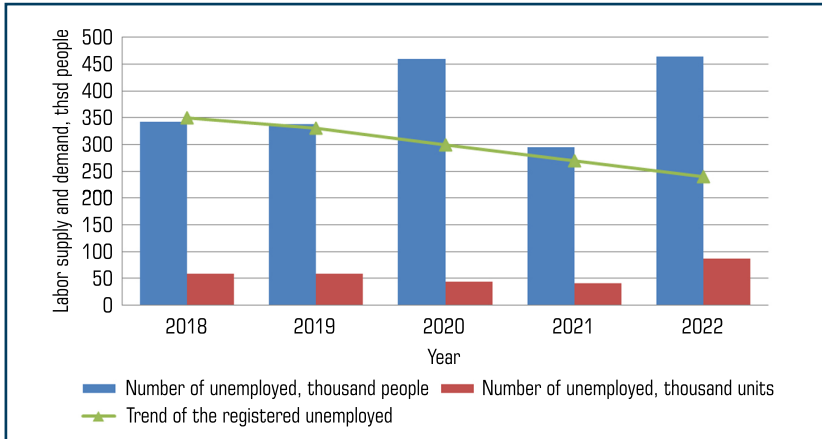

Fig. 2.5 Dynamics of labor supply and demand in Ukraine in 2018–2022
Source: Developed by the authors based on the source [10, 11]

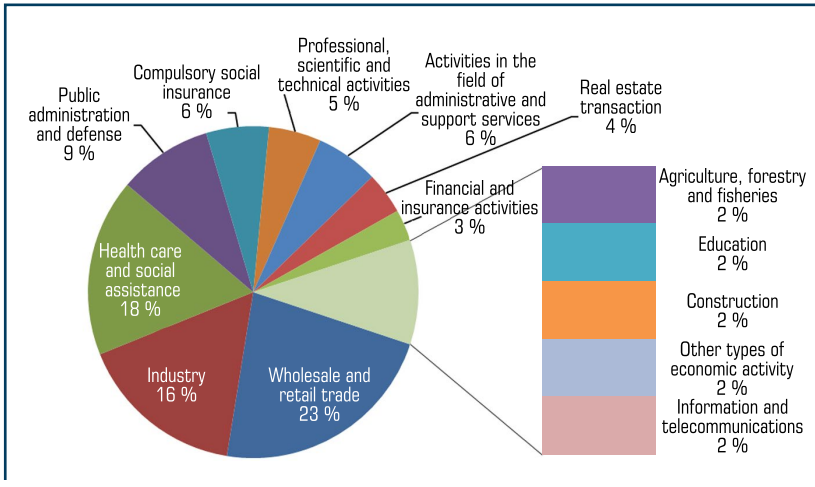

Fig. 2.6 Average number of employed population by type of economic activity in 2022
Source: Developed by the authors based on the source [10, 11]

With high unemployment and a corresponding decrease in demand for labor, average wages of Ukrainians began to decline, as the supply on the labor market exceeded demand by several times in 2022. Another reason for the decline in wages was cost savings by the management of enterprises, which, in order to stay in the market, were forced to literally "gnaw" every order and offer the most competitive prices, which can only be obtained by reducing costs, and as it is known, wages account for about 25 % of the cost of a product or service. The dynamics of Ukrainian wages is shown in more detail in **Fig. 2.7**.

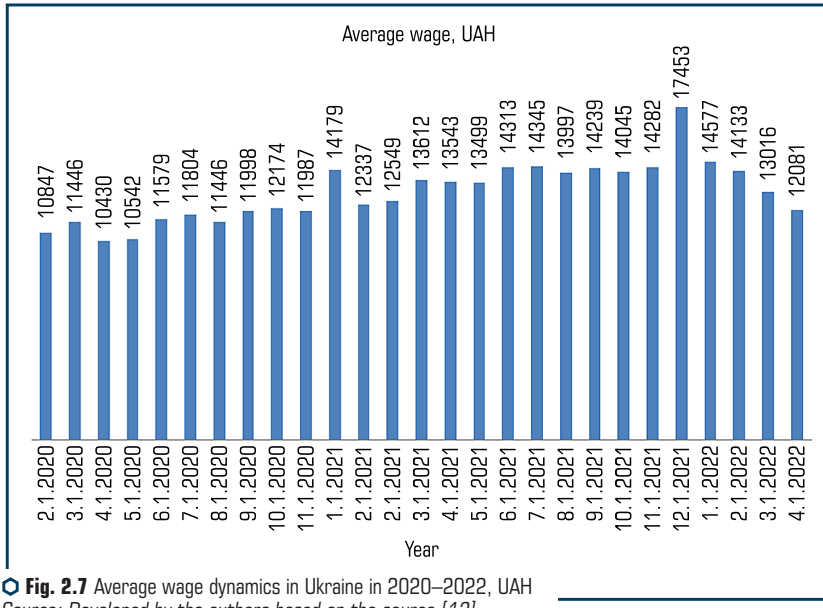

Fig. 2.7 Average wage dynamics in Ukraine in 2020–2022, UAH
Source: Developed by the authors based on the source [12]

Fig. 2.7 shows the critical situation on the labor market in Ukraine, but this is the least that Ukrainians can pay for the "right to life" in a free and independent country.

Negative trends in the labor market are also related to the dynamics of external migration with the opening of the visa-free regime in 2017 and reached catastrophic levels in 2022, which is what we propose to study in more detail.

For many years, the issue of migration has been on the list of key political topics at both the national and international levels. The inflow or outflow of people into or out of a country is a subject of debate in almost every election campaign. Thus, there is a risk that the presence of war refugees in Poland could easily become the subject of intense political debate with all the negative consequences that this entails.

The situation with migration in Ukraine is complex and it is difficult to make a definite assessment of the situation at the moment, due to constant changes. Due to the large number of refugees and constant attacks on civilians, migration flows to neighboring countries are increasing.

The decision of Hungary, which stated that it and other Visegrad states – Poland, the Czech Republic and Slovakia – do not support the decision of Brussels, as there are already common rules for refugees, was negative in relation to Ukrainian refugees. This was another act of demonstrative disagreement with Brussels' decisions, an attempt to show that the Eastern EU states have their own opinions and want to have the same weight in their decisions and proposals as the Western EU states, but on the same day the conflict was resolved and Hungary changed its mind about refugees from Syria, Hungary, which even built a wall on the border with Serbia and Croatia, immediately expressed its readiness to accept Ukrainians and, according to statistics [8], Romania has accepted almost a million Ukrainians, Poland – more than 3.5 million and Hungary – almost 700 thousand.

For more than 3 months of the war and the operation of the mechanism for granting temporary protection to Ukrainians in the EU, there have been no cases of denial of protection to people who really need it. Human rights organizations, including Amnesty International, have also not commented on improper procedures or discrimination in the granting of temporary protection status to Ukrainians.

Ukrainians receive cash benefits, housing assistance, and health insurance in EU countries. This assistance varies from country to country due to differences in the economic, health, and social systems of different EU countries; however, as described in the first section of this paper, the European Union has adopted several legal documents that set minimum levels of such assistance and standards for its provision. This aid has a significant impact on the economic situation in the countries. In addition to significant expenditures from national budgets, the EU has used 3.5 billion EUR from the emergency reserve fund for EU countries bordering Ukraine to help reduce the burden on the economic system of the countries due to the costs associated with Ukrainian refugees (**Fig. 2.8**).

Analyzing the EU's assistance to Ukrainian refugees, it is clear that Poland and Germany provided the most funds, accounting for 56 % of all EU countries.

As noted above, millions of refugees have moved to neighboring countries. Despite signs of population mobility and significant movement to the west, a limited number of refugees are returning home. It is still likely that the crisis will drag on, and the UN predicts a steady increase in the number of refugees as long as the war in Ukraine continues. If, as a result of the escalation of hostilities, refugees remain in host countries longer than expected, they may begin to look for work in the labor markets of these countries.

The majority of refugees are women, children and people over 60. The ILO estimates that approximately 2.75 million of the total number of refugees are of working age. Of these, 43.5 %, or 1.2 million, were employed at the start of the conflict but quit or lost their jobs during the conflict (**Fig. 2.9**).

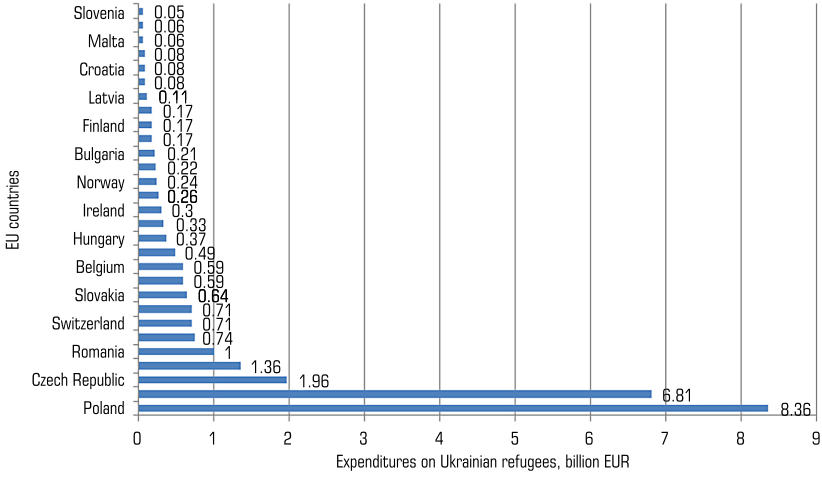

Fig. 2.8 Expenditures on Ukrainian refugees by EU countries as of 2022, billion EUR
Source: Developed by the authors based on the source [13]

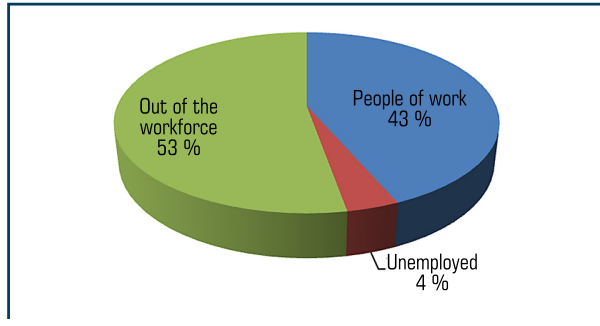

Fig. 2.9 Structure of employment of Ukrainian refugees in the EU
Source: Developed by the authors based on the source [14]

Over 87 % of previously employed refugees worked full-time. The overwhelming majority (88 %) were employees of enterprises, while the remaining 12 % were self-employed. Two-thirds had the highest (higher) level of education. Almost half (49 %) were employed in highly skilled positions and only 15 % in low-skilled positions.

Most of the refugees who left Ukraine are retired and unable to work in the EU, so only half of them are competitive on the EU labor market.

The Strategy of the State Migration Policy of Ukraine for the period up to 2025 states the need to direct the efforts of the state and society to the formation and implementation of the state migration policy, which would have a positive impact on the consolidation of the Ukrainian nation and the security of the state, accelerate socio-economic development, slow down the rate of depopulation, stabilize the quantitative and qualitative composition of the population, meet the needs of the economy in labor, and meet international standards and international obligations of Ukraine [15].

One of the directions of the strategy's implementation (on migration and mobility of the population of Ukraine) singled out goal 2: to reduce the negative effects of emigration from Ukraine and increase its positive impact on the development of the state. In this regard, it is envisaged to "develop opportunities for temporary legal employment abroad".

Addressing and implementing these issues is very important, as the difficult situation on the domestic labor market, high unemployment, and a significant gap in wages in Ukraine and abroad push Ukrainians to seek better conditions for earning money and self-realization in foreign countries.

The main problem of labor resources is the inability of young people to find a job after graduation. In the area of youth employment, there are a number of programs and measures aimed at supporting their employment and development. Some of them are shown in **Fig. 2.10**.

These programs and activities are aimed at providing young people with opportunities for self-realization in choosing a profession, developing skills and gaining practical experience, which in turn helps to improve their employment and career growth.

As an example, one of these programs is the existing USAID program "Dreaming and Acting", which is a long-term initiative aimed at supporting and developing the potential of young people in Ukraine. The main goal is to create an enabling environment where young people will have the opportunity to realize their dreams and ideas and contribute to the development of the country.

This program seeks to promote the active involvement of young people in various projects and initiatives. By focusing on working with young people, not just for young people, it promotes innovative approaches, entrepreneurship, and active participation in decision-making at both the community and national levels [16].

In addition, the program actively engages young people in the development and implementation of projects, conducts research that helps shape and improve youth policy and promotes sustainable change.

The "Dreaming and Acting" initiative is the result of joint efforts of IREX, Building Ukraine Together (BUR), Center for Corporate Social Responsibility Development (CSR Ukraine), Making Cents International (MCI), International Republican Institute (IRI) and Zinc Network.

The main beneficiaries of the program are Ukrainian youth aged 10 to 35, communities, organizations, as well as the public and private sectors.

The goals of the program are to:

– expanding economic opportunities by supporting youth innovation, entrepreneurship and career readiness;

– engaging young people in active participation in decision-making and problem-solving at both national and local levels;

– strengthening the potential of Ukrainian youth as active agents of pluralism and respect for diversity;

– conducting research and analysis to inform youth policy and program initiatives aimed at achieving effective and sustainable change.

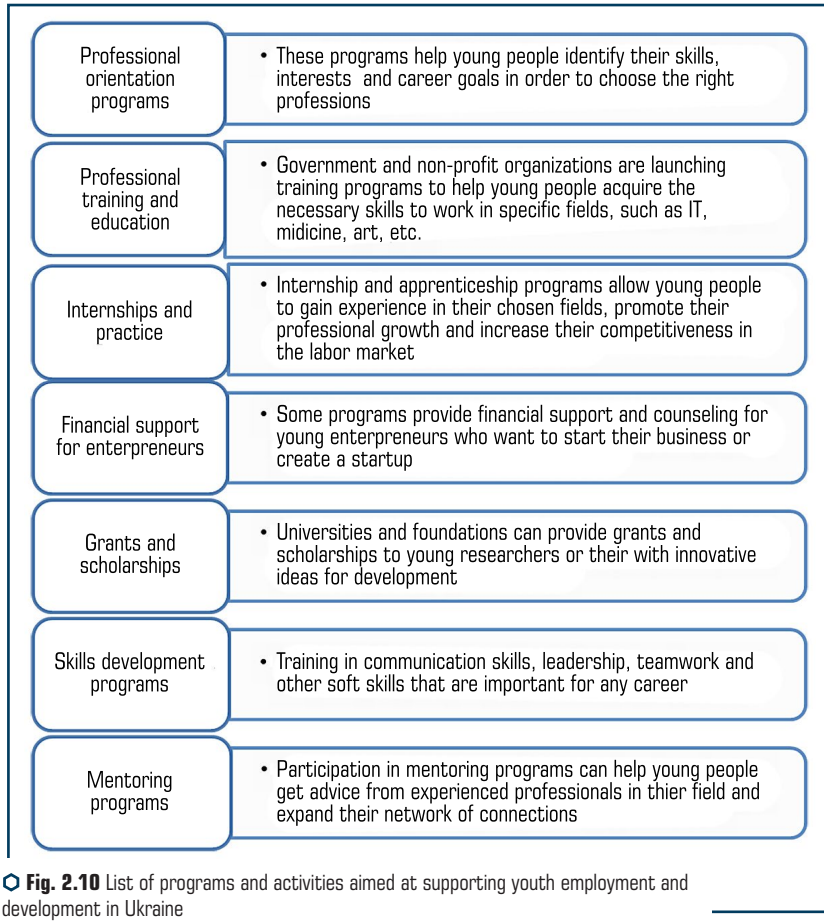

Fig. 2.10 List of programs and activities aimed at supporting youth employment and development in Ukraine
Source: Developed by the authors

During the first two years of the program, more than 70,000 young people participated in events and projects, and more than 760,000 young Ukrainians used educational material and online tools.

During this period, 59 % of participants stated that they had improved 10 key competencies through participation in the program and the use of its resources. These competencies include entrepreneurial thinking, lifelong learning, collaboration, leadership and social impact, emotional intelligence, adaptability, civic engagement and awareness, inclusiveness, communication, and information and media literacy.

The program operates at both the national and regional levels, offering flexible and adaptive initiatives that respond to current challenges and aim to develop strategic solutions for the future.

Under the umbrella of this program, many projects are implemented together with young people or aimed at supporting and educating them, contributing to the development of competencies and skills. It also provides resources for educators and professionals working with children and youth.

To achieve its first objective, which is to empower young people through innovation, entrepreneurship and career preparation, the program actively collaborates with the private and public sectors. It creates activities and resources aimed at enhancing the ability of young people to start their own businesses, build professional careers and adapt to the demands of the labor market, allowing them to realize their potential.

For example, the program focuses on career guidance. In cooperation with the Career Hub of the Center for Corporate Social Responsibility Development, it implements various career counseling projects, helping young people choose professional paths and preparing them for job search (teaching them self-presentation, resume preparation, interviewing, effective use of experience and acquired skills). In 2023, it is planned to modernize the career counseling system in various types of educational institutions and introduce the concept of a career-oriented school.

Based on the findings of the Future of Work 2023 study, two large interactive exhibitions "Future of Work 2030" were implemented and held, aimed at young people and dedicated to forecasting the future of work by 2030 in Ukraine. The Center has developed a number of analytical materials that help to understand future trends in the labor market: the study "Future of Work 2030: Preparing for Changes in Ukraine", "Future of Work: Impact of War and Professions for the Recovery of Ukraine", and an analysis of trends and recommendations for the future of work in Ukraine until 2025, taking into account the consequences of a full-scale war [17].

In addition, an interactive manual "How to Create a Career Center?" was developed for the community of educators, specialists of youth centers, NGOs and employment centers, which provides practical advice for the effective implementation of career services for young people.

A third of the youth who used the program's career counseling service found a job.

In addition, there is a government program, the EU4Youth program, which is an initiative aimed at supporting youth employment and development. This program promotes cooperation between the public employment services of the Eastern Partnership countries and the European Union. It aims to support young people in building their professional potential and securing employment opportunities.

The EU4Youth program creates conditions for cooperation and exchange of experience between different countries, promoting the development of programs and initiatives aimed at supporting young people in acquiring work skills, finding a job and developing their careers. The program

aims to improve young people's access to the labor market and increase their competitiveness by providing support for the training and practical experience needed to successfully enter the work environment.

On October 10, the first EU4YOUTH DAYS event of the Eastern Partnership Public Employment Service Network took place, where representatives of the Eastern Partnership countries and public employment services of the European Union member states gathered to discuss cooperation. The main goal of the event was to bring together the State Employment Services (SES) of the Eastern Partnership and discuss the benefits of cooperation between them and the SES of the EU countries.

State Employment Services are tasked with cooperating with the business sector and other organizations, providing career counseling and providing retraining for young people, including those with disabilities.

These challenges are typical for European countries as well. Although the unemployment rate, especially among young people, is higher in the EaP countries than in other European countries, the experience of the EU's State Employment Services can be useful for the development of the EaP countries [18].

The EU4Youth Phase III program, aimed at youth employment and entrepreneurship, receives funding from both the European Union and the Ministry of Foreign Affairs of Lithuania. This initiative is being implemented through the Central Project Management Agency (CPMA) in the Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine) until the end of 2024 [19]. The program includes a number of technical assistance activities aimed at supporting organizational structures and institutions, both governmental and non-governmental, in the area of youth employment and employability.

The development of youth learning is not only an investment in their future, but also a key factor for the development of society, its sustainability and prosperity.

The development of youth learning can have a significant impact on unemployment and employment through several key factors (**Fig. 2.11**).

Thus, the development of youth learning has a great potential to reduce unemployment and improve employment opportunities by increasing competitiveness, developing skills, stimulating entrepreneurship, and creating a favorable environment for economic development.

Any combination of systems and technologies used to engage workers on the one hand and to find employment opportunities on the other in a digital environment can be considered a digital labor market ecosystem. A digital labor market ecosystem should be open and create a digital environment for bringing together its participants: job seekers, employers, employment intermediaries, and government agencies.

Digital tools for interacting with job sites are implemented through job board software (JBS), which are search engines that collect job listings from employers and other sources and organize them into an easy-to-use database. Their search features allow users to post and filter jobs based on keywords related to location, job title, industry, and salary. Some PJSs are general in nature, while others specialize in specific economic activities such as finance, information technology,

or agriculture. Job posting software is multifunctional and serves job seekers, employers (looking to fill their vacancies) and companies (looking to create job sites and job boards).

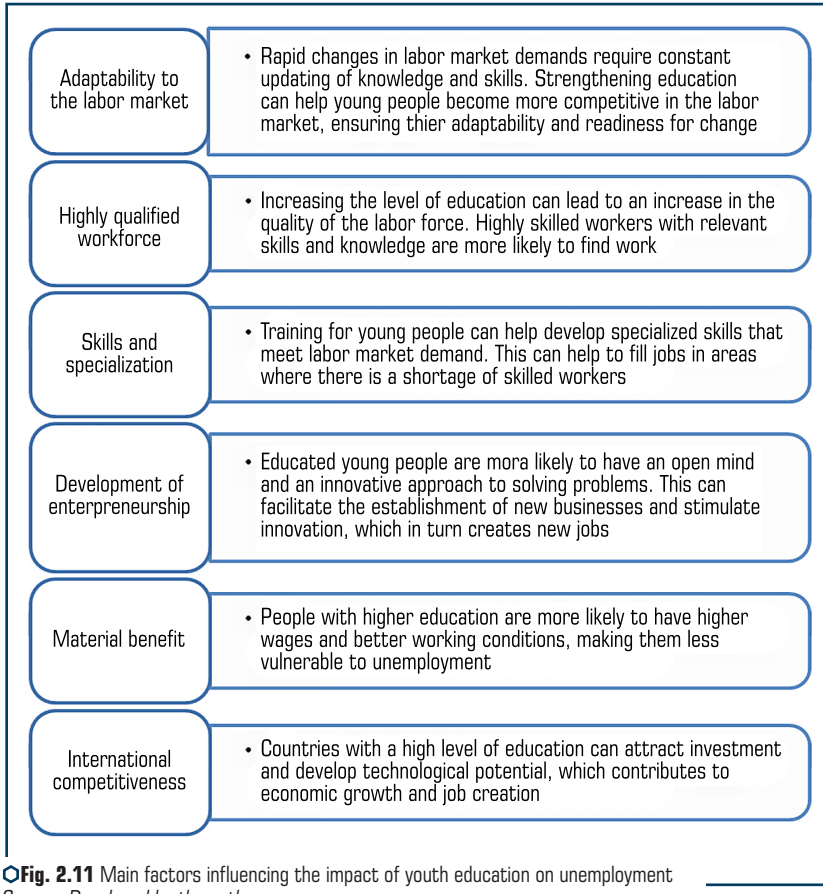

Fig. 2.11 Main factors influencing the impact of youth education on unemployment
Source: Developed by the authors

In Ukraine, the use of JBS has intensified during the COVID-19 pandemic and over the past few months, as Russia's military invasion of Ukraine has become widespread. In such circumstances, many businesses in Ukraine have been forced to switch to remote work, while others will have to adapt, as this situation is likely to last for many months.

For employers who have open positions, job posting software connects them with potential candidates by providing an easy-to-use database where they can post jobs, thereby digitizing the

hiring process. Employers can post jobs and track all the activity on their job listings. Some job boards also allow employers to search for resumes and then contact potential employees registered on the platform.

Businesses that create a job board need the right tools. Some of them use unbranded job board software (so-called "white label software") to publish and monetize job ads on websites, while others use these solutions to develop new job boards. These solutions allow businesses to create engaging content that provides job seekers with easy-to-use search capabilities and recruiters and other HR professionals with the ability to attract talent. They can also provide automated job advertising, user profile analysis, and more.

For job seekers looking for new career opportunities, job boards provide a variety of search options, including location filters, job description keywords, and salary levels. Once they find the right listing, job seekers can get more information about each position and find links to submit resumes, portfolios, or ask additional questions. Standalone job portals allow job seekers to upload resumes or integrate LinkedIn profiles so they can easily apply to all jobs.

Job and search sites, portals, and social networks such as LinkedIn, CareerBuilder, and Monster have already become one of the global job intermediaries in the international employment intermediary market [9]. Job boards are the largest in terms of the number of people they reach, with LinkedIn's audience of over 400 million users representing 150 businesses from 200 countries.

Having studied the most popular Ukrainian job search and posting portals, such as: Work.ua, Rabota.ua, Jobs.ua, Eurabota, and Grc.ua [13], it is possible to say that the war affected all spheres of life, including the labor market, tens of thousands of people lost their jobs, and organizations and enterprises lost their staff. The digital ecosystem of labor market elements relevant during the war is presented in **Table 2.8**.

With the development of Internet technologies, job search has become much easier for both HR managers and candidates. The Internet makes it possible to work remotely at home or on the other side of the world. The most popular job search sites in Ukraine are Work.ua and Rabota.ua, which have been the most popular in terms of the number of vacancies posted and employees hired since the pandemic and up to now.

An important indicator of economic development is the level of exports in Ukraine, which we propose to analyze (**Fig. 2.12**).

This market shows how Russian aggression has affected Ukraine's international activities. In 2014–2015, due to the unstable situation in eastern Ukraine, exports and imports decreased. In 2022, due to the declaration of war and Russia's attack on Ukraine, exports decreased by 30.06 % and imports by 1.79 %. It was 2022 that became a turning point both in the history of our country and in the structure of trade partners. Starting in 2022, Ukraine finally took a pro-European direction and focused on strengthening trade relations with the EU and Western partners.

Thus, as can be seen from **Fig. 2.13**, the share of the CIS countries (primarily Russia, as it was one of Ukraine's largest trading partners among the CIS countries) decreased by 4.48 % in 2022,

while the share of European countries increased by 18.75 %. It is also possible to see a decrease in the share of Asian countries by 11.63 % due to Russia's blockade of the port of Odesa and restrictions on ship traffic. The year 2022 was the year of a complete change in Ukraine's trade partners and final orientation towards the EU.

Table 2.8 Elements of the digital labor market ecosystem relevant during the war in Ukraine

An element of the digital labor market ecosystem	Characteristics
Job search sites	*Work.ua*. One of the most popular job search sites grc.ua. It is a well-known resource that publishes hundreds of vacancies daily. *Robota.ua*. Added a section "Jobs for winning"
Job search platforms	*Jooble*. Work on different schedules and directions, about 80 thousand vacancies. *Jobs.Dou*. Jobs for IT companies. *Jobs for Ukraine*. Academic, scientific, creative, professional and other vacancies. *Upwork*. Jobs for freelancers. *Work in the rear*. Here you can also offer your help. *Hire for Ukraine*. Posting resumes of HR managers, IT specialists, creative workers, builders, architects, and service providers. *UA Talents*. Non-profit job search platform. *Interact*. A set of job search sites. Here you can search for jobs in different countries and specializations
Telegram channels for job search	*RobotaNow*. Work in all specializations and areas. *Goodjob*. Jobs in Ukraine and abroad, language courses, tips on how to write a resume. *Resume of vacancies*. Creative jobs, volunteer offers. *Zaychenko's team*. Jobs for journalists, designers, marketers, IT specialists. *UaJobNow*. Employment in Ukraine, Europe and remote work. *Remote Job*. An English-language channel with vacancies in design, sales, and other fields. *Lobby X*. Work and volunteering opportunities in Ukraine

Source: Developed by the authors

Let's analyze the structure of Ukraine's main trading partners in 2021–2022 (**Fig. 2.13**).

Ukraine's position in the Global Competitiveness Index has been declining since 2014. An important indicator of the growth of the Ukrainian economy is the Innovative Development ranking, and let's determine its place in the innovation ranking for 2021–2022 (**Fig. 2.14**).

Analyzing the data in **Fig. 2.14**, it is clear that Ukraine is far behind economically developed countries. The war between Russia and Ukraine had a particularly negative impact on the innovative development of our country, as in 2022 Ukraine fell to 57th place, which is an extremely negative consequence of the war [21].

Let's determine the place in the ranking of Ukraine's competitiveness in the dynamics over the past ten years (**Fig. 2.15**).

As can be seen from **Fig. 2.15**, Ukraine lags far behind the rest of the world in terms of its place in the competitiveness ranking by almost three times. This significant gap has led to a huge difference in the economies of both countries and has affected business development in Ukraine.

Since the beginning of the Russian Federation's full-scale invasion of Ukraine, more than 12 million Ukrainians have been temporarily displaced, including about 5.2 million abroad. As a result of the war, about 22,000 teachers have gone abroad, almost 40 % of Ukrainians lost their jobs during the war, 24 % work part-time or online, and 32 % continue to work as usual.

