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## PERSONNEL DEVELOPMENT UNDER DIGITAL ECONOMY CONDITIONS

**Purpose.** This article aims to improve organizational, methodological, and practical approaches to a comprehensive assessment of the personnel development system in the digital economy, which will provide the basis for further development of specific mechanisms and tools for personnel development depending on the level of such development.

**Methodology.** To achieve this goal, a whole range of both general scientific and special methods of scientific knowledge were used, namely abstract-logical methods, induction and deduction to study and summarize the existing theoretical and methodological foundations of personnel functioning and development in digital economy, generalization, comparison, index method to study the level of development of digital transformations and digital education of personnel in Ukraine, and graphical method to present the results of the study.

**Findings.** While studying the theoretical and methodological foundations of personnel functioning and development in digital economy, it was found that despite the inevitability of the transition to digital economy and the importance of preparing personnel to work under new conditions, fundamental and analytical research is virtually absent. The existing studies only focus on the importance of digital transformation processes and the need for personnel development, but no specific mechanisms are proposed. The authors make an attempt to assess the level of personnel development based on the methods applied in Ukraine and the European Union, analyze the level of digital transformation and the level of digital education development across the regions of Ukraine, and compare the level of digital literacy of Ukraine's personnel among the main age groups as well as with the corresponding indicators in the European Union.

**Originality.** The results obtained in the course of the study have not been previously highlighted by domestic scientists and form a comprehensive system for assessing personnel development in the digital economy, which will allow them to be used in the future to apply certain tools for acquiring digital competences by personnel, based on the identified level.

**Practical value.** The results of the study can be used by government agencies in terms of formulating state policy on the implementation of a digital economy and with regard to state plans on the formation of digital literacy of the population as well as by business entities in the process of selecting and developing their personnel.

**Keywords:** *digital economy, personnel development, digital competences, digital education*

**Introduction.** The digital economy can be represented as an infinite combination of traditional and non-traditional forms of economic activity, which are connected to each other by various types of relations based on the use of modern information, and more precisely, digital technology for creating and exchanging data. On the basis of such relations, new forms and types of economic activity are born and developed. For a long time, the digital economy has been perceived quite simplistically, just referring to the production and exchange of created products via the Internet and information and communications technology. Currently, the digital economy is developing rapidly and is based on the creation of its own values and products both in informational and virtual spaces as well as in the traditional economy. In this way, specific types of products and values that cannot exist outside the digital world are created.

The modern digital economy has gone beyond the borders of particular countries or the world as a whole. Today, a virtual universe with virtual companies is being actively created based on the use of cryptocurrencies and block-chain technologies or so-called cryptonomics. In our opinion, the transition period from a traditional economy based on innovation and globalization of all processes to a full-fledged digital economy will be quite short. Therefore, modern personnel of companies must not only possess certain professional competences, but also be active participants in digital transformations, namely know basic principles and elements of building a digital economy and use existing technologies and tools in this field. The

success of companies' transition to the digital world will depend on, first of all, digital knowledge and digital interaction skills of company personnel. Personnel will be faced with the tasks of not only the traditional performance of basic job functions and administration of management processes in the organization, but also there will be the need for non-standard and creative solutions to tasks. That is why talent and intellectual abilities are becoming competitive advantages of personnel in the digital economy on an equal basis with education and a high level of professionalism.

**Literature review.** Today, no one doubts that the transition of society to the full-scale use of digital technology in all spheres of life is inevitable. However, among scientists, there are not so many authors who deal with the issues of personnel development in the digital economy. For example, the authors of the monograph "Transformation of the company's personnel management system" consider the issue of theoretical and methodological foundations of the personnel management system and highlight certain trends in digitization of such a management system. At the same time, the scientists limit themselves to determining the importance of digitalization processes in management, which leads to the strengthening of intellectual abilities of personnel and, accordingly, the need to acquire and develop new digital knowledge and skills [1]. Concurrently, issues of the development of a personnel management system under the influence of digitalization and transformation of approaches to such development are neglected. I. A. Gruzina and V. I. Derykhovska have similar points of view [2].

Another group of scientists, researching approaches to the formation of the management personnel development system of

an organization under knowledge economy conditions, emphasizes the importance of intellectual and creative abilities of personnel and indicates the significance of information and technologies as influencing factors on the functioning of personnel [3, 4]. The specified characteristics of personnel development are extremely relevant, but not crucial in the digital economy.

A digital economy significantly expands the opportunities of personnel to access a wide variety of information, artificial intelligence and processing of large volumes of data are actively emerging, (AI Big Data Analysis), which requires personnel to have, first of all, critical thinking skills and speed of working with information.

Kantsur I., Kononova O. and Khmarska I., researching the peculiarities of personnel management in the digital economy, emphasize the high demand of a labor market for qualified personnel and, accordingly, the need to train qualified employees and find new approaches to personnel management. According to the researchers, personnel management in the digital economy is carried out through planning, organization, motivation, and control, the most complicated ones are personnel planning and personnel selection [5]. However, the research is completely focused on the automation of certain management functions in the process of personnel development, and not on the acquisition of new digital competences and skills of the personnel themselves.

Having conducted an analysis of general trends in personnel management under the influence of the digital economy, T. Zbarytska and O. Soroka indicate that the use of digital technology by personnel can be multivariate and is built on the basis of interaction with the employer through the creation of a new type of workplace using digital platforms and tools [6]. The authors focus their attention more on technological solutions to personnel management, but not on the readiness and opportunities of the personnel themselves to use the latest technologies and tools.

To conclude, the analysis of scientific sources devoted to the study of personnel management issues and its development in the digital economy shows that most scientists focus their attention precisely on technological solutions of interaction between the organization and its personnel.

**Unsolved aspects of the problem.** Today, in fact, there are neither fundamental nor empirical studies of the level of per-

sonnel development and their readiness to be actively involved in and use modern digital technology while working. Not only the efficiency of a company's activities under new conditions, but also the possibility of applying specific digital solutions while working will depend on the degree of such readiness, which is determined by relevant knowledge and skills of digital interaction among personnel.

**Problem statement.** The purpose of the article is a comprehensive study of the state of digitization of both the regions of Ukraine and certain segments of population with the aim of further developing the mechanisms of personnel development in the digital economy.

**Description of the methodology.** To achieve the goal, a wide range of methods of scientific knowledge was used, in particular observation, generalization, and comparison when researching the level of development of digital technology and digital competences of personnel; an index method while determining certain indicators of a digitalization level; a graphic method in the course of presenting research results regarding the digitization level; system analysis when considering basic concepts and researching digitization processes.

**The main material of the article.** The active use of digital technology by companies in a modern economy is a key to the success of both the companies and the country's economy as a whole. Any country is interested in active development of digital transformations, including Ukraine. Despite the outdated economic model and the lack of formation of the market mechanism, Ukraine is in a comparatively high position among other countries in terms of digitalization indicators. Moreover, Ukraine, as a state, acts as a generator and catalyst for such a transition to digital technology and actively involves citizens and businesses. According to UN data, Ukraine ranked 46<sup>th</sup> among 193 countries in the world in terms of the level of electronic government development (E-Government Development Index) and 57<sup>th</sup> in terms of the level of citizens' participation in electronic services (E-Participation Index) in 2022. Fig. 1 presents the dynamics of change in Ukraine's positions in the world according to the E-Government Development Index and the E-Participation Index in digital services in 2003–2022.

The calculation of these indices is based on three criteria: 1) the level of electronic service development; 2) the level of

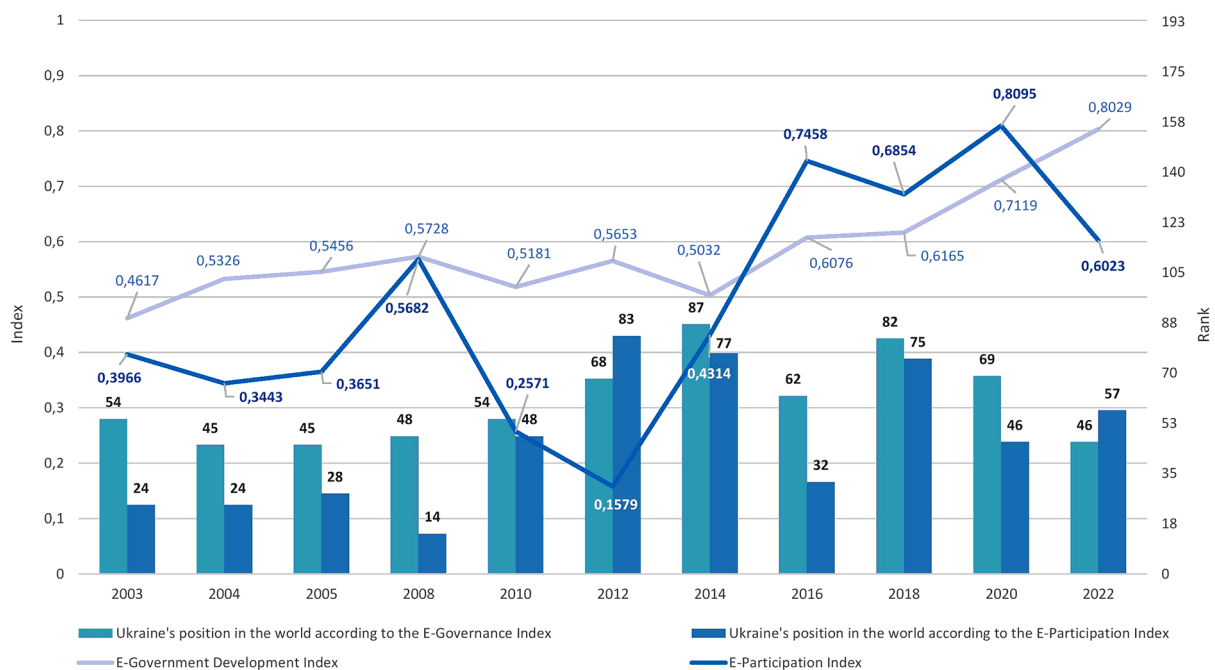


Fig. 1. Dynamics of change in Ukraine's positions in the world according to the E-Government Development Index and the E-Participation Index in digital services in 2003–2022 [7]

telecommunications infrastructure development; 3) the level of human capital development [7]. The retrospective analysis of these indicators proves that the state policy regarding the implementation of digital transformations is quite balanced and has a clear vector of development. Therefore, over 20 years of observation, the E-Government Index has almost doubled. At the same time, we observe that the rating of Ukraine among 193 countries changed quite irregularly and unevenly, which indicates a certain lag in the electronic government development in Ukraine, compared to other countries. However, Ukraine is consistently in the first third/half of the leading countries in terms of e-government development.

As for the E-Participation Index in the e-government system, here there are rather sharp and dynamic changes. Thus, during the period of 2003–2014, the E-Participation Index was lower than the E-Government Development Index, which indirectly indicates the rapid pace of development of digital technology implementation by the state and the unwillingness or unreadiness of society to use them. At the same time, between 2016 and 2020, there was a dramatic increase in demand from society for the use of digital services provided by the state, but the state could not fully satisfy such requests. Such a sharp demand for the use of digital services was caused by a number of objective factors, the main ones of which are the COVID-19 pandemic and migration processes (both within the country itself and abroad) caused by a full-scale invasion of Ukraine.

Based on the results of the analysis, it can be concluded that the state implements the elements of digital transformations much more actively than the society is able to master and actively use them. The fact that in 2022 the E-Participation Index sharply decreased is alarming. It may be a consequence of the situation that some working-age population that was the most active participant in the digital economy – 18–35 years old fled from Ukraine. In spite of the significant reduction in the number of users of digital services, the development of the latter continues actively, even in the conditions of a full-scale war and a severe shortage of funds in the State Budget. Thus, the state remains a generator and an active implementer of digital transformations, despite the military situation and the lack of funds in the National Budget for fulfilling such initiatives. It can be stated that if in the period from 1991 to 2003 digitization of management processes at the state level and its individual bodies was carried out chaotically and unsystematically, since 2004, a clear policy has been followed regarding the activation of digital transformations and their active implementation in public life.

It is obvious that the dynamics of the use of digital technology by business organizations during the analyzed period does not coincide with the indicators of the use of digital services at the state level. However, it is not possible to empirically investigate this process due to the lack of generalized statistical data. At the same time, the state is a certain moderator in this area, since the possibility of using certain digital services is based on the state's existing technological capabilities through which business can interact with the state. The expansion of the state's digital capabilities provides significantly ample opportunities for the use of digital technology for businesses and citizens. This process is characterized by a synergistic relationship, when the strengthening of each element of the system makes the system itself much stronger and more efficient. Consequently, by expanding digital services, the state provides additional opportunities for business in terms of their use and involves citizens in digital interaction both with the state and business. A more active implementation of digital technology by business contributes to increasing the importance of digital skills in personnel and the need to acquire relevant competences. Increasing the level of digital literacy of personnel and active use of such skills both in working and public lives will lead to an increase in the quality of digital transformations as a whole and the possibility of further development of a digital economy.

The effectiveness of a full-fledged transition to the digital economy and the active use of digital technology by the personnel of organizations depends on the level of trust in such technologies in society and the possibility of obtaining certain benefits as a result of their use. It is known that resistance to change is naturally inherent in humans, therefore the main task both the state and the commercial sector of the economy are facing today is the formation of society's understanding and acceptance of digital technology and its gradual implementation in social life and the economy.

At the beginning of 2018, the Cabinet of Ministers of Ukraine approved the "Concept of Development of the Digital Economy and Society of Ukraine for 2018–2020", which provided a specific plan of measures to be implemented. The document identifies 13 main directions, including: overcoming the digital gap by developing digital infrastructures and digital competences along with the implementation of the concept of digital workplaces; digitization of the real sector of the economy [8]. The implementation of the provisions of the concept provides a harmonization with digital transformations in the European Union and further creation of a single digital space (Digital Single Market) by including Ukraine in such EU programs as: Interoperability Solutions for European Public Administrations 2, e-CODEX, e-Invoicing, Single Digital Gateway, eIDAS, etc. The implementation of relevant European standards and regulations in Ukraine should contribute to the formation of open state data in Ukraine, which will ensure an increase in transparency and efficiency of state bodies. The status of the concept as an administrative document by the Cabinet of Ministers of Ukraine did not require its implementation, and its provisions were not further developed in other state documents, which is why it was not possible to fully implement it. Moreover, the period of this concept was not prolonged to 2021 and subsequent years, and the entire range of digital transformations in the country was entrusted to the Ministry of Digital Transformation created in 2019. Thus, today the country lacks a single direction and principles of implementation of digital transformations both at the state level and at the level of certain sectors and branches of the national economy.

Another problem for Ukraine in terms of implementing digital services and their use by population is the uneven rate of digitalization across regions. We conducted a comparative analysis of the level of digitization across the regions of Ukraine and the level of digital education of the population of these regions in 2022. The level of digitization is determined on the basis of the digital transformation index developed by the Ministry of Digital Transformation of Ukraine, which includes 8 sub-indices, 31 indices and 76 indicators. The scale of such an index is from 0 to 1, where 0 is the absence of digitization in the region, and 1 is full digitization. The results of such a comparative analysis are presented in Fig. 2.

The curve illustrates change in the development and implementation of digital technology across the regions, which is certain evidence of the low efficiency of the implemented state policy in this sphere. Only four oblasts (Dnipropetrovska, Ternopil'ska, Odeska and Poltav'ska) have a high digital transformation index (more than 0.8), in 9 oblasts (Lviv'ska, Rivnens'ka, Vinnyts'ka, Zakarpats'ka, Volyn'ska, Cherkaska, Zhytomyr'ska, Ivano-Frankiv'ska and Khmelnyts'ka) digitization has an average value (in the range of 0.6–0.79). In 10 oblasts (Kyiv'ska, Kharkiv'ska, Chernivets'ka, Sumska, Chernihiv'ska, Kher'sonska, Donetsk, Kirovohrad'ska, Mykolaiv'ska and Luhans'ka) the level of digitization is quite low – less than 0.6. In our opinion, the situation in Kirovohrad'ska and Mykolaiv'ska oblasts, where the level of digital transformation is lower than in the oblasts that are under occupation and where active hostilities are taking place, is quite difficult. The level of digital transformation development in Zaporizka oblast is critically unsatisfactory. The general situation is also quite difficult, especially because of continuing military actions. Therefore, in our opinion, it will be necessary to adjust the state policy in

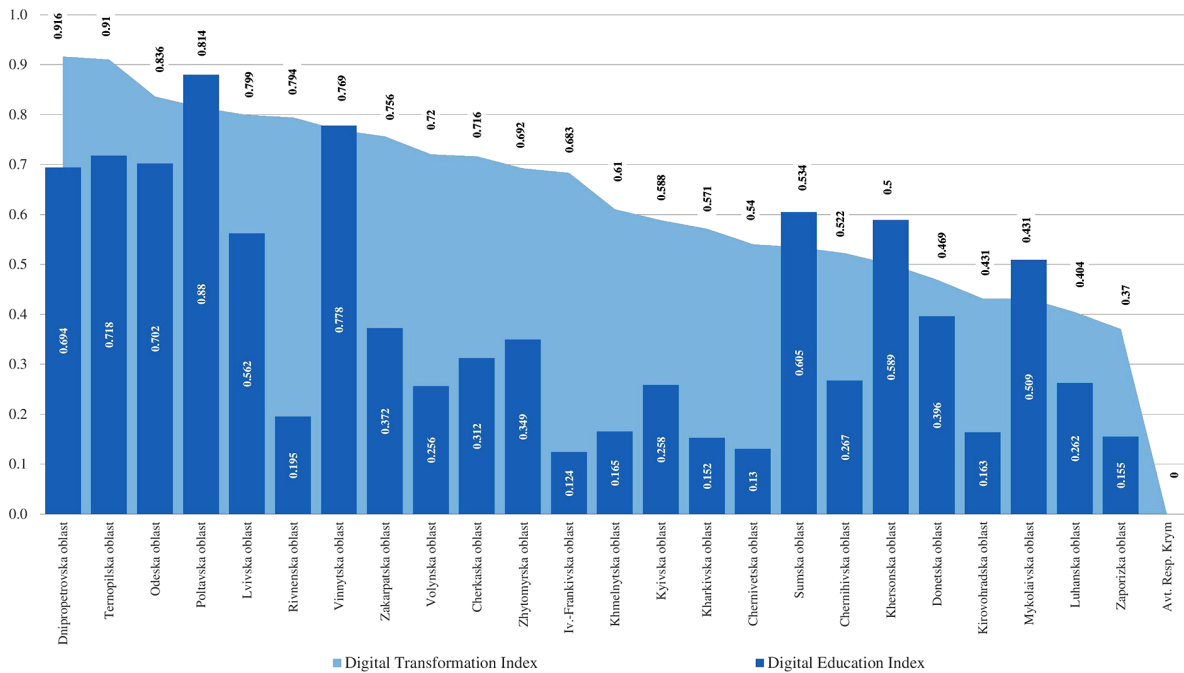


Fig. 2. Comparative analysis of the level of digitization across the regions of Ukraine and the level of digital education in these regions in 2022 [9]

this sphere with the primary goal of equalizing the average indicator of the digital transformation index. Only on the basis of the national level of this indicator not lower than 0.75 will it be possible to effectively implement further transformations of the domestic economy on its way to digitalization.

The digital education index in Ukraine also shows a very high asymmetry across regions in terms of implementation of digital education and its generally low level. Moreover, we observe a situation in which regions with a high level of digital transformations have a rather low level of digital education among the population. This situation is evidence of the lack of a correlation between the digitization level and population's abilities to implement available digital opportunities. For instance, Dnipropetrovska oblast, which is a leader in the digitization level, is only in the fifth place in the country in terms of the digital education level. This means that the entire burden of adapting to digital technology is carried either by the population or employers who want to improve their businesses. At the same time, many modern employers are reluctant to hire professionals with no or a low level of digital competence. Therefore, the way out of such a situation should be comprehensive: more actively popularize digital education at schools and universities, and most importantly, educate working adults in order to reach the necessary level of digital competences. Moreover, the number of regions with a low level of digital education (index less than 0.2) is, in our opinion, unacceptable in our time, even during the war.

If we look at the world experience of implementing digital technology in the real economy, it is obvious that in most countries such development was carried out on the basis of officially approved documents, usually in the form of strategies. For example, the United States of America started the digitalization process back in 1991 as part of the implementation of the Information Superhighway, which was later transformed into the National Broadband Plan (National Broadband Plan, 2010), the Agenda for the Digital Economy of the USA (Digital Economy Agenda, 2015). In 2005, the European Union started the implementation of the Digital Divide in Europe, designed for 5 years, and today it operates within A Digital Agenda for Europe 2020 [10].

As part of its digital strategy implementation, the European Commission has developed the Digital Economy and Society

Index (DESI), which compares the level of digitization of each member state and tracks the progress achieved by the EU member states in the field of digital technology. According to the report released in 2022, the EU member states made progress in their digitalization efforts during the Covid pandemic, but they are still struggling to close gaps in digital skills, digital transformation and the deployment of advanced 5G networks. Charitable foundation 'Resilience and Recovery', which provides around €127 billion for digital reforms, offers an unprecedented opportunity to accelerate the digital transformation that the EU and its Member States cannot miss [11]. There is no doubt that such investments in digitalization development of Ukraine's economy are somewhat unrealistic, at the same time, our country is ahead of most European countries in certain areas of digital services implementation and the use of digital technology. It became especially noticeable in the first year of the war when a large number of refugees from Ukraine fled to European countries and had the opportunity to compare the real level of digitization while meeting basic social needs.

In 2022, two basic laws The Digital Services Act (DSA) and The Digital Markets Act (DMA) were made in the European Union. These two laws form a single set of rules applicable across the EU. Their main goals are: 1) to create a safer digital space in which the basic rights of all users of digital services are protected; 2) to create a level playing field to promote innovation, growth and competitiveness both in the single European market and around the world. On 25 April 2023, the European Commission took the first decisions to identify under the Digital Services Act (DSA) 17 Very Large Online Platforms (VLOPs) and 2 Very Large Online Search Engines (VLOSEs) that reach at least 45 million monthly active users. As a result of this designation, these companies have four months to comply with a full set of new obligations under DSA which aim to empower and protect online users, including minors, by requiring designated services to assess and mitigate their systemic risks and provide reliable content moderation tools. Thus, a certain digital culture and protection of users of digital services is being formed in Europe. Unfortunately, such institutional foundations for formation and consumption of digital services are not yet available in Ukraine.

It is undeniable that the success of digitalization of economy directly depends on the level of digital literacy of popula-



tion and their involvement in the digital space. Today, the method that involves the definition of four spheres of digital competences is used to study the level of digital literacy of Ukraine's population [12]:

1. Information skills deal with determining the level of skills in searching, analyzing and transmitting relevant information in the digital environment.

2. Communication skills – the ability to interact using digital technology, in particular e-mail, Skype, Messenger, WhatsApp, Facetime, Viber, Facebook, Twitter, Instagram, etc.

3. Problem solving skills involve the validity of digital needs and the ability to make reasonable decisions using appropriate digital tools.

4. Software skills for content manipulation require the ability to create new digital content.

The method mentioned above also provides the segmentation of population according to the level of digital literacy into the following groups:

- the level 'No skills' is characteristic of those who completely lack relevant digital skills as well as those who have not used digital tools for three months;

- the level 'Low skills' implies the absence of digital skills in at least one of the four listed competence areas;

- the basic level 'Basic skills' implies that a citizen has a basic (not "below average") level of digital competences;

- the level 'Above basic skills' means that a citizen can apply digital skills at the "above average" level.

The results of the level of digital literacy development of Ukraine's population across the regions of the country are presented in Table 1.

Table 1

Level of digital literacy of Ukraine's population in 2019 and 2021\*, %

Indicator of digital literacy development	General indicator**		Information skills***		Communication skills***		Problem solving skills***		Software skills for content manipulation***	
	2019	2021	2019	2021	2019	2021	2019	2021	2019	2021
Western regions (Ternopilska, Lvivska, Rivnenska, Zakarpatska, Ivano-Frankivska, Chernivetska, Volynska oblasts)										
Above basic skills	32.6	28.4	73.6	77.0	75.7	79.4	57.2	50.3	29.3	36.2
Basic skills	19.6	24.2	7.1	8.7	5.0	5.7	21.4	28.9	18.3	15.7
Low skills	36.6	43.6								
No skills	11.2	3.7	19.3	14.3	19.3	14.9	21.4	20.8	52.4	48.1
Central regions (Vinnytska, Poltavska, Cherkaska, Khmelnytska, Kirovohradska oblasts)										
Above basic skills	29.3	30.5	71.2	69.5	69.1	74.5	54.7	52.5	31.4	42.6
Basic skills	18.6	24.7	4.2	3.6	5.1	4.9	17.8	22.8	17.8	21.1
Low skills	30.9	32.3								
No skills	21.2	12.6	25.8	20.6	25.8	20.6	27.5	24.7	50.8	36.6
Northern regions (Zhytomyrska, Kyivska, Sumska, Chernihivska oblasts)										
Above basic skills	28.3	33.9	70.9	85.2	70.9	81.3	57.0	60.8	20.9	37.6
Basic skills	23.8	18.9	3.7	3.2	2.4	5.8	24.3	26.6	25.2	16.1
Low skills	33.4	38.2								
No skills	14.4	8.9	17.4	12.9	17.6	12.6	18.7	12.7	47.6	46.3
Southern regions (Odeska, Khersonska, Mykolaivska oblasts)										
Above basic skills	23.2	27.7	81.5	76.1	84.8	78.4	48.3	54.9	25.6	31.9
Basic skills	12.8	22.5	6.2	4.7	2.8	4.7	36.0	25.8	10.4	22.1
Low skills	55.0	36.2								
No skills	9.0	13.6	12.3	19.2	12.3	16.9	15.6	19.2	64.0	46.0
Eastern regions (Dnipropetrovska, Kharkivska, Donetsk, Luhanska, Zaporizka oblasts)										
Above basic skills	23.5	33.9	70.4	81.5	70.4	79.9	56.7	59.4	27.6	36.1
Basic skills	23.7	18.9	10.9	3.9	9.9	4.7	9.9	4.7	21.1	17.4
Low skills	37.4	35.9								
No skills	15.3	11.4	18.7	14.6	19.7	15.4	19.7	15.4	51.3	46.5
Avtonomna Respublika Krym										
Above basic skills	–	–	–	–	–	–	–	–	–	–
Basic skills	–	–	–	–	–	–	–	–	–	–
Low skills	–	–								
No skills	–	–	–	–	–	–	–	–	–	–

\* The table was compiled by the author on the basis of a nationwide survey [12]

\*\* Calculated according to the digital skills assessment methodology used by the European Commission

\*\*\* The results were obtained during a nationwide survey

The indicators shown in the table testify to certain positive dynamics in the digital literacy development of Ukrainian citizens. In 2019, about half of the population had the indicator of the basic level of digital technology, then in 2021 this share increased by 5.2 %, and the share of Ukrainians with no digital competences (No skills) decreased by 4 % or by 1.09 million people [12]. Analyzing the components of digital skills, it is obvious that since 2019 communication and information skills have remained more developed, the level of which is higher than the level of basic skills. In our opinion, problem solving skills and software skills for content manipulation remain insufficiently developed. At the same time, there is an asymmetry in the level of digital literacy in the regions of Ukraine in terms of the digital competences mentioned above, which is another confirmation of the need to develop and implement an appropriate policy at the national level.

According to the results of a national survey conducted in 2021, it became clear that the share of people in Ukraine who have access to the Internet reached 92 %, which is a rather high indicator, even by the standards of leading European countries. At the same time, the level of involvement of the population in digital services remains quite low, especially in rural areas. For example, the survey showed that more than half of Ukrainians (52 %) tried using digital tools for the first time only during the COVID-19 pandemic, the leading ones among which were online shopping, news on the Internet, and remote work [12].

The age structure of the population and level of digital literacy are indicative within our research. Undoubtedly, the younger generation is more adapted to digital technology, but they are not fully economically active participants in the market, although they form the basis for the further formation of a digital economy. Fig. 3 shows the age segmentation of Ukraine's population by the level of digital competences. This segmentation clearly demonstrates the fact that today a large part (more than 50 %) of a working population has a low level of digital competences. At the same time, the share of the population with a basic level of competences in almost all working age groups remains almost unchanged – at the level of 21 %.

This situation indicates the impossibility of fully involving the majority of the country's working age population in digital services and business due to the lack of elementary skills of working with modern information technologies, software products, etc. This, in turn, leads to a decrease in labor efficiency, the lack of effective communications while working, the impossibility of introducing the latest information products, and, most importantly, the need for personnel development specifically in the direction of mastering digital compe-

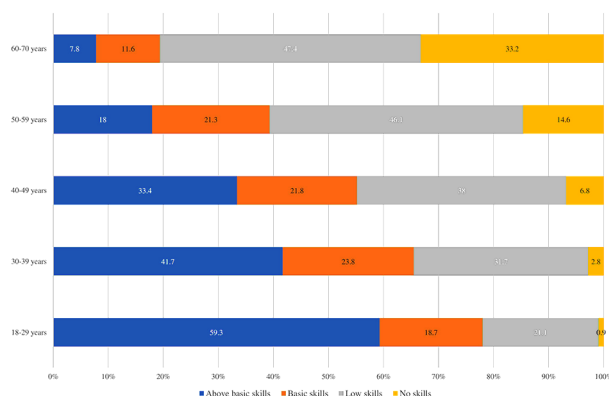


Fig. 3. Age segmentation of Ukraine's population by the level of digital literacy [12]

tences. Therefore, the most urgent task for the domestic economy and Ukrainian entrepreneurs is training and development of personnel who will be ready for working effectively under digital economy conditions.

The age segmentation in terms of each of the four groups of competences is considered (Table 2).

Clearly, there is a disparity between the level of information and communication skills and problem solving skills along with software skills for content manipulation. Such an asymmetry will require a differentiated approach to personnel development, depending on age and tasks performed. However, the low level of software skills for content manipulation does not allow us to become an active participant in the digital economy in terms of creating digital products. Therefore, we will remain mainly consumers of digital products, which is an analogy with the commodity type of a traditional economy.

If we compare the level of digital literacy of Ukraine's population and the countries of the European Union (Fig. 4), it is obvious that the level of digital literacy in Ukraine corresponds to general European trends and is even higher than in some European countries (Romania, Bulgaria, Poland, Italy, etc.).

A national feature of the level of digital literacy is that in Ukraine there is a clear division between high and low levels of proficiency in digital technology, while in most European countries this gap is somewhat indistinct. Compared to all EU countries, the levels of "Low skills" and "No skills" are quite high that need to be further reduced.

In such a situation of the development of digital literacy, a number of businesses and enterprises, where there are employ-

Table 2

The level of digital literacy according to groups of digital competences and the age structure of Ukraine's population in 2021, % [12]

Group of digital competences	Level of proficiency	Age group				
		18–29	30–39	40–49	50–59	60–70
Information Skills	Above basic skills	93.4	89.7	86.2	74.1	48.6
	Basic skills	2.4	3.9	4.5	5.2	9.8
	No skills	4.2	6.4	9.3	20.7	41.6
Communication skills	Above basic skills	93.4	92.2	85.8	70.1	50.9
	Basic skills	2.1	3.2	2.0	9.5	8.1
	No skills	4.5	4.6	10.2	20.4	41.0
Problem solving skills	Above basic skills	80.1	68.1	65.2	43.3	19.1
	Basic skills	16.0	26.4	24.6	33.2	33.5
	No skills	3.9	5.5	10.2	23.5	47.4
Software skills for content manipulation	Above basic skills	65.3	45.2	37.7	22.9	10.7
	Basic skills	16.0	21.8	19.2	19.5	10.7
	No skills	18.7	33.0	43.1	57.6	78.6

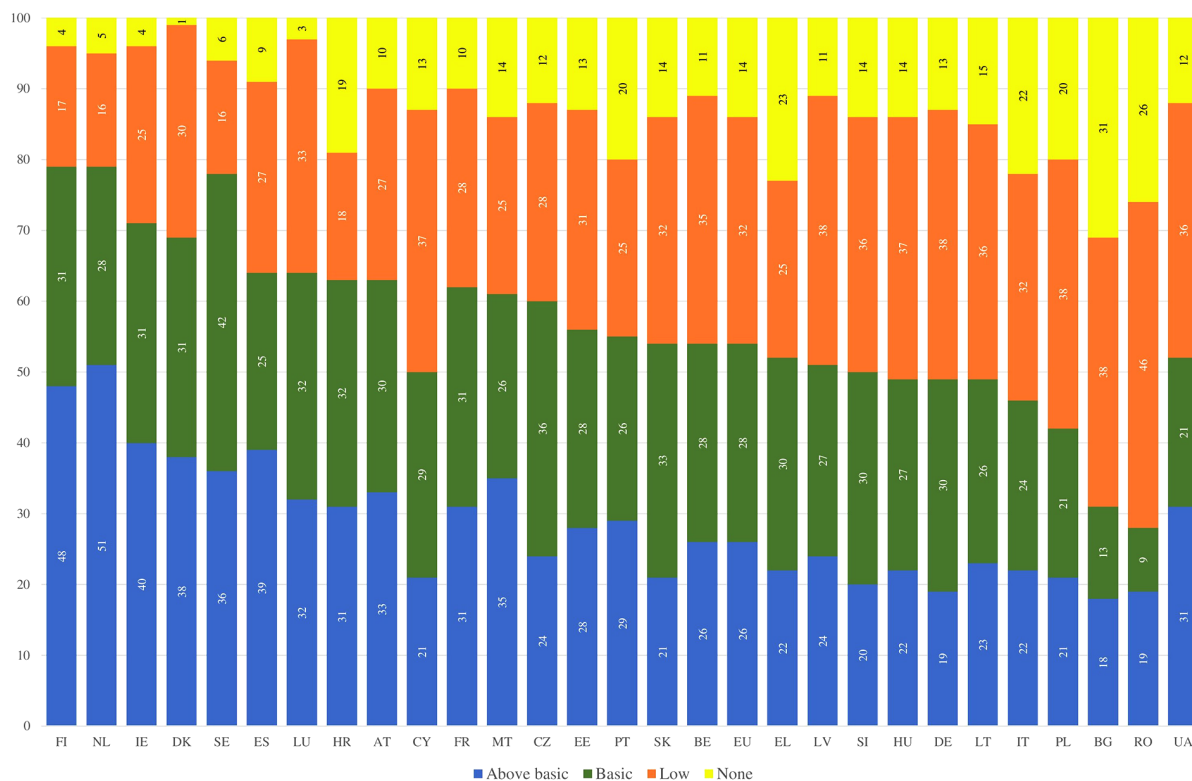


Fig. 4. Comparative analysis of the level of digital literacy in EU countries and Ukraine in 2022, % [11, 12]

ees of different age groups, when implementing various digital products and technologies, may face the problem of the need for different programs for developing digital skills for each group separately. As a result, it is necessary to carry out a current assessment of the digital literacy of personnel and its constant monitoring. In our opinion, the presence of digital competences at a level no lower than “Basic skills” should become a mandatory qualification requirement for modern personnel, and this level should be determined not by the employer but by the state. It means that the state must have a minimum standard of digital literacy in order to hold certain positions that require digital interaction. At the same time, the level of such skills must be constantly improved.

Ukraine is experiencing the situation in which a large share of working age population (more than 50 %), despite the low level of digital skills, does not show a desire to improve them. Therefore, managers face the task not only of organizing the learning process itself, but also of encouraging and providing incentives for personnel development to acquire digital skills. It should be noted that the influence of digital competences on citizens in European countries is much stronger. Taking this into account, in 2018 the Framework Program of updated key competences for lifelong learning was adopted, in which digital competence is recognized as one of the eight key ones that are mandatory and necessary for a full life and activity in the European Union [13].

Ukraine is also moving forward on the path towards digital education, digital literacy and digital competences, but still, it is only at the level of development of separate concepts. In 2018, the Concept of development of the digital economy was approved, which is supposed to provide opportunities for the development of digital competences that are the result of the formation of human capital, namely knowledge, talents, skills and abilities, experience and intelligence.

Such competences would accelerate the transition to the full implementation of the digital economy. As noted in the document, the state guaranteed that favorable conditions are created for obtaining relevant digital skills, creating digital jobs, engaging citizens in the digital economy, etc. [8]. Unfortunately,

the state failed to create an institutional environment to activate the launch of population’s acquisition of digital competences. However, in 2020–2021, the COVID-19 pandemic showed that the functioning of the economy is possible in a partially virtual format, but many enterprises and workers were simply not ready for this. The war and numerous destructions of industries and territories force us to look for new innovative approaches to the restoration of activities. And such approaches should already be based on the implementation of digital solutions, and that is why it is necessary to train the appropriate personnel.

Moreover, the concept envisaged creation of digital jobs. A digital workplace requires not only the reproduction of its virtual equivalent, but also appropriate interaction skills of personnel in the digital environment [8]. The digital economy no longer needs jobs to be tied to the physical location of direct production. Such virtual workplaces provide greater flexibility for staff and the opportunity to work directly from home, free up time to commute, increase time for rest, etc. At the same time, the introduction of digital workplaces also involves a change in the methods for monitoring employees’ activities, since there is some decentralization of management functions and an increase in the level of awareness and responsibility of employees themselves. As a result, there is a need to introduce certain standards of digital workplaces and creation of a flexible working environment. The advantages of digital workplaces are cost reductions on appropriate hardware, since in most cases personnel can use their own digital devices, business trips, renting and maintaining office premises, etc. At the same time, employees are bearing an informational and psychological burden of work in a new environment more and more. Consequently, their active preparation for new working conditions and further development at workplaces are the key to a company’s success.

One of the reasons for the impossibility to implement the concept adopted in 2018 was precisely the fact that the majority of Ukraine’s population had the low level of digital competences, therefore in 2021 the Cabinet of Ministers of Ukraine developed and approved a new Concept, which aims to devel-

op the digital competences of all population. The new concept should be implemented by 2025, but the war may become a significant obstacle on this path. The main goal of the Concept is to determine the priority areas and main tasks for development of digital skills and digital competences as well as to increase the level of digital literacy among working age population. The main ways of development of digital competences of citizens are:

- receiving a basic digital education;
- continuous development of digital competences during life;
- creation of the Unified state web portal of digital education “Diia. Digital education”;
- active use of digital communication channels [14].

To date, the Ministry of Digital Transformation has developed 30 digital competences, which can be conventionally divided into six groups: 1) basic computer literacy; 2) information literacy; 3) processing and creation of digital data; 4) digital communication; 5) digital security; 6) digital learning [14]. The level of proficiency of the competences mentioned above is proposed to be achieved according to 3 main levels and 6 sub-levels, which are presented in Table 3.

Today, the portal “Diia. Digital education” gives every citizen the opportunity to take a test ‘Digigram’ to determine the level of digital literacy and receive an electronic certificate. At present, the Beta version of Digigram has 90 questions. In May 2023, according to the data provided by the Unified State Web Portal of Digital Education, 877,524 people passed the test [14]. However, it should be stated that Digigram is optional, and the certificates issued are not equivalent to state education documents confirming the level of digital competences, and are not taken into account by employers in the process of hiring.

In our opinion, the basic elements of digital literacy should be formed in the process of getting secondary education and further developed at universities. Employers who are also interested in increasing digital literacy of their employees, both existing and potential ones, should be engaged. However, employers’ interests are quite narrow and are based on the realization of their own interests. Despite this fact, employers should also be involved in creating the prerequisites for increasing digital knowledge of their employees.

One of the possible mechanisms for increasing digital literacy is the acquisition of digital competences by citizens through adult education. Under the provisions of Article 18 of the Law of Ukraine “On Education”, adult education is a component of lifelong education, which envisages the possibility of continuous learning taking into account a citizen’s personal needs and social needs of the economy as a whole [15]. Despite the importance of adult education in the transition to the digital economy, this issue remains unregulated by

law. Therefore, the state does not have adult education standards, goals, necessary competences, forms of its acquisition, or assessment criteria. Unfortunately, the issue of acquiring digital education and digital competences has not been reflected in various bills under consideration by the Verkhovna Rada of Ukraine. In our opinion, such an omission is unacceptable as it is necessary to first provide adults with the opportunity to get digital education, on the basis of which the remaining components of adult education can be implemented for further adaptation in the digital economy.

The formation of the digital economy is accompanied by creation of a large number of information products, which requires working citizens to acquire competences in the field of OpenData and analysis of BigData. The lack of such competences for working with data makes it impossible for employees to be included in more effective integration into the digital economy. Although there are different frameworks of digital competences and information technology, until recently Data Science and Data Analytics were not previously defined as necessary and basic for modern business. However, from the experience of leading companies fully immersed in the digital world, the development of companies without such skills is simply impossible. Moreover, the range of specialists with such competences is constantly expanding. Thus, basic Data Science and Data Analytic skills are a prerequisite for personnel working in the digital economy. The level of competence in working with open and big data can be divided into three groups: junior (initial, basic), intermediate (above basic) and senior (high level). For each individual position in the company, it is necessary to determine the required level of competences, based on the specifics of a company’s activities. In our opinion, the initial basic level should be a mandatory criterion for personnel selection.

It is obvious that employees carry the burden of acquiring digital competences themselves. Despite the lack of legislative regulation of this issue, the market offers a number of different ways of employee adaptation, in particular coaching, trainings, E-learning, case studies, self-study, secondment, in-basket test, business games, interactive methods (chat bots, virtual reality, online games and other interesting forms), mobile learning, learning using social networks, gamification, microlearning, etc.

**Conclusions and recommendations for further research.** The study shows that despite a wide range of methods and tools for personnel development in the digital economy, the scope of their use is somewhat limited. Such limitations are due to the asymmetric development of digitalization in Ukraine and the low level of digital literacy, especially among working age population. Ensuring sustainable personnel development in a digital economy must be carried out, first of all, through the development and implementation of standards of digital competences and corresponding system of their measurement. The development of relevant standards must be carried out at the state level, taking into account existing European approaches to solving this issue.

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Table 3

Assessment of the level of digital competences

Level		Skill description
Basic	A1	Solving simple tasks under a mentor
	A2	Solving simple tasks independently, if necessary with a supervisor
Intermediate	B1	Independent performance of standard and clearly defined tasks
	B2	Solving non-standard tasks independently based on one’s own interests and needs
Senior	C1	Independent performance of tasks of various complexity and coordination and management of the work of other users of digital services
	C2	Solving complex tasks with a limited range of possible solutions, transferring existing skills to other users and managing other users



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## Розвиток персоналу в умовах цифрової економіки

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**Мета.** Удосконалення організаційно-методичних і практичних підходів до комплексної оцінки системи розвитку персоналу в умовах цифрової економіки, що забез-

печить формування підґрунтя для подальшої розробки конкретних механізмів та інструментів розвитку персоналу залежно від рівня такого розвитку.

**Методика.** Для досягнення поставленої мети було застосовано цілий комплекс як загальнонаукових, так і спеціальних методів наукового пізнання, а саме: абстрактно-логічний; індукції й дедукції – для вивчення та узагальнення існуючих теоретико-методичних основ функціонування й розвитку персоналу в умовах цифрової економіки; узагальнення, порівняння, індексний метод – для дослідження рівня розвитку цифрових трансформацій і цифрової освіти персоналу в Україні; графічний метод – для представлення результатів дослідження.

**Результати.** У ході вивчення теоретико-методичних основ функціонування й розвитку персоналу в умовах цифрової економіки було з'ясовано, що попри невідворотність переходу до цифрової економіки та важливості підготовки персоналу до роботи в нових умовах, фундаментальні та аналітичні дослідження фактично відсутні. Існуючі дослідження лише фокусують свою увагу на важливості процесів цифрових трансформацій і необхідності розвитку персоналу, однак конкретних механізмів не пропонується. У роботі запропонована спроба здійснення оцінки рівня розвитку персоналу, виходячи із розроблених в Україні та Європейському Союзі методик, виконано аналіз рівня цифрових трансформацій і рівня розвитку цифрової освіти в розрізі регіонів України, проведено порівняльний аналіз рівня цифрової грамотності персоналу України в розрізі основних вікових груп, а також із відповідними показниками у країнах Європейського Союзу.

**Наукова новизна.** Отримані у ході дослідження результати раніше не виділялися вітчизняними вченими та формують комплексну систему оцінки розвитку персоналу у цифровій економіці, що дасть змогу в подальшому використовувати їх для застосування тих чи інших інструментів набуття цифрових компетентностей персоналом, виходячи із виявленого рівня.

**Практична значимість.** Отримані результати дослідження можуть бути використані як державними органами в частині формування державної політики щодо впровадження цифрової економіки та з питань державної політики щодо формування цифрової грамотності населення, так і суб'єктами господарювання у процесі відбору й розвитку свого персоналу

**Ключові слова:** цифрова економіка, розвиток персоналу, цифрові компетентності, цифрова освіта

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