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Anatolii Rumiantsev
D.Sc. in Economics, Professor, Department of International Economic Relations and Business, National Aviation University, Kyiv, Ukraine;
ORCID: 0000-0002-7531-654X

Lesya Pobochenko
Candidate of Economic Sciences, Associate Professor of Department of International Economic Relations and Business, National Aviation University, Kyiv, Ukraine;
e-mail: lesya.pobochenko50@gmail.com
ORCID: 0000-0002-3094-6417
(Corrosponding author)

Zoia Pichkurova
Candidate of Economic Sciences, Associate Professor of Department of International Economic Relations and Business, National Aviation University, Kyiv, Ukraine;
ORCID: 0000-0002-6561-8413

Tatiana Tolpezhnikova
Candidate of Economic Sciences, Associate Professor of Department of Management, Mariupol State University, Ukraine;
ORCID: 0000-0001-7404-5912

Tatiana Kovbych
PhD Student of the Department of International Economic Relations and Business, National aviation university, Kyiv, Ukraine;
ORCID: 0000-0001-8543-9386

Dmytro Lyashov
Candidate of Economic Sciences, Department of International Economic Relations and Business, National Aviation University, Kyiv, Ukraine;
ORCID: 0000-0001-6712-6562

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THE IMPACT OF GLOBAL DIGITALIZATION ON THE UKRAINIAN LABOR MARKET DEVELOPMENT

ABSTRACT

The article examines the labor market of Ukraine (LMU) as a systemic formation. The features of its development in the conditions of its global distribution and intensive use of digital technologies in the world economy are determined. It was substantiated the expediency of taking into account such modern trends in the development of the world, regional and domestic labor market as: a) the digitalization transformation of regional labor markets takes place, especially the European Union, b) on the global, regional and national labor markets level is the untimely legal, institutional and financial response to the adoption of appropriate measures, aimed at supporting and accelering at the implementation of innovative changes in the working conditions of highly qualified specialists, c) in Ukraine there is a decrease in the education costs effectiveness, which is concretely manifested in the training of a significant mass of insufficiently qualified specialists who cannot meet the existing demand on the national labor market, and especially their level of training does not meet world standards, d) the domestic market mechanism inability to promptly respond to the needs to improve the workforce quality in the context of new digital and technical skills of employees, e) in the conditions of the Russian Federation aggression against Ukraine, an essential feature of the domestic labor market development is a significant outflow of qualified specialists outside the borders of our country.

The proposed economic-mathematical model for calculating the synthetic index of digitalization of the LMU. The calculation of the segmental index of digitalization of the LMU in its industry sector was carried out. The innovative component of LMU digitalization is analyzed, in particular, the employment and activity of technology parks, enterprises in the innovative and technical IT sphere, and IT clusters. Conclusions are presented regarding the state and prospects of optimal use of the global digitalization influence on the development of LMU.

Keywords: globalization, digitalization, labor force, Ukrainian labor market, synthetic Digitalization Index of LMU, technology parks, IT clusters

JEL Classification: F22, J21, J23, L86

INTRODUCTION

The transition of the world community countries to the post-industrial society formation is marked by the widespread digital technologies usage in all branches of material production and the sphere of services. This process leads to the creation of a new scientific and technical basis for the modernization of workplaces and determines the need for the training of highly qualified personnel capable of ensuring the rational use of digital technologies, in particular in the IT segment of the global labor market, including within the domestic economy. The main goal of the digital technologies implementation in practice, both in the world and in our country, is undoubtedly the creation of conditions for increasing the economic efficiency level of the business entities functioning of various ownership forms, ensuring the strengthening of their and the state's international competitiveness and improving the welfare of the population. Therefore, the study of ways to harmoniously use the world's digitalization achievements within national borders, primarily at LMU, is relevant and should be considered a priority direction for

domestic economic growth. Among the main aspects of the study of the global digitalization impact on the LMU, it is necessary to include the analysis of meaningful features, directions of global digitalization, prerequisites for their implementation to the structural links of the LMU system, substantiation of specific features, possibilities of introducing digital technologies at the LMU, the use of economic and mathematical methods, the definition of a synthetic index of LMU digitalization, substantiation of prospective guidelines for the digitalization development of the LMU.