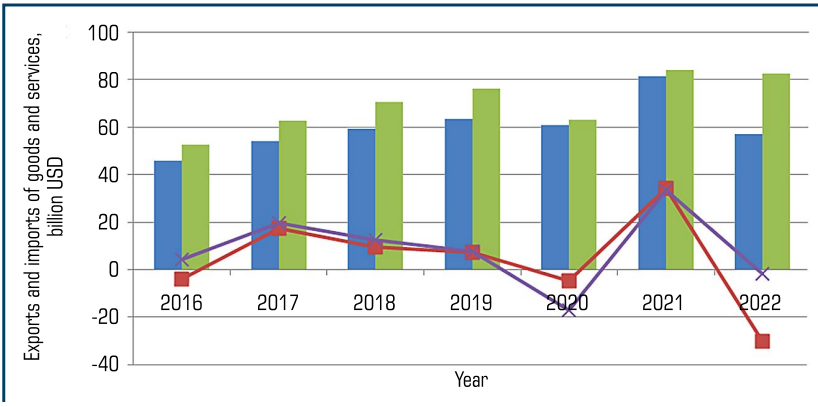

Fig. 2.12 Analysis of the dynamics of exports and imports of goods and services of Ukraine in 2016–2022, billion USD
Source: Developed by the authors based on the source [18]

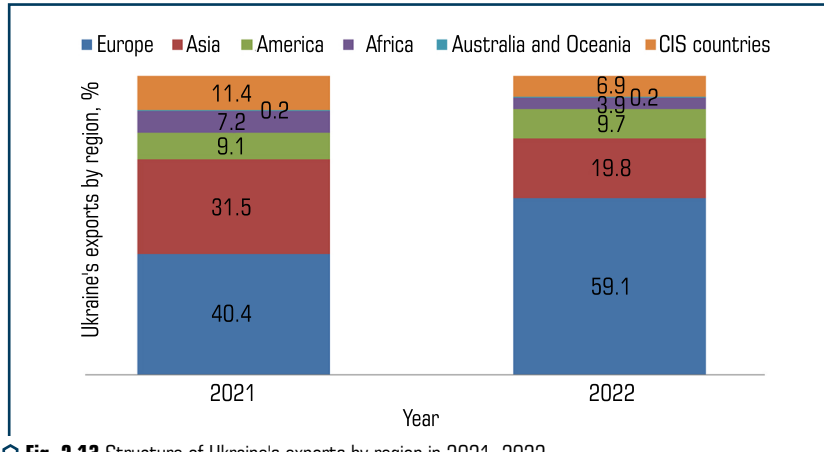

Fig. 2.13 Structure of Ukraine's exports by region in 2021–2022
Source: Developed by the authors based on the source [18]

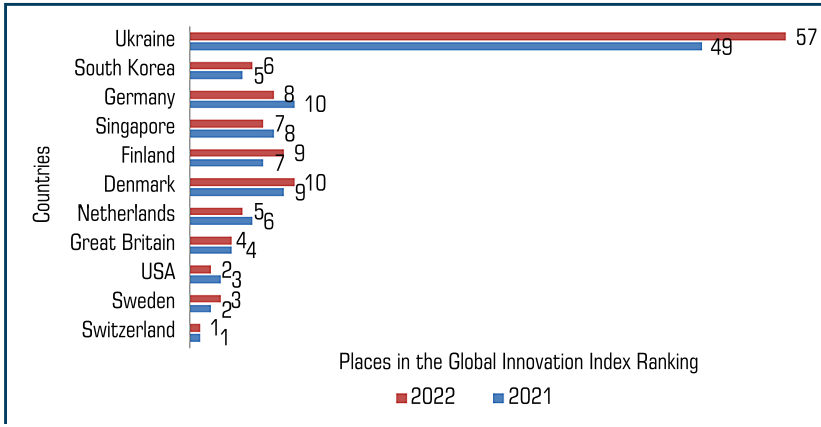

Fig. 2.14 Ukraine's place in the Global Innovation Index Ranking for 2021–2022
Source: Developed by the authors based on the source [20, 21]

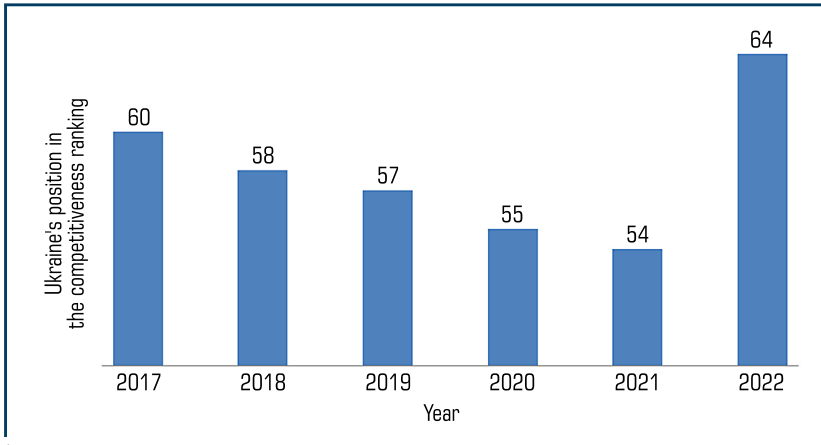

Fig. 2.15 Analysis of Ukraine's position in the competitiveness ranking for 2017–2022
Source: Developed by the authors based on the source [22–24]

In Ukraine, the labor market is in crisis due to the war. Currently, the number of vacancies has significantly decreased, and the average salary dropped from 15,035 to 13,736 UAH in the first month of Russia's full-scale war against Ukraine alone. Many Ukrainians have already lost their jobs due to the fighting and it is becoming increasingly difficult to find a new job. Indeed: 34 % of Ukrainians surveyed claim that it is difficult to find a job in their area, and 21 % of respondents claim that the jobs they can find do not meet their expectations [25].

Therefore, based on the above, let's provide the following measures that can contribute to the recovery of the labor market, as well as create conditions for improving the quality of the labor market in Ukraine, which is necessary for the post-war economic recovery:

– due to the difficult situation in the labor sphere in Ukraine and the significant outflow of the able-bodied population from the labor market, especially to the Armed Forces of Ukraine, territorial defense forces and NGOs, there is a growing demand for the most efficient use of labor and ensuring a sufficient level of adaptation of competent people to changes in the labor market, which requires balanced government decisions;

– the strategic direction of the state policy of the IT sector development should be: creation of a favorable investment environment; formation of an effective policy of system development and legal support, adequate to the requirements of the time and increased competition in the industry; adaptation of the personnel training sphere to the final demand, taking into account the requirements of soft skills, among which the most important are critical thinking, self-organization, teamwork, customer-oriented methods of work, communication skills, flexibility and adaptability, creativity;

– to improve the level of labor during the war and in the period of economic recovery, it is very important to ensure labor mobility, which will contribute to increased adaptation, increased competition, and consumption efficiency. Labor mobility, which determines the qualitative characteristics of the workforce, its ability to change the production activities of tangible and intangible goods, preparation for professional development and qualification, management of new skills, adaptation to situations of active production, must be ensured for the successful operation of enterprises that will be located outside the combat zone, as well as those that have been relocated from dangerous areas;

– to overcome the negative trends in the labor market, a comprehensive program for its recovery should be developed, which would include measures aimed at creating jobs in industries that ensure the country's defense capability, as well as in industries that will be prioritized in the post-war period. Obviously, these industries will require, first and foremost, specialists in blue-collar occupations, the shortage of which was observed even before the outbreak of hostilities. Therefore, it is important to create conditions for retraining the unemployed in order to overcome structural imbalances in the labor market. To this end, special attention should be paid to the development of the vocational education system, which has lost a third of its educational institutions and 40 % of its students over the past ten years [26];

– reform of higher education is also inevitable, as it is currently poorly oriented to the needs of the labor market. The labor market recovery program should provide incentives for emigrants to return to the country, as the professional experience they gained during their forced emigration will be useful in the economic recovery process. In addition, the lack of labor resources can be a significant obstacle to economic growth, as it will not allow for an increase in the production of goods and services, nor will it generate effective demand for them, nor will it ensure the receipt of the necessary amount of financial resources to the budget and social insurance funds. An important incentive could be the restoration of damaged and construction of new housing. However, the settlements where such construction should be stimulated should be chosen taking into account

both the security component and the prospects for creating research and production clusters that could become the engines of the postwar economy;

– the problem of returning able-bodied emigrants cannot be solved without a reform of wages. Full de-shadowing of labor income is required, and for this purpose, incentives for concealing it must be eliminated.

This can be done by combining the PIT, unified social tax, and military fee into one tax, the amount of which should be added to the gross salary, and the obligation to pay this tax should be transferred from the employer to the employee. When paying such tax annually, the taxpayer should be entitled to a broad tax credit for the amount of expenses for educational and medical services, mortgage, etc.

Thus, given the importance of improving conditions for the realization of entrepreneurial potential in the post-pandemic and post-war economic crisis, it is necessary to continue to study the existing obstacles to the development of entrepreneurship in Ukraine in order to identify priorities for overcoming them to stimulate sustainable economic development.

REFERENCES

1. Rynok pratsi Ukrainy v umovakh voiennoho stanu: deiaki analitychni otsinky (2022). National Institute for Strategic Studies. Available at: http://surl.li/oyycw Last accessed: 30.01.2024
2. Hrishnova, O. A. (2006). Ekonomika pratsi ta sotsialno-trudovi vidnosyny. Kyiv: Znannia, 559.
3. Darchenko, N. D., Ryzhykov, V. S., Yeskov, O. L. et al. (2007). Ekonomika pratsi ta sotsialno-trudovi vidnosyny. Zbirnyk zavdan i vprav. Kyiv: Center for Educational Literature, 252.
4. Marshavin, Yu. M. (2001). Shliakhy udoskonalennia instytutsiinoho zabezpechennia rozvytku rynku pratsi Ukrainy. Zainiatist ta rynok pratsi, 14, 99–110.
5. Analitychna ta statystychna informatsiia. Derzhavna sluzhba zainiatosti Ukrainy. Available at: https://www.dcz.gov.ua/analitics/view Last accessed: 30.01.2024
6. Pro vnesennia zmin do deiakykh zakonodavchykh aktiv Ukrainy shchodo usunennia barieriv dlia zaluchennia inozemnykh investytsii (2017). Zakon Ukrainy No. 2058-VIII. 23.05.2017. Available at: https://zakon.rada.gov.ua/laws/show/2058-19#Text Last accessed: 02.02.2024
7. Postanova Sudovoi palaty u tsyvilnykh spravakh Verkhovnoho Sudu Ukrainy vid 9 serpnia 2017 roku (2017). Available at: http://surl.li/rqpso Last accessed: 02.02.2024
8. Blenkinsop, P., Szakacs, G. (2022). EU backs move to give Ukraine refugees temporary residency. Available at: http://surl.li/rqqcc Last accessed: 01.02.2024
9. Danylina, S. O. (2022). Ukraine's labor market in the conditions of digitalization and martial status. the Russian-Ukrainian war (2014–2022): historical, political, cultural-educational, religious, economic, and legal aspects, 80–86. https://doi.org/10.30525/978-9934-26-223-4-11
10. Derzhavne rehuliuvannia rynku pratsi v Ukraini. Available at: http://surl.li/rqpjy Last accessed: 02.02.2024

11. Analitychna ta statystychna informatsiia. Derzhavna sluzhba zainiatosti Ukrainy. Available at: https://www.dcz.gov.ua/analitics/67 Last accessed: 30.01.2024
12. Pensiinyi fond opryliudnyv pokaznyk serednoi zarplaty za 2022 rik: yak zminiuvalysia vyplaty (2022). Available at: http://surl.li/rqpqn Last accessed: 30.01.2024
13. Estimated total Ukrainian refugee costs in selected countries worldwide from March 2022 to February 2024 (2024). Available at: http://surl.li/rqqfk Last accessed: 05.02.2024
14. Shevchenko, L. S. (2007). Rynok pratsi: suchasnyi ekonomiko-teoretychnyi analiz. Kharkiv, 336.
15. Gonchar, O., Cherep, A., Cherep, A. (2019). Substantiation of the model of innovative development of the enterprise. Proceedings of the 6th International Conference on Strategies, Models and Technologies of Economic Systems Management (SMTESM 2019), 355–358. https://doi.org/10.2991/smtesm-19.2019.69
16. Dzhuma, N. (2021). U 2020 rotsi z Ukrainy vyikhaly ponad 66 tys. likariv i medpratsivnykiv, – doslidzhennia. Dzherelo. Available at: https://censor.net/ua/n3254293 Last accessed: 31.01.2024
17. Future of Work 2030: yak pidhotuvatysia do zmin v Ukraini. Available at: http://surl.li/rqqcj Last accessed: 03.02.2024
18. Statystyka zovnishnoho sektoru Ukrainy (2022). Available at: https://bank.gov.ua/ua/statistic/sector-external Last accessed: 30.01.2024
19. Prohrama EU4Youth Phase III. Available at: http://surl.li/rqptl Last accessed: 03.02.2024
20. Global innovation Index 2021 (2021). Available at: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_2000-section3.pdf Last accessed: 05.02.2024
21. Global Innovation Index 2022. (2022). Republic of Korea. Available at: http://surl.li/rqqep Last accessed: 05.02.2024
22. The Global Competitiveness Report 2017–2018 (2018). Available at: http://surl.li/rqqfn Last accessed: 05.02.2024
23. Schwab, K., Zahidi, S. (2020). How Countries are Performing on the Road to Recovery. WEF The Global Competitiveness Report 2020. Available at: http://surl.li/rqqhm Last accessed: 05.02.2024
24. WEF The Global Competitiveness Report 2022 (2022). Available at: http://surl.li/rqqhp Last accessed: 05.02.2024
25. Danylyshyn, B. (2022). Shchodo stanu investytsiinykh protsesiv v ekonomitsi Ukrainy ta shliakhiv yikh aktyvizatsii. LB.ua. Available at: https://lb.ua/blog/bogdan_danylysyn/503439_shchodo_stanu_investitsiynih_protsesiv.html
26. Rubezhanska, V. O. (2016). Vplyv faktoriv zovnishnoho seredovyshcha na suchasnyi rynok pratsi. Scientific Bulletin of Kherson State University, 2 (20), 136–140.

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2.3 EUROPEAN COUNTRIES' EXPERIENCE REGARDING PRIVATE PARTNERSHIP IN TERMS OF DIGITALIZATION

Oksana Hamova, Pavlo Polishuk, Viktoriia Oryna Raksha

ABSTRACT

Analyzing the fundamental factors of strengthening the significance of partnership management configurations in the economy determine that partnership interaction between the state and business is an efficient instrument for economic development; public-private partnerships (PPP) basic theories are mutually supportive and continue to expand with PPP development.

One of the principal and most important determinants of socio-economic development, growth, ensuring the competitiveness of countries and their national economies is digitization, which means the active introduction and application of information and telecommunication technologies (ICT) in all aspects of life of society (changes, transformations that emerge in societies when affected by information and telecommunication technologies – digital transformations).

KEYWORDS

Partnership management, public-private partnerships (PPP), economic development, competitiveness, digitization, information and telecommunication technologies (ICT), digital transformation, national economies.

In recent years in the European Union, PPPs have expanded the spectrum of their activity, some of them traditionally focusing on agreements in the mobility sector.

Public-private partnerships started to be used with the construction of public institutions and their equipment (hospitals, schools) and while providing various communal public services (sewerage and water supply), eliminating threats to environmental safety (desert advancing control, etc.).

Also, the experience of public-private partnership has become more diverse across countries. After Great Britain, which is the leader in terms of the number of completed PPP agreements, some other countries have created developed PPP markets (France, Germany, Spain); others have showed interest and began developing PPP programs.

Some EU Member States have either limited or no experience of public-private partnerships.

The experience of EU countries in the development of PPP projects can be useful for Ukraine as well, where this type of economic relations is just beginning to develop.

An important contribution to the study and research of scientific problems associate with the development of public-private partnership was made by such domestic and foreign scientists as: O. Besedina [1], O. Boiko [2], A. Cherep [3–5], M. Adamenko [3], O. Cherep [3, 6], I. Dashko [3, 5], R. Korolenko [3], O. Kornukh [3], P. Gudz [4], P. Ileva-Naydenova [4], L. Oleinikova [4, 6],

O. Honcharenko [7], E. Klijn [8], D. Laponoh [9], N. Lokhman [5], V. Serebrenikov [5], T. Beridze [5], J. Nederhand [8], E. Androsova [6], L. Bexhter [6], O. Korotaieva [6], I. Petrova [10], D. Rogers [11], C. Skelcher [12], H. Sullivan [12], L. Tarash [10], R. Warden [13], R. Warsen [8] and others.

More specifically, L. Tarash studied world and European trends in the development of public-private partnership when determining priority areas of application [14].

It is possible to consider the importance of the practice and theory of private partnership on the basis of digitization, analysis and evaluation, the condition and peculiarities of European countries as the beginning of the era of development of the public-private partnership mechanism in our country.

Under modern market conditions, the rapidity of life is constantly gathering pace; there is speedy progress in the scientific and technological areas, economic and social development of countries. There is bulk information coming out.

State bodies, even in developed democratic countries, are no longer able to fully fulfill their social obligations to citizens and society.

The processes of involvement of non-governmental institutions – private business, local self-governing authorities, self-management of territorial communities, civil society – in the execution of the functions and powers of the state are opening more and more widely, which extremely actualizes the issue of implementing the mechanism of public-private partnership into the sphere of public administration.

Over recent years, the issue of introducing the PPP institute has found its level among the priorities of the governmental strategic development programs as an alternative method to restore and modernize the national economy. International technical assistance agencies, in particular USIAD in Ukraine, which is the originator of the "PPP Development Program in Ukraine", in their research also emphasize the PPP importance as "...a new instrument of state regulation that contributes to economic development" [1].

The experience and level of developed and successful European countries demonstrates that public-private partnership has evolved into an effective and powerful instrument for economic advance and social development both at the local level and at the level of national projects.

During such cooperation between subjects of authority and economic subjects, better results are achieved in the fulfillment of social tasks and requirements, budgetary resources and public property are used more effectively.

During the formation of a partnership form of management in the economy, the state and market (private) sectors of the economy are transformed, forming marginal forms – quasi-state and quasi-market sectors of a mixed economy, which results in the emergence of multi-sector or heterogeneous effects.

Analyzing the findings of the research of the basic theories of public-private partnership, it makes sense to emphasize the necessity to determine the rational relationship between the state and the private sector, which is shown in **Fig. 2.16** [1].

Fig. 2.16 emphasizes the significance of a harmonious combination of interests and efforts of two partners, the state and private (market) sectors, to ensure the development of the economy and overcoming crisis events.

According to the conclusions and results of the research of the place and role of partnership interaction of the state and business in the implementation of the state policy of economic development, the following peculiarities can be stood out: activization of cooperation between the state and private sectors of the economy, modern economy.

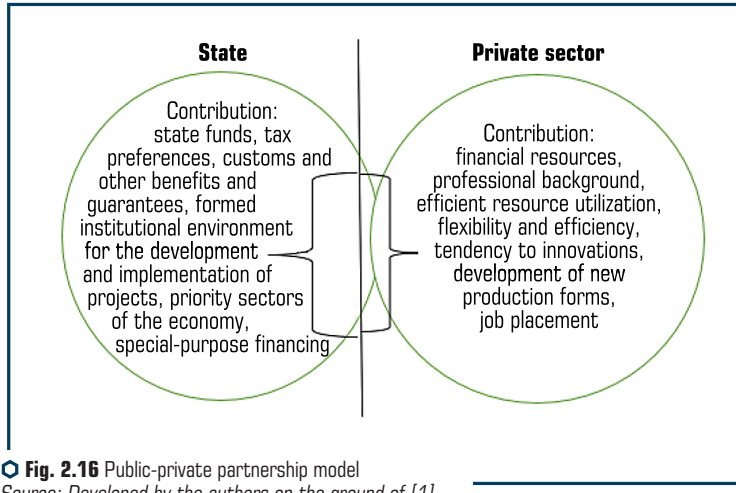


Fig. 2.16 Public-private partnership model
Source: Developed by the authors on the ground of [1]

The efficiency and success rate of the introduction of the mechanism of cooperation between the public and private sectors of the economy is contingent both on the regulation of legislative aspects at the state level and on the results of studying prosperous European theories and practices, and their introduction in the native sphere of public administration.

To make a more complete and accurate analysis of the global experience of PPP development, it is also necessary to consider in which countries PPP is registered at the legislative level (**Table 2.9**).

Consequently, the existence of a PPP law is not always a supposition for the successful functioning of this mechanism. This is confirmed by the experience of the Netherlands or Turkey, which, as it is possible to see above, are top performers in the European PPP market [15].

On the other hand, the practice and theory of project implementation in France, which is the leader according to quantitative and value indicators of the development and advancement of cooperation between the state and business [15], shows a different way.

It has been determined that in countries where there is no special legislation on PPPs, laws on public procurement or concession legislation are an alternative. Another means of regulating

PPP relations is the option when laws on concessions contain only general provisions, and detailed regulation is implemented through the adoption of special laws in a certain sector of the economy.

Table 2.9 Legislative framework in the PPP field in the countries of the world

No.	Country	Availability of a legislative measure	Year of adoption
1	France	Law "On PPP"	2004
2	Great Britain	Non-available	–
3	Germany	Law "On PPP Development"	2005
4	Turkey	Non-available	–
5	Netherlands	Non-available	–
6	Ireland	Law "On Public-Private Partnership"	2002
7	China	Non-available	–
8	USA	Non-available	–
9	Canada	Non-available	–
10	Kazakhstan	Law "On Public-Private Partnership"	2015
11	Ukraine	Law "On Public-Private Partnership"	2010

Source: Constructed by the authors according to data [15–18]

In Ukraine, the public-private partnership procedure is regulated in sufficient detail by the Law of Ukraine "On Public-Private Partnership" (as amended dated July 27, 2023) and a number of regulations thereunder. In this Law, public-private partnership is specified as cooperation between institutions of state power and legal entities exclusive of state and public utility services, institutions, organizations (private partners) [19].

Signs of a public-private partnership are the creation and construction (overhaul, reconstruction, restoration, new construction and technical re-equipment) of a public-private partnership object and management (use, operation, maintenance) of such an object; longtermness of the relationship (from 5 to 50 years); transfer of part of the risks to a private partner in the process of implementing a public-private partnership; private partner's investment in a public-private partnership object. Art. 4 of the above Law of Ukraine defines the spheres of application of public-private partnership [19].

The Law of Ukraine "On Concession" opens the form of implementation of public-private partnership and provides for the transfer to the concessionaire of the majority of the operational risk, which encompasses the risk of demand or the risk of supply [20].

The resolution of the Cabinet of Ministers of Ukraine "On the Approval of the Methodology for Identifying the Risks of Public-private Partnership Implementation, their Assessment and Determining the Form of their Management" affirms that during the preparation of public-private partnership projects, all risks are subject to determining, assessment and distribution between public and private partners. Certain recommendations are provided [21].

The analysis of scientific sources and the regulatory environment afford an opportunity to formulate our own vision of the essence of the definitions, namely: partnership is an activity (mainly entrepreneurial) that involves the aggregation of resources of several business entities, their joint management to achieve strategic objectives and joint responsibility for the result. Public-private partnership is a certain interaction of state and business structures to solve socially significant tasks with modalities of mutual satisfaction.

The research showed that one or another option of PPP regulation in the country depends to a considerable extent on the political willpower and interest of the country's government. Thus, not only the improvement of regulatory and legal support, but also the creation by the state of appropriate conditions for the institutional development of PPPs remains important in the direction of the development of PPPs.

Since the process of relations between PPP partners is quite complex, many countries in which specialized legislation for the development of PPPs has been created or is absent create bodies to support the development of PPPs – a specialized division of PPPs – PPP Agency or PPP Unit [22–24].

This unit is authorized to effectively manage PPP projects, promote their implementation, evaluate planned PPP projects, stimulate the involvement of private partners, conduct negotiations, perform the functions of control and monitoring of the implementation of PPP contracts, and provide support for digital and innovative technologies for business processes.

Also, the important functional responsibilities of the PPP Unit should include the development of a PPP development strategy, improvement of legislation in the PPP field, coordination of all processes related to the implementation of the PPP project, provision of advice to investors and assistance to the state partner in negotiating the terms of the PPP contract, etc. [25]. PPP Agencies can operate at different levels (national, sub-national, regional) and in different sectors.

At the same time, the spheres of activity and functions of PPP agencies differ significantly in different countries and at different levels. Such divisions may be established within the line ministry or as a separate institution or as a separate economic entity with partial state ownership.

Let's believe that industry-specific PPP agencies mostly belong to the industry ministry. So, for example, the sectoral ministries of France have considerable autonomy in matters of organizing the PPP process in such sectors as justice, health care, higher education, railway transport.

Academic research has shown that in Germany, a specialized agency for PPP development in the road sector was created on the basis of the Ministry of Transport [9]. Such subdivisions are not mandatory, but, as international experience shows, they contribute to the country's quick and high-quality adaptation to PPP processes.

Research of institutional and state structures for the development of PPPs performed by the Organization for Economic Cooperation and Development (hereinafter – OECD) in 2010 [26] and the updated findings of the research by the World Bank (2020) [27] showed that almost all OECD member countries created PPP Units [26].

In particular, PPP Units have been formed in 29 OECD member countries, including: Australia, Belgium, Great Britain, Greece, Denmark, Estonia, Israel, Spain, Ireland, Italy, Canada, South

Korea, Latvia, Lithuania, Mexico, Germany, New Zealand, Netherlands, Poland, Portugal, Slovakia, USA, Turkey, Hungary, France, Czech Republic, Chile, Sweden, Japan.

However, only in 8 countries (Austria, Iceland, Luxembourg, Colombia, Norway, Slovenia, Finland, Sweden) this specialized PPP units have not yet been created.

Consequently, the number of countries with specialized bodies for PPP support is increasing, which indicates the growing interest of state governments in the development of the PPP mechanism.

PPP's organizational and technological basis is actively influenced by the processes of the economy and society digitization.

In 2015–2020, the EU made significant progress towards increasing digital competitiveness, increasing the level of the economy and society digitization.

The DESI index (The Digital Economy and Society Index reflects the efficiency of digital transformations in Europe, the dynamics of digital competitiveness of EU member states), for EU countries increased on the average by 13.7 points (from 38.9 points in 2015 growth to 50.7 2021 growth, however, in 2020 it was even higher: 52.6 points), which indicates a change in the gap between the expected and actual level of EU digitalization (GAP) [11].

The European Commission has published the results of 2022 Digital Economy and Society Index (DESI), which monitor s the progress that EU member states have made in digital technologies. The Renewal and Resilience Fund allocated approximately 127 billion EUR to reforms and investments in the EU's digital technologies sector.

Table 2.10 Dynamics of EU countries digital transformation

Country	DESI											
	2015			2020			2022			Δ		
	Index	Rating	GAP**	Index	Rating	GAP**	Index	Rating	GAP**	Index	Rating	GAP**
European Union	38.9	–	61.1	52.6	–	47.4	50.7	–	49.3	11.8	–	–11.8

*Note: **GAP – gap, difference between exact (actual) and standard (desirable) values (standard value – 100)*
Source: [25]

The results show that the introduction of main digital technologies by enterprises, such as artificial intelligence (II), is low. It is demandable to intensify efforts to provide the complete deployment of the connection infrastructure (including 5G) necessary for innovative services and applications. Digital technology is another important area where EU member states need to make more progress.

DESI shows where it is necessary to strengthen efforts, for example, stimulating digitization of the economic activity branch including small and medium-sized businesses. The EU deals with the task of having the best available digital solutions and access to the digital connection infrastructure of the international standard.

It provides the member states a framework to assume common responsibilities and generate multipartner projects that strengthen their collective forces and resilience in in global terms.

Digital transformation is a modern legal and socio-political substantiality that defines the contemporary world. It is the main catalyst of the economic advance for any country. Analyzing the values of the Digital Economy and Society Index (DESI) for 2022, it is now becoming apparent that the progress achieved by the European Union member states. All member states have shown a certain level of development in the sphere of digitalization, but the overall pattern is a versatile one. Even though there is some convergence, a significant gap between EU leaders and countries with very low DESI scores exists. Despite the improvement, all member states shall continue to exert joint reasonable efforts to achieve the objectives set in the Digital Decade Strategy for Europe by 2030.

It has been determined that Ukraine has already launched its way in this new actuality. The fact that we are moving onward is positive, nevertheless there is also a negative aspect – our steps are not always compliant with the standards adopted in the EU countries with which Ukraine aspires to integrate. Ukraine has formed a work group, which includes representatives of the main state authorities, which is intended to work on the incorporation of our country to DESI. Under stewardship of EU4DigitalUA professionals, a report and accompanying analytical materials were generated, through which the current state is evaluated and the necessary steps for Ukraine's accession to DESI are determined. Therewith, a draft resolution of the Cabinet of Ministers aimed at stimulating the creation and development of the DESI ecosystem in Ukraine was launched. This project, together with key ministries, continues the work targeted at creating a favorable environment for the successful integration of Ukraine into the digital market of the European Union.

The introduction of DESI in Ukraine opens up the opportunity to monitor the dynamics and progress of digital development comparing with the digital economies of the EU, and thus will contribute to its inclusion into the EU digital market [72].

It has been determined that the EU is constantly increasing the level of digitalization, and other states, that began with underperformance, are gradually overtaking, moving at a robust pace. The standouts are Poland, Italy, and Greece, which have definitely improved DESI scores over the past five years, investing with emphasis on digital technologies supported by European financing. One of the objectives of the Digital Decade is to ensure that at least 80 % of the population has basic digital skills by 2030. Although 500,000 specialists entered the IT labor market from 2020 to 2022, the 9,000,000 specialists in the EU do not comply with the established EU purpose of 20,000,000 specialists by 2030.

The "Way to the Digital Decade" strategy, proposed by the EU in September 2021, will launch a modernized management mechanism through cooperation between EU institutions and other states to achieve the common purposes and objectives of the strategy. This approach involves monitoring changes using DESI, so the DESI indicators are structured around the four main aspects of the 2030 Digital Compass [26].

The innovation process is taking on new changes, making the transition to a digital society, knowledge economy and digital technologies closer. They are attractive to a private partner as an

investor, demanding meanwhile innovative solutions and technologies from the PPP. It is conceivable that the innovative commitment of the PPP will contribute to a speedy and technologically different solution to the socio-economic challenges of society.

It was settled that the state represents a dual role in the digital economy. As a moderator of relevant relations, it generates and establishes the regulatory standards and principles of digital relations between society and the government at the level of elements, instruments and mechanisms of the digital economy, controls and verifies the methods of their use, directly implements technology shifts.

PPP acts more often as an onlooker and user of the state's digital services at the level of e-governance than as a participant in their formation. Acting as a user of digital mechanisms and resources of the digital economy, the state uses the Internet and information technologies through its structures to provide services in e-government and online trade (tender purchases and assets sales).

Within the framework of digitalization, PPP experiences various innovative technology that open up new interesting and attractive areas for investors:

a) at the intersection of various types of economic activity;

b) in consequence of combining of the PPP project innovations of different nature into a single innovative idea (high-tech with socio-economic or ecological ones) [25].

Projects and development of digital infrastructures and digital transformations are an upcoming trend for using the PPP format and resources. The implementation of innovative and digital PPP projects inevitably occurs on the basis of one or another industry segment of the global system of digital networks and communications.

Since the PPP, built on an innovative basis, the nature of which is digitalization (digital nature), is always used in the long- or medium-term contemplation, it as a part of the global system of digital networks throughout the long period of its existence will absorb and process all the innovations that will be born during the introduction of the PPP project, hence building the technological basis for the subsequent self-modernization and self-development of the innovative environment. In other words, it is definite that there exists interactive self-development as a forced and inevitable consequence of PPP introduction, which has an innovative digital technological basis.

The array of instruments, which includes the search for funding sources, methods of their accumulation and application for the public-private partnership project, plays an important main role in the introduction of the project. Depending on the expected participants and types of work, different methods of financing the project can be used (**Fig. 2.17**).

Financing on the basis of specific weight is the most common and expensive method used in the implementation of large-scale projects. Nevertheless, it is often not able to protect participants from risks.

State financing provides full or partial financing of state projects, mainly infrastructure projects, through the state or local budgets, and actually from extrabudgetary funds. The risks are related to the reduction of revenues of the budget system and the possible reduction or freezing of project financing.

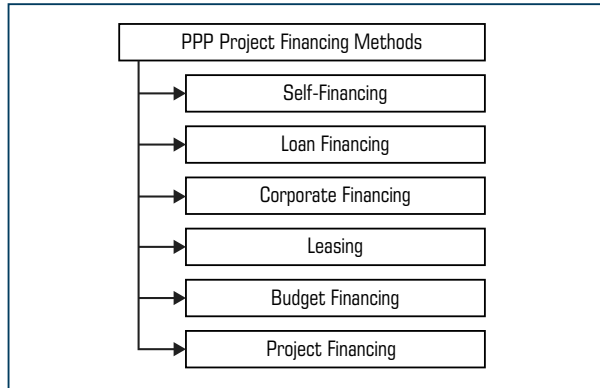


Fig. 2.17 Methods of PPP projects financing

Project financing is a future-oriented method of financing individual projects, which is investment lending. It has come into widespread acceptance in the financing of projects performed under the terms of PPP. It provides money for the cash flow that the project will generate after its completion. It involves aggregation of resources, belonging to many participants, which are accumulated and distributed by a specially formed project company. The risks are stipulate by the fact that, like a classic loan, this loan is risky and undersecured, which creates high risks and problems for lending banks.

Credit financing is a method often used in medium- and short-term investment projects with a high return on investment. Within the framework of PPP, project lending by individual banks, syndicated lending, financing through the issuance of infrastructure bonds, export credit financing, etc. are used. Risks are associated with the implementation of the project itself as well as with a possible change in the terms of concluding contracts and financing by investors.

Leasing financing mechanism is one of the methods of attracting loan funds for project financing. It is considered as one of the types of contractual loans, which are provided by the leasing company or bank to the lessee in commodity form and are repaid in installments. Leasing cannot always be used for social and some other PPP infrastructure projects.

Mixed financing is a combination of several sources or methods of financing, which were discussed above. This is the most common method of financing that is used in the implementation of investment projects in the infrastructure sector, primarily in the implementation of PPP projects, which allow to smooth out existing risks.

Consequently, within the framework of projects implemented on the basis of PPP, the choice of a financing profile depends on each specific project and the participants' assessment of the financial benefit from participating in it.

Many regions of the world need to invest money to form modern infrastructure in all sectors. The contemporary practice of implementing PPP projects affords possibility to bring to light that

the real set of instruments is very limited. As indicated in World Bank reports, this is mainly equity and credit financing.

Other methods and sources of financing have not been widely developed. Loans from international organizations prevail in state sources.

Nevertheless, the set of methods and instruments that can be used in the implementation of public-private partnership projects may be diverse, which is discussed below.

Furthermore, the structure of possible sources of financing and formation instruments will also differ depending on the phase of implementation of the PPP project.

At the pre-investment stage of the development of the PPP project, the project's funds prevailed over the project initiator's own funds:

– own savings and profit, which can be supplemented in a small amount by budgetary funds (extra-budgetary funds) for the development of project documentation, funds from grants, competitions, angel investors finances, if the initiator is a private person;

– budgetary funds (extra-budgetary funds) provided for the implementation of this project, if the initiator is a public participant.

At the investment stage of the PPP project, the choice of funding sources is somewhat expanded. At this stage, it is possible to use the following sources:

– own funds of the project participants: savings and profit, funds and reserves created if the initiator is a private person;

– budgetary funds (extra-budgetary funds) allocated for project implementation including guarantees, if the initiator is a public party;

– subject to conditions of co-financing, funds from the issue and sale of shares, other securities; funds involved in project financing;

– loan sources: budget loans, loans from banks and other financial organizations and institutions, loans from international organizations, bond loans, leasing, project financing.

It has been determined that in the course of the work of the project, the choice of funding sources becomes as wide as possible and may include:

– own funds of the project participants: own capital, savings and profit, depreciation charges, development funds and other target funds and reserves (private person);

– budgetary funds or extra-budgetary funds provided for the implementation of the project (public party);

– sources of involvement in the financial market: grants, tenders, funds from commercial investors under co-financing conditions, involved in the project, funds from the issuance of additional shares, other securities; funds received in the frames of project financing;

– funds received as a result of redistribution: insurance reimbursements, funds formed on a share (partial) basis;

– loan sources: budget and tax investment loans, guarantees, loans from banks and other financial organizations, syndicated loans, loans from international organizations, bond loans, factoring, guarantees.

At the final (liquidation) stage of the project, the choice of funding sources is again significantly reduced. These are going to be:

– own funds of the project participants: owners' equity, savings and profit, depreciation deductions, development funds and other target funds and reserves (private person);

– funds received through the reissuance and mobilized on the financial market: insurance reimbursements, limited budgetary and extra-budgetary resources involved in the project on a targeted basis;

– funds from the sale of securities; funds received from the sale of superfluous, unused, obsolescent fixed assets;

– loan resources: bank loans are limited; it is possible to receive funds as part of project financing.

The world trends in the development of PPPs are:

a) the qualitative growth of PPPs in the world and in the EU (the number of projects and the total volume of investments in them);

b) branching of the PPP market according to states and sectors of the economy;

c) infrastructure orientation of PPPs, when countries implement important projects with the help of PPPs, which results in an increase in the quality and quantity of infrastructure services;

d) state support for the development of a certain type of PPP or in a certain industry or trend;

e) PPP development in the sphere of innovative activity.

PPP projects bring a different amount of investment to the respective sphere, as they have different investment capacity. Transport is still the most investment-intensive [11].

At the same time, digital PPP projects along with investment in information and communication technologies, accounting for only 0.8 % of their total number of transactions, Innovative aspects of institutional transformations bring 1.7 % of investments. The investment capacity of PPPs on an innovative and informational basis, calculated for PPPs in the field of "information and communication technologies", is 2.1. The only PPP investment capacity in relation to airports is much higher than it [28].

One of the most important strategic documents of the EU, which defines digital transformations as the basis of EU development until 2030, is the Digital Compass 2030: the European way for the Digital Decade (2030 Digital Compass: the European Way for the Digital Decade) [26].

Considerable experience of the effective application of the mechanism of public-private partnership has been accumulated in the countries of the European Union (hereinafter – the EU). **Fig. 2.18** presents the dynamics of the number of agreements and investments implemented on the basis of PPPs among the member states of the European Union [29].

As evidenced by the data in **Fig. 2.18** from 1990 to 2020, 2,023 projects with a total cost of 406.3 billion EUR were implemented in EU countries.

Overview of the European public-private partnership market in 2022 is presented in **Fig. 2.18**.

Large public-private partnership projects (500 million EUR or more) as a share of total activity in 2022 [30].

Implementation of PPP projects in the countries of the European Union during 1990–2020 is presented in **Fig. 2.19**. In 2022, 20 PPP projects were implemented, of which PPP agreements

were concluded for 16 projects, the overall price of which is 12.7 million USD. 3 large projects worth 4.2 billion EUR have been completed. The bidding process for 2 projects worth 2.50 million USD has been accomplished and they are in the process of signing the PPP agreement.

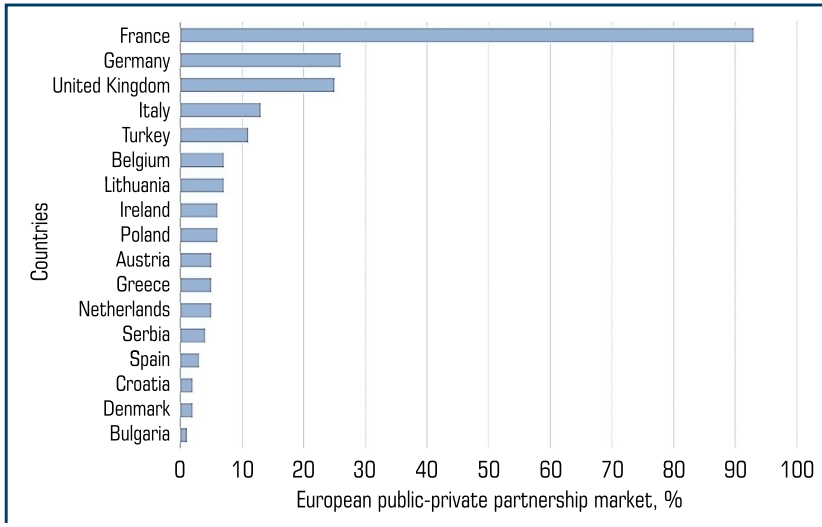


Fig. 2.18 Development of the European public-private partnership market by country (2018–2022)
Source: [27]

The number of demand/income-based transactions reaching financial closure increased up to 70 % of total transactions in 2022 (66 % – in 2021).

The enhancement in value and number of public-private partnership agreements in 2022 proves that in spite of the uncertainty and instability of construction prices, the public-private partnership is recovering after the coronavirus pandemic (**Fig. 2.20**) [28].

It is important to note that in different European countries the development and level of the PPP mechanism occurs at different speed: if in France, Germany, Great Britain this mechanism is already quite developed, then there are other countries that do not have significant experience in the implementation of PPPs or have just begun to master and study this cooperation mechanism. Such countries include Denmark, Croatia and Cyprus [28].

Analysis of the European market for PPP development over the past 7 years has shown that France ranks the first by quantitative criteria as well as by the value of signed agreements among the EU member states. Likewise, among the countries with a large scope of projects using the PPP mechanism in **Table 2.11**, it is possible to lay emphasis on Great Britain, which during 2016–2020 established itself as a leader among other countries of the world, as well as Turkey, Germany and

the Netherlands. Other states have a significantly lower level of indicators both in terms of number and nominal value of projects.

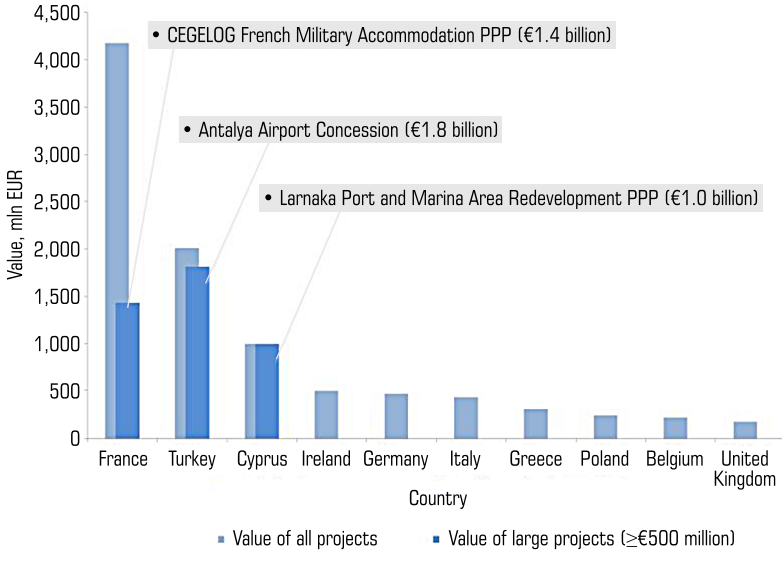


Fig. 2.19 Implementation of PPP projects in the countries of the European Union during 1990–2020

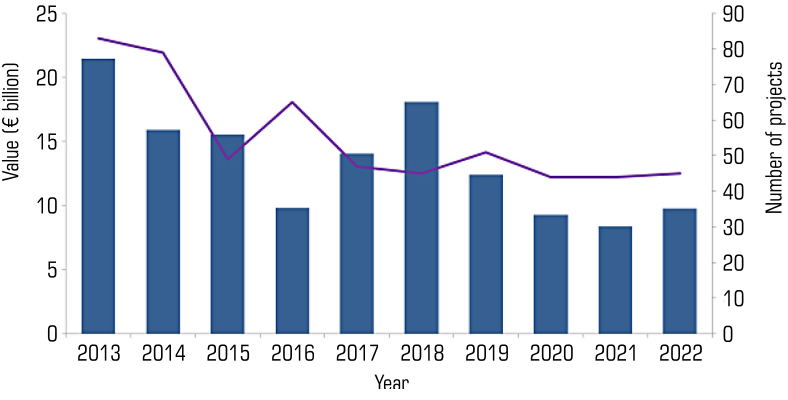


Fig. 2.20 Enhancement in the value and number of public-private partnership agreements
Source: [28]

● **Table 2.11** Dynamics of public-private partnership projects among EU member states from 2016–2020 and in 2022

Country	Number of PPP projects, units, in 2016–2020	Cost of PPP projects, billion EUR in 2016–2020	Number of PPP projects, units, in 2022	Cost of PPP projects, billion USD in 2022	Progression between 2016–2020 and 2022	
					Number of PPP projects	Cost of PPP projects
France	67	13.54	25	4.2	–42	–9.34
England	58	10.29	2	0.1	–56	–10.19
Germany	22	6.63	4	0.6	–18	6.06
Turkey	16	12.68	2	2.0	–14	–10.68
Netherlands	11	4.3	–	–	–11	–4.3
Italy	9	4.05	2	0.4	–7	–3.65
Belgium	7	4.05	2	0.2	–5	–3.85
Ireland	7	0.95	2	0.6	–5	–0.35
Austria	5	0.44	–	–	–5	–0.44
Greece	5	1.02	1	0.3	–4	–0.72
Lithuania	4	0.07	1	0.07	–3	0
Spain	3	0.57	–	–	–3	–0.57
Poland	2	0.47	2	0.2	–	–0.27
Serbia	2	0.79	–	–	–2	–0.79
Bulgaria	1	0.88	–	–	–1	–0.88
Finland	1	0.17	–	–	–1	–0.17
Slovakia	1	1.00	–	–	–1	–1.00
Cyprus	–	–	1	1.00	+1	+1.00
Denmark	–	–	2	0.06	+2	+0.06
Croatia	–	–	1	0.03	+1	+0.03

Source: constructed by the authors according to data [31]

These tables show that in the course of 2022, Turkey has the second largest public-private partnership market in terms of value, with a total of 2.0 billion EUR (1.4 billion EUR in 2021) [32]. When it comes to completed transactions according to the number of projects, Germany was the first and has the second largest public-private partnership market with four completed transactions (seven transactions were completed in 2021). Seven countries concluded no less than two agreements (six countries in 2021), and 4 countries concluded no less than one public-private partnership agreement (compared to 2014 vs 2021).

France and Germany lead the European public-private partnership market concerning the total number of concluded agreements.

In 2022, the total value of EU public-private partnership agreements that reached the phase of financial closure amounted to 9.8 billion EUR, which is 17 % more than in 2021 (8.4 billion EUR).

In the sectoral section, the priority sphere in the countries of the European Union concerning public-private partnership in 2022 according to the number of agreements is transport, environment and telecommunications industries [32].

Development of the main sectors of public-private partnership according to project number (2018–2022) (**Fig. 2.21**).

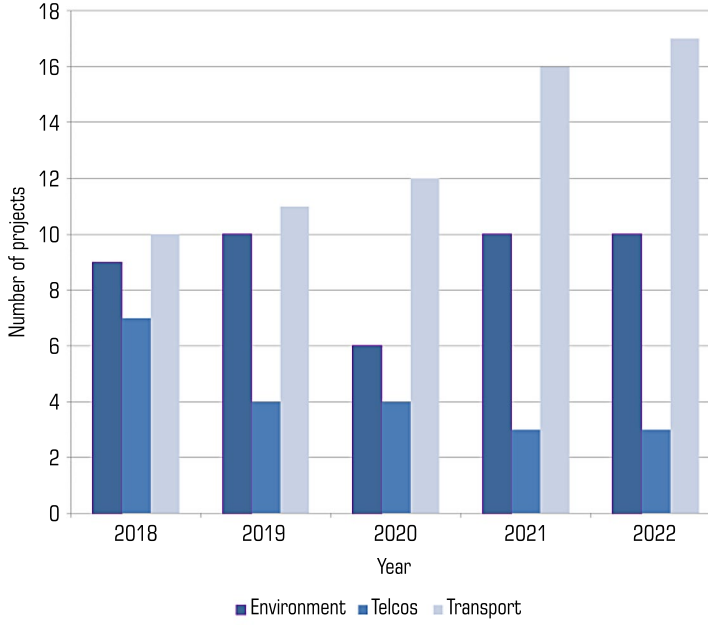


Fig. 2.21 Development of the main sectors of public-private partnership according to project number (2018–2022)

The share in the areas of protection, public order and security, recreation and culture, provision of public services and housing and communal services remains insignificant. According to sectoral placement in developing countries, the top performers in the total volume of financing is the electric power sector. For 2016–2020, 176.42 billion USD were invested in this sphere [33].

In 2022, the transport sector continued to be the most important in monetary terms. The transactions amount was 5.2 billion EUR (6.0 billion EUR in 2021). The number of projects increased. 17 transport projects reach financial closure in 2022 (compared to 2016 and 2021).

These are such large projects as four roads (two in France, one in Greece and one in Italy) and four ports (two in France, one in Croatia and one in Cyprus).

The tables data show that 10 projects in the environment sector were completed during 2022 (10 were completed in 2021) with a total value of 1.3 billion EUR (1.1 billion EUR in 2021). It was the second most active sector among the projects.

5 projects were implemented in the field of centralized heat supply – all of them were in France, with a total cost of 576 million EUR. In the education sector, the number of financially completed projects increased from 5 to 8, and the total value rose to 910 million EUR (391 million EUR in 2021). 6 were school projects (3 in Germany, 2 in Great Britain and 1 in Belgium). 3 projects were completed in healthcare (2 in 2021) for a total of 509 million EUR (224 million EUR in 2021). 2 projects in terms of medical institutions (1 in Denmark and 1 in Turkey). In the field of telecommunications, 3 projects were completed (3 in 2021) with a total amount of 231 million EUR (427 million EUR in 2021). All 3 concerned broadband Internet projects in France [33].

The water supply and drainage sector turned out to be the least attractive among the considered sectors – 15.78 billion USD. In quantitative terms, PPP projects are most intensively introduced in the field of electricity, as well as in transport infrastructure, which includes the construction and operation of highways, railway transport, seaports and airports [33].

The given statistics show that the public-private partnership is developing quite actively on the international market, which is confirmed by the number of introduced projects and the number of investments. Consequently, this type of cooperation has proven itself quite well and has a basis for further development.

The experience of implementing PPP projects at the local level in the EU is very valuable: the PPPs are an effective and future-oriented instrument for economic and social development at the regional and local levels, as well as a means of financing projects in which national and local authorities wish to maintain control and establish cooperation with investors.

Such cooperation between local authorities and business entities results in the improvement of technical and economic indicators and results of projects, as well as in the effective use of state resources and communal property.

For example, public-private partnership projects have been implemented in the field of water supply and drainage for many years. In France, concessions for the construction and operation of water supply and drainage facilities have been in effect for at least 50 years, which has led to the development of a large and diverse private sector that operates water supply and drainage facilities.

Together with the implementation of the Directive of the European Commission on the quality of potable water and wastewater treatment, the obligations of state authorities to take responsibility for the maintenance and operation of facilities to provide consumers with high-quality potable water have substantially increased.

In order to satisfy the requirements of the Directive, it was determined that many countries will have to diversify their investments in the construction of technically new water supply and drainage facilities or in the reconstruction of existing water supply and drainage facilities. As a result, the countries that previously did not involve the private sector in this public services sector are now considering the possibility of using the technology, expertise and resources of the private sector to fulfill the requirements of the aforementioned Directive.

According to a recent study by the World Bank (Public-Private Partnerships for Urban Water Utilities, 2009), over the past 15 years, 32 developing countries and transition economy countries have implemented water and sanitation projects based on forms of PPP such as management contracts, concession agreements and leases. An overlook of 65 large public-private partnership projects in this sector showed that private operators achieved the greatest success in improving operational efficiency and service quality.

Most of the private operators surveyed by the World Bank have been successful in reducing water losses. The analysis also showed that the involvement of private operators significantly increases the level of collection of payments for services rendered.

Currently, public-private partnership projects have been extended to areas such as waste management, where the financial burden has increased significantly within the traditional responsibilities and functions assigned to the public sector. For economic reasons, as well as for environmental reasons, local authorities are giving less and less consideration to traditional landfills as the only economically viable solution to the problem of waste and pollution. More present-day methods, such as waste-to-energy schemes and sorting stations, require significant investment.

The most comprehensive forms of PPPs are suitable for waste management projects where most of the operational and financial risks are transferred to the private sector. Furthermore, the concession agreement stipulates that the private partner will not only finance the project, but also collect fees for services provided to consumers (according to the "polluter pays" principle), and also assume the risks associated with the volume of waste.

An effective example of mutually beneficial cooperation between the city and a private investor can be the PPP project implemented in Birmingham (Great Britain). Birmingham has approximately 2,500 kilometers of streets, roads and urban highways, as well as 850 bridges, tunnels and related transport structures. Therefore, the city must provide lighting for 97,000 city-owned streets during the dark hours of the day. In the past, most of the lamps used for lighting were high pressure sodium, mercury or metal halide lamps. Before the PPP project, most of the street lighting was outdated and they need substitution.

The street lighting substitution is part of a larger agreement (117 million USD of the 4.2 billion USD total agreement value) targeted at incremental improvements to the highway network and the maintenance and management of 2,500 kilometers of roads, 4,200 kilometers of sidewalks, 97,000 lights, 76,000 streets, 1,100 traffic lights and more than 850 bridges, tunnels and road structures. The project implementation period is from 2007 to 2035. Projected energy savings – 50 % [31].

The lighting substitution is planned in two stages: the first stage lasting 5 years (the main investment period, 2010–2015), during which 57,404 lamps were substituted with 35,804 posts, 21,402 PhilipsIndalStela LEDs, 14,204 conventional high-pressure sodium lamps and 198 other types of lamps. Most of the capital expenditures (Capex) were made during the capital investment period, from June 2010 to June 2015 [29].

The first stage concentrates on the most problematic issues, specifically:

– improvement of the average condition of roads, carriageways and sidewalks, especially those that were in extremely poor condition;

– substitution of up to 41,000 noncurrent posts, including modernization of equipment in the posts to ensure control and improve the efficiency of electricity management;

– reconstruction of three main tunnels of the city center with up-to-date equipment to improve safety;

– strengthening of bridges so that city roads are able to withstand more load;

– restoration of a large number of old traffic signal regulators to improve the ability to connect traffic control systems with other institutions [29].

The second phase provided operational expenditure (Opex) during the period from 2015 to 2035 to maintain the higher operating indices that had already been achieved as of 2015. Approximately 40,000 fixtures will also be gradually upgraded during this phase.

In the case of Birmingham, the private and public sectors joined efforts using private funds to upgrade the city's infrastructure up to established standards. The partnership also includes the obligation of the private partner to maintain the infrastructure in good keep throughout the duration of the agreement [12].

Since the city and its residents continue to use the infrastructure, the private partner is responsible for the ongoing management and maintenance of the infrastructure and its improvement.

The expected results of the project implementation are:

– improving the quality of light from LEDs, which will improve sight distance and overall road safety by reducing the number of accidents, crimes, and environmental contamination;

– high operational efficiency, reliability and long service life will help save energy and reduce carbon dioxide emissions by 50 % or more;

– reengineering of street lighting systems with control elements and creation of a central control system will provide with the freedom to achieve maximum energy savings;

– ability to adjust the level of power supply of LED lamps will help reduce heating and extend the service life of such devices;

– improvement of lighting will be noticeable to the public and will affect the general perception of roads and their maintenance.

Separately, it will be observed that the agreement allows a private partner to install LED lighting, but does not require periodic updates of the technology.

Along with this, there is a general trend that the service provider actively looks for and studies new technologies for their implementation for the purpose of using the most

energy-efficient and progressive technologies for street lighting, thereby increasing the profitability of the project [25].

In 2022, the following important public-private partnership projects in the member states of the European Union achieved financial completion:

1. The second public-private partnership transaction amounting to more than 500 million EUR occurred in Cyprus for the project "Reconstruction of Larnaca Port and the Marina Area" (1 billion EUR) and achieved financial closure;

2. Irish Community Nursing Units (CNU) project (245 million EUR) achieved financial closure in 2022. This is the first public-private partnership for community nursing in Ireland and the second public-private partnership transaction in Ireland since 2016.

3. The public-private partnership project in Greece "Salonica Circular Road" has reached financial closure (300 million EUR). This is the first public-private partnership project in Greece regarding road accessibility. The last road projects in Greece prior to this reached financial closure in 2007.

4. The public-private partnership project "Krakow tram" (186 million EUR) achieved financial closure in Poland. This is the first project based on public-private partnership in municipal transport in Poland.

The successful international and national experience of public-private partnership shows that PPP is an instrument of partnership, equal and mutually beneficial cooperation between the state, the community represented by interested state authorities and local self-government bodies, and also business, where projects are implemented by joint efforts.

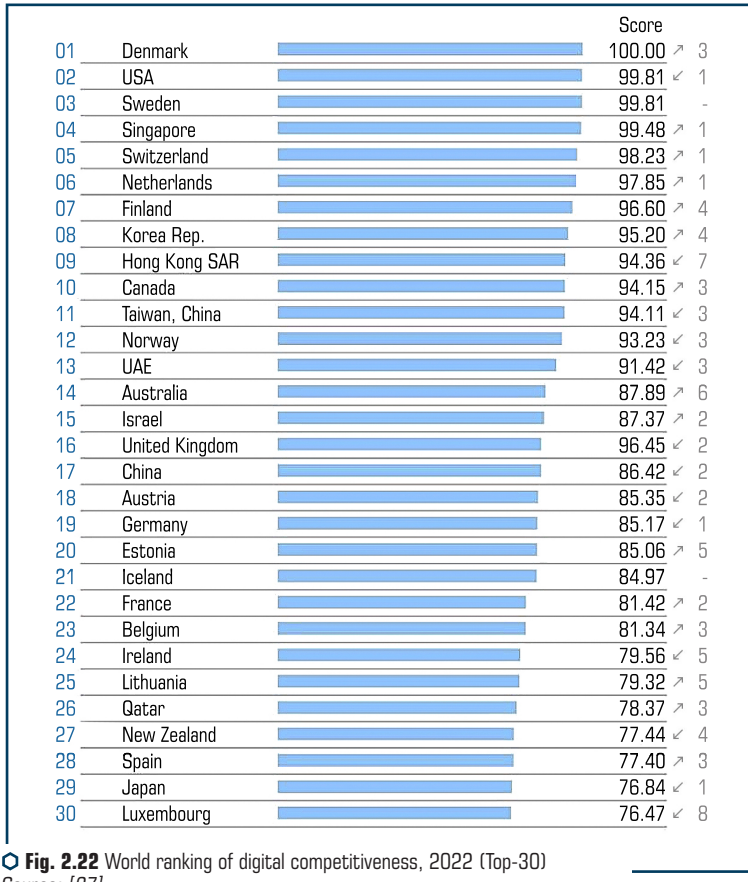
In reliance on the research performed, let's contribute suggestions in terms of innovation-oriented development of public-private partnership, namely:

a) the joint process of creating innovative value by the state, a private partner and society includes finding a compliance between existing necessities and the possibilities of their satisfaction (science, engineering, technology, knowledge and competence), between which there may be contradictions;

b) further optimization of the internal innovation environment of the PPP according to the old approaches is practically impossible, since the existing methodological approaches have drained themselves as a consequence of two technological revolutions (computer, biotechnological ones) and the development of integrator technologies of the 1st and 2nd generations.

The latter combine the 4Ss: smart technologies, smart environment, smart production and smart products. These technologies and the outcome of their combinations and integration, contribute to the growth of productivity and competitiveness of certain sectors of national economies in the process of creating new markets and industries.

The PPP digitization mechanism is ambivalent in nature. Primarily, it is the use of digital financial instruments in the investment process of PPP projects (financial component of the PPP mechanism), and secondly, the use of digital platforms to integrate the interests of PPP project participants (organizational and communication component). World ranking of digital competitiveness, 2022 (Top-30) listed on the **Fig. 2.22**.



⬡ **Fig. 2.22** World ranking of digital competitiveness, 2022 (Top-30)
Source: [27]

This approach, along with the development of organizational and financial instruments, allows to conclude that in the implementation of PPP projects in European countries, digital instruments are used, which allow for more effective interaction between national and municipal authorities, special information and analytical systems and technological platforms.

Therefore, the digital environment creation within the state and the private sector, open data, services and instruments for their use forms an information infrastructure for business communities, countries and their people including within the framework of PPPs. This approach makes it possible to get closer to the system of digital transformation of the PPP mechanism based on a combined array of instruments, which is noted in the form of general and digital financial instruments in the process of project implementation, as well as to face the detection of all parties through a digital platform.

REFERENCES

1. Besedina, O., Nizalov, D., Semko, R. (2012). Basic Survey on Awareness of Public-Private Partnership. USAID Materials. Official site of the PPP Development Program in Ukraine, USAID. Available at: https://me.gov.ua/Files/GetFile?fileId=7a714519-0fbf-4c61-82ec-145d5ead9f10
2. Boiko, O. (2013). Derzhavno-pryvatne partnerstvo: svitovyi dosvid ta perspektyvy realizatsii v Ukraini. Yurydychna Hazeta, 22, 42–43. Available at: https://yur-gazeta.com/publications/practice/derzhavnoprivatne-partnerstvo/derzhavnoprivatne-partnerstvo-svitoviy-dosvid-ta-perspektivi-realizaciyi-v-ukrayini.html
3. Cherep, A., Adamenko, M., Cherep, O., Dashko, I., Korolenko, R., Kornukh, O. (2023). The Influence of the Innovation Potential of Personnel on Strengthening Economic Security of Ukrainian Enterprises in the Post-War Period. Wseas Transactions on Business and Economics, 20, 70–79. https://doi.org/10.37394/23207.2023.20.8
4. Gudz, P. V., Ileva-Naydenova, P., Cherep, A. V., Oleinikova, L. H. (2021). Use of State Support Levers for Small and Medium-Sized Enterprises within the Dynamic Environment. Economic Studies, 2, 140–158. Available at: https://ideas.repec.org/a/bas/econst/y2021i2p140-158.html
5. Lokhman, N., Serebrenikov, V., Beridze, T., Cherep, A., Dashko, I. (2020). Analysis of economic and mathematical modeling of industrial enterprise functioning at multicollinearity based on parameterization. Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu, 2, 179–184. https://doi.org/10.33271/nvngu/2020-2/179
6. Oleynikova, L., Cherep, O., Androsova, E., Bexhter, L., Korotaieva, O. (2023). Modern architecture of the infrastructure of Ukraine and its development strategy in the post-war period. Financial and Credit Activity Problems of Theory and Practice, 5 (52), 299–313. https://doi.org/10.55643/fcaptp.5.52.2023.4180
7. Honcharenko, O. (2020). Samorehulivni orhanizatsii u sferi tsyfrovoi ekonomiky. Entrepreneurship, Economy and Law, 2, 93–97. https://doi.org/10.32849/2663-5313/2020.2.15
8. Warsen, R., Nederhand, J., Klijn, E. H., Grotenbreg, S., Koppenjan, J. (2018). What makes public-private partnerships work? Survey research into the outcomes and the quality of cooperation in PPPs. Public Management Review, 20 (8), 1165–1185. https://doi.org/10.1080/14719037.2018.1428415
9. Laponoh, D. (2020). Evaluating the public-private partnership development trends in the road transport services market. Bulletin of the Kyiv National Technology and Design University. Economic sciences series, 5 (151), 94–103. Available at: https://er.knutd.edu.ua/handle/123456789/17298
10. Tarash, L., Petrova, I. (2015). World and European pro-gress trends of the public-private partnership to identify priority applications. Herald of the Economic Sciences of Ukraine, 1 (28), 133–141. Available at: http://dspace.nbuv.gov.ua/handle/123456789/87519
11. Rogers, D. L. (2023). The Digital Transformation Roadmap. Davidrogers.digital. Available at: https://davidrogers.digital/digital-transformation-roadmap/

12. Skelcher, C., Sullivan, H. (2008). Theory-driven approaches to analysing collaborative performance. Public Management Review, 10 (6), 751–771. https://doi.org/10.1080/14719030802423103
13. Warden, R. (2010). The Internet and Scientific Communication: Blurring the Boundaries. Ecancermedicalscience, 4, 203. https://doi.org/10.3332/ecancer.2010.203
14. Kilkist zareiestrovanykh bezrobitnykh v Ukraini z 2000 po 2023 rr. Available at: https://index.minfin.com.ua/ua/labour/unemploy/register/2022/ Last accessed: 05.02.2024
15. Bondar, N. M. (2010). The world experience of public-private partnership in the transport industry. Efektyvna ekonomika, 6. Available at: http://www.economy.nayka.com.ua/?op=1&z=241
16. Masyk, M. Z. (2018). Foreign Experience in the Implementation of PPP Projects. State and Regions. Series: Public Management and Administration, 1 (61), 119–123. Available at: http://pa.stateandregions.zp.ua/archive/1_2018/23.pdf
17. Repeta, Yu. V. (2022). Origin and development of contractual forms of public-private partnership. Current Problems of State and Law, 94, 87–98. https://doi.org/10.32782/apdp.v94.2022.11
18. Slobodyanyuk, N. (2016). Foreign experience of strategic public- private partnership in the investment sphere. Investytsiyi: praktyka ta dosvid, 13, 49–53.
19. Pro derzhavno-pryvatne partnerstvo (2010). Zakon Ukrainy No. 2404-VI. 01.07.2010. Available at: https://ips.ligazakon.net/document/view/t102404?an=273&ed=2023_07_27
20. Pro kontsesiiu (2019). Zakon Ukrainy No. 155-IX. 03.10.2019. Available at: https://zakon.rada.gov.ua/laws/show/155-IX#Text
21. Pro zatverdzhennia Metodyky vyiavlennia ryzykiv, poviazanykh z derzhavno-pryvatnym partnerstvom, yikh otsinky ta vyznachennia formy upravlinnia nymy (2011). Postanova Kabinetu Ministriv Ukrainy No. 232. 16.02.2011. Available at: https://zakon.rada.gov.ua/laws/show/232-2011-%D0%BF#top
22. Vorobiova, M. (2021). Public-private partnership: world experience and domestic realities. Naukovi Perspektivi, 5 (11), 267–283. https://doi.org/10.52058/2708-7530-2021-5(11)-267-283
23. Maksymchuk, K. (2020). Kontsesiia pid mikroskopom: pliusy ta minusy chynnoi modeli DPP. Yurydychna Hazeta, 1 (707). Available at: https://yur-gazeta.com/dumka-eksperta/koncesiya-pid-mikroskopom-plyusi-ta-minusi-chinnoyi-modeli-dpp.html
24. Pavliuk, A., Liapin, D. (2012). "Shchodo rozvytku derzhavno-pryvatnoho partnerstva yak mekhanizmu aktyvizatsii investytsiinoi diialnosti v Ukraini". Analitychna zapyska. National Institute of Strategic Studies. Available at: https://www.niss.gov.ua/doslidzhennya/ekonomika/schodo-rozvitku-derzhavno-privatnogo-partnerstva-yak-mekhanizmu-aktivizacii
25. Digital Economy and Society Index (DESI) 2021 (2021). Available at: https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2021
26. 2030 Digital Compass: the European Way for the Digital Decade (2021). Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021DC0118
27. Market update Review of the European public-private partnership market in 2022 (2023). Available at: https://www.eib.org/attachments/lucalli/20230009_epec_market_update_2022_en.pdf

28. Dedicated Public-Private Partnership Units. A Survey of Institutional and Governance Structures (2010). OECD. https://doi.org/10.1787/9789264064843-en
29. Proven Delivery Models for LED Public Lighting. Available at: https://documents1.worldbank.org/curated/en/869131477561325418/pdf/Proven-delivery-models-for-LED-public-lighting-synthesis-of-six-case-studies.pdf
30. Large Public-Private Partnership Projects (€500 million or more) as a Share of Total Activity in 2022 (2022). Ministry of Economy of Ukraine. Available at: https://www.me.gov.ua/Documents/Detail?lang=uk-UA&id=9fc90c5e-2f7b-44b2-8bf1-1ffb7ee1be26&title=StanZdiisnenniaDppVUkraini&isSpecial=true
31. Derzhavno-pryvatne partnerstvo yak mekhanizm realizatsii novoi rehionalnoi polityky: mozhlyvosti zastosuvannia ta praktychni aspekty pidhotovky i vprovadzhennia investytsiinykh proektiv (2017). Available at: http://rdpa.regionet.org.ua/images/129/PPP_report_U-LEAD_30_10_2017.pdf
32. Market Update Review of the European PPP Market in 2022 (2023). European PPP Expertise Center (EPEC). Available at: https://www.eib.org/attachments/lucalli/20230009_epec_market_update_2022_en.pdf
33. Market Update Review of the European PPP Market in 2020 (2021). European PPP Expertise Center (EPEC). Available at: https://www.eib.org/attachments/epec/epec_market_update_2020_en.pdf

PART 3 PROSPECTS FOR THE IMPLEMENTATION OF EUROPEAN PRACTICES OF THE ECONOMY DIGITIZATION IN THE PANDEMIC COVID-19 AND THE RUSSIAN-UKRAINIAN WAR

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3.1 DIGITAL HR AS AN INNOVATIVE TOOL FOR PERSONNEL MANAGEMENT IN ORGANIZATIONS AGAINST THE BACKGROUND OF CONTEMPORARY ISSUES AND CHANGES

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ABSTRACT

Digital HR continues to be relevant and even becomes a still more core element of personnel management in organizations against the background of constant change. The consequences and impact of constant change such as technological innovation, demographic change, economic turbulence and globalization establish new challenges for HR management. Digital HR tools make it possible for organizations to easily scale up or scale down their HR processes depending on their necessities. They can be conveniently configured to respond to any changes in the company's scope of work or strategy. Digital HR platforms can support employee engagement and involvement, even in remote or distributed work environments. This is especially essential in environments where employees may work in different geographic locations or at different times. Constantly changing conditions often require a deep understanding of data to make informed management decisions. Digital HR systems provide tools to collect, analyze and use HR data to make effective strategic decisions. Constantly changing conditions may require constant updating of skills and competencies of employees. Digital HR tools can help keep and develop talents by providing access to learning resources, planning individual learning and development programs, and tracking learning progress. Therefore, digital HR remains a relevant and essential personnel management tool against the background of constant change, giving organizations the opportunity to effectively adapt to new challenges and support competitiveness.

KEYWORDS

Digital HR, technological innovation, personnel management, employee engagement, HR data analysis, competitiveness, strategic decisions.

Digital technologies make it possible to automate and optimize many processes in the area of personnel management, which ensures a quick response. Business environment changes rapidly, and organizations need to respond quickly to these changes. Digital HR makes it possible to introduce new tools and modify HR processes quickly and efficiently to satisfy changes in the business environment. Digital HR forwards the most important tasks and priority issues in personnel management, which is especially important under the conditions of limited resources and a competitive environment [1].

In a competitive environment, involvement and keeping talents is a crucial task. Digital HR can provide innovative tools to involve and keep the best staff members, such as staff development, mentoring programs and individualized career development plans. Against the background of

constant changes, it is particularly important to ensure the security and confidentiality of personal data of employees. Digital HR makes it possible to implement data security arrangements and control access to confidential information. Constantly changing conditions can result in stress and uncertainty among employees. Digital HR can provide tools to support work relationships, communication and team spirit even in a virtual environment. Against the background of constant changes, digital HR continues to be a necessary tool for effective personnel management and achieving advance in business, – notes A. Yurhen in his paper "Management 3.0. Agile Management. Leadership and Team Management" [2].

Let's give consideration to some core aspects of analyzing the concepts of digital HR, which will help to understand how digital HR can be successfully implemented and integrated into organizational strategy and business processes. Concepts and authors related to digital HR.

Domestic scientists such as: M. Adamenko [3], A. Cherep [3–7] contributed significantly to the development of the theory of personnel management and the impact of digitalization on the efficiency of the use of employees at each workplace and the activity of the enterprise as a whole, O. Cherep [3, 6], I. Dashko [3, 6], O. Honchar [7], O. Kornukh [6], R. Korolenko [3], D. Krylov [7], P. Matkovskyi [36], A. Kolot [8], T. Kostyshyna [9], L. Oleinikova [7], O. Rozhenko [6], M. Semykina [10], M. Voinarenko [7].

These authors are known for their research and action-oriented recommendations presenting different perspectives and approaches to personnel management and the use of digital technologies in digital HR management. Their research and publications can be helpful for those interested in the implementation of innovative practices in personnel management and the use of digital tools to attain the strategic goals of the organization.

In her work "The Necessity of Forming a Labor Motivation Mechanism at Enterprises", the author specifies that by acquiring new knowledge and experience, developing their innate abilities, people multiply their human capital, increasing its quantitative and qualitative scope of functionality. Like any other capital, human capital shall generate income. This income depends on both on the amount and structure of capital and on the efficiency of its use [2].

In our research, let's also rely on paper (Buhaichuk, Oksana; Nikitenko, Vitalina; Voronkova, Valentyna; Andriukaitiene, Regina & Malysh, Myroslava "Interaction of the Digital Person and Society in the Context of the Philosophy of Politics" (2022), which specifies the evolution of flexible models, organizational structures of the enterprise under the conditions of digital transformation, which affected all processes of the society – economy, politics, community, people, the way management and staff communicate and cooperate with each other, on the formation of a digital person [11]. In Appelo Jürgen's paper "Management 3.0. Agile Management. Leadership and Team Management", a new approach to management in organizations is offered, especially within the framework of Agile software development methodologies [2]. Appello solves important problems of contemporary management, such as employee motivation, distribution of power, cooperation in teams, adaptation to changes, etc., considers them from the perspective of an Agile approach important for digital HR, which emerges as a core element of personnel management in contemporary

organizations, especially through the lens of constant change in the labor market and technological innovations. Appelo Jürgen offers a number of tools and practices that can help managers and leaders increase the effectiveness of their work and stimulate the development of the organization. "Management 3.0" book is intended to help readers understand what changes can be made in the management approach to increase performance and adjust to the rapidly changing environment of contemporary businesses.

Research of O. Danilian, O. Dzeban, Y. Kalynovskyi testified that a digital person is a product of the information society, since in the contemporary information society a large amount of information about people is stored and processed in digital format [12, 13]. From our Internet browsing to transactions for the purchase of goods and services, our digital footprints become the basis for analysis and use by various organizations. Digitization has brought significant benefits to human resource management providing greater efficiency, accuracy and flexibility in processes related to human resource management. This means that workers shall have the necessary skills, knowledge and competencies to work efficiently in a digital environment. Digital transformation demands HR professionals to accustom to modern technologies and management strategies so as to successfully introduce these changes in the organizational culture. The digital environment is constantly changing, so it is essential to ensure the continuous improvement of employees' digital skills through training programs and regular updates. Chris Skinner's paper "Digital Human: The Fourth Revolution of Humanity Includes Everyone" investigates the impact of digital transformation on contemporary society and human life [14]. The author examines changes the digital revolution has brought and will bring in various aspects of life including the economy, politics, culture, education and the work environment. Skinner analyzes the impact of new technologies, such as artificial intelligence, blockchain, the Internet of Things, on social relations, business processes and other areas of life. He also examines the possible consequences of these changes and the challenges they pose to society, which is important for the rapid transformation brought about by the digital era and may be useful for those interested in the future development of technology and its influence upon our lives.

For the purpose of solving the research tasks of digital HR as a priority issue of organizations and an important element of change management, let's rely upon the evolution of digital technologies of the industrial revolution from 4G to 5G within the framework of the issues of digital globalization [15]. Effective change management: Changes in today's business environment require adaptability and flexibility. Digital HR can help organizations manage these changes by introducing new technologies and approaches to HR management, contribute to improving the effectivity of HR processes, allowing the automation of many routine tasks in the area of HR management, saving time for strategic analysis and decision-making.

The analysis of management information support in organizations as complex systems under the conditions of digitalization is a crucial issue [16]. Managing information streams in organizations involves a number of core aspects, as organizations collect large amounts of data from various sources such as internal systems, social media, IoT sensors, and more. It is important to have effective systems in place to analyze this data for the purpose of obtaining valuable information for

decision-making. Digital transformation of organizations involves the application of various technologies, such as cloud services, artificial intelligence, data analytics, blockchain, etc. To implement successful digital transformation, organizations shall be ready to implement and optimize these technologies. *People Analytics* concept concentrates on the use of data and analytics to make strategic decisions in the area of personnel management, which is developed on the basis of data analytics, psychology and management. Ben Waber, President and Founder of *Humanyze* specializes in analyzing data about employee workflows and communication to improve productivity and effectivity.

Digitalization settings require employees to be flexible and able to quickly adjust to changes. The analysis of the literature proved that digital transformation requires organizations not only to invest in technology, but also to change culture and management approaches, digital transformation of education based on artificial intelligence, which should change the way we learn and perceive education [17]. The expanding automation and introduction of artificial intelligence in various spheres of life require specialists to gain new skills, such as data analysis, the ability to work with algorithms and machine learning models, and comprehension of the ethical aspects of the artificial intelligence application. Digital training of specialists within the framework of artificial intelligence requires a combination of technical knowledge with a deep understanding of the social and ethical aspects of this technology.

The paper of M. Tegmark "Life 3.0: The Age of Artificial Intelligence", in which he examines the impact of artificial intelligence on the future of humanity [18] was very helpful for us. The author suggests the concept of "Life 3.0" describing the stage of the society development in which technology and artificial intelligence becomes the main architects of our lives and exponentially expands their capabilities. Tegmark examines the ethical, social and political aspects of the implementation of artificial intelligence and puts forward a number of suggestions for how society should interact with these new technologies ensuring maximum benefits and minimizing risks. This research, which is very influential in the field of artificial intelligence and technology development, as well as in the field of philosophy and ethics, offers important perspectives for understanding what the future may look like within the meaning of the rapid development of intelligent machines. In the monograph "Artificial Intelligence: an Era of New Threats or Opportunities?" (2023) reference is made to the fact that such an approach will be helpful for ensuring effective ethical integration of artificial intelligence into the educational process [19]. Open-mindedness to innovation, flexibility and the ability to quickly adjust oneself become core components of successful management of information resources in conditions of digitalization.

We are interested in the research of A. Vance and E. Musk "Tesla, SpaceX and the Way to a Fantastic Future", two prominent figures of the contemporary technological world [20]. Both are famous for their high-flying projects and influence upon the development of modern technology; their names are often associated with *Tesla* and *SpaceX* companies, which they founded. Elon Musk founded *SpaceX* with the purpose of reducing the cost of space launches and making space more accessible to private companies and individuals. *Tesla* has come into prominence for its electric cars and innovative approaches to the automotive industry, the *Neuralink* project is developing

brain implants, and *The Boring Company* is developing underground transportation infrastructure. Vance Ashley, as the founder and CEO of *Neuralink*, co-founder of *OpenAI*, and former *SpaceX* collaborator, is well-known in the field of artificial intelligence and neural interfaces. The path of these two inventors is paved with great difficulties, but their achievements have already made a huge contribution to technological progress and influenced the perception of the future. Their companies and projects continue to change the world, opening new opportunities in space, automotive, energy and artificial intelligence fields.

The paper of G. van den Berg and P. Pietersma "25 Key Models of Management. Change Management", includes creating strategies, planning, communication and supporting employees during the change process [21]. Digital technologies can help organizations optimize their business processes, improving performance and reducing time and resource costs. The use of automated control systems and artificial intelligence can improve the effectivity of flexible structures. They are helpful for tracking and analyzing large quantities of data, and make it possible to take more informed decisions and forecast future trends.

In the papers of B. Christian and T. Griffiths "Life According to Algorithms. How to Make a Rational Choice" [22], G. Sunil "Digital Strategy. Guide to Rethinking Business" [23], E. Brynjolfsson and E. McAfee "The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies" [24] reference is made to the fact that in the framework of digital transformation, 5G development of flexible management structures plays an integral role in ensuring digital HR as a powerful lever for efficiency, competitiveness and optimization of human resource management. Flexible management structures have made it possible for organizations to quickly respond to changes in the technological environment and market conditions. They are able to quickly switch over between different strategies and methods of responding to challenges. Flexible management structures require continuous training and development of personnel. This includes both professional developments to ensure proficiency in the use of new technologies and soft skills development to facilitate communication and collaboration in flexible team structures.

The overall purpose of these activities is to create a team that is ready and able to work effectively in a digital environment, thus contributing to the success of the enterprise in the current digital world. The theoretical foundations of "Digital HR Transformation" confirm that digital technologies for the development of flexible management structures in the framework of the digital transformation of the 5G industry can transform the entire personnel management cycle, from recruiting to keeping talented employees and their development [25]. The transition from 4G to 5G opens up new opportunities for the introduction of advanced technologies in the area of HR, such as augmented reality (AR), virtual reality (VR), artificial intelligence (AI) and Big Data analytics. Considered all round, the development of flexible governance structures is an important factor in the prosperous digital transformation of the 5G industry, as they enable the efficient implementation of new technologies and rapid response to changes in the environment.

Let's use data (BID DATA), artificial intelligence, AGILE-methodology as a factor for increasing the efficiency of a digitalized society and analyzing digital HR as a core element of personnel

management against the background of challenges and changes in organizations. *The Future of Work* concept includes an analysis of the impact of digital technologies on organizational culture, team structure and work processes. The paper of C. Schwab "The Fourth Industrial Revolution" is an important contribution to the understanding of current technological trends and their impact on the improvement of digital HR as a core element of personnel management under the conditions of rapid changes [26]. The paper analyzes important aspects of the implementation of digital technologies in the field of personnel management, such as the use of artificial intelligence, data analytics, online tools and platforms for personnel development, automation of routine processes in the global economy and society. In this book, Schwab examines how emerging technologies such as artificial intelligence, robotics, the Internet of Things, and bio- and nanotechnology are joining together to create a new era of industrial development. He considers how these technologies are changing business models, labor, production, governance and the environment. Schwab also addresses the social and economic challenges arising from these technological changes, and proposes strategies for how societies can adjust to the new existence of the fourth industrial revolution. "The Fourth Industrial Revolution" is an important resource for comprehending how technological progress is transforming the global economy and society, and for finding ways to adjust to these changes.

Authors' papers O. Cherep, V. Voronkova, S. Bespalova and S. Tabachnikov "Personnel Motivation: from Theory to Practice of Motivating Employees to Perform Effective Activities" [27] and O. Cherep, B. Babajanov and V. Voronkova "Digitalization of the Economy as a Platform for Creating New Values in a Transformational Environment" [28] have helped to investigate the digitalization of the economy as a platform for creating new values in a transformational environment, to determine theoretical and practical aspects of digital HR as a core element of personnel management in organizations under the conditions of constant change. These authors are known for their research and action-oriented recommendation presenting different perspectives and approaches to personnel management and the use of digital technologies in digital HR management. Their research and publications can be advantageous for those interested in the implementation of innovative practices in personnel management and the application of digital tools to achieve the strategic purposes of the organization. Digital HR becomes an important element of strategic change management in organizations, as it makes it possible to effectively adjust to the rapidly changing business environment, develop digital strategies and gain competitive advances in the era of digital globalization [23].

General problem: personnel management under the conditions of constant changes. Let's make attempts to analyze the most current problems faced by organizations under the conditions of constant changes. More specifically, the use of artificial intelligence in HR organizations, which require the implementation of specific innovations in contemporary personnel management systems including machine learning and data analytics to improve personnel management processes against the background of constant changes of the "second machine epoch" [24]. Digital HR helps organizations effectively manage remote teams and work in an environment of constant change, taking into account the issues of communication, collaboration and team cohesion. Digital HR strategies are intended for keeping professionals and talented employees in an unstable environment facing new global challenges

including through staff development and career development plans. Data security and privacy in digital HR requires the provision of privacy of employees' personal data in digital HR, especially considering the issues in the field of cyber security. Organizational leaders are using innovative digital HR approaches to support the psychological health and well-being of employees in the settings of constant change, including remote work and stressful situations. Digital HR helps organizations to adjust their training and development programs to rapidly changing needs and requirements due to constant changes in the business environment, for which organizations shall be flexible and adaptive [2]. Effective management of dynamic teams uses innovative HR to form and manage transient teams that can quickly adjust to new tasks and challenges in an environment of constant change. At the same time, digital HR contributes to the creation of an innovative culture and stimulates creativity among personnel in the framework of constant change, helping organizations implement new ideas and strategies. Digital HR helps leaders and managers adapt to unpredictable circumstances and make strategic decisions in conditions of constant change, in particular by means of data analysis and promoting the development of leadership competencies. These aspects reflect the core trends that we have considered in the article regarding the role of digital HR in solving the problems of personnel management under constant change. The questions that were raised remain relevant in the context of modern personnel management and digital HR, the development of artificial intelligence and machine learning [20].

Under the conditions of constant change, it is essential to quickly and effectively adjust to the new requirements of the labor market and provide the necessary competencies. Digital tools facilitate automation and optimize recruiting and selection processes. Organizations shall be flexible and respond rapidly to changes in their environment. Digital HR helps create work environments that support team closeness and effective communication. The leadership having change management skills is a core element to an organization's advance against the background of constant change. Digital resources and programs promote to preparing leaders capable to effectively manage change, and employee satisfaction and engagement remain critical to company productivity and development. Digital tools raise the possibility of timely identification and resolution of problems arising during the process. Remote work has become an increasingly common practice, especially in an environment of constant change, as effective communication and collaboration of remote teams is enabled by digital tools. Thus, these issues remain essential for consideration and discussion in the framework of current personnel management in a transformational environment [28].

3.1.1 DIGITAL HR AS A PRIORITY ISSUE OF ORGANIZATIONS AND AN IMPORTANT ELEMENT OF CHANGE MANAGEMENT

Digital HR is a core element of personnel management in organizations, particularly against the background of constant change in business and market environment. Let's analyze the reasons why digital HR is accepted to be a priority issue and an important element of personnel motivation and stimulation of change management practitioners [27]:

1. Digital tools provide more efficient monitoring and management of work processes such as hiring, employee evaluation, training and staff development.

2. In response to digital technologies, HR can automate many routine tasks, which allows employees to dedicate more time to strategic tasks and competence development.

3. Digital solutions can support internal communications and help create a corporate culture that promotes employee involvement and satisfaction.

4. Digital tools make it simple for HR to quickly respond to changes in the organization and market environment, providing flexibility in implementing current HR strategies and policies.

5. Digital platforms collect large quantities of personnel data, enabling analytics and predicting trends that help make informed HR decisions.

6. Digital tools facilitate finding, selecting and attracting the best candidates for vacancies. They provide more efficient methods of job posting, resume analysis, and candidate evaluation. For another thing, digital platforms can promote the maintenance and development of talents, which contributes to their keeping in the organization.

7. Digital HR systems make it possible to better control access to confidential information and ensure compliance with legal regulations on data protection. This is especially important within the framework of strict regulatory requirements such as the General Data Protection Regulation (GDPR).

8. Digital solutions can generate incentives for innovation and creativity among personnel, giving them convenient access to resources for self-development and joint collaboration on projects.

9. Digital tools give the possibility to automate the processes of introducing changes in the organization, which simplifies coordination and communication between different departments and levels of management.

10. Digital HR solutions can significantly reduce the costs of administrative processes such as document processing, storage and sharing information. Automating these processes reduces the need for human resource and reduces the possibility of errors.

11. Digital platforms facilitate the creation of transparent HR systems where employees can easily access their career information, salary, benefits and other important aspects, resulting in increased confidence and employee satisfaction.

12. Due to digital HR tools, organizations can more easily adjust to changes in internal and external factors, respond faster to challenges and provide flexibility in solving problems.

13. Digital HR tools can help improve relationships with customers and partners by providing quick and efficient access to personnel information, making communication with the organization more transparent and effective.

14. Digital HR systems can render assistance to organizations in order to ensure conformity with HR regulatory requirements, specifically in the area of personal data storage and protection, which is increasingly important in current data world.

All these factors make digital HR not only a priority issue for organizations, but also an important change management tool, making it possible for organizations to efficiently adjust to new challenges and market conditions. In recent years, digital HR has become not only a necessity,

but also a competitive advantage for organizations. Companies that successfully implement digital initiatives in the field of personnel management usually have a greater ability to adjust to changes and compete effectively in the market, forming core management models [21].

3.1.2 DIGITAL HR AS A POWERFUL LEVER OF EFFICIENCY, COMPETITIVENESS AND OPTIMIZATION OF HUMAN RESOURCE MANAGEMENT

Digital HR refers to all digital methods, tools and services used for optimization and improvement of human resource management. Objectively, this is an actual digital shift driven by the company's HR function. Change management, which more and more companies see as a necessary element, reflects the desire to adjust to current trends, new user behavior and new ways of working. The digital transformation of the HR function can happen on several levels:

1) for recruitment: job sites, bulletin boards, mobile applications, video interviews, professional social networks, big data, artificial intelligence, ATS (recruiting software), HRIS (personnel management information system), etc. For several years, digital technologies have been a tool necessary to facilitate the search for talents and the entire hiring process, contributing to the formation of a digital person as a product of the information society [12];

2) for administrative management of human resources with process automation, employee training: e-learning, mixed learning, MOOC, videos, webinars, etc.;

3) for management: with powerful tools facilitating activity monitoring and improving the quality of employees' work;

4) for HR marketing and internal communications (social networks, newsletters, intranet, etc.).

Digital technologies as HR function comply with the main challenges. This is an important step for the company that makes it possible to match the behavior and new habits of candidates and employees. It is also a powerful lever of the company's performance and competitiveness. Activating digital transformation within the HR function, firstly, enables to automate labor-intensive tasks such as payroll, job position management, absences, leaves, expense reports, schedules, etc. This allows HR teams to save time and concentrate themselves on the company's main activity and on objectives with high added value (talent management and employee loyalty, training, etc.). Dematerialization of the HR function is also important for simplifying and enhancing talent acquisition and thus reducing recruitment costs and limiting errors when choosing sources (use of big data, artificial intelligence, statistical tools, HR software, etc.). Tools like cloud computing also help protect and simplify HR data management. Digital tools will also improve the adaptation and welcoming of new employees (for example, by offering them access to a digital platform designed to facilitate adaptation) against the background of social instability as a global trend in the contemporary world [13]. Digital HR also makes it possible to offer employees a quality digital experience in their work environment. Digital tools facilitate internal communication, organization and interaction within teams, as well as the development and monitoring of skills by means a digital and accessible learning offering. Digital

transformation within the HR function will also strengthen the company's employer brand through a strong digital appearance on various communication channels (social networks, websites, etc.). According to estimates, 82 % of candidates get to know about the company online before applying. Digital technologies are also an excellent means of maintaining and increasing employee loyalty within the company. It allows to offer new ways of arranging work (remote work, flexible office, etc.), help teams improve their skills, optimize tasks and move forward management. Consequently, the digital transformation of HR has become an essential element of change management within the company. Furthermore, 82 % of HR decision makers believe that digitalizing of HR functions is a priority issue. Digital HR acts as a powerful lever for increasing performance, competitiveness and optimization of human resource management within the framework of the evolution of digital technologies of the industrial revolution from 4G to 5G against the background of the challenges of digital globalization [15]. It has an influence on various aspects of personnel management and provides a significant number of preferences. Digital tools allow automation of many routine HR tasks, such as timekeeping, processing employee inquiries, and responding to inquiries concerning benefits and licensing. Digital platforms enable the collection and analysis of personnel data, making it possible for the management to make informed decisions concerning personnel development, HR planning, and strategic management. Digital tools can support employee involvement and satisfaction by providing convenient access to information, development opportunities and communication in a remote framework. Digital HR allows organizations to be more flexible and adjustable to changes in the economic and social environment with the help of rapid introduction of new initiatives and strategies for information management in organizations as complex systems under the conditions of digitalization [16]. Digital platforms can support talent development by providing access to educational materials, training and other development opportunities in an employee-friendly form. All these factors contribute to increased performance, improved interaction between employees and management, and increased competitiveness of the organization in the labor market.

3.1.3 DEVELOPMENT AND IMPROVEMENT TRENDS OF DIGITAL HR AGAINST THE BACKGROUND OF PERSONNEL MANAGEMENT

Digital transformation of human resource management is the application of basic elements such as digital professionals, digital tools, digital management and digital scenarios for a comprehensive modernization of all aspects of human resource management, which is facilitated by the digital transformation of education on the basis of artificial intelligence [17]. Of these, it is necessary not only to transform the conventional thinking and development management logic, but also to adjust the organizational structure, strengthen business transformation, form new work methods, business forms and management models, as well as build a digital ecosystem by means of the company's own developments, characteristics. So, and in no other way it is possible to ensure reliable support for the general operation and management activities of the enterprise. Digital

professionals are a core element in the digital transformation of human resource management, they can skillfully use various digital technologies and tools, such as mastering digital application development, digital application programming, and command of data collection and big data. At the same time, these professionals can use digital skills or accurately interact with other company departments, external partners and customers with data-based platforms, along with effective solution of various issues related to human resource management activities, making advanced personnel solutions. Digital specialists occupy a dominant position in the digital transformation of human resource management.

Digital tools are an important foundation for the digital transformation of human resource management and the foundation of big data management of human resource. They can provide powerful support of data, technology, information and platforms for digitization and intelligent human resource management. Currently, the new generation of information and communication technologies, represented by the Internet, the Internet of Things, big data, cloud computing, and 5G, has an unprecedented influence upon the work and development of human resource management and contributes to the formation of a digital person [14]. The use of big data is one of the main issues facing the digital transformation of human resource management. The major feature of digital tools is the scientific improvement of work methods, business activities and work processes of human resource management. For example, using digital platform tools, such as remote office systems, to remove conventional time and space barriers for human resource management to improve work efficiency, improve the employee experience and overcome obstacles related to employees being unsynchronized with time and progress tasks to ensure the effective development of various management actions within the framework of the flexible management structures development against the background of the digital transformation of the 5G industry [25].

So that to advance the performance, effectiveness and improve digital HR of human resource management, some technology companies have also developed various operational digital tools for enterprises related to human resource management, such as Social Security Cloud, Red Sea Cloud and other additional tools that integrate digital thinking in human resource management, employment, education, evaluation and keeping, including the comprehensive collection and analysis of corresponding data on human resources, generation of an employee database, creation of a data system for the evaluation of specialists. The model, processes and content of human resource management in the digital era undergo profound changes, with greater emphasis on the complete use of big data, artificial intelligence and other data processing technologies to obtain and analyze valuable data related to human resource management for achieving technological purposes. The major task of managers is to generate a new model of human resource management and implement the process, automation and intelligence of human resource management to adjust to the actual needs of the digital era. The digital management of human resources primarily involves the generation of a digital network platform for building a highly programmed and automated model of human resource management, the formation of a complete model of human resource management within the enterprise and their integration into the overall strategy of the digital transformation

of the enterprise [29]. Subsequently, accelerating the digital transformation of human resource management, strengthening the advanced management of human resource data applications we have the opportunity to generate a digital system that provides reliable assurance and support for enterprise development. Furthermore, to complete the digitization of human resource management activities such as recruitment, training, appraisal, compensation and career development, while at the same time extracting and collecting valuable digital information to "build a database". Finally, to create "digital twins of employees" within the enterprise, use digital technology to analyze the daily behavior and work performance of employees, accurately predict the work performance of employees, and provide the various talents necessary for the development of the enterprise. So, and in no other way it will be possible to carry out various types of employee activities. The enterprise is transformed, becomes more efficient and faster, and also creates new ways of control, coordination and cooperation [1].

The ultimate outcome of the digital transformation of human resource management is the creation of digital scene to more intuitively display activities related to human resource management, significantly increase the efficiency of cooperation between departments and help enterprises in making scientifically-based decisions. Digital scenarios are based on human resource data (including internal and external data) and develop monitoring and analysis models to describe current problems and effectively forecast future problems and issues with which human resource management deal, facilitate accurate selection of people and positions, and reduce labor costs, resource inconsistencies. Building a digital scene can create an ecosystem of digital human resources, help use intelligent data analysis to create multi-dimensional portraits of employees, and understand their current behavior, attitudes, emotions and supply status of corporate employees to develop a company's work interface, an innovative communication model. It is necessary to form intelligent, humanized and individual human resource service products for organizations and individuals. On this basis, team interaction in different units of the enterprise will also have digital characteristics. For example, changes in digital platforms, applications and service methods will improve the employee experience and provide significant business development assistance to reduce costs and improve efficiency. Currently, some companies have begun to use applications for integrated personnel management and self-service of employees to help implement intelligent and automated management of human resources, as well as in the selection of employees, management service methods, recruitment and dismissal, self-service, intelligent training, individual approach. So as to accelerate the process of digital transformation of human resource management, it is possible to take advantage of digital technologies and digital systems such as cloud computing, big data, artificial intelligence, mobility and 5G to the full extent to promote a comprehensive, three-dimensional and holistic approach. Changes in human resource management activities, including business ecosystem creation, corporate change facilitation, value and added value formation, etc., provide strong support for the digital transformation of the company's internal strategy, structure, functions, composition and processes, and continue to update its forms and application scenarios, which will help companies compete in the market and gain a competitive advantage in the artificial intelligence era [18].

Table 3.1 Trends for improving digital HR in the context of personnel management

Development trend	Description
Technological tools	It is necessary to analyze the available technologies and platforms for the implementation of digital HR. These can be HR information systems (HRIS), cloud solutions, social networks for business, software tools for data analysis and other innovative tools
Functionality scope	It is important to understand which specific functions can be automated and optimized with digital HR. This may include recruiting processes, employee evaluations, project management, training and development, analytics, etc.
Impact on business processes	It is necessary to understand how the implementation of digital HR will affect various business processes in the organization. This may include efficiency improvement, cost reduction, improvement of service quality for employees and customers, competitiveness increase, etc.
Adaptation to business needs	The concept of digital HR shall be adapted to the unique needs and requirements of a specific organization. This may require integration with existing systems, development of own solutions or involvement of external service providers
Change management	It is important to consider how the implementation of digital HR will affect organizational culture and change management processes. This may require communication with employees, training and support for the implementation of new tools
Legal aspects and data security	Compliance with data protection and employee privacy laws shall be considered. This is especially important within the framework of the introduction of new technologies that collect and process personal data
Personnel and training requirements	With the introduction of new digital tools, new requirements for staff skills and competencies may arise. A training and development plan should be considered to ensure that employees have the necessary skills to successfully use digital HR

Source: developed by the authors

Hence, the improvement of digital HR (human resource management) against the background of personnel management includes a number of trends that are intended to ensure more effective and productive management of human capital, which covers:

1. Application of digital tools and software solutions for automation of routine tasks in the area of personnel management, such as time-keeping, report preparation, personnel administration, etc.

2. Using data analytics to collect, analyze and apply information on employees, which allows for more informed decisions in the area of personnel management.

3. Implementation of specialized software products for effective management of employee information including salary data, vacations, personal data, etc.

4. Use of digital platforms for recruitment including job postings, candidate selection, testing and interviews.

5. Development of interactive online courses and platforms for personnel training and development, which makes it possible for employees to acquire new skills and knowledge at any time convenient for them.

6. Using digital means of communication and collaboration to keep in touch with employees and stimulate their engagement in work.

7. Using technology to provide an individual approach to each employee considering their needs, skills and career purposes.

These trends help to increase the performance and efficiency of personnel management providing greater flexibility, accuracy and an individual approach to interaction with employees.

The purpose of the digital transformation of human resources management is to use digital technologies to solve existing problems in human resources management activities, to redefine and design business scenarios and processes of human resource management, as well as to improve the relationship between internal systems and the external environment based on functional interoperability, which provides support of continuous transformation, innovation and advancement of enterprises. It is necessary to understand that the digital transformation of human resource management is not carried out randomly, but shall comply with a certain core logic, otherwise it will not just achieve actual results, but will also lead to increased costs and risks, which makes it difficult to develop digital transformation or to satisfy expectations [26].

In the digital era, promoting digital transformation of human resource management is an important task of enterprise development. Nevertheless, limited by previous conceptions, this activity shall be performed for the internal functions and services of the enterprise, in other words, it shall be based on the construction of a digital human resource management system, through the analysis and correlation of big data, which allows to penetrate into the "selection" of employees. The entire hiring, training, retention, screening and compensation process will drive the viability of the entire human resource life cycle and further strengthen employees' sense of identity, belonging and responsibility. It is important to note that, moreover, human resource management activities should also be oriented towards the development of satisfying the needs of external users, that is, creating value by providing support for relevant external activities. The change in the way of thinking also advance higher demands as to human resource management, or rather, it emphasizes that the human resource management department is no longer a cost center, but can be a business center, contributing to the development of corporate governance, entrepreneurial activity and create value. With this objective in view, the digital transformation of human resource management shall transform from internal services to market competition so as to rapidly increase the market competitiveness of enterprises. As a consequence, the study of digital HR as a core element of personnel management in organizations within the framework of challenges and changes has theoretical significance as well as practical one. Studying the topic make it possible to expand knowledge about the impact of digital technologies on personnel management and organizational processes; contributes to the development of theoretical concepts of personnel management and organizational development; understanding the principles of digital HR helps improve HR management practices to achieve better performance.

The practical significance of this study is that the use of digital technologies in HR provides a means for the automation and optimization of many processes, such as recruitment, training and development, evaluation and reporting. Organizations that effectively use digital solutions in HR can

adjust more quickly to changes in market conditions and remain competitive. The use of innovative technologies in HR can improve employee satisfaction and engagement, which in turn helps keep talented staff. This means that the understanding and implementation of digital HR is important for both academic research and practical application in human resources management of organizations.

REFERENCES

1. Garnier, A. (2022). Digital RH: transformation numérique de la fonction ressources humaines. Available at: https://www.wayden.fr/digital-rh-la-transformation-numerique-de-la-fonction-ressources-humaines/
2. Yurhen, A. (2019). Menedzhment 3.0. Agile-menedzhment. Liderstvo ta upravlinnia komandamy". Kharkiv: Vyd-vo "Ranok: Fabula", 432.
3. Cherep, A., Adamenko, M., Cherep, O., Dashko, I., Korolenko, R., Kornukh, O. (2023). The Influence of the Innovation Potential of Personnel on Strengthening Economic Security of Ukrainian Enterprises in the Post-War Period. Wseas Transactions On Business And Economics, 20, 70–79. https://doi.org/10.37394/23207.2023.20.8
4. Cherep, A. V. (2013). Interrelation between labour motivation and efficiency indicators of personnel usage. Actual Problems of Economics, 1 (139), 117–123. Available at: http://nbuv.gov.ua/UJRN/ape_2013_1_15
5. Cherep, A. V. (2013). Necessity for formation of labour motivation mechanism at enterprises. Actual Problems of Economics, 3 (141), 134–149. Available at: http://nbuv.gov.ua/UJRN/ape_2013_3_15
6. Cherep, A., Cherep, O., Dashko, I., Rozhenko, O., Kornukh, O., Matkovskyi, P. (2022). Strengthening Economic Security of Enterprise on the Basis of Investing in Staff Management System. Academy of Strategic Management Journal, 21 (4), 1–9. Available at: https://www.abacademies.org/articles/strengthening-economic-security-of-enterprise-on-the-basis-of-investing-in-staff-management-system.pdf
7. Voinarenko, M., Cherep, A., Honchar, O., Krylov, D., Oleinikova, L. (2019). Information Provision for Forecasting Strategies Innovative Activities of Enterprises. Proceedings – International Conference on Advanced Computer Information Technologies, 362–365. Available at: https://scientific-rating.znu.edu.ua/index.php?r=publication%2Fview&id=8008
8. Kolot, A. M. (2019). Pratsia 4.0" yak model ta platforma novoi (tsyfrovoi) ekonomiky. The sphere of employment and income in the digital economy conditions: mechanisms of regulation, challenges and development dominants. Kyiv: KNEU, 13–28. Available at: https://r.donnu.edu.ua/bitstream/123456789/1622/1/%E2%84%9610.pdf
9. Kostyshyna, T. A. (2018). Socio-economic motivation of employees in enterprises in modern conditions. Scientific Bulletin of Poltava University of Economics and Trade. Series: Economic Sciences, 3, 109–117.

10. Semykina, M. V. (2011). Labour motivation: a new paradigm in competitive environment. Chernihivskyi naukovyi chasopys. Seriia 1, Ekonomika i upravlinnia, 2 (2), 118–126. Available at: https://core.ac.uk/download/pdf/81588446.pdf
11. Marusiak, N., Bak, N. (2022). Financial security of the enterprise and threats of its loss in the modern economic environment. Ekonomika ta Derzhava, 2, 109–113. https://doi.org/10.32702/2306-6806.2022.2.109
12. Danilian, O. H., Dzeban, O. P., Kalynovskyi, Y. Y. (2023). Digital Man as a Product of Information Society. Cogito, 15 (1), 142–159. Available at: https://cogito.ucdc.ro/COGITO_MARTIE_2023.pdf
13. Danilian, O. H., Dzeban, O. P., Kalynovskyi, Y. Y. (2022). Social Instability as a Global Trend of the Modern World. Cogito, 14 (3), 141–162. Available at: https://cogito.ucdc.ro/COGITO_SEPTEMBER_2022.pdf
14. Skinner, C. (2020). Digital Human: The Fourth Revolution of Humanity Includes Everyone. Kharkiv: Ranok Publishing House: Fabula, 272.
15. Voronkova, V., Nikitenko, V., Oleksenko, R., Andriukaitiene, R., Kharchenko, J., Kliuienko, E. (2023). Digital Technology Evolution of the Industrial Revolution From 4G to 5G in the Context of the Challenges of Digital Globalization. TEM Journal, 12 (2), 732–742. https://doi.org/10.18421/tem122-17
16. Marienko, V.; Tabachnikov, S., Oaks, S. (Ed.) (2022). Information security of management in organizations as complex systems in the conditions of digitalization. Modern Scientific Strategies of Development. California: GS Publishing Services, 62–81. https://doi.org/10.51587/9781-7364-13395-2022-008-62-81
17. Klopov, I., Shapurov, O., Voronkova, V., Nikitenko, V., Oleksenko, R., Khavina, I., Chebakova, Y. (2023). Digital Transformation of Education Based on Artificial Intelligence. TEM Journal, 12 (4), 2625–2634. https://doi.org/10.18421/tem124-74
18. Tegmark, M. (2019). Life 3.0 The Age of Artificial Intelligence. Kyiv: Nash format, 432.
19. Cherep, A. V., Voronkova, V. H., Bekhter, L. A., Cherep, O. H., Lyshchenko, E. H.; Tatomyr, I., Kvasnii, L. (Eds.) (2023). Minimization of Information Security Risks Amid the Challenges of Digital Society. Artificial intelligence: an Era of New Threats or Opportunities? Praha: Oktan print, 190–201. https://doi.org/10.46489/aiaeont-23-23
20. Vance, A. (2018). Elon Musk. Tesla, SpaceX and the Way to a Fantastic Future. Kyiv: FOP Forostina O. V., 428.
21. Van den Berg, G., Pietersma, P. (2020). 25 kliuchovykh modelei upravlinnia. Kharkiv: Ranok-Fabula Publishing House, 208.
22. Christian, B., Griffiths, T. (2020). Griffiths Vol. Life According to Algorithms. How to Make a Rational Choice. Kyiv: Nash format, 510.
23. Sunil, G. (2020). Digital Strategy. Guide to Rethinking Business. Kyiv: KM-BUKS Publishing House, 320.
24. Brynjolfsson, E., McAfee, E. (2016). Druha epokha mashyn: robota, prohres ta protsvitannia v chasy nadzvychainykh tekhnolohii. Kyiv: FUND, 236.

25. Metelenko, N., Klopov, I., Voronkova, V., Nikitenko, V., Oleksenko, R., Brytvienko, A., Runcheva, N. (2023). Development of Flexible Management Structures in the Context of Digital Transformation of INDUSTRY 5G. Review of Economics and Finance, 21 (1), 2052–2060. Available at: https://refpress.org/wp-content/uploads/2023/12/Oleksenko-3_REF.pdf
26. Schwab, K. (2019). Chetverta promyslova revoliutsiia. Formuiuchy chetvertu promyslovu revoliutsiiu. Kharkiv: Knyzhkovyi klub "Klub Simeinoho Dozvillia", 426.
27. Cherep, O., Voronkova, V., Bespalova, S.; Tabachnikov, S. (2023). Motyvatsiia personalu: vid teorii do praktyky stymuliuvannia pratsivnykiv do Zdiisnennia efektyvnoi diialnosti. Prospective Directions of Scientific and Practical Activity. Sherman Oaks: GS Publishing Services, 57–64. https://doi.org/10.51587/9798-9866-95921-2023-011-58-64
28. Cherep, O. H., Babajanov, B. A., Voronkova, V. H. (2022). Digitalization of the economy as a platform for creating new values in a transformational environment. Financial Strategies of Innovative Economic Development, 54 (2), 25–28. https://doi.org/10.26661/2414-0287-2022-2-54-04
29. Christopher, S. (2018). Total Automation. How Computer Algorithms Change Life. Kyiv: Nash format, 280.

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3.2 ADAPTATION OF EUROPEAN PRACTICES IN MANAGING DIGITIZATION OF THE UKRAINIAN ECONOMY TO COMMON EUROPEAN STANDARDS

Svitlana Markova, Ivan Markov

ABSTRACT

In today's unstable conditions of development, digitization is one of the key megatrends in the development of society, covering its various aspects. The development of society today is impossible without digitization, which plays a key role in the transformation of various aspects of human life. Digital technologies affect all spheres of life, including the economy, education, medicine, communications and culture. They provide access to information and the ability to communicate at any time and from any place, promoting global connectivity and knowledge sharing.

Digital innovations contribute to more efficient management of resources, increased productivity and convenience for citizens. They also stimulate economic growth by creating new opportunities for business and entrepreneurship. On the other hand, digitization raises a number of challenges, such as issues of data privacy, cyber security and the digital division of the population. Therefore, it is important to consider digitization as a complex process that requires a balanced approach and the participation of all stakeholders. It is possible to emphasize that digitization is an integral part of modern society, which opens up new opportunities, but requires careful study and regulation to maximize its benefits and reduce risks.

KEYWORDS

Digitization, digital technologies, global connectivity, innovations, economic growth, data privacy, cyber security.

The relevance of the development of digitization in the modern world is determined by the need to adapt to the rapidly changing digital environment and the maximization its potential for economic, social and technological progress. Digital technologies are penetrating all areas of life, from business and education to medicine and manufacturing, transforming the way we interact and work. In today's Ukraine, digitization acquires its own characteristics. Digitization in the conditions of war acquires special importance and becomes a key factor in managing crisis situations and ensuring security. In today's world, where information technology penetrates all spheres of life, the digital infrastructure becomes vulnerable to attacks and cyber threats. Russian aggressors actively use cyber attacks, disinformation and data manipulation to achieve their goals. Digital tools are used as a means of surveillance, espionage, and propaganda. In such conditions, security and protection of information systems become critical tasks for our country. Digitization can also play an important role in wartime recovery and coordination. It allows to ensure more effective

communication, coordination of humanitarian aid, and to increase the level of accounting and monitoring of military actions.

Therefore, after russia's military attack on Ukraine, digitization became not only an important means of ensuring security and information protection, but also a powerful tool for coordination and effective operations in crisis and complex conditions for our country.

The growing importance of digital transformation stems from its potential to improve productivity, innovation and competitiveness. Digital tools enable businesses to use data more efficiently, automate processes, and create new products and services. In addition, digital technologies promote the growth of global communication and collaboration, which helps to solve complex global problems.

Due to the growing importance of digital transformation, academic research and practical applications of digital technologies are becoming key areas of development. The relevance of the development of digitization lies in the need to understand and effectively use its opportunities to achieve economic growth, innovation and improve the quality of life of people around the world.

Digital technologies penetrate into the everyday life of people, affecting various spheres of professional activity and recreation, as well as becoming a necessary component of communication, cognition and socialization. Currently, it is difficult to predict how long-term this megatrend and how intensive its further development will be. However, it is safe to say that digitization, which has become one of the phenomena of the 21st century, remains a strong catalyst for progress, which promotes changes both in the field of technology and in the fields of consciousness and social dynamics of society. The expansion of the concept of digitization to various spheres of the economy and other aspects of social activity takes place within the paradigm of the "fourth industrial revolution" or "industry 4.0", which is considered as a new technological breakthrough.

The growing role of digital technologies in all spheres of life requires the creation of universal norms and standards that ensure effective interaction and solving problems related to digital transformation. Adaptation to European standards implies not only compliance with technical requirements, but also consideration of ethical, legal and socio-cultural aspects. Ensuring compatibility with European standards becomes a crucial step for promoting trade and investment, encourages mutual understanding and cooperation between countries and regions. It also helps ensure the protection of consumer rights and data privacy. Adaptation to European standards also increases competitiveness and stimulates innovation. It contributes to the creation of a favorable environment for the development of new technologies and their effective introduction on the market. Therefore, the adaptation of digitization to European standards is necessary to ensure safety, efficiency and competitiveness in the conditions of a rapidly changing digital world. Therefore, there is a need to conduct an analysis of digitization problems in the context of adapting the digitization management practices of the Ukrainian economy to common European standards.

Analysis of the latest research and publications testify to the growing importance and spread of digitization every year. Taking into account the significant practical value of implementing the digital economy in the country, many domestic and foreign scientists are actively researching this phenomenon.

Many scientists from various fields are researching digitization and its impact on various aspects of society. Some of them specialize in the economic aspects of digital transformation, examining its impact on labor markets, entrepreneurship and the financial system. Other scientists examine the social implications of the digital economy, such as changes in communication, education and culture. There are also researchers who focus on the technological aspects of digitization, studying new technologies and their possibilities.

Among the leading foreign scientists engaged in digitization research, it is possible to name:

– Erik Brynjolfsson and Andrew McAfee, who study the impact of information technology on the economy and society. The scientist insisted that new technologies improve society, despite rising unemployment and falling wages [1];

– Judit Schulze – specializes in studying the impact of digital transformation on education and training;

– Michael Kasper – researches the role of information technologies in the formation of new economic models.

Analysis of scientific works by Michael Schrage, in the field of development and functioning of the digital economy [2, 3] reflects the impact of digitization on the efficiency of the economic system as a whole, as well as the identification of mechanisms and consequences of this impact on the sustainable development of individual countries, regions and enterprises. The book "Rethinking the Value of Customers in a Digital Economy" by M. Schrage [2] considers important aspects of interaction with customers in the digital economy. It is likely to include an analysis of how digital technologies are changing the ways businesses interact with their customers and how they evaluate and understand the value of their customers. According to the authors' conclusions, the digitization process should not be an end goal for enterprises, regions or states, but only serve as a tool for achieving the goal of sustainable development. These scientists, among many others, contribute significantly to the development of scientific understanding of digitization and its consequences.

Nicholas Negroponte [4] is an American scientist, a pioneer in the field of computer science and information technology. He is known as the founder and former head of the Media Lab of the Massachusetts Institute of Technology, one of the most influential research centers in the field of technology. Negroponte has played a significant role in defining the future and development of the information society and advancing ideas about how technology can change the way we live, work and communicate. He used the term "digital economy" for the first time in 1995. N. Negroponte described the advantages of using new information and communication technologies as a factor in the formation of a new economy.

The book "The Digital Economy: Promise and Peril in the Age of Networked Intelligence" by D. Tapscott [5] is one of the important works in the field of digital economy. In this book, the author examines the impact of digital technologies on the economy, business and society as a whole. Tapscott explores various aspects of the digital economy, including the benefits and threats it brings. He examines the role of the Internet, computers, networking, and other digital technologies in shaping a new type of economy based on knowledge and networking. The author [5] also draws

attention to the problems of data privacy, security and ethics that arise in connection with the development of the digital economy. He discusses the ways to enable society to take advantage of the digital economy while minimizing the risks and negative consequences. The book "The Digital Economy" is an important source for understanding modern trends in the development of the economy and society in the conditions of digital transformation.

Among domestic researchers, it is possible to single out T. Baigarin [6], S. Bashlai [7], S. Korol [8], I. Tokmakova [9], D. Shatokhin [9], M. Rudenko, A. Cherep [10–13] and others, who analyze issues of digitization, development of the digital economy, and transformation of all sectors of the economy in the context of globalization and modern changes. Let's consider the opinion of T. Baigarin to be appropriate, who emphasizes that digital changes in the business sphere are recognized as an integral part of progress in the international economic arena. The rapid development of technologies and deep processes of globalization of the world economy push the participants of traditional businesses to adapt their activities to modern, digital realities of the market [6].

The group of economists [14] determines that one of the key features of the digital economy is a direct connection with the traditional economy, which provides access to the necessary goods and services at the appropriate time. The advantages of this approach are the quick receiving of the necessary goods or services, the reduction of costs for the end consumer due to the decrease of the number of intermediaries and the simplification of the process of finding suppliers and buyers.

It is impossible not to agree with the opinion of scientists [8] regarding the process of digitization of the economy of Ukraine, which is that this process requires support from the state, leads to the redistribution of tasks in the enterprise and the interaction between people and information technologies, and also requires the possession of digital skills and constant professional growth.

At the same time, the issue of digitization in the context of the adaptation of management practices of digitization of the economy of Ukraine to common European standards is not sufficiently studied.

Despite the difficult economic conditions, the war, the complications of many international processes, Ukraine is actively working on integration into the European economic space. Adaptation of management practices to European standards helps to ensure the compatibility and interaction of the Ukrainian economy with European partners. The use of European digitization management standards helps to increase the competitiveness of Ukrainian enterprises on the European and world markets. The application of European digitization management standards in Ukraine will make the country more attractive to foreign investors, who see compliance with European standards as a guarantee of stability and effective management. The implementation of European management standards will contribute to increasing the efficiency, transparency and openness of management processes in all spheres of the economy. Therefore, the adaptation of digitization management practices to European standards is an important step for the Ukrainian economy in an open and competitive global market environment.

Digitization is becoming increasingly important in today's world with diverse perspectives and needs. Digital technologies allow to automate processes, optimize resources and reduce costs.

They enable tasks to be completed faster and more efficiently, allowing companies and governments to increase their productivity. Digital technologies make information and services more accessible to the public. They allow faster and more convenient access to various services and resources, which helps to improve the quality of life. Digital technologies provide new opportunities for innovation and development. They enable the creation of new products, services and business models that can accelerate economic development and stimulate competition. In today's world, digitalization is becoming a key factor in competitiveness for companies, countries and institutions. Those who adapt to digital technologies in time have the opportunity to increase their efficiency and ability to attract and retain customers. Therefore, digitalization is an important process that affects all spheres of life and activity of society. It not only improves efficiency and competitiveness, but also creates new opportunities for development and innovation.

Digitization, or digitalization, is the process of converting ordinary materials, such as paper documents or analog records, into a digital format that can be easily processed and stored on computers. This process enables the rapid exchange of data and information over the Internet, contributing to greater convenience and connectivity in our daily lives. New opportunities for learning, working and communicating are constantly opening up in the digital world, changing the way we live and interact.

The concept of "digitization" means the transition to modern models and methods of action based on information technologies. As examples, it is possible to name communication using video communication and instant messengers, the implementation of the idea of a "smart city", and the transition to electronic document management. Citizens are increasingly using the Internet for online consultations with specialists and making purchases.

Digitization is the process of introducing digital technologies in order to improve the life of a person, society and the state [15].

In a general sense, digitization is considered as a process of transition to digital business and digital transformation, which includes the creation of new, digital streams of income and offers [16].

The concept of "digitization" can be considered in a narrow and general sense. Digitization means converting analog systems, processes, and services into digital format using digital technologies. This results in improved efficiency, convenience and accessibility.

The process of digitization is accompanied by the transformation of economic processes, which includes the robotization of the production of goods and services of mass use, as well as the emergence of new factories for to create products for the individual requests of specific consumers. According to experts, in the near future about half of the goods and services on the consumer and investment markets will become completely or relatively "new smart" [9].

The digital economy is characterized as an innovation-oriented economy based on the implementation of advanced information and communication technologies in all spheres of the country's economic activity. In this regard, it is about the potential of the digital economy in terms of increasing the efficiency and competitiveness of modern enterprises [17].

Bill Gates, a well-known entrepreneur, considers digitization as an opportunity for companies to adapt to the environment, identify competitor problems and consumer needs, and respond to them at the appropriate time. In general, digitization is considered as a strategic process of implementing digital technologies to optimize processes, improve efficiency and create new opportunities in various areas of life [18].

In his studies, Professor B. van Ark [19] draws attention to an important aspect of digitization, which arouses the interest of the scientific community. He notes that the conditions of digitization lead to the rapid digitizing of data and information, but the growth of the overall productivity of economic systems has limited results. This is an important aspect, but most researchers focus on the long-term impact of digitization processes. Therefore, on a short-term basis, it is difficult to observe a sudden increase in the productivity of both individual economic entities and general economic systems. C. Elding and R. Morris [20] consider the digitization process through the prism of the impact of technologies on the main economic indicators, such as competition, productivity, employment and interaction with institutions and management. Scientific research led by A. Cherep [10] indicates that a significant feature of the process of digital transformation of the Ukrainian economy is the uneven application of information technologies in various industries. The highest level of use of these technologies is observed in Ukrainian companies providing financial, educational and communication services, as well as in logistics companies. In these branches of Ukraine's economy, the use of information technologies meets international standards. However, in other sectors of the economy, the intensity of automation, robotics and digital application is low. The researcher points out that if this level remains unchanged, it will significantly affect the productivity of Ukrainian enterprises through indicators of labor, production and sale of products. Therefore, the main strategic task for Ukrainian companies is the implementation of innovative information technologies that will ensure competitiveness on domestic and foreign markets.

Digital transformation is a key perspective for the development of the Ukrainian economy, which is aimed at stimulating business and the population to actively use information and communication technologies as more effective, high-quality, economical and fast [21]. Digital economy acts as a scientific direction that researches the possibilities of using modern digital technologies for managing economic systems. Within this direction, the use of information technologies enables modeling, research and organization of management processes in economic systems, which contributes to the revolutionary renewal of approaches to business and the economic sector.

The emergence of the digital economy opens up wide opportunities for positive changes, especially when all industries are combined into a single system. The transition to the digital age leads to significant changes in traditional approaches to business, management and marketing. It is important to note that digital transformation has many benefits for national economic progress. Innovative technologies, smart developments and other advances in the digital sphere can significantly improve the quality of service and solve problems in various areas of business. Digital transformation involves the full integration of digital technologies into

all aspects of economic life, leading to radical changes. The digitization of the economy enables the optimization of business processes and the development of new products and services using various technologies, such as the Internet of Things, virtual reality, cloud services and artificial intelligence.

The expansion of the idea of digital transformation to various spheres of social life and the establishment of global management priorities on this basis began to take place in the context of the idea of the "fourth industrial revolution", also known as industry 4.0, which is considered as a new technological direction. Despite the innovative nature of this approach in industrial and social relations, the roots of digital transformation can be traced back to past attempts to create an ideal society. The concept of "digitization" can be interpreted in a narrow sense as the process of transforming information into a digital format, and in a broad sense – as a global trend in modern world development. It is important to note that the main goal of digitization is the transformation of existing sectors of the economy and the emergence of new ones, as well as the transformation of various aspects of life into new, more efficient and modern forms. The digital economy is based on information, communication and digital technologies, and its rapid development is already affecting the traditional economy, changing it from a resource-using economy to a resource-generating economy. The digital society, including the digital economy, represents a modern trend that significantly transforms the structure of professional management in society and requires urgent preparation for these changes. Let's agree with the point of view of researchers who believe that it will be beneficial for Ukraine to use electronic services at all stages of service provision in the context of its desire to join the European Union. This includes the provision of information (direct notification of government or administrative services), one-way interaction (the ability for the user to receive an electronic form of the document), two-way interaction (the ability to process the electronic form of the document, including identification) and conducting transactions [22].

The conducted survey of experts (**Fig. 3.1**) regarding the identification of the main problems and obstacles to the development of digitization of the economy of Ukraine proves that the lowest level is "corruption and bureaucracy" (32 %) and "low level of digital literacy" (31 %): (from left to right) insufficient infrastructure and access to the Internet, lack of qualified personnel, lack of appropriate legislation, corruption and bureaucracy, low level of digital literacy.

Corruption and bureaucracy are serious obstacles to digitization in Ukraine (**Fig. 3.2**).

According to **Fig. 3.2** it can also be noted that corruption complicates the implementation of digital technologies, as it promotes collusion and unfair practices. Bureaucratic obstacles can also lead to implicit restrictions on access to markets and opportunities for innovation.

Bureaucratic procedures and long permitting times can slow down the implementation and development of digital projects. This negatively affects the competitiveness and efficiency of the business.

Lack of legal support: Insufficient clarity and lack of legal regulation can make it difficult to deploy digital initiatives and create instability in the business environment.

Corruption and bureaucracy can lead to the loss of funds and insufficient control over the implementation of projects, which has a negative impact on the development of the economy and society.

For successful digitization in Ukraine, it is necessary to implement effective corruption control mechanisms, simplify bureaucratic processes, ensure transparency and openness in government and business, as well as create incentives for innovation and development of digital technologies.

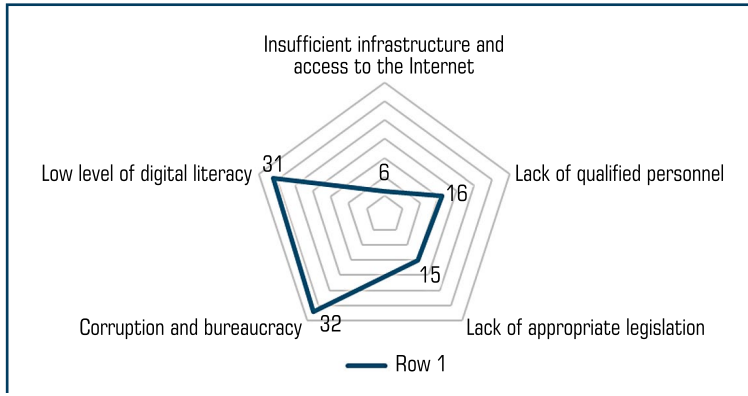

Fig. 3.1 The main problems and obstacles to the development of digitization of the economy of Ukraine

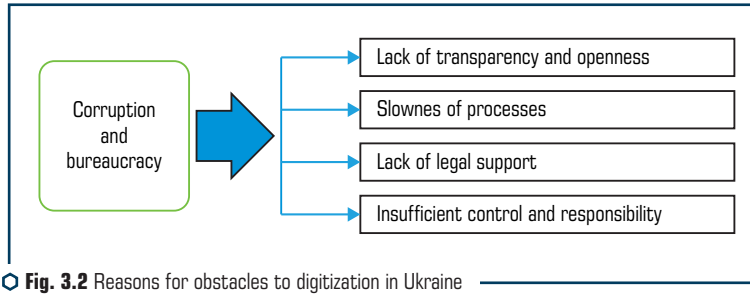

Fig. 3.2 Reasons for obstacles to digitization in Ukraine

Among the neighboring countries, Ukraine is even more ahead of Russia in 2023. Russia, which lost 2 points this year, now has 26 points and is in 141st place in the world list. On the other hand, the indicators of Belarus, which lost 2 points this year, are also decreasing. Although Belarus is still ahead of Ukraine, it has a tendency to decrease in the corruption perception index (**Fig. 3.3**).

Ukraine's western neighbors show different trends. Romania's indicators remained stable (46 points, 63rd place), while Poland lost another 1 point, but remains one of the leaders among the countries close to Ukraine, with 54 points and ranked 47th. Poland now shares this place

with Slovakia, which added 1 point and also got 54 points. Moldova, like Ukraine, added 3 points, overtook Hungary, which allowed them to share 76th place with 42 points.

World leaders and outsiders according to the Corruption Perceptions Index in 2023 remain practically unchanged. The high level was recorded in Denmark, which got 90 points, followed by Finland with 87 points, New Zealand with 85 points and Norway with 84 points. As for outsiders, the situation remains stable. Somalia lost 1 point and kept the last position, ranked 180th with 11 points. South Sudan and Syria, with 13 points each, were previously ranked 177; this year they were joined by Venezuela, also with a score of 13 [23].

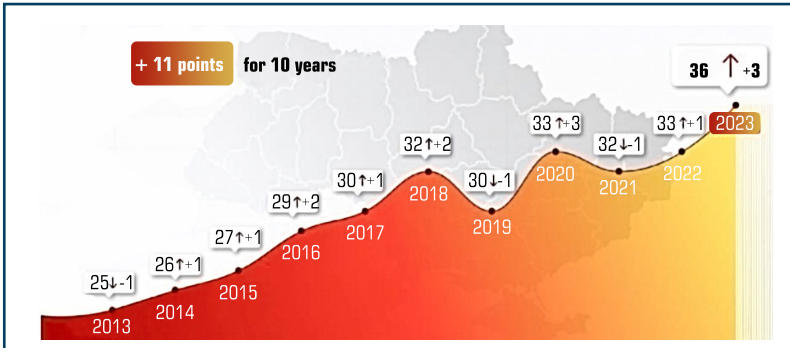

Fig. 3.3 Corruption Perceptions Index (CPI), 2023

Experts determined that insufficient infrastructure and access to the Internet negatively affects the development of digitization in the country. Many regions of Ukraine have limited access to high-speed Internet and low-quality communication, which makes it difficult to implement digital technologies.

According to the annual report Global Digital Overview, as of the beginning of 2023, 5.16 billion people used the Internet, which is approximately 64 % of the Earth's population. At the same time, 78.3 % of the urban population are Internet users, and only 45.8 % among the rural population [24].

During the war, it became necessary to provide shelter with high-speed Internet and Wi-Fi access in social institutions, in particular in kindergartens, schools and hospitals. The average value of the indicator is 0.632 out of a possible 1 (**Fig. 3.4**).

As of the end of 2023, 3 regions became leaders in this indicator: Kharkiv [0.926], Poltava [0.917] and Ternopil [0.916]. The following positions are occupied by Lviv [0.914], Dnipropetrovsk [0.902] and Volyn [0.870] regions. As for the regions with the lowest indicators, Kherson [0.179], Sumy [0.173] and Donetsk [0.118] stand out among them. In general, access to the Internet is provided on average for 71.0 % of shelters in secondary education institutions, for 67.0 % of shelters in kindergartens and for 57.0 % of health care institutions [25].

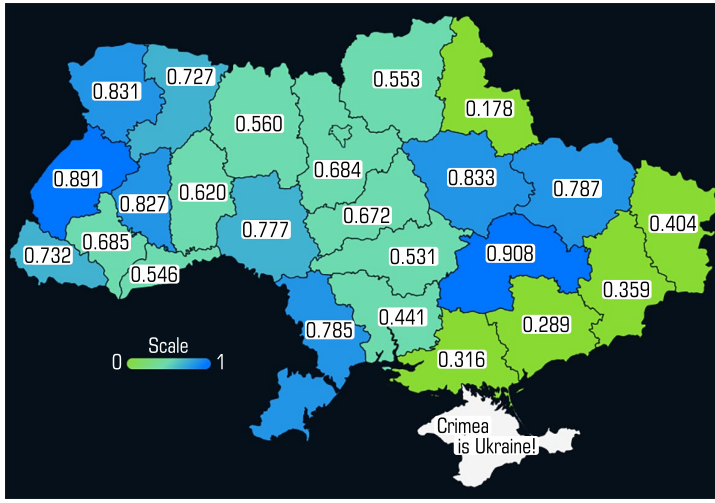

Fig. 3.4 Index of digital transformation of Ukraine, 2023
Source: [25]

The level of digital literacy in Ukraine is below the "basic level" mark (53 %), 15.1 % do not have digital skills at all, 37.9 % of Ukrainians aged 18–70 have skills below the basic level (**Fig. 3.5**) [26].

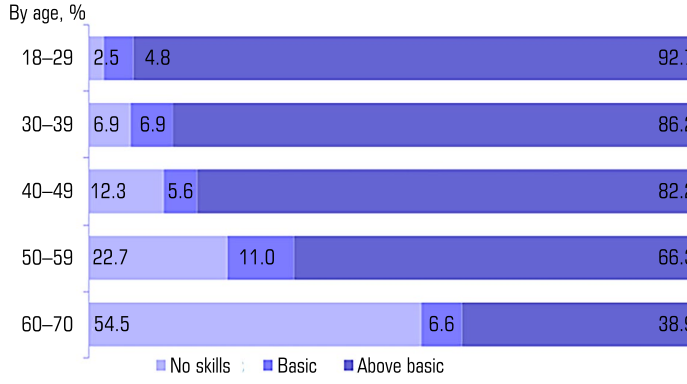

Fig. 3.5 Level of digital literacy, by age
Source: [26]

The relevance of learning digital skills in Ukraine is 47.4 % by age (**Fig. 3.6**)

Analysis of the number of appliances in one household indicates a sufficient indicator, that is, one unit of appliances per household member (**Fig. 3.7**).

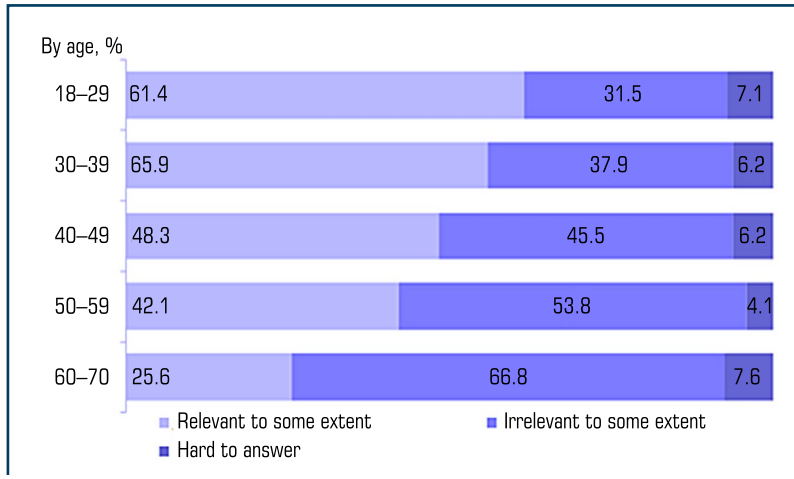

Fig. 3.6 Relevance of learning digital skills, by age
Source: [26]

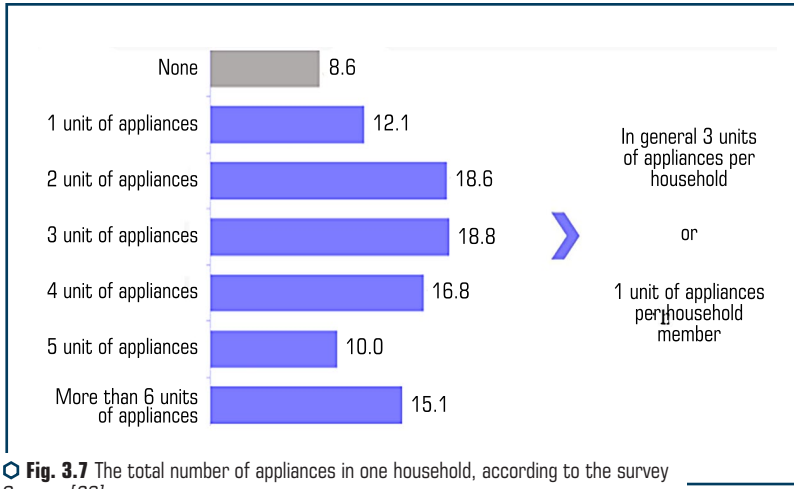

Fig. 3.7 The total number of appliances in one household, according to the survey
Source: [26]

Therefore, the level of digital literacy is insufficient in Ukraine, the low level of digital literacy is a serious problem that can complicate the development of Ukraine in the modern world. Let's identify possible ways to improve digital literacy (**Table 3.2**).

● **Table 3.2** Ways to improve digital literacy in Ukraine

Direction	Characteristic
A large-scale educational campaign	Development and implementation of a national program to increase the level of digital literacy, which covers all segments of the population
	Conducting information campaigns in mass media, social networks and public space to popularize the importance of digital literacy
Inclusion in educational programs	Development and implementation of specialized courses on digital literacy in comprehensive secondary and higher educational institutions
	Supporting initiatives to include elements of digital literacy in all subjects of the syllabus
Teacher training	Organization of trainings and seminars for teachers on the use of modern technologies and methods of teaching digital literacy
Access to the Internet and technologies	Expanding access to the Internet and computers in rural areas and less developed regions
	Development of programs to support low-income families in purchasing technologies
Partnership with the private sector	Involvement of private companies in the implementation of digital literacy programs through sponsorship, technical support and other forms of cooperation
Self-education and self-study	Creation and support of online platforms for self-education on digital literacy
	Promotion of available online resources and courses for self-study of digital literacy
Evaluation and monitoring	Conducting regular research and monitoring the level of digital literacy to determine the effectiveness of measures and the need to adjust strategies

These measures can contribute to increasing the level of digital literacy in Ukraine and help the population to use technology more effectively in all spheres of life.

According to a study by IT Research Ukraine, the number of specialists in the field of information technologies in Ukraine increased to 307 thousand in 2023, which is approximately 8 % more than in the previous year. The average salary in the information technology industry is 2,630 USD, which is 270 USD more than in 2022 [27].

The share of IT in the gross domestic product of Ukraine is 4.9 %, and the contribution of the IT industry to the total gross added value is 5.5 billion USD (**Table 3.3**).

The export of Ukrainian IT services in 2023 amounted to 6.7 billion USD, which is 8.4 % less than in 2022, when it reached a record 7.3 billion USD, reports ain.ua, referring to the report of the National Bank of Ukraine. During the 12 months of last year, the average export amount of Ukrainian IT services amounted to 560 million USD per month, which is almost 9.3 % less than in 2022. The main partner countries of Ukraine traditionally include the USA, Malta, Great Britain, Cyprus and Israel.

● **Table 3.3** The volume of IT services exports in 2022–2023

Country	The volume of export of IT services		
	2022	2023	Deviation, +/–
USA	2973	2677	–296
Malta	581	567	–14
Great Britain	693	535	–158
Cyprus	314	362	48
Israel	347	275	–72
Germany	286	274	–12
Poland	122	162	40
Netherlands	146	132	–14

Source: [27]

As of the beginning of July 2023, the Top 50 IT companies of Ukraine had 86,254 specialists (**Fig. 3.8**). EPAM remained the leader, but within six months the number of employees in this company decreased by more than 1,100 people. The same losses were noted in the company SoftServe, which occupies the second place in the rating. The rating also included new companies Metinvest Digital and Netpeak Group, each of which has more than 800 employees. At the same time, Andersen, WIX and Dev.Pro were excluded from the rating.

In the second half of 2023, IT companies actively expanded their presence by opening new offices. At least 27 companies have taken this step. Poltava has become the most popular city in Ukraine, five new offices of IT companies have opened there. In addition, IT companies chose Odesa, Kyiv, Kharkiv, Lviv, Cherkasy, Kropyvnytskyi, Uzhhorod, Ternopil, Ivano-Frankivsk and Chernivtsi. However, more and more new offices of Ukrainian IT companies are opening outside the country. Poland, Romania, Colombia, India, Portugal and Spain are the leaders among the selected locations.

According to experts, the most common directions in the IT industry are the following, as shown in **Table 3.4**.

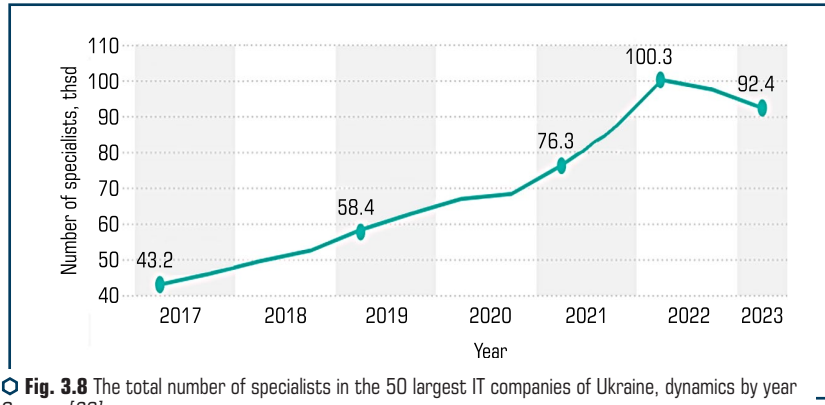

Fig. 3.8 The total number of specialists in the 50 largest IT companies of Ukraine, dynamics by year
Source: [28]

Table 3.4 The most common directions in the field of IT

Direction	Characteristic
Electronic commerce	Development of online stores, software to conduct operations and transactions over the Internet and other aspects
Fintech	Optimization of financial services of companies
Development of mobile applications	Creation of applications for smartphones on the Android and iOS platforms
Media	
Technologies in health care	Development of software to improve the quality of medical services
Game development	Development of games for various platforms, including mobile devices, PCs, consoles, and others

The Digital Europe programme, which was launched by the European Union in 2021 in response to the COVID-19 pandemic, is an important example of the implementation and adaptation of European experience to improve the digital transformation of the economy. The main goal of this program is the development of advanced digital skills, the introduction of digital tools into the business sphere, the development of digital infrastructure and the provision of digital services for citizens and authorities.

Ukraine's participation in the "Digital Europe" program represents a significant step in promoting the digital transformation of the economy, especially in the context of integration with the European Union. The main goal of this program is to achieve two strategic goals of the EU: "green transformation" and digital transformation, as well as strengthening sustainability and strategic autonomy. It should be noted that this program is one of the most influential sources of funding to which Ukraine already has access.

Ukraine joined the "Digital Europe" program until 2027, which provides for financing the digital transformation of European countries in various sectors. The main goal of the program is to accelerate the recovery of the economy and its digital transformation. Participation in this program will help bring Ukraine closer to the EU's Single Digital Market. The total fund of the program is 7.5 billion EUR, of which approximately 6 billion EUR are intended to finance various projects available to Ukraine. In total, there are four main areas in which financing can be obtained for Ukraine (**Table 3.5**).

The project "Ukraine 2030E – a country with a developed digital economy" developed by the Ukrainian Institute for the Future envisages the achievement of the following indicators:

The share of the digital economy in the total GDP of Ukraine in 2030 will be 65 %.

99.9 % of Ukrainian households will have broadband Internet access.

The territory of Ukraine will be 100 % covered by 4G–5G networks.

Mobile Internet technologies will cover 99 % of all highways and railways and 95 % of rural areas.

99.9 % of citizens will have digital identification (citizen-card, Mobile ID) and technical abilities to use trust services and other services [29].

Table 3.5 The main directions in which it is possible to receive funding under the Digital Europe programme

High performance computing	Artificial intelligence, data and cloud services	Digital skills	Use of digital technologies in the economy and society
2,2 billion EUR	2,1 billion EUR	580 billion EUR	1,1 billion EUR
projects that compute large amounts of data for economic, health care, or defense industry solutions may be submitted	projects that create products based on artificial intelligence to facilitate the work of enterprises, state administrations or research institutions can be submitted	projects that create opportunities to acquire new IT skills may be submitted	projects that introduce digitization in business or in the field of e-government, health care, environment, education and culture, Smart City technologies can be submitted

Source: [30]

The European CEF funding program, launched on October 12, 2022, opens the opportunity for domestic mobile operators and Internet providers to participate in the competition and join the implementation of strategic networks. These networks will contribute to improving the quality of communication between Ukraine and EU countries, in particular with the help of submarine cable systems, satellite infrastructure and connection to Internet hotspots. Currently, the funds for the modernization and construction of digital infrastructure, strengthening of cyber defense, as well as the development of new digital technologies are coming through the UNITED24 platform. In particular, as part of the memorandum signed between the Ministry of Digital Transformation of Ukraine and Kyivstar, the telecommunications operator has already transferred 150 million hryvnias for digitalization [31].

The expansion of the program "E-Government to ensure openness of government and community participation" (EGAP), financed by the "Eastern Europe" Foundation and the "Innovabridge" Foundation from Switzerland, provides for an increase in EGAP funding by 15 million Swiss francs for the development of new digital services and services. During the Ukrainian Recovery Conference 2022 in Lugano in July 2022, the Ministry of Digital Transformation of Ukraine and the Swiss Agency for Development and Cooperation (SDC) signed an agreement on cooperation in the field of digital transformation. This agreement provides support for the development of the Diya portal and application, the Diya.Digital Education platform, as well as the automation of the business registration process in Ukraine. These measures will contribute to the country's integration into the European digital community [32].

Additional support for Ukraine's economy is provided through the purchase of military bonds through the "Diya" application with up to 16 % guaranteed profit. As of October 25, 2022, Ukrainians have already purchased 70,000 military bonds worth almost 70 million hryvnias, which contributes to the victory of Ukraine.

The "eOselya" program uses testing through the "Diya" application with special lending rates – 3 % for certain categories and 7 % for others. This allows citizens affected by the invasion of the Russian Federation and employees of the health care, education and science sectors to get the opportunity to purchase new housing.

With the support of the EU4DigitalUA program, national legislation is being adapted to the standards of the European Union in the fields of electronic identification and electronic trust services. Participants of the Ministry of Digital Transformation, the State Service for Special Communications and Information Protection, the State Enterprise "Diya" and the National Bank of Ukraine participated in the Forum on trust services in Berlin, where the intermediate results of the implementation of the eIDAS node and the development of the electronic wallet EU Digital ID Wallet were presented. Representatives of the European Commission highly appreciated these achievements.

In order to accelerate Ukraine's integration into the EU's Single Digital Market and coordination of the legislation with European norms in the fields of electronic identification and electronic trust services, as well as the creation of a national body for assessing compliance, the Verkhovna Rada of Ukraine is studying a draft law on mutual recognition of qualified electronic trust services and the implementation of the legislation of the European Union in the field of electronic identification [33].

It is important to support Ukraine both during the conflict and after its end, contributing to the restoration and modernization of the country's Internet networks. During the meeting in Davos, the Ministry of Digital Transformation of Ukraine and the management of Nokia reached an agreement on cooperation in the direction of digitization, joint development of telecommunications infrastructure and integration of Ukraine in the international telecommunications market, as well as on strengthening the power of Internet networks. Since the beginning of the military actions in Ukraine, Nokia has transferred 1,770 WiFi access points, which provide Internet access to schools, and another 3,230 such points are planned to be transferred in the near future. In addition, the company also provides expert support for the implementation of solutions for smart cities and the development of data centers [34].

Strengthening of cyber security in Ukraine, aimed at countering cyber threats from the Russian Federation, mainly focuses on information and communication systems of government structures and on objects of critical information infrastructure.

In October 2022, Ukraine joined the cyber security month organized by the US and the EU as part of the UA30 cyber reform to draw public attention to cyber security and create a full-fledged cyber defense ecosystem. The Ministry of Digital Transformation, together with the company FAVBET Tech, is forming its own cyber army and organizing cyber troops, which are already effectively attacking the enemy's IT infrastructure around the clock. After the introduction of changes to the Tax Code, FAVBET Tech plans to introduce new payment methods in the seven most popular virtual currencies. In order to protect state information resources and objects of critical information infrastructure, a corresponding draft law was submitted to the Verkhovna Rada of Ukraine [35].

Implementation of the planned measures will contribute to the development of the digital transformation of the economy, which will ensure the stability and flexibility of the national state and its introduction to the international digital environment on strategic principles. Activation of relevant processes can contribute to attracting funding from the EU program "Digital Europe" and the funding program for connecting the internal network to global digital gateways. This will allow to increase the digital potential of Ukrainian companies, their structural modernization and ensure stability in the post-conflict period [32].

With the support of Google and UNESCO, the Ministry of Digital Transformation of Ukraine, together with the Ministry of Education and Science of Ukraine, continued the "Laptop for every teacher" initiative, thanks to which 50,000 new Chromebooks were delivered to educational institutions – this will allow teachers not to interrupt the educational process and stay in touch with students [36].

The adaptation of European practices for managing the digitization of the Ukrainian economy to common European standards is an important task in the context of the modernization and development of the Ukrainian economy. To achieve this goal, it is necessary to implement a number of measures in the **Table 3.6**.

The implementation of these measures will help Ukraine to increase the competitiveness of its economy, attract investments and ensure sustainable development in the context of global digital trends.

Lack of qualified personnel: the lack of qualified specialists in the field of information technologies and the digital economy hinders the implementation of innovations and the development of digital projects.

Insufficient legal framework and lack of regulatory norms in the field of digitization can inhibit the development of the digital economy and create legal ambiguities for business [37]. A high level of corruption and a large number of bureaucratic obstacles can complicate the development of the digital economy and investment in digital projects. Lack of awareness and skills in the use of digital technologies among the population and enterprises can inhibit the development of the digital economy [38]. To overcome these problems, it is necessary to improve communication infrastructure, provide qualified education and training in the field of IT, develop and implement effective legislation, fight corruption and simplify business procedures, as well as promote digital literacy among the population.

Let's list the main laws of Ukraine that regulate aspects of digitization of the economy (**Table 3.7**).

● **Table 3.6** Adaptation of European practices for managing the digitization of Ukraine's economy to common European standards

Directions	Characteristics
Harmonization of legislation	Ukraine should bring its legislation in the field of digitalization into compliance with European standards. This applies to aspects such as data protection, e-identification, the digital market, etc.
Infrastructure development	It is necessary to ensure the appropriate level of infrastructure for digital development, in particular, fast and reliable communication networks, access to the Internet, development of digital platforms and services
Stimulation of innovations	The government should actively support innovative projects and start-ups in the field of digitization, provide financial and infrastructure support, and promote cooperation between business, higher education institutions and state bodies
Development of personnel potential	It is necessary to ensure the appropriate level of qualification of specialists in the field of digitization by improving the quality of education and training of specialists
Cooperation with the European Union and other countries	The Government of Ukraine should actively cooperate with European partners, using the mechanisms of cooperation and exchange of experience to implement the best practices of digitization management
Encouraging digital transformation in all areas of the economy	It is important to create incentives for businesses and citizens to actively participate in digital transformation, for example by providing tax benefits, simplifying procedures for online business registration, etc.

● **Table 3.7** The main laws of Ukraine regulating aspects of digitization of the economy

Law	Characteristics
Law "About Electronic Documents and Electronic Document Management"	Establishes rules for the creation, exchange, storage and use of electronic documents, as well as regulates interaction with state authorities and organizations in the field of electronic document circulation
Law "About Protection of Personal Data"	Determines the rules of collection, storage, use and protection of personal data of citizens of Ukraine and other persons staying on its territory in electronic systems
Law "About Electronic Document Management and Amendments to Certain Legislative Acts of Ukraine Regarding the Use of Electronic Technologies"	Regulates the procedures for the exchange of electronic documents between business participants and state bodies
Law "About Electronic Interbank Payments"	Determines the rules for making electronic payments between banks and other financial institutions
Law "About Digital Transformation"	Determines the general principles of digital transformation of various sectors of the economy and stimulates the development of innovations and digital technologies

These laws establish the legal foundation for the development of the digital economy in Ukraine and regulate important aspects of digitization in various spheres of activity (**Table 3.8**).

Table 3.8 Laws of Ukraine regulating important aspects of digitization in various spheres of activity

Law	Characteristics
About electronic communications [39]	This law regulates issues related to electronic means of communication, information transmission, protection of personal data, Internet services, etc. It contains regulations aimed at creating favorable conditions for the development of electronic communication services and ensuring the rights of individual and corporate users
About the National Informatization Program [40]	Establishes the main principles of formation and implementation of the national policy in the field of informatization of Ukraine, promotes the development of the information society, ensures the creation and development of the information infrastructure and other aspects of the country's informatization
About state support for the development of the software industry [41]	Creates legal conditions for the development of the Ukrainian software industry, promotes the creation of a favorable environment for the development of innovative technologies and support for Ukrainian IT companies
About electronic documents and electronic document circulation [42]	Establishes the legal basis for the creation, circulation and storage of electronic documents, regulates the use of electronic document circulation in state bodies and enterprises
About electronic commerce [43]	The law defines the legal basis of e-commerce in Ukraine, establishes the rules of electronic trading, liability for violations of legislation in the field of e-commerce and other important aspects of this industry

Each of these laws is important for the regulation of the digital economy and the development of information technologies in Ukraine.

Despite the martial law, the process of digital transformation and the development of the digital economy in Ukraine continue and are actively developing. Work is underway to create an appropriate institutional foundation for these processes and create favorable conditions for innovations in the field of management. Ukraine's participation in the "Digital Europe" program, aimed to accelerate economic recovery and digital transformation of each of the participating countries, plays a significant role in this. The study confirms the need for investment in the development and creation of digital platforms for business in the conditions of the digital economy. Particularly important areas of business management in this context are collaboration and convergence, cyber security, digital competence and the development of digital skills.

There is no doubt that by implementing best practices and management standards with digital transformation, Ukraine has the opportunity to improve its economic infrastructure and increase its competitiveness at the international level. An important step is the adoption and implementation of standards that meet the requirements of European management practices. This will contribute to increasing the efficiency, transparency and stability of digital economy management processes. In general, the development and implementation of a strategy for adapting European digital transformation management practices in Ukraine is a step towards achieving international standards and ensuring sustainable and innovative development of the country's economy.

REFERENCES

1. McAfee, A., Brynjolfsson, E. (Eds.) (2017). Machine, Platform, Crowd: Harnessing Our Digital Future. W. W. Norton & Company, 416.
2. Schrage, M. (2016). Rethinking the Value of Customers in a Digital Economy. Available at: https://www.researchgate.net/publication/342048166_Rethinking_the_Value_of_Customers_in_a_Digital_Economy
3. Colin, N., Landier, A., Mohnen, P., Perrot, A. (2015). Économie numérique. Notes Du Conseil d'analyse Économique, 26 (7), 1–12. https://doi.org/10.3917/ncae.026.0001
4. Negroponte, N. (1996). Being Digital. Vintage Books.
5. Tapscott, D. (1996). The Digital Economy: Promise and Peril in the Age of Networked Intelligence. McGraw-Hill, 342.
6. Baigarin, T. (2021). Approaches to changes in business-model by applying digital technologies. Central Asian Economic Review, 2, 161–169. https://doi.org/10.52821/2224-5561-2021-2-161-169
7. Bashlai, S., Yaremko, I. (2023). Digitalization of Ukraine's economy in the conditions of European integration processes. Economy and Society, 48. https://doi.org/10.32782/2524-0072/2023-48-48
8. Korol, S., Polovyk, Ye. (2019). Digitization of the Economy as Professional Development Factor. Modern Economics, 18 (1), 67–73. https://doi.org/10.31521/modecon.v18(2019)-11
9. Tokmakova, I. V., Shatokhin, D. A., Melnyk, S. V. (2017). Strategic management of enterprise development in conditions of digitalization of the economy. The bulletin of transport and industry economics, 64, 283–291. https://doi.org/10.18664/338.47:338.45.v0i64.149563
10. Cherep, A., Voronkova, V., Cherep, O. (2022). Digital transformation of society as a necessary condition for its innovative development. Theory and Practice of Intellectual Property, 2, 68–73. https://doi.org/10.33731/22022.259745
11. Cherep, A., Voronkova, V., Androsova, O. (2022). Transformational changes in organizational management and human resources in the digital age. Baltic Journal of Economic Studies, 8 (3), 210–219. https://doi.org/10.30525/2256-0742/2022-8-3-210-219

12. Cherep, A., Cherep, O., Mendela, I., Hostryk, A., Moskaliuk, H. (2019). Methodological Approach to Determining the Strategy Efficiencyof the Economic Mechanism Development for Innovation Implementation at Engineering Enterprises. Proceedings of the 2019 7th International Conference on Modeling, Development and Strategic Management of Economic System (MDSMES 2019), 272–277. https://doi.org/10.2991/mdsmes-19.2019.51
13. Cherep, A., Cherep, A., Babenko, V., Dubynina, S., Lyshchenko, E., Hamova, O. (2021). Impovement Of Cost Formation Methods At Industrial Enterprises Taking Into Account Supply Chains. Studies of Applied Economics, 38 (4). https://doi.org/10.25115/eea.v38i4.4038
14. Havrylenko, N. H., Tarasenko, I. O. (2021). Current trends of digitalization of the economy: problems and prospects of development. Internauka. Series: "Economic Sciences", 1 (3 (47)), 36–46. https://doi.org/10.25313/2520-2294-2021-3-7046
15. Kuibida, V. S., Karpenko, O. V., Namestnik, V. V. (2018). Digital Governance in Ukraine: Basic Definitions of the Conceptual Apparatus. Bulletin of the National Academy of Public Administration under the President of Ukraine (Series "Public Administration"), 1, 5–10.
16. Digitization, digitalization, digital and transformation: the differences. i-SCOOP. Available at: https://www.i-scoop.eu/digitization-digitalization-digital-transformation-disruption/ Last accessed: 01.03.2024
17. Hudz, O. Ye. (2018). Digital economy: changing values and guidelines enterprise management. Ekonomika. Menedzhment. Biznes, 2, 4–12.
18. Main Areas of Digital Transformation (2024). BDO. Available at: https://www.bdo.ua/uk-ua/insights-2/information-materials/2024/main-areas-of-digital-transformation Last accessed: 01.03.2024
19. Van Ark, B. (2016). The Productivity Paradox of the New Digital Economy. International Productivity Monitorm, 3, 3–18.
20. Elding, C., Morris, R. (2018). Digitalisation and its Impact on the Economy: Insights from a Survey of Large Companies. ECB Economic Bulletin, 7. Available at: https://www.ecb.europa.eu/pub/economic-bulletin/focus/2018/html/ecb.ebbox201807_04.en.html Last accessed: 01.03.2024
21. Hroysman, V. (2017). Tsyfrova ekonomika zdatna strimko pidvyshchyty VVP. Economic News. Available at: https://www.ukrinform.ua/rubric-economy/2300896-cifrova-ekonomika-zdatna-strimko-pidvisiti-vvp-grojsman.html
22. Terletska, N., Rusnak, D. (2019). Implementation of new standards of service provision in the con text of modernization of the pension system of Ukraine. Young Scientist, 1 (65), 520–523. https://doi.org/10.32839/2304-5809/2019-1-65-119
23. Indeks spryiniattia koruptsii – 2023 (2024). Available at: https://ti-ukraine.org/research/indeks-spryjnyattya-koruptsiyi-2023/ Last accessed: 01.03.2024
24. Danylenko, Yu., Myronovych, V. (2023). Skilky ukraintsiv ne maiut dostupu do internetu i koly my podolaiemo tsyfrovyi rozryv. Speka. Available at: https://speka.media/skilki-ukrayinciv-dosi-nemayut-dostupu-do-internetu-i-shho-robiti-z-cifrovim-rozrivom-plg4x9 Last accessed: 01.03.2024

25. Indeks tsyfrovoi transformatsii rehioniv Ukrainy (2023). Available at: https://thedigital.gov.ua/storage/uploads/files/page/community/reports/Індекс-цифрової-трансформації-регіонів-України-2023.pdf Last accessed: 01.03.2024
26. Cifrova gramotnist naselenna Ukraini (2019). Available at: https://osvita.diia.gov.ua/uploads/0/585-cifrova_gramotnist_naselenna_ukraini_2019_compressed.pdf Last accessed: 01.03.2024
27. Obsiah eksportu IT-posluh z Ukrainy u 2023 rotsi skorotyvsia na 8,4 % – do $6,7 mlrd. Finbalance. Available at: https://finbalance.com.ua/news/obsyah-eksportu-it-posluh-z-ukrani-u-2023-rotsi-skorotivsya-na-84---do-67-mlrd Last accessed: 01.03.2024
28. Top-50 IT-kompanii Ukrainy, zyma 2023: minus 5 tysiach fakhivtsiv cherez relokatsiiu (2023). Available at: https://dou.ua/lenta/articles/top-50-winter-2023/ Last accessed: 01.03.2024
29. Amelin, A., Fishchuk, V., Lavryk, Y., Yurchak, O., Cherniev, Y., Matiushko, V. (2019). Ukraina 2030E – kraina z rozvynutoiu tsyfrovoiu ekonomikoiu. Available at: https://strategy.uifuture.org/kraina-z-rozvinutoyu-cifrovoyu-ekonomikoyu.html#6-2-3
30. Ukraina doluchylasia do Prohramy "Tsyfrova Yevropa": shcho tse oznachaie (2022). Cabinet of Ministers of Ukraine. Available at: https://www.kmu.gov.ua/news/ukraina-doluchylasia-do-prohramy-tsyfrova-ievropa-shcho-tse-oznachaie Last accessed: 01.03.2024
31. Ohliad tsyfrovoi transformatsii ekonomiky Ukrainy v zhovtni 2022 roku (2022). Available at: https://niss.gov.ua/sites/default/files/2022-11/cifra-monitoring-10-2022_gotove.pdf
32. Government expands cooperation with IMF: Ukraine Capacity Development Fund launched with a target budget of USD 65 million (2024). Ministry of Finance of Ukraine. Available at: https://www.kmu.gov.ua/en/news/uriad-ukrainy-rozshyriuie-spivpratsiu-z-mvf-zapochatkovano-fond-rozvytku-potentsialu-ukrainy-z-tsilovym-biudzhetom-u-65-mln-dolariv-ssha Last accessed: 01.03.2024
33. Proekt Zakonu pro vnesennia zmin do deiakykh zakonodavchykh aktiv Ukrainy shchodo zabezpechennia ukladennia uhody mizh Ukrainoiu ta Yevropeiskym Soiuzom pro vzaiemne vyznannia kvalifikovanykh elektronnykh dovirchykh posluh ta implementatsii zakonodavstva Yevropeiskoho Soiuzu u sferi elektronnoi identyfikatsii (2022). Available at: https://w1.c1.rada.gov.ua/pls/zweb2/webproc4_1?pf3511=72983 Last accessed: 01.03.2024
34. Spivpratsia Mintsyfry i Nokia: kompaniia nadaie Ukraini 5000 WiFi Beacons (2023). Ministerstvo tsyfrovoi transformatsii Ukrainy. Available at: https://thedigital.gov.ua/news/spivpratsya-mintsifri-i-nokia-kompaniya-nadae-ukraini-5-000-wi-fi-routeriv Last accessed: 01.03.2024
35. Pro vnesennia zmin do deiakykh zakoniv Ukrainy shchodo nevidkladnykh zakhodiv posylennia spromozhnostei iz kiberzakhystu derzhavnykh informatsiinykh resursiv ta obiektiv krytychnoi informatsiinoi infrastruktury (2022). Proekt Zakonu Ukrainy No. 8087. 29.09.2022 Available at: https://itd.rada.gov.ua/billInfo/Bills/Card/40554 Last accessed: 01.03.2024
36. A Laptop for Every Teacher: Ukrainian Educators Received 50,000 Chromebooks from Google and UNESCO (2023). Available at: https://www.kmu.gov.ua/en/news/noutbuk-kozhnomu-vchyteliu-ukrainski-osvitiany-otrymaly-50-tysiach-khrombukiv-vid-google-ta-iunesko Last accessed: 01.03.2024

37. Tsyfrova ekonomika: yak tobi sluzhytsia? ZN.ua Available at: https://zn.ua/ukr/macrolevel/cifrova-ekonomika-yak-tobi-sluzhitsya-326706_.html Last accessed: 01.03.2024
38. Digitalisation for Recovery in Ukraine (2022). Available at: https://www.oecd-ilibrary.org/economics/digitalisation-for-recovery-in-ukraine_c5477864-en Last accessed: 01.03.2024
39. Pro elektronni komunikatsii (2020). Zakon Ukrainy No. 1089-IX. 16.12.2020. Available at: https://zakon.rada.gov.ua/laws/show/1089-20#Text Last accessed: 01.03.2024
40. Pro Natsionalnu prohramu informatyzatsii (1998). Zakon Ukrainy No. 74/98-VR. 04.02.1998. Available at: https://zakon.rada.gov.ua/laws/show/74/98-%D0%B2%D1%80#Text Last accessed: 01.03.2024
41. Pro derzhavnu pidtrymku rozvytku industrii prohramnoi produktsii (2012). Zakon Ukrainy No. 5450-VI. 16.10.2012. Available at: https://zakon.rada.gov.ua/laws/card/5450-17 Last accessed: 01.03.2024
42. Pro elektronni dokumenty ta elektronnyi dokumentoobih (2003). Zakon Ukrainy No. 851-IV. 22.05.2003. Available at: https://zakon.rada.gov.ua/laws/show/851-15#Text Last accessed: 01.03.2024
43. Pro elektronnu komertsiiu (2015). Zakon Ukrainy No. 675-VIII. 03.09.2015. Available at: https://zakon.rada.gov.ua/laws/show/675-19#Text Last accessed: 01.03.2024

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3.3 ENSURING ECONOMIC GROWTH OF THE STATE IN THE CONTEXT OF DIGITALIZATION

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ABSTRACT

The GDP development trends are the basis for analyzing the changes that occur according to various evaluation criteria, and therefore this may affect the formation of state policy in the financial and economic sphere. The conditions for sustainable economic development are created through the introduction of digital technologies, especially in the face of constant changes and challenges in the country. Today, digital technologies are a key factor in the development of society and the economy, and their use and promotion of the country's digital development is not only a strategic necessity but also a key factor in ensuring the country's competitiveness in the international arena. International rankings of the level of digital development of countries are an important tool for comparing the achievements and weaknesses of digital initiatives. The digital economy sector is transforming approaches to doing business and expanding the presence of companies in the digital environment.

KEYWORDS

GDP, sustainable economic development, digital technologies, state policy, financial and economic sphere, digital development, competitiveness, international rankings, digital economy, business transformation.

3.3.1 PREREQUISITES FOR ENSURING THE ECONOMIC STABILITY OF THE STATE AND THE MANIFESTATION OF THE DESTRUCTIVE CONSEQUENCES OF THE RUSSIAN-UKRAINIAN WAR

External and internal threats have a significant impact on the economic development and well-being of the nation. The stability of the banking system, financial discipline, and financial management capacity have an impact on economic security. Effective regulation and supervision are important factors. New technologies and innovations, which are currently being actively developed, are key to increasing competitiveness and adapting to changes in the global economic environment. Jobs and economic growth. The development of small and medium-sized businesses, easy access to credit, and the promotion of entrepreneurship contribute to the growth of the economy. Responding to geopolitical events and changes in international relations is important to avoid negative impacts on the economy. An effective anti-corruption system promotes transparency and trust in economic institutions. The ability to interact on international markets and conclude profitable trade

agreements is important for sustainable economic development. Assessment of these indicators and strategic decision-making can help ensure the sustainability of the economy and its resilience to various challenges [1, 2].

The state is looking for new methods and means of influencing participants in relations in the field of financial and economic security in accordance with modern realities. The legal framework for ensuring financial and economic security is of paramount importance, in particular, the National Economic Strategy for the period up to 2030 was approved by the Cabinet of Ministers of Ukraine on March 3, 2021, No. 179. According to the economic vision of the National Economic Strategy 2030, Ukraine is the most attractive economic opportunity for investment, innovation, and business; the best place for the realization of the hard potential and the implementation of ideas, personal development. The mission of this Strategy is to create opportunities for the realization of the country's exi sting geographical, resource and human potential to ensure an adequate level of well-being, self-realization, security, rights and freedoms of every citizen of Ukraine through innovative, outpacing economic growth, taking into account the Sustainable Development Goals, in particular in the context of achieving the economic vision [3].

Today, security risks remain the determining factors for assessing the prospects for further development of Ukraine's economy. But the most significant risk is the duration and intensity of active hostilities.

During a full-scale war, Ukraine's economic security depends on the efficient use of available resources and the ability of society to adapt to new conditions. Pre-war reserves, consolidation of society's efforts, self-organization and cohesion of citizens play a key role in ensuring the sustainability and functioning of the economy.

The cost of damage and losses from Russian aggression is already reaching record levels, and the decline in real GDP (**Fig. 3.9**) in Ukraine is deeper than in most countries with experience of armed conflict [4]. In 2022, real GDP declined by 29.1 %, the largest annual economic decline in Ukraine's history. The main reason for the decline in GDP is the full-scale war that Russia started on February 24, 2022, which has consequences. In particular, these consequences include the occupation of certain territories, the destruction of infrastructure and production facilities, the blockade of Black Sea ports and the disruption of logistics ties, and large-scale migration. All of this led to a sharp decline in consumer demand, investment, exports, and harvests [5].

At the same time, Ukraine managed to maintain macrofinancial stability and attract significant amounts of international assistance, which will have a positive impact on the prospects for post-war recovery [4].

The destructive effects of war are manifested not only in the economy but also in the financial system of a country that is engaged in armed struggle. In Ukraine in 2022, the average annual inflation rate was 20.2 %. The rather moderate inflation in Ukraine in 2022, despite the large-scale destruction of the production base and infrastructure, was due to the fact that Ukraine's western border remained open and neighboring countries were not involved in the war. Thus, a significant portion of consumer demand in Ukraine was met by imports. Imports compensated for part of the

lost domestic supply (with real GDP falling by 29.2 %, dollar imports decreased by only 4 %), and large-scale foreign aid supported the purchasing power of the population relative to imports. The freezing of energy tariffs in Ukraine with rising global energy prices is also a deterrent to the current inflation rate [4].

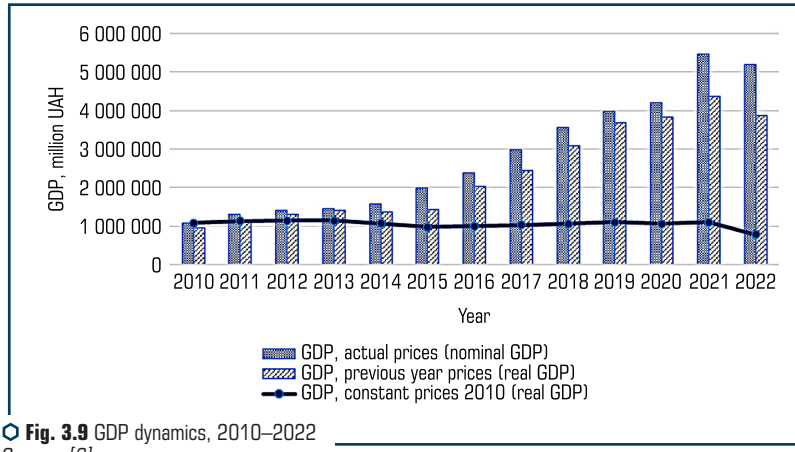

Fig. 3.9 GDP dynamics, 2010–2022
Source: [6]

The situation in which the economy is subject to targeted attacks and influence in wartime requires a comprehensive and balanced approach to economic security management.

Ukraine's actions and measures during the war indicate important steps towards ensuring economic resilience and support for society. Let's focus on the key points of 2022–2023:

1. Financing defense and social spending. Issuing military bonds and mobilizing financial resources is strategically important to ensure financial support for defense and social programs in times of war.

2. Tax liberalization and deregulation. A wide range of measures, such as simplification of the taxation system, tax and customs privileges, voluntary payment of taxes, unified social tax, and other tax simplifications, are aimed at easing financial pressure on businesses and supporting micro and small businesses.

3. Simplification of the tax administration regime. The moratorium on documentary tax audits and other measures to simplify tax administration procedures help to maintain business activity under martial law.

4. Support for humanitarian and volunteer initiatives. Tax and customs exemptions for humanitarian and volunteer aid are seen as important steps to provide humanitarian aid to the victims and the army.

5. International investment in military bonds. Attracting investments from citizens and business investors in military bonds helps to expand sources of financing in times of war.

These measures allow the Ukrainian state to adapt to the economic challenges of the wartime period and maintain economic stability.

Expanding the participation of entrepreneurs in government programs and providing credit support are important measures to support entrepreneurship in times of war. The implementation of the programs "Affordable Loans 5–7–9 %" and "Affordable Financial Leasing 5–7–9 %" expands the opportunities for entrepreneurs to receive financial support at reduced rates, which helps to intensify business activities. Loan support based on portfolio guarantees can help reduce risks for banks, which contributes to the revival of lending activity in times of economic difficulties. Revitalizing lending activity by banks is an important aspect of ensuring that entrepreneurs have access to the necessary financing, which can be difficult in a time of war. The increase in the amount of debt under the Affordable Loans 5–7–9 % program and the hryvnia loan portfolio demonstrates the effectiveness of the program and the response of businesses to the opportunities for support. These measures help to ensure financial stability and support economic activity, especially in difficult conditions such as martial law.

The measures taken by the state in the monetary sphere during the war have a significant impact on the financial stability and liquidity of the country. The introduction of a 100 % state guarantee for household deposits during martial law is an important measure to ensure stability and restore depositors' confidence in the banking system. This helps to avoid panic and withdrawal of funds from banks. Active refinancing of banks in the first weeks of the war helped to avoid a banking crisis and provided the necessary liquidity. Fixing the hryvnia exchange rate at the level of February 23, 2022, for non-cash transactions (with permission to buy foreign currency to import goods from the government-approved list of critical imports) helped to contain inflation and avoid large fluctuations in the foreign exchange market. The increase in the key policy rate to 25 % in June is a tool to reduce pressure on the foreign exchange market and contain inflation. A high key policy rate can be used to attract investment and maintain the stability of the financial system. Local commodity shortages and rising producer costs may be the factors that influence inflation. Addressing these aspects may help to reduce the pressure on inflation.

The introduction of the "customs visa-free regime" on October 1, 2022 is an important step for Ukraine in the context of its economic integration with the European Union. The visa-free regime will simplify and reduce customs restrictions for goods exported and imported between Ukraine and the European Union. This may have a positive impact on the volume and diversity of trade operations. Accession to the Convention on the Simplification of Formalities in Trade in Goods and the Convention on a Common Transit Procedure is a step towards further trade facilitation, simplification of customs procedures and reduction of administrative barriers. The customs visa-free regime could have a positive impact on increasing exports of Ukrainian goods to the European Union and facilitate the growth of imports of goods to Ukraine from the EU. This initiative fits into the framework of the overall strategy of Ukraine's economic integration with the European Union, which could lead to deeper cooperation in various areas. Reducing customs restrictions and facilitating trade could make Ukraine more attractive to foreign investors, which could have a positive impact on economic

development. These steps are important for deepening economic and trade ties between Ukraine and the European Union and contribute to Ukraine's establishment in the global economic market.

The blockade of seaports, closure of airports, shelling of railway infrastructure and missile attacks across Ukraine have significantly posed risks to the country's foreign trade.

At the end of September 2022, Ukraine demonstrates resilience in the economic sphere, although the war has led to a certain decline in foreign trade. Even in the face of war and geopolitical tensions, Ukraine is resilient in foreign trade. The significant decline in trade turnover demonstrates the country's adaptability to new realities and efforts to maintain stability. Exports experienced a more significant decline (31.6 %) than imports (17.8 %). The losses were primarily driven by non-precious metals and their products, as well as mineral products. Exports of chemical and related products almost halved, while machine building lost a quarter of its volume. Imports were affected by a decline in purchases of machinery, chemicals and related products, finished food products, polymeric materials, and other sectors. Price factors, such as rising prices for energy, grain, and fertilizers, contributed to the decline in physical volumes of trade in goods. Due to restrictions on northern, eastern, and southern trade routes, Ukraine reoriented its main commodity flows to the west. During this period, the share of trade with the European Union increased. Ukraine is actively adapting to the new trade conditions, changing the directions and structure of exports and imports to ensure sustainability in the economy [1, 2].

Digital technologies in finance, such as electronic payments and card accounts, play a key role in ensuring the stability of Ukraine's financial system in the context of the military conflict. Effective development of digital tools helps to maintain stable servicing of business transactions and cash flows of the population, even under difficult conditions, such as difficulties in the supply of cash and the suspension of some bank branches. The National Bank of Ukraine's activities in the extensive electronic payment system, as well as the massive introduction of card accounts for various payments, provide the necessary infrastructure for financial transactions. This not only supports the operation of banks and financial institutions, but also helps to meet the needs of the population in paying for goods and services, receiving salaries, pensions, and other social benefits under martial law. Digital transformation in the financial sector is also proving useful for managing financial operations in times of economic difficulties and emergencies.

The remote access technologies developed during the quarantine restrictions have proven to be an important tool for preserving jobs and providing basic administrative services in the context of war and forced displacement. The only state web portal for electronic services, the Diia portal, has become an effective tool for citizens and businesses, reaching more than 14 million users. The Diia portal functions not only as a "state in a smartphone" but also as a means of identifying people who have lost their documents (through the eDocument service), provides tools for collecting information about damaged property, assists in applying for social benefits, and informs the population in times of war. Such technologies not only facilitate access to administrative services, but also serve as an effective tool for resolving issues related to the loss of documents, assessing property damage, and as a means of alternative public information and organizing social assistance in times of crisis.

3.3.2 STUDY OF THE DYNAMICS OF INDIVIDUAL INDICATORS OF FINANCIAL AND ECONOMIC SECURITY OF THE STATE

Financial and economic security is "a component of the economic security of the state, which qualitatively characterizes the financial and economic system, determines its ability to maintain normal conditions for the system's performance, is based on the independence, efficiency and competitiveness of the financial and credit sphere, is aimed at development within the framework of the goals set for the system, and in cases of various threats (external and internal), the system is able to withstand them and restore its performance" [7].

As for ensuring the financial security of Ukraine, the "Concept of Financial Security of Ukraine" was developed on behalf of the NSDC (National Security Council of Ukraine) (CJSC "Ukrainian Financial Development Agency" is the project coordinator) [8]. Thus, the Concept of Ensuring National Security in the Financial Sphere (2012) states that national security in the financial sphere includes "security issues in the budgetary sphere, in the sphere of public debt management, publicly guaranteed debt and corporate sector debt, taxation, real sector finance, banking, foreign exchange market and in the spheres of stock market and non-banking financial sector. The characteristic features of national security in the financial sector are balance, resilience to internal and external threats, and the ability to ensure the effective functioning of the national economy and economic growth of the state" [9]. The "Concept of Ensuring National Security in the Financial Sphere" states that "...the state of national security in the financial sphere depends on the phenomena and factors of both domestic and foreign financial and credit policy of the state, the political situation in the state, the perfection of legislative support for the functioning of the financial system, as well as the state's international obligations" [9].

Statistics show a significant budget imbalance and large deficits. The significant deficit between revenues and expenditures indicates the need for large financial resources to support important sectors, including defense and social services. For example, September 2022 was characterized by revenues from tax and customs payments of 83.6 billion UAH and expenditures of 233.1 billion UAH (including 106 billion UAH for military salaries).

A slight increase in budget expenditures, excluding defense, security, and public order, by 2 pp of GDP (30.2 % of GDP in 2022) against the background of a significant increase in the budget deficit (17.62 % of GDP in 2022) poses a serious challenge to the country's economic stability. An increase in the budget deficit may cause problems of financial sustainability and has a potentially negative impact on the economic situation. The real threat to security and military activity has led to a sharp increase in defense and security spending, which creates a need to limit spending in other budget sectors. After the end of military conflicts, there may be a need for large-scale economic and infrastructure reconstruction. This may lead to an additional increase in spending and, as a result, to an increase in the budget deficit. A significant economic decline and a one-third reduction in real GDP in 2022 could affect tax revenues and lead to financial difficulties [10] (**Fig. 3.10**).

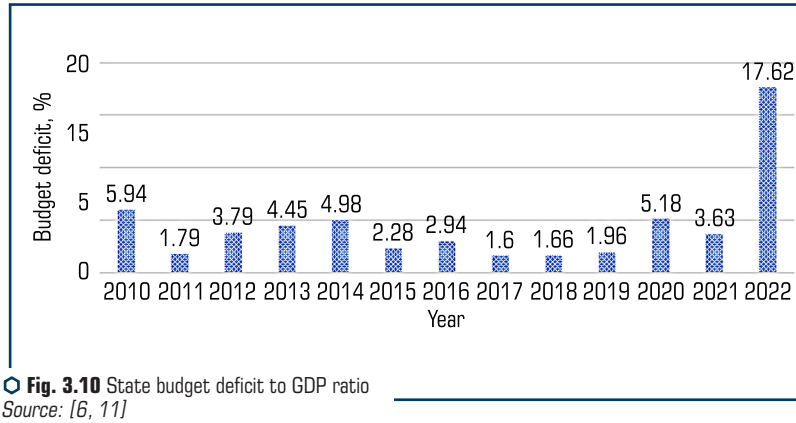

Fig. 3.10 State budget deficit to GDP ratio
Source: [6, 11]

The structure of sources of financing of public expenditures in Ukraine in 2022 is as follows: 41 % of expenditures were financed by tax and non-tax budget revenues, 35 % by external loans and grants, 13 % by monetary financing, and 9 % by borrowing on the domestic market.

In other words, the state's expenditures on military operations and the functioning of the social and humanitarian sphere were almost equally shared by Ukrainian taxpayers and external creditors/donors. The NBU also made its contribution by covering part of the deficit by issuing money. However, the Government's internal creditors played a minimal role, especially if to consider net loans to the Government [4].

Proper financial planning and budget management is an important part of effective economic management in times of war. The main features of the financial situation in Ukraine in 2022 include: a significant increase in budget expenditures, a budget deficit, acceptable performance of the budget revenue side, and large-scale attraction of external financing. All these factors point to the need for careful and effective financial management in times of war to ensure budget stability and economic sustainability of the country [10].

The state of Ukraine's public finances in the context of the military situation is extremely difficult. The military events have led to a sharp decline in the tax base due to a decline in economic activity, shutdown of certain industries and loss of production. The increase in public and publicly guaranteed debt is a response to the need to finance defense spending, humanitarian aid, and other urgent war-related expenses. The IMF's forecast of an increase in gross public debt to 86.2 % of GDP in 2022 indicates serious pressure on the country's financial sustainability. The agreement with international creditors to suspend debt repayments until the end of 2023 is a temporary measure to preserve foreign currency liquidity and reduce the budget deficit. It is also supported by international partners such as the G7 and the Paris Club of creditors. The announcement of the possibility of suspending debt payments to the IMF and other international financial organizations indicates attempts to find ways to reduce financial pressure in the crisis [2].

The increase in Ukraine's public and publicly guaranteed debt by 13.4 billion USD in 2022 and reaching 78.4 % of GDP (**Fig. 3.11**), and its further projected growth to 6.4 trillion USD by the end of 2023, are significant economic challenges for the country. The Russian invasion and the conflict in Ukraine have had a significant impact on the national economy, leading to lower production, higher costs, and economic uncertainty. The decline in nominal GDP to 161 billion USD reflects the severe loss of production and business activity due to the military events. Increasing debt levels create financial sustainability issues and may lead to difficulties in paying interest and a decrease in the country's credit rating [12].

Significant monthly defense spending (230–250 billion UAH is spent each month, of which about 1/2 is allocated to defense) indicates the large amount of funding that Ukraine spends to protect the country from enemy invasion and ensure the safety of its citizens.

Obtaining financial support to cover military, social, educational, and medical expenses from Western partners in the form of grants (September 2022: 72.5 billion USD) and loans is an important element of financial management and budget support. The continuation of the trend of increasing debt (in 2023, this trend will remain according to the draft state budget) may require the government to implement strategies to ensure sustainable economic activity and a balanced financial position.

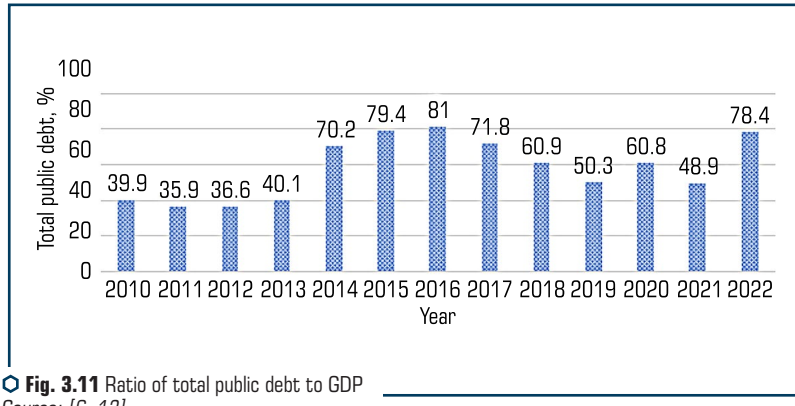

Fig. 3.11 Ratio of total public debt to GDP
Source: [6, 13]

The projected increase in public debt to 106 % of nominal GDP may create significant financial pressure for the country. High debt levels affect the country's ability to service its obligations and pose a threat to financial stability [14, 15].

An increase in the cost of debt compared to economic output (GDP) may indicate an unfavorable financial situation, especially if economic growth is not sufficient to cover the increase in debt service.

The increase in Ukraine's gross external debt by 1.2 billion USD in 2022, which led to its growth relative to GDP from 64.9 % to 82.2 %, indicates significant financial pressure and an increase in the country's external liabilities (**Fig. 3.12**) [11].

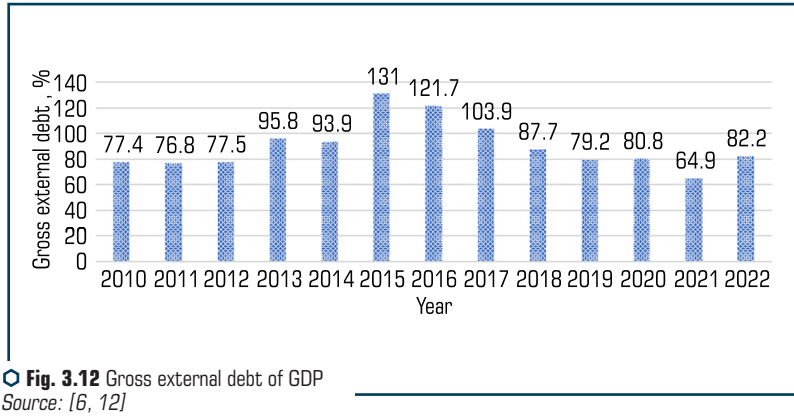

Fig. 3.12 Gross external debt of GDP
Source: [6, 12]

A high level of external debt can create difficulties in servicing these obligations and reduce the country's financial stability.

The established National Council for the Reconstruction of Ukraine from the Consequences of the War is noted for its important role in the process of economic recovery and structural modernization. The Presidential Decree on the establishment of this Council recognizes the need for coordination and a systematic approach to the tasks of recovery after the war. Reducing bureaucracy and simplifying procedures for business entities will allow them to receive compensation for damages faster and more efficiently. The termination of state supervision and control measures, as well as the abolition of the requirement to obtain permits, promote entrepreneurial initiative and ease the conditions for business activity. A simplified procedure for conducting business activities by industrial enterprises, including relocation, can encourage enterprises to take effective steps towards recovery and development.

The government's plan of urgent measures to relocate the production facilities of business entities to safe territory is marked by a wide range of measures to ensure not only safety but also the efficiency of the enterprises' operation in the new locations. The plan covers the process of relocating production facilities and personnel from areas where hostilities are ongoing or threatened to safe areas. It includes aspects such as connecting to utilities, simplifying procedures for obtaining land plots, and rescheduling interest payments on loans. Local authorities are actively supporting displaced businesses by helping them find premises, connect to networks, restore logistics and supply and sales markets. They are also providing employment and recruitment services.

The launched microgrant program "eRobota" is aimed at creating and developing own business in the conditions of war and martial law, which contributes to the development of Ukraine's economic potential and support of the population [1, 2]. Through the severe trials of warfare, the Ukrainian country has shown impressive strength and determination of the people, business, local communities and authorities [2].

3.3.3 THE DIGITAL ECONOMY SECTOR IN UKRAINE AS A FACTOR OF THE COUNTRY'S ECONOMIC DEVELOPMENT

Digital financial technologies have become an integral part of the modern financial sector due to the massive digitalization of society and business processes. Before the advent of digital financial technologies, the financial sector was largely traditional and conservative, dependent on complex and inefficient systems. With the Internet revolution and the proliferation of mobile technology, financial technology began to evolve rapidly, offering new, innovative solutions that revolutionized the way people interact with financial services. One of the main factors that has contributed to the development of digital financial technologies is convenience and accessibility for users. Modern technologies allow for online financial transactions without the need to visit bank branches or use paper documents. This significantly increases the speed and convenience of transactions for users and reduces costs for companies.

In addition, digital technology capabilities offer new financial products and services that were previously unavailable or difficult to deliver through traditional channels. For example, payment systems using mobile phones, payment gateways for e-commerce, and investment platforms for small and medium-sized enterprises. "The development of digital financial technologies in Ukraine has been particularly noticeable in recent years, due to a number of factors: the global economic crisis that began in 2008 and its consequences; the growth of global digitalization processes; the active spread of the Internet; the development of competition in financial markets; the rapid spread of social networks and messengers; the desire for innovation, increased requirements for ease of use, quality and speed of information; the success of technology companies in other sectors of the economy; the growth of e-commerce; and the growth of the e-commerce industry [16].

In 2022–2023, the main trends in the development of Ukrainian financial technologies are as follows: embedded finance, which is already actively working on specific products in Ukraine; cross-border payments and transfers; forced displacement of part of the Ukrainian population abroad has necessitated the expansion of money transfer opportunities, in particular, the availability of services and the speed of transactions (SEPA is one of the most popular bank transfers); adaptation of Ukrainian financial services to European legislation; improvement of acquiring, implementation of The development of financial technologies in Ukraine continues even in the context of the Russian-Ukrainian war, which demonstrates the importance of this sector for the country's economic development.

The digital economy sector in Ukraine has the potential to ensure stability and growth of financial revenues, especially in the context of post-war reconstruction. Digital solutions perform not only a financial function, but are also strategically important as they contribute to the efficiency of various industries in which they are implemented. The development of digital infrastructure in Ukraine plays a key role in the country's integration into the EU Digital Market. The analysis of international rankings of the formation and development of the digital society and innovations provides important information about the state of Ukraine's digital economy.

According to the UN E-Government Survey 2022, in 2022, Ukraine ranked 46th in the E-Government Development Index (EGDI) (in 2020 – 69th, in 2018 – 82nd, in 2016 – 62nd, in 2014 – 87th, in 2012 – 68th, in 2010 – 54th). It should be noted, however, that in the past our country managed to occupy better positions, in particular in the first decade of the twenty-first century, the indicators were even somewhat higher and more stable, compared to the chaotic fluctuations in the future However, it was in 2022 that Ukraine moved to the group of countries with a "very high level of e-government development" (VHEGDI). Leaders among other countries in 2022: Denmark, Finland and South Korea. The e-government assessment shows that there is generally a close relationship between the level of income in a country (expressed as gross domestic product per capita) and the EGDI values [17–19] (**Fig. 3.13**).

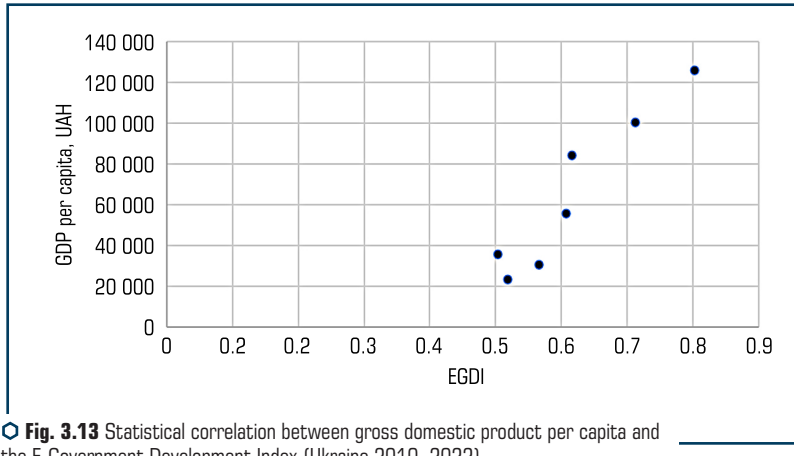

Fig. 3.13 Statistical correlation between gross domestic product per capita and the E-Government Development Index (Ukraine 2010–2022)
Source: [6, 17–19]

The correlation coefficient (r_{xy}) is 0.9529, which indicates (according to the empirical rule (Chaddock scale) for assessing the closeness of the relationship [20]) a strong relationship between the indicators. Since it is direct, when the E-Government Development Index increases, the GDP per capita increases. And vice versa.

This generally confirms that improving the provision of online services requires significant resources as a priority [21].

An analysis of the dynamics of the WEF/WI TSA Networked Readiness Index (NRI) shows that Ukraine has significantly improved its position in the ranking, rising from 90th place in 2011 to 50th place in 2022. Until 2014, there was a particularly difficult period in ensuring the country's innovative development. However, after the Revolution of Dignity, when the vector of the country's further development changed, a number of reforms were implemented, the value of the network readiness index also began to improve. In particular, in recent years, from 2019 to 2022, Ukraine has moved up 17 positions in this ranking, which indicates qualitative changes in the development of the digital economy in the country, and improved conditions for innovation. Leaders in 2022: The United States, the United Kingdom, and Sweden [22, 23]. The group of lower-middle-income countries is headed by Ukraine (50th place), Indonesia (59th place), and India (61st place). Ukraine is the only lower-middle-income economy in the top half of the NRI ranking. Ukraine's strongest performance is in the People dimension (37th), especially when it comes to individual adoption of digital technologies (7th), where the economy benefits from high adult literacy rates (1st) and higher education enrollment (18th). Improvements have been made in the government sub-level (52nd), partly due to increased trust through initiatives such as the publication and use of open data (23rd) and public investment in new technologies (45th). Ukraine also scores well in technology adoption (45th) and investment due to its international internet bandwidth (33rd) and FTTH/Internet subscription development (9th), improving the ability of citizens to be connected. Its weakest dimension equally concerns the governance (57th) and impact (57th) of digital technologies. Improvements in cybersecurity (84th) and the ICT regulatory environment (82nd) could improve Ukraine's performance in the areas of trust (54th) and regulation (84th) [24].

The Global Innovation Index (GII) takes into account various aspects of a country's innovation ecosystem, such as scientific and technological achievements, intellectual property, venture capital, technological readiness, access to financial resources, etc. Ukraine, like any other country, can use the Global Innovation Index data to identify areas where there is potential for innovation and competitiveness. In 2022, Ukraine saw a deterioration in its ranking, taking 57th place in the Global Innovation Index among 132 countries. This corresponds to 34th place among 39 European economies. However, in 2023, there was some improvement, and Ukraine rose to 55th place in the global ranking. At the same time, compared to other European economies, it also ranked 34th among 39 countries [25].

The World Digital Competitiveness Index (WDCR) measures the level of readiness of countries for digital transformation, including the availability of technology, digital infrastructure, and other factors that affect their competitiveness [26].

The WDCR 2021 report ranks Ukraine 54th out of 63 countries, which is 4 positions better than in 2020. However, according to the analysis of Ukraine's position in this ranking, it has not risen above 54–60 positions over the past 7 years (2015–2021), although the 2014 ranking assessed the country's digital competitiveness higher – Ukraine was ranked 50th in the ranking.

The relatively low level of Ukraine's position in the digital competitiveness ranking is justified by its low positions in certain factor indicators, namely, digital technologies and digital readiness [27–29].

Leaders among foreign countries in 2022: Denmark, the United States, and Sweden, but Ukraine was not included in the 2022 edition of the digital ranking due to the limited reliability of the data collected.

The analyzed relationship between the change in real GDP and the IMD World Digital Competitiveness Ranking (**Fig. 3.14**) is characterized by a high degree of closeness, which is confirmed by the value of the correlation coefficient $r_{xy}=0.7753$. That is, GDP depends on the IMD World Digital Competitiveness Ranking. With an increase in the IMD World Digital Competitiveness Ranking, GDP increases.

These international rankings help to determine the current state and trends in digital development and e-governance in Ukraine compared to other countries. This allows the government and stakeholders to focus on improving digital infrastructure, developing e-government, and promoting digitalization of all spheres of public life to achieve a high level of competitiveness and ensure integration into the European digital space [30].

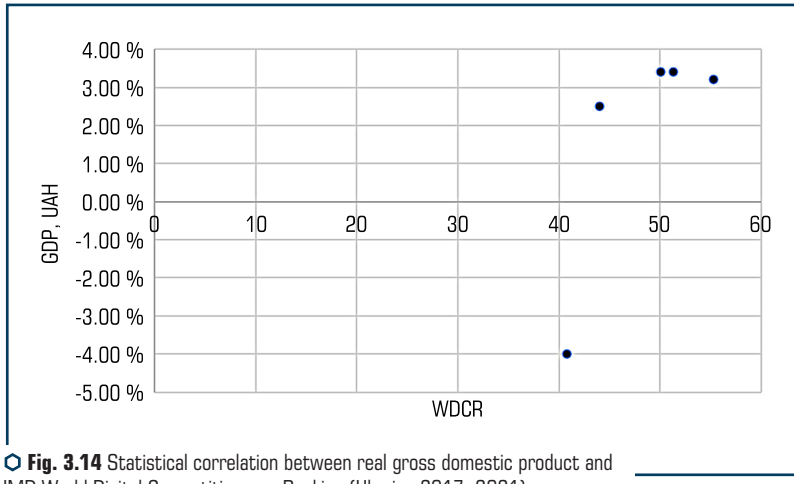

Fig. 3.14 Statistical correlation between real gross domestic product and IMD World Digital Competitiveness Ranking (Ukraine 2017–2021)
Source: [6, 28]

An analysis of the relationship between GDP and digital economy indices shows the direct impact of digitalization on the country's financial and economic sustainability [31].

Ukraine is not yet fully ready to move to a digital economy. The idea of transitioning to a digital economy has not been fully explored and the financial system is not ready for full digitalization. This will lead to a lower level of financial security, deterioration of financial conditions for stable

socio-economic development of the country, as well as lack of resilience to financial shocks and imbalances, and cyber attacks in the financial sector.

The World Economic Forum's Global Risks Report 2023 keeps cybersecurity high on the agenda, noting that "the Rush War against Ukraine is inspiring cybercriminals, highlighting the challenge for organizations to adjust their investment priorities in response to geopolitical risk. On a positive note, there is an increase in organizations that take cyber risks into account in their decision-making process, as a result of which they are more confident in their cyber resilience and recover better from cyber attacks [32, 33]. Today, the main risks are typical for the financial and credit industry, but the threat may already become relevant for all industries. Cyber threats are characterized by the fact that they are constantly changing and appear almost every day.

Along with all their innovative power, digital technologies also bring new challenges and risks, such as data and privacy security; regulatory aspects; emerging financial products and services that can be difficult for the general public to understand and evaluate; low levels of financial and digital literacy can lead to risks to personal finances (manipulation, fraud, outright fraud); the dependence of financial systems on digital technologies creates threats of cyberattacks and data security breaches, the demand for cybersecurity professionals is growing, but the cost of protecting infrastructure is also increasing; the implementation of cryptocurrency-related projects can disrupt the financial balance in the world and cause real financial chaos.

Cybersecurity is becoming increasingly important in the context of the modern global economy, as digital technologies and the Internet play a key role in the development of enterprises and contribute to economic growth [34]. The Cybersecurity Ventures Cybercrime Report 2023 predicts a rapid increase in the cost of cybercrime-related losses. Cybercrime losses are expected to reach 10.5 trillion USD by 2025, a significant jump from the 3 trillion USD recorded in 2015. These losses represent the cost of data breaches, stolen funds, intellectual property theft, business disruptions, and recovery from an attack. The report emphasizes the importance of implementing a risk-based approach to avoid business disruption [35]. The Law of Ukraine "On the Basic Principles of Ensuring Cybersecurity of Ukraine", which came into force on April 5, 2018, establishes the legal and organizational framework for protecting the vital interests of a person and a citizen, society and the state, and the national interests of Ukraine in cyberspace. One of the priorities of the state is to develop and improve the legal framework for effective prevention and suppression of offenses in the field of information technology, protection of electronic information in computer systems and telecommunication networks in order to ensure economic, political, military and other spheres of society [36].

The analysis has shown that there is a direct correlation between GDP and the E-Government Development Index and the IMD World Digital Competitiveness Ranking. Therefore, to ensure economic development and financial and economic security, Ukrainian authorities and business structures should actively implement cybersecurity measures, develop appropriate legislative mechanisms and provide professional training for specialists in this area. The development of financial technologies in Ukraine continues even in the context of the Russian-Ukrainian war, which

demonstrates the importance of this sector for the country's economic development. Other indicators of digital transformation, such as the availability of high-speed Internet, the number of electronic trading platforms, and the level of digital literacy of the population, can be taken into account to conduct a more accurate analysis. This approach will allow to better understand the digital impact on economic development and ensure Ukraine's financial and economic security. Thus, the development of the digital economy in Ukraine is an important factor in ensuring both economic and national security, stability, and growth of the country in the context of post-war recovery.

REFERENCES

1. Aktualni vyklyky ta zahrozy ekonomichnii bezpetsi Ukrainy v umovakh voiennoho stanu (2023). National Institute for Strategic Studies (NISS), 16. Available at: https://niss.gov.ua/sites/default/files/2023-05/executive-summary_ecsecurity_2023_gotovee-1.pdf
2. Analitychna dopovid do shchorichnoho Poslannia Prezydenta Ukrainy do Verkhovnoi Rady Ukrainy "Pro vnutrishnie ta zovnishnie stanovyshche Ukrainy" (2022). Available at: https://niss.gov.ua/publikatsiyi/poslannya-prezydenta-ukrayiny/analitychna-dopovid-do-shchorichnoho-poslannya-1
3. Pro zatverdzhennia Natsionalnoi ekonomichnoi stratehii na period do 2030 roku (2021). Postanova Kabinety Ministriv Ukrainy No. 179. 03.03.2021. Available at: https://zakon.rada.gov.ua/laws/show/179-2021-%D0%BF#Text
4. Bohdan, T. (2023). Financial and economic consequences of the war. Information portal LB.ua. Available at: https://lb.ua/blog/tetiana_bohdan/550614_finansovoekonomichni_naslidki.html
5. Komentar Natsionalnoho banku shchodo zminy realnoho VVP u 2022 rotsi (2022). Available at: https://bank.gov.ua/ua/news/all/komentar-natsionalnogo-banku-schodo-zmini-realnogo-vvp-u-2022-rotsi
6. Valovyi vnutrishnii produkt Ukrainy (2022). Minfin. Available at: https://index.minfin.com.ua/ua/economy/gdp/
7. Solomonova, L. V. (2018). Financial and economic security as a component of national security. Black Sea Economic Studies, 27, 193–198. Available at: http://bses.in.ua/journals/2018/27_1_2018/38.pdf
8. Kontseptsiia finansovoi bezpeky Ukrainy. Availble at: https://ufin.com.ua/koncepcia/008.doc
9. Pro skhvalennia Kontseptsii zabezpechennia natsionalnoi bezpeky u finansovii sferi (2012). Rozporiadzhennia kabinety ministriv Ukrainy No. 569-p. 15.08.2012. Availble at: https://zakon.rada.gov.ua/laws/show/569-2012- %D1 %80#Text
10. Bohdan, T. (2023). Implementation of the budget-2022: the main results of the year. Information portal LB.ua. Available at: https://lb.ua/blog/tetiana_bohdan/545981_vikonannya_byudzhetu2022_golovni.html

11. External debt of Ukraine at the end of 2022 (2022). Department of Statistics and Reporting, Department of External Sector Statistics. Available at: https://bank.gov.ua/files/ES/ExDebt_y.pdf
12. Derzhborh Ukrainy za rik zris do 78,5% VVP (2023). Ukrinform. Available at: https://www.ukrinform.ua/rubric-economy/3698436-derzborg-ukraini-za-rik-zris-do-785-vvp-minfin.html
13. Minfin.com.ua: ukrainskyi portal pro finansy ta investytsii. Available at: https://index.minfin.com.ua/
14. Parashchy, O. (2024). Derzhborh Ukrainy zris do istorychnoho maksymumu u $145 mlrd. Forbes Ukraine. Available at: https://forbes.ua/money/derzhborg-ukraini-zbilshivsya-do-80-vid-vvp-zamist-86-analitik-oleksandr-parashchiy-rozpovidae-chomu-tse-pozitivniy-rezultat-v-situatsii-viyni-02022024-18961
15. Vinokurov, Y. (2022). Derzhavnyi borh Ukrainy perevyshchyt 100 % VVP. Shcho tse oznachaie? Ekonomichna pravda. Available at: https://www.epravda.com.ua/publications/2022/10/25/692991/
16. Liakhova, O., Yurkevich, O., Korets, K. (2023). Fintech market in Ukraine: current conditions. Black Sea Economic Studies, 79, 189–195. https://doi.org/10.32782/bses.79-28
17. Halushchak, M., Halushchak, O., Mashliy, H. (2023). Electronic Ukraine in the digital world. Galic'kij Ekonomičnij Visnik, 85 (6), 174–182. https://doi.org/10.33108/galician-visnyk_tntu2023.06.174
18. E-Government Development Index (2022). Country Data 2022. United Nations. Available at: https://publicadministration.un.org/egovkb/Data-Center
19. E-Government Development Index. Ukraine 2003–2022 (2022). United Nations. Available at: https://publicadministration.un.org/egovkb/en- us/Data/Country-Information/id/180-Ukraine/dataYear/2012
20. Bradul, A., Varava, L., Turylo, A., Dashko, I., Varava, A. (2021). Forecasting the effectiveness of the enterprise to intensify innovation and investment development, taking into account the financial component of economic potential. Eastern-European Journal of Enterprise Technologies, 4 (13 (112)), 89–100. https://doi.org/10.15587/1729-4061.2021.239249
21. Khaustova, M. (2022). Public policy in the context of digitalization of society. International experience in implementing programs and digitization strategies. Analytical and Comparative Jurisprudence, 2, 209–216. https://doi.org/10.24144/2788-6018.2022.02.40
22. Kotelevets, D. O. (2022). The Main Obstacles to the Development of Digital Economy Infrastructure in Ukraine. Business Inform, 12 (539), 127–132. https://doi.org/10.32983/2222-4459-2022-12-127-132
23. Khaustova, V. Y., Reshetnyak, O. I., Khaustov, M. M., Zinchenko, V. A. (2022). Analyzing the ICT-Sphere Development in Ukraine According to International Indices and Rankings. Business Inform, 5 (532), 40–56. https://doi.org/10.32983/2222-4459-2022-5-40-56
24. The network readiness index 2022 (2022). Press Release. Washington. Available at: https://networkreadinessindex.org/nri-2022-edition-press-release/

25. Informatsiini materialy shchodo stanu innovatsiinoi diialnosti (2023). Ministry of Economy of Ukraine. Available at: https://www.me.gov.ua/Documents/Print?lang=uk-UA&id=69b9a9bf-5fbc-4035-8c0f-ac26b853c0eb
26. Roshchuk, M. (2020). Ukraina v mizhnarodnykh reitynhakh tsyfrovoho rozvytku: stratehuvannia ta perspektyvy. DICTUM FACTUM, 3 (8), 49–58. Available at: https://df.duit.in.ua/index.php/dictum/article/view/163/141
27. Khaustova, V. Y., Reshetnyak, O. I., Khaustov, M. M., Zinchenko, V. A. (2022). Analyzing the ICT-Sphere Development in Ukraine According to International Indices and Rankings. Business Inform, 5 (532), 40–56. https://doi.org/10.32983/2222-4459-2022-5-40-56
28. IMD World digital competitiveness ranking (2022). Available at: https://imd.cld.bz/Digital-Ranking-2022
29. Bakalinska, A. (2022). Prerequisites for the formation and development of information economy in Ukraine. Proceedings of Scientific Works of Cherkasy State Technological University Series Economic Sciences, 67, 87–96. https://doi.org/10.24025/2306-4420.67.2022.277701
30. Shtal, T., Pliekhanov, K. (2023). Ukraine's position in international rankings assessing the level of digital development of countries. Digital Economy and Economic Security, 8 (8), 22–28. https://doi.org/10.32782/dees.8-5
31. Lutsyk, Y., Demenev, O., Parkhomenko, P., Telehin, V. (2023). Preservation of financial and economic stability as a guarantee of stabilization of the state's economy and reliable financial support for defense and security needs in the context of full-scale russian aggression against Ukraine. Air Power of Ukraine, 1 (4), 74–80. https://doi.org/10.33099/2786-7714-2023-1-4-74-80
32. At Least 10 Years of Cyber Risk Ahead – WEF's Global Risks Report (2023). Available at: https://10guards.com/ua/articles/at-least-10-years-of-cyber-risk-ahead-wefs-global-risks-report-2023/
33. Global Cybersecurity Outlook 2023 (2023). Available at: https://www3.weforum.org/docs/WEF_Global_Security_Outlook_Report_2023.pdf
34. Ramachandran, R. (2019). Cybersecurity and its Critical Role in Global Economy. Information Systems Audit and Control Association (ISACA). Available at: https://www.isaca.org/resources/news-and-trends/isaca-now-blog/2019/cybersecurity-and-its-critical-role-in-global-economy
35. Cybersecurity Ventures Report on Cybercrime (2023). Information portal eSentire. Available at: https://www.esentire.com/cybersecurity-fundamentals-defined/glossary/cybersecurity-ventures-report-on-cybercrime
36. Pro osnovni zasady zabezpechennia kiberbezpeky Ukrainy (2017). Zakon Ukrainy No. 2163-VIII 05.10.2017. Available at: https://zakon.rada.gov.ua/laws/show/2163-19#Text

CONCLUSIONS

The monograph established that despite the state of war, the process of digital transformation and development of the digital economy in Ukraine continues and is actively developing. Work is underway to create an appropriate institutional framework for these processes and create favorable conditions for innovations in the field of management. An important role in this is played by Ukraine's participation in the Digital Europe program, the purpose of which is to accelerate the recovery of the economy and the digital transformation of each of the participating countries. The study confirms the need for investment in the development and creation of digital platforms for business in the conditions of the digital economy.

Particularly important areas of business management in this context are collaboration and convergence, cyber security, digital competence and the development of digital skills.

Undoubtedly, thanks to digital transformation and the implementation of best practices and management standards, Ukraine has the opportunity to improve its economic infrastructure and increase its competitiveness at the international level. An important step is the adoption and implementation of standards that meet the requirements of European management practice.

This contributes to increasing the efficiency, transparency and stability of the process of managing the digital economy. In general, the development and implementation of strategies for the adaptation of European practices of digital transformation management in Ukraine is a step towards achieving international standards and ensuring sustainable, investment-innovative development of the country's economy.

In the monograph it is proved that the establishment of investment and innovation activities contributes to ensuring a high level of economic security of enterprises by financing and implementing innovations, software, new technologies, which increases their competitiveness and indicators of financial and economic activity. Given the importance of improving investment and innovation activities, the expediency of introducing digital technologies at enterprises is determined, which will improve business processes, management, personnel policy and cover all processes of activity. It is substantiated that investment and innovation activities are interconnected and it is advisable to increase them, which will ensure the growth of indicators of economic security and economic activity. An analysis of the status of investment and innovation activity in the Ukrainian industry is carried out. The state of financial and economic security of enterprises is studied. The status of digitalisation at industrial enterprises is analysed. It is substantiated that an important task is to take measures regarding the intensification of investment activity, which is possible by using the established mechanism of intensification of investment and innovation activity as a tool for ensuring the financial and economic security of industrial enterprises.

In the monograph the expediency and necessity of PPP, which is aimed at partnership relations between the state and the private sector regarding the development of economic processes in Ukraine aimed at maintaining a high level of competitiveness of enterprises, regions, the state and society, is substantiated. PPP allows to attract various forms of financing for the trend-setting development of

enterprises, regions, states and citizens. Methods of financing PPP projects have been defined and expanded. The dynamics of the digital transformation of the EU countries and the progress of the digital development of the EU countries were analyzed, as well as comparison with similar processes in Ukraine was made. It was established that the EU has developed a digital compass, which is a strategic document aimed at further digital transformations and a digital compass for the coming decades. The dynamics of the cost and compliance of PPP agreements in the EU for 2018-2022 has been characterized. Data on the evolution of public-private partnership sectors in the EU countries and statistics on the international market and public-private partnership are quoted. As a result of research, examples of diversification of public-private partnership forms in the member states of the European Union are given.

In the monograph also explores the process of digitization of the Ukrainian economy and the adaptation of European management practices to common European standards. The authors research the impact of digitization on economic development, examining trends and challenges arising from this process. They discuss key initiatives and programs aimed at supporting digital transformation in the Ukrainian economy, such as legislative reform, infrastructure development, and support for innovative projects. Special attention is paid to the implementation of cutting-edge technologies, the development of digital services, and the creation of a conducive environment for innovation across all sectors of the economy. The authors highlight key aspects, including the role of the state, business, and civil society in the process of digital transformation, as well as the challenges and obstacles that may arise on the path to achieving digital success in Ukraine. The work includes an analysis of the current state of the digital economy in Ukraine, recommendations for further steps in digital transformation, and conclusions regarding the prospects for development in this direction in the future.

It is established that conditions of constant change often require a quick response to new market demands or internal transformations in the organization. The effective implementation of digital HR requires the availability of appropriate technical infrastructure and competent personnel for the development and support of personnel management systems. Digital HR provide a means for quick adaptation to changes, accelerating decision-making processes and implementing the necessary changes in personnel management.

Therefore, in order to ensure economic development and financial and economic security, Ukrainian authorities and business structures need to actively implement cyber security measures, develop appropriate legislative mechanisms and provide professional training of specialists in this field. The development of financial technologies in Ukraine continues even in the conditions of the Russian-Ukrainian war, which demonstrates the importance of this sector for the economic development of the country.

To implement digital transformation in the post-war period, it is advisable to carry out measures aimed at: the availability of high-speed Internet, increasing the number of electronic trading platforms, increasing the level of digital literacy of the population. Such a comprehensive approach allows for a more complete understanding of the impact of digital technologies on economic development and to ensure the financial and economic security of Ukraine. Thus, the development of Ukraine's digital economy is important from the point of view of economic and national security and can become an important factor in ensuring the stability and growth of Ukraine's economy.

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PROSPECTS FOR THE DEVELOPMENT OF THE STATE ECONOMY THROUGH ITS DIGITAL TRANSFORMATION AFTER THE RUSSIAN-UKRAINIAN WAR IN THE PANDEMIC OF COVID-19

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