LITERATURE REVIEW

The problem of researching the peculiarities of the development of globalization, world, regional, and national labor markets, and the specifics of using the global advantages of digitization, including at RPU, is devoted to enough scientific works in domestic and foreign economic literature. A significant contribution to the development of this scientific problem was made by Adams J. and Richard H., Belorus O., Bliznyuk V., and Yuryk Y., Brych V. and Olyvko, O., Vavryshchuk N., Vidyakina M., Gayuduky A., Druzhynina V., Karpenko O. ., Libanova, E., Lukyanenko, D., McKenzie, D., and Marshall, R., Mora, J., Mospan, N., Okunska, K., Osterhammel, J., and Peterson, N., Petyukh, V., Taylor, D., and Martin, P. ., Rybchuk A., Stakanov R., Stupnytskyi O., Tul S., Fedunchyk L., Filipenko A., Friedman T. and others. [1-27]. Among the main provisions of the scientific works of these authors, first of all, it is possible to highlight: a) analysis of essential features, driving forces, prerequisites, and contradictions of the development of globalization processes, including in the direction of digitalization of international, regional and national labor markets; b) peculiarities of intellectual international labor migration; c) specifics of migration capital of Ukraine; d) the human dimension of the global economy; e) RPU regulation mechanisms, etc. However, highlighting the problem of the impact of global digitalization on the RPU in modern conditions, in particular, during the aggression of the russian federation against Ukraine, requires additional research. First of all, there is an urgent need to develop science-based measures aimed at accelerated and optimal use of digital technologies at police station. The following statements of scientists are of particular importance for the study of theoretical issues in the article. First of all, it is about the content of the labor market as an economic category. According to Petyukh V., the labor market is a socio-economic category that characterizes the relations of people, which are manifested in the process of hiring, evaluating, firing employees, and determining the amount of compensation for the labor force used, depending on a number of factors. The labor market is an institution of interaction between consumers of labor, that is, employers (legal entities and individuals on the one hand, and specific individuals who have certain physical and mental abilities, certain professional knowledge, skills and abilities - on the other, V. Petyukha believes [18]. Brych V. and Olyvko, O. claim that the labor market is a system of labor relations that reflects the level of social development and the balance of interests achieved for the current period between subjects participating in the labor market: employers, employees, the state, trade unions and intermediaries [4]. Druzhynina V. interprets the labor market as a system of social relations, institutions, and social norms ensuring generally accepted rights and freedoms of the individual, the exchange of labor for remuneration, which is determined by demand and supply on the market [6]. Mospan N. examines the "labor market" as a system of social relations related to the purchase and sale of the commodity "labor power". The labor market, in her opinion, is a system of relations between the employer and the able-bodied population on the conclusion of labor contracts regarding the quantity, conditions, and payment of labor. The peculiarity of the labor market, in her opinion, is that it covers not only the sphere of circulation of goods "labor", but also the sphere of production, where an employee works [15]. Fedunchyk L. considers the labor market as an element of the economic system that ensures the distribution of remuneration for work [25]. Stakanov R. points out that in the labor market employers hire workers who, in fact, produce goods and services sold by entrepreneurs on commodity markets and bring them profit [7].

The generalization of the above scientific approaches to the disclosure of the content of the labor market as an "economic category" provides grounds for its systematic definition. First, the labor market is a complex socio-economic system reflecting the commodity-monetary relations of employees and employers regarding the purchase and sale of labor directly or indirectly through intermediaries that reflect the welfare of the population and the economic development of the country. In the context of this definition, we note that digitalization has contributed to the emergence of new intermediaries between the employee and the employer - digital job search platforms and labor resources, which have contributed to the flexibility of the labor market. Secondly, the main objective prerequisite for the formation of the labor market should be considered the labor market, which specifies the directions of the formation and functioning of the labor market, in particular at the global, regional, and national levels of its functioning. Thirdly, a meaningful component should be considered that the labor market covers all phases of the production process, from its scientific and technological, informational, and digital provision, to operations in the sphere of exchange of goods and services that are the result of hired labor. Fourthly, it is necessary to point out such a feature of the labor market as the fact that the labor of hired workers is exchanged on it for remuneration, that is, wages. Fifth, the components of the labor market should include the management activities of

employers, which bring to a logical conclusion, the realization of tangible and intangible products produced by hired workers.

PURPOSE AND TASKS

The purpose of the article is to study the directions of global digitalization's influence on the development of LMU. Its specific tasks are the analysis of the LMU as a system entity, the definition of its main structural elements, the study of the digitalization level of the latter, the proposal of an economic-mathematical method for calculating the synthetic index of LMU digitalization, the justification of promising forms of digital technologies optimal application at the LMU.

METHODOLOGY

When conducting a study of the impact of global digitalization on the RPU, the following scientific methods were used: 1. system-structural and system-functional methods for identifying and analyzing the main components of the RPU system and their functional orientation; 2. method of comparison in the study of statistical indicators of RPU development within the defined time period; 3. methods of extrapolation, variants when justifying the priority areas of digitization of the RPU in the IT sphere; 4. economic-mathematical method for calculating the synthetic and segmental index of digitization of the RPU. The content of the calculation of the specified synthetic index is as follows. All calculations of specific directions of digitization of the RPU are carried out using the multidimensional average method, which allows ranking objects by dividing them into groups. Each calculated group of indicators is ranked by the highest indicator in each group, respectively, by year. After that, in order to determine the specific statistical value of the digitalization of a certain component of the labor market according to each group of indicators, it is necessary to take the highest share as a basis, in our case this is the industry group, and to separate from it the number of employees most covered by digitalization in the relevant sectors of the economy for a certain year and divide on the number of such sectors. The calculation of the synthetic index of digitalization of the RPU in the industry sector makes it possible to determine the parameters of the level of digitalization of the labor market and its individual segments, which forms an economic and mathematical justification of the feasibility of formation and development in the further demand for personnel supply. The detailed calculation of the segmental index of digitization of the RPU, which is based on the above-mentioned method of forming the synthetic index, focuses on the need for more complete use of the country's economic potential, the creation of prerequisites for the growth of labor force employment, in each specific branch sector of the RPU.

RESULTS

One of the essential features of the modern stage of civilizational development of mankind is the globalization processes intensification, which covers all social life aspects of the world countries at the national and international level. Among the priority directions of globalization, it is worth highlighting the growth of the spread of the 4th industrial revolution achievements on a planetary scale, the measures of the world community to implement scientifically based norms of environmental greening, the formation of new mechanisms aimed at applying conditions for the rational use of world economic resources, in particular, labor force. In this connection, the study of the problem of introducing optimal principles, forms, methods, tools, and levers for the functioning of national and international production, creating innovative workplaces with the aim of effectively using the intellectual and professional potential of workers acquires special importance. Digitalization of economic life, the global signs of which are also manifested in the process of the labor market development, in general, within the limits of the world economy and integration and national formations, can undoubtedly contribute to the solution of such a task. Therefore, objectively, global digitalization certainly also causes its influence on the transformation (LMU) in the direction of its accelerated transition to a qualitatively higher level of scientific, technological, ecological, and social functioning.

Taking into account global trends, the spread of digitalization in the process of the rather complex current period of LMU development is an important prerequisite and perspective strategic orientation of activity for workers, specialists, highly qualified personnel, educational institutions, representatives of business circles, ministries, departments of our country. The distribution in all spheres of the economy of digital technologies, computer equipment, digital software, and the use of information and communication systems is aimed at and leads to the qualitative reform of the LMU as an integral system formation in the direction of creating modern workplaces, retraining personnel, optimizing and increasing the efficiency of the functioning of all organically related industries and spheres of our country's economy. Characteristic of this period of the system development of the LMU is the growing remote work attractiveness, the corresponding recruitment of highly

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qualified specialists, the implementation of digital training programs, which significantly increases the use of digital tools in all areas of activity, first of all, among the active part of the Ukrainian working population. At the same time, it is necessary to note certain obstacles on the way to the LMU system digitalization, among which there is a certain structural and sectoral disparity between the industries, construction, agriculture, transport, communication, and other service areas, which is determined and is a consequence of the use of planned methods management of the domestic economy in the past.

Among the global digitalisation challenges to the growth of modern, systematic scientific and technological development of LMU, which require mandatory consideration, it is worth noting the need for adequate funding: a) creation of a digital material and technical basis for employees, at least in priority industries that determine scientific and technical progress of our country; b) accelerated proper training and retraining of specialists in the digital technologies field in order to meet the existing demand for them at the LMU; c) raising the digitalisation level of the domestic monetary, currency and banking system to world standards as regulatory instruments of market relations between business entities and at the level of all strata of our population; d) introduction of digital mechanisms for social tension relief - first of all, reducing the number of unemployment, including through the use of various scientific and technical, financial, educational assistance of the world community countries and their involvement in online work.

In order to more fully use the potential and advantages of global digitalization at the LMU, it is advisable to comprehensively take into account international and national features that objectively influence and are inherent in its development. In our opinion, the following should be attributed to them, first of all:

First of all, innovative changes are taking place in the world markets of goods, services, capital, labor, and intellectual property, which are caused by various opportunities for the use of national, regional, international and scientific and technical potential by the countries of the world community. This has led to the aggravation of international competitive relations, in particular in the labor markets of countries receiving highly qualified specialists. Such competition leads to an increase in the efficiency of national production and the creation of conditions for the spread of innovative technologies. At the same time, the unskilled part of the labor force in the countries of the world community replenishes the number of unemployed, whose involvement in modern production requires at least their retraining and mastering of new modern specialties.

Secondly, significant structural shifts between segments of the national and global labor markets towards the emergence of new industries and spheres of production, which are formed on the basis of the 4th industrial revolution achievements usage, are monitored. It is, first of all, about the development of the service sector and, above all, its information and communication technologies.

Thirdly, there is a digital transformation of regional labor markets, especially those that are formed within integration associations, the members of which are highly developed countries, such as the European Union. An important feature of the development, in particular, of the common market of the EU member states, is the involvement of an intellectual foreign workforce in the integration group, especially those specialists who have the skills to work effectively in the field of computer technologies.

Fourthly, there is a decrease in the education costs effectiveness in our country, which finds a concrete manifestation in the training of a significant mass of insufficiently qualified specialists who cannot meet the existing demand in the national labor market, and especially their level of training does not meet world standards.

Fifthly, the inability of the domestic market mechanism in the short term to respond to the needs to improve the workforce quality in the context of the new digital and technical skills of employees.

Sixthly, a characteristic feature of the labor markets functioning at the global, regional and national levels is the untimely legal, institutional and financial response to the adoption of appropriate measures aimed at supporting and accelerating the implementation of innovative changes in the working conditions of highly qualified specialists. It is about proper wages, material and technical support of working conditions at the level of global requirements, creation of a foundation for professional and creative employee development.

Seventhly, in the conditions of the Russian Federation's aggression against Ukraine, a significant feature of the domestic labor market development and its relations with the global and regional, primarily the EU, labor markets is a significant outflow of qualified specialists outside the borders of our country. In particular, since February 2022, more than 7 million people have left Ukraine, among whom a significant number have higher education. The main receiving countries are Poland, where 1,207,650 people moved, Germany – 867,000, the Czech Republic – 388,097, Great Britain - about 91 thousand people and Italy – 141,562, Spain – 130 thousand and Estonia about 50 thousand Ukrainian citizens [34].

Eighthly, the training of new national highly qualified personnel in the field of digitalization has not yet gained sufficient demand among those wishing to obtain, in particular, higher education. This, of course, leads to a significant dissatisfaction with the needs of the relevant digital specialists at the LMU.

Ninthly, increasing the digital level of the LMU system functioning should overcome the uneven provision of specialists in its regional sectors. Here it is worth considering that regional police departments feel the need to implement digital technologies as soon as possible, which will contribute to the growth of the business structure's competitiveness. This is hindered by an insufficient influx of necessary specialists, and failure to solve relevant problems of a material and financial nature.

Tenthly, the restraining factor of LMU digitalization in modern conditions is the decrease in the foreign investment volume in the priority domestic industry sector. So, only in 2022, direct foreign investments in our country decreased by 6.8 billion US dollars [33]. This is mainly due to the war between the russian federation and Ukraine.

The mentioned features of the LMU development, primarily negative, will still exist in the near future. This will have certain braking trends, both for the implementation of the global digitalization development achievements of the world countries at the LMU, and will not contribute to the economic growth of Ukraine. Despite this, it is worth noting the positive developments regarding the digitalization of the LMU, which are characteristic, first of all, of the development of its IT sector. In the process of LMU system digitalization, the IT sector undoubtedly has a leading role. It is characterized by: an increase in jobs, a sufficient level of their filling by qualified specialists, and an increase in the volume of orders, including from foreign companies, which are performed remotely. The attractiveness of employment in the domestic IT sector is evidenced by the following data: thus, according to the Work.ua job search platform in May 2022 [30], the largest rate of posted vacancies falls into the categories: "service sector" 5,841 vacancies, "sales, purchasing» 5,383 and "working specialties, production" 5,113 vacancies. The top five popular categories also include "IT, computers, Internet" with 3,255 vacancies and "administration, middle management" with 3,151 vacancies. Among the main reasons for the growth of the IT sphere in Ukraine are the level of remuneration and flexible working conditions, the possibility of remote employment, and the expansion of activities outside Ukraine, which have a positive effect on the transformational shifts of the LMU. According to the data, as of May, various IT specialists received the highest salaries: Net programmer - UAH 77,000, Java programmer - UAH 60,000, back end programmer - UAH 53,000, full-stack programmer and python programmer - UAH 50,000 [31].

In our opinion, the substantiation of the globalization digitalization impact on the LMU and the optimization of this process involves the use of economic and mathematical methods. For this purpose, it is necessary to determine both the components of the alternative model of LMU development and its main parameters. In particular, to characterize the regional division and structure, to determine the sectoral components of LMU, and professional components of LMU, to consider the demographic, educational, and innovation structure (technology parks, scientific and technological production clusters, IT clusters, the number of employees in innovative sectors, in particular in IT clusters), the social structure of the LMU and the number of employees in social and cultural institutions. Based on qualitative and quantitative economic-mathematical analysis of the characteristics and structure of the LMU, it is possible to determine alternative possibilities for its digitalization at the current stage.

First, it is necessary to take into account the general indicators of the LMU, regarding the economically active population in 2010-2021. Yes, the volume of the workforce and its dynamics, the volume of employed and unemployed. The LMU is characterized by a reduction in the workforce by 3572.5 thousand people in 2010-2021 or 1.65% every year, in particular, the number of people of working age decreased by 2497.2 thousand people or 1.23% every year. The number of the employed population of Ukraine also decreased by 3,570.2 thousand people aged 15-70, by 1.8% every year, while the number of unemployed people aged 15-70 increased by 1.7 thousand or 0.37% every year [32].

Secondly, an important parameter of the regional structure of the LMU is the working-age population analysis by place of settlement and age groups in 2021, which indicates the predominance of employment in cities compared to rural areas in various age groups, except for youth aged 15-24, employment which is higher in rural settlements and amounted to 28.7% in 2021 (correspondingly with a lower unemployment rate of 18.1%) [32].

Thirdly, the rate of population participation in the labor force, the level of employment, and unemployment at the age of 15 and older, which indicates significant regional differentiation, should be considered a characteristic feature of the LMU regional structure in 2020. Thus, the highest level of employment is observed in Dnipropetrovsk, Kyiv, Lviv, Odesa, Kharkiv regions, and the city of Kyiv, which is due to the socio-economic features of these regions, which are key to the attractiveness of specialists in various professions. The average rate of employment in other regions is 3%. At the same time, unemployment is higher in some of these regions: 8% in Dnipropetrovsk region, 5% in Lviv region, 5% in Odesa region, 5% in Kharkiv region, except for Kyiv region - 3% [34].

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Fourthly, an essential constituent element of the LMU is its sectoral structure by types of economic activity and the characteristics of its changes in the period 2012-2020. In general, according to the indicator of the average rate of the industry group, the following sectors of the economy are most employed: agriculture (18%), industry (16%), wholesale and retail trade (22%), and education (9%). A significant rate of those employed in the transport sector, warehousing, postal and courier activities (6%), public administration and defense (6%), health care, and the social sector (6%). During the specified period, there is a tendency to reduce employment in all sectors of the economy. In particular, the highest rates are in the industrial sector (4% every year from 2012-2020), construction (3% every year), financial and insurance activities (5% every year), health care, and social assistance (3% every year) [34].

Fifthly, concerning the sectoral aspect of directions for the implementation of global digitalization at LMU, the ICT sector should be singled out separately. Thus, in 2020, 9% of people aged 15-70 (283.7 thousand people) were employed in the ICT sector of Ukraine, which indicates the importance of digitalization and its impact on the structure of the LMU. More people are employed in the ICT sector than in the construction sector, it is the fourth in terms of population employment after agriculture with a rate of 24% in 2020, an industry with a rate of 21%, and trade with a rate of 33% in 2020 [34].

Sixthly, the features of the professional components of the LMU reflect the dynamics of the employed population by qualification groups and gender in 2010-2021. Among the main trends in 2010-2021: reduction in the number of people employed in various professional groups, except for professionals (annual growth by 0.65%) and skilled workers in agriculture and forestry, fish farming, and fishing (annual growth by 1.77%); significant rates of employment reduction of the following professional groups: technical employees (-2.3% annually); skilled workers with tools (-1.42% every year), workers in the maintenance, operation, and monitoring of the work of technological equipment, assembly of equipment and machines (-2.23% every year), the simplest professions (-4.25% every year). In the structure of the LMU professions, the following prevail: the simplest professions - 20%, professionals - 17%, workers in the field of trade and services - 16%, specialists - 12%, skilled workers with tools - 12%, workers in maintenance, operation, and monitoring of the work of technological equipment, assembly of equipment and machines - 11%, legislators, senior civil servants, leaders, managers (managers) - 8% [33].

Seventhly, it is expedient to consider its inherent educational structure as an important link of LMU concerning its global digitalization. The educational structure of the LMU according to the indicator of the employed population is as follows: the rate of employed people with a full higher education is 33%, with basic higher education - 2%, with an incomplete higher education - 20%, professional and technical - 26%, complete general secondary education - 17%, basic, elementary general secondary or no education - 2%. The educational structure of the LMU according to the indicator of the unemployed population is as follows: the rate of the unemployed with a full higher education is 25%, with a basic higher education - 2%, with an incomplete higher education - 19%, professional and technical - 30%, complete general secondary education - 21%, basic, elementary general secondary education or no education – 3% [34].

Eighthly, it is also worth noting that the employment of the population by the professional group does not correspond to the acquired skills and the specialty in which the employee studied. Therefore, in 2020, 30,400 people in the professional group "legislators, senior civil servants, leaders, managers (managers)" received the diploma of "manager (manager) of enterprises, institutions, organizations" (2%), while 877, 1,000 people have a professional diploma (69%), 204,700 people have a specialist diploma (16%). 48% of qualified workers in agriculture and forestry, fish breeding, and fishing do not have a profession with a diploma. 25% of workers in trade and services, 18% of skilled workers with tools, 21% of workers in maintenance, operation, and control over the work of technological equipment, assembly of equipment and machines also do not have a profession with a diploma. 47% of workers in the simplest professions also do not have a diploma [34].

The given statistical data characterize the systematic development of LMU under the influence of global digitalization. It is about the fact that the quantitative parameters of scales, dynamics, and factual data, which characterize such basic structural links inherent in it as the volume of the workforce, regional division, industry components, professional, demographic, educational, innovative components, and the sphere of information and communication services, must be considered as parties to the integral formation of the LMU.

This provides a basis for their analysis using an economic-mathematical model. Conducting such a study aims to determine the most receptive value of the synthetic parameter of the domestic Ukrainian labor market digitalization with the possibility of its optimal implementation in practice with a concrete justification of measures for the accelerated use of digital technologies in the further development of the LMU. To solve this economic-mathematical task, it is necessary to determine the effectiveness of the specified structural links of the LMU system. At the same time, it is necessary to determine the specific statistical value of the digitalization of the above LMU components. This will be the basis for calculating the corresponding general, synthetic index of the LMU digitalization. Specifically, such a synthetic index of the LMU digitalization is calculated using the multivariate average method, which allows you to rank objects by dividing them into groups.

The synthetic index of the LMU digitalization can be determined by using the following formula, the value of which is a multidimensional average value, as a ratio result of statistical values of the LMU structural elements:

$$SLDMI = \frac{\sum_m^n se_j^i}{n} \quad (1)$$

where $SLDMI$ – synthetic index of the LMU digitalization, the content of which is a multidimensional average value; se_j^i – multivariate average; $\sum_n^m p_{ij} \sum_m^n se_j^i$ – the sum of the LMU structural elements; n – the number of the LMU structural.

After ordering the structural elements se_j^iaccording to the highest indicator in the group, the synthetic Labor Market Digitalisation Index (SLMDI) looks as follows:

$$SLDMI = \frac{\text{VL+RD+IC+PC+DS+ES+IS+ICS}}{8} \quad (2)$$

where VL – the volume of labor; RD – regional division; IC – industry components; PC– professional components; DS – demographic structure; ES – educational structure; IS– innovative structure; ICS – information and communication sphere.

To understand in more detail how the synthetic Labor Market Digitalisation Index works, it is suggested to use its organic component, such as the segmental Digitalisation Index of individual LMU sectors by types of economic activity for a certain period of time. As an example of the application of the segmental index of the individual LMU sector's digitalization, we will use the data on the development of its branch structure by types of economic activity for 2012-2021. The reference indicator for this is the average rate of the industry group most employed in the following sectors of the economy: agricultural sector (18%), industrial sector (16%), wholesale and retail trade (22%), education (educational sector) (9%). A significant rate of those employed in the transport sector, warehousing, postal and courier activities (6%), public administration and defense (6%), health care, and social sector (6%). By analogy with the previous formula, we use the above statistical data to calculate the segmental Index of digitalization of the LMU sectoral structure (SLDMISS):

$$SLDMI = \frac{\text{AS+IS+WRT+ES+TSWPCA+PAD+HCSS}}{7} \quad (3)$$

According to calculations, the value of the segmental index of digitalization of the LMU sectoral structure (SLDMISS) is 11.85%. The numerical value of this Index points to the need for more complete use of the country's economic potential to create the conditions for the growth of the labor force employed in each LMU sector, as a systemic formation, in particular, in the digitalized service sector, which should gain more and more importance in the growth of the country's GDP and, in as a whole, in the domestic digital economic system.

In the context of the priority perception of the global digitalization impact on LMU, it is advisable to analyze its innovative component, which, in particular, is the activity of technology parks, the level of employment of highly qualified specialists in them, the development of IT clusters as leading regional associations of IT enterprises.

Technoparks are zones of economic activity that combine the potential of universities, research structures, industrial enterprises, and subjects of innovative infrastructure at the regional national, and international levels. In recent years, both in Ukraine and throughout the world, technoparks or territorial-production scientific complexes have become the most effective organizational and economic form of integration of science and production among all other innovative structures. According to the Ministry of Education and Culture, only 12 technoparks are officially registered in Ukraine. Their number, and most importantly, the material and financial base do not yet ensure the realization of even the existing intellectual potential and demand for innovative products [35].

The formation of domestic IT clusters, which are engaged in the development of the IT industry in the city, uniting leading companies and partners working in the field of software product development and export outsourcing, can be considered a new direction of accelerated implementation of globalization digitalization at LMU. About 185,000 developers and 4,000 IT companies work in Ukraine, and the technology sector became the country's second export industry in 2018. In addition, 20% of world-leading companies, including Microsoft, Samsung, ABBY, and Huawei, have their offices in Ukraine. According to the Fortune 500 list, more than 100 companies use the services of Ukrainian firms, while 18 outsourcers from Ukraine are among the top 100 best outsourcing companies in the world [36].

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There are 22 IT clusters in Ukraine in such cities as Kyiv, Kharkiv, Lviv, Dnipro, Odesa, Ternopil, Konotop, Sumy, Chernihiv, Cherkasy, Vinnytsia, Lutsk, Mariupol, Zaporizhzhia, Ivano-Frankivsk, Kolomyia, Mykolaiv, Kherson, Khmelnytskyi, Chernivtsi, Severskodonetsk, Zhovti Vody. The five most active IT clusters of Ukraine employ 192,000 specialists, or 89.7% of the total number of people employed in the IT sphere in Ukraine, as shown in Table 1.

Table 1. The number of companies and IT specialists in the Top 5 IT clusters of Ukraine. *(Source: compiled by the authors based on [37])*

The name of the IT Cluster	The number of IT companies employees	Number of IT companies
Kyiv IT Cluster	90.000	58
Kharkiv IT Cluster	45.000	511
Lviv IT Cluster	31.000	511
Dnipro IT Cluster	16.000	378
Odesa IT Cluster [5]	10.000	6
Zaporizhzhia IT Cluster	7.000	-
Vinnytsia IT Cluster	5.000	-
Mykolaiv IT Cluster	4.000	2
Ternopil IT Cluster	3.000	-
Kherson IT Cluster	3.000	16
Total:	214.000	1482

The dynamics of the IT market are evaluated, first of all, by the number of the main asset - personnel. In recent years, this market has been showing steady growth of 10-12% year on year. In fact, this is one of the few areas of the labor market, that, despite the crisis, not only does not shrink but also shows confident growth. In 2015, according to the estimates of the N-iX company, the number of IT specialists in Ukraine was 91,000 people, and the profit was USD 2.7 billion. According to 2018 estimates, the number already reached approximately 154,000, 39,000 of which (25%) work in the largest 25 IT companies: Epam, SoftServe, GlobalLogic, Luxoft, Ciklum, Infopulse, NIX, ELEKS, EVOPLAY, DataArt, etc. According to 2019 data, the country had 184,500 IT specialists, more than 4,000 technology companies, and USD 4.5 billion in exports [38]. By the end of 2019, the number of IT specialists in Ukraine was about 200,000. In 2020, the figure increased to 214,000 specialists [39]. According to GlobalLogic Ukraine, under favorable conditions, the information technology sector can grow to USD 8.4 billion, or 2.3 times, by 2025 [40]. Such rapid growth is easily explained by the perspective, prestige, and dynamism of the IT sphere in Ukraine. There are also some advantages in terms of the work environment, from access to advanced technology to flexible working hours in most offices.

In our opinion, freelancing and outsourcing can be attributed to the main organizational business models in the IT sphere. The use of freelancing within self-employment, and the development of information technologies in Ukraine have led to the spread of remote employment (remote work, telecommuting, freelancing). The majority of Ukrainian freelancers work either in the IT field or in areas related to it. The rate of the Ukrainian freelance market by category had the following distribution: information technologies (Web, Mobile & Software Development) – 83%, design, and creativity – 6%, and other categories (translation, SMM, sales and marketing, engineering, architecture, etc.) – 11% [37].

One of the significant trends of the impact of global digitalization on the LMU is that it is the private sector in our country that shows the greatest interest in digitalization, which proves in favor of the statement that the digitalization of economic activity, the widespread use of information technologies contribute to the growth of labor productivity and the efficiency of entrepreneurial activity. This shows that the field of information technologies in Ukraine is practically based on FOP workers (individual entrepreneurs). Data on the number of registered FOPs became available in April 2016. The rate of individual entrepreneurs in the field of information technologies among other individual entrepreneurs increased from 5% to 7.5%. According to Opendatabot, the number of individual entrepreneurs in the field of information technologies since 2016 increased by 45% (by 40.7 thousand) (although the total number of private entrepreneurs decreased by 8%). Thus, positive dynamics are characteristic only of the information technologies field. In other types of activity, the dynamics are negative. According to Mind24 (regarding the IT Ukraine Association), according to the open data of the register of individual entrepreneurs at the beginning of 2018. 127 thousand programmers were registered. About 90% of them are registered as FOP.

The use of outsourcing as a model of business organization in the IT sector at LMU is characterized by the fact that domestic companies that provide services to foreign firms do not show a significant desire to establish their own, large, high-tech enterprises. It should be noted that outsourcing companies in our country can exist and actively develop even without the institutional capacity of the state and proper infrastructure. The Ukrainian outsourcing services market is developing at a very fast pace. According to various expert estimates, market growth is in the range of 10-25% annually. Outsourcing of business processes is most common, involving the transfer of standardized current operations (for example, handling customer phone calls in specialized call centers, usually located in places with cheaper labor). According to the research conducted in Ukraine, the following are more often outsourced: IT services (40.5%), logistics (35.1%), resource support for production processes (27%), marketing services (21.6%), recruitment (18 .9%), accounting (13.5%), payroll (13.5%), information processing and systematization (8.1%), outsourcing of medical representatives (8.1%), personnel accounting and personnel support (5.4%), administrative functions (2.7%) [37].

It is also worth assessing the current level of LMU digitalization and trends in the use of digital technologies by the main components of the LMU (in particular, professional and industry groups). Table 2 shows the dynamics of the rate of the number of enterprises employing ICT specialists in the total number of enterprises, which demonstrates the LMU digitalization level by industry structure, in particular, reflects the rate of enterprises in each industry with the level of employment of ICT specialists. Among the leaders, there is the ICT sector, where 76.9% of companies employ ICT specialists. The next most attractive employment sector for ICT specialists is information and telecommunications, where 60.5% of all companies have ICT specialists. The field of scientific research and development is also among the most significant in terms of employment: 39.6% of companies have ICT specialists. Enterprises of the processing industry, the supply of electricity, gas, steam, and air conditioning, enterprises in the fields of law and accounting; activities of the main departments (head offices); management consulting; in the fields of architecture and engineering; the spheres of technical testing and research, the spheres of advertising activities and market research, professional, scientific and technical activities, the spheres of administrative and auxiliary services also attract a significant number of ICT personnel.

Table 2. Rate of the number of enterprises employing ICT specialists in the total number of enterprises, 2018-2021, %. *(Source: [37])*

	The rate of the number of enterprises with the most qualified ICT specialists in the total number of enterprises		
	2018	**2019**	**2021**
Total	**22.3**	**21.6**	**21.7**
Processing industry	22.6	21.8	23.2
Electricity, gas, steam, and air-conditioning supply; water supply; sewerage, waste management	23.5	22.2	21.1
Supply of electricity, gas, steam, and air-conditioning	33.4	31.4	28.1
Water supply; sewerage, waste management	17.3	16.5	16.3
Construction	11.2	10.7	10.3
Wholesale and retail trade; repair of motor vehicles and motorcycles	23.9	23.5	23.4
Transport, warehousing, postal, and courier services	17.0	16.7	16.8
Temporary placement and organization of food	14.4	13.6	13.7
Information and telecommunications	58.8	58.8	60.5
Real estate transactions	17.7	17.5	17.7
Professional, scientific, and technical activity	32.0	30.4	31.2
Activities in the fields of law and accounting; activities of the main departments (head offices); consulting on management issues; activities in the areas of architecture and engineering; technical tests and research	31.8	29.0	29.4
Scientific research and development	36.3	38.4	39.6
Advertising and market research; other professional, scientific, and technical activities	30.6	30.7	32.9
Activities in the field of administrative and support services	15.1	14.5	13.5
Repair of computers and communication equipment	47.1	43.3	45.1
Information and communication technologies	68.8	63.7	76.9

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Among the main trends that will be characterized by higher growth rates in the future is the provision of training for employees to develop ICT skills (Table 3). The given data show that the share of the number of enterprises in which the performance of ICT functions was carried out by external service providers was 14.1% of the total number of enterprises. It is possible to note the transformation of the LMU by the indicator of the level of staff qualification and the acquisition of digital skills.

Table 3. Specialists and skills in the field of ICT at enterprises in 2018-2020, %. *(Source: [37])*

	2018	2019	2020
The rate of the number of enterprises that conducted training in the field of ICT, in the total number of enterprises by areas of training, %:			
For IT professionals	3.7	3.8	4.5
For other professionals	4.14	4.3	4.4
The rate of enterprises that hired/tried to hire ICT specialists in the total number of enterprises, %	6.3	6.1	6.4
The rate of enterprises that had vacancies of ICT specialists, which were difficult to fill, in the total number of enterprises, %	2.1	2.1	2.0
The share of enterprises, where the performance of ICT functions was performed by external service providers, in the total number of enterprises, %	14.4	13.8	14.1

The need for the digital skills development of personnel at enterprises operating in various sectors of the economy is due to the active penetration of technologies, which, in particular, is evidenced by the following [31]:

1) growth in the number of enterprises that have access to the Internet: 86.6% of all enterprises of various industries as a whole have access to the Internet in 2021;
2) corresponding increase in the number of employed workers who have access to the Internet: 28% of all employed workers in various sectors of the economy have access to the Internet in 2021;
3) growth in the number of enterprises with a website: in 2021, 35.3% of the total number of enterprises had a website;
4) the need of enterprises of various industries to provide interactive services: in 2021, 31% of companies of various industries carried out a description of goods or services, and information about their prices; 10.4% of firms provided the possibility of ordering or booking online; 9.3% of companies provided the possibility of tracking or checking the status of placed orders; 9.3% of companies implemented personalized content (content) of the website for regular customers; 16.9% of companies provided an electronic link to company profiles in social media;
5) the spread of popularity of cloud computing services (e-mail, office software, enterprise database hosting, file storage, accounting, finance, customer/customer information management application software, computing power to run Software).

DISCUSSION

In the theoretical-methodological and practical aspects, within the provisions considered in this article, in our opinion, it is worth, first of all, to pay attention to the debatable nature of various scientific approaches to clarifying the content of the labor market as an economic category. In this connection, a certain one-sidedness in the disclosure of specific essential components of the labor market and the forms of their appearance at the global, regional, and national levels seems debatable. This, for example, is reflected in the following: firstly, the "labor market" is considered by some scientists as a system of relations between the employer and the able-bodied population with the conclusion of employment contracts regarding the number of conditions and wages, and acts as a sphere of employment, formation of demand and supply for labor strength Secondly, the labor market, claims V. Petyukh, is a socio-economic category that characterizes people's relations regarding the hiring, evaluation, dismissal of employees and setting the amount of compensation for the labor force used [18]. Thirdly, Brych V. defines the labor market as a system of labor relations that reflects the balance of interests between its subjects [4]. Fourth, according to the interpretation of L. Fedunchyk, the labor market is an element of the economic system that determines the vector of macroeconomic policy influence on the quality of life, the well-being of the population, and ensures the distribution of remuneration for work [25]. Fifth, V. Druzhynina believes that the labor market is a system of social relations that involves the exchange of labor for remuneration [6]. Sixth, as an essential feature of the labor market component, R. Stakanov [7] notes that employees produce goods and services that are sold

by entrepreneurs and bring them profit. Mospan N. notes that the labor market covers not only the sphere of circulation of goods "labor force", but also the sphere of production, where the hired worker works [15].

Agreeing, in general, with the given definitions and features of the economic category "labor market", we note that from the point of view of our research, it is worth defining a specific sphere, boundaries and its structural elements, which objectively function as a whole system entity. In our opinion, the labor market, first of all, is dialectically connected with its objective prerequisite of formation and development with the labor market of the workforce. Secondly, the labor market includes all types of production activities of employees. Thirdly, the results of the work of the hired workforce are embodied in goods and services. Fourthly, the management, ensuring the working conditions of the hired workforce and the sale of the products produced by them is a function of the employer and his staff, which should also be attributed to the labor market. Fifth, the final stage of the functioning of the labor market should be considered the implementation of trade operations for the sale of products manufactured by hired workers and receiving their monetary equivalent. The latter, in particular, in part, in the form of a set proportion of wages and profits, respectively, constitutes monetary reimbursement of labor costs of each of the subjects of the labor market.

In the context of the debate, the fundamental difference between our interpretation of the labor market and the definitions given by scientists is the expediency of its study as a systemic entity. When applying the system method to the analysis of the labor market, it is possible to distinguish its subject, material, technical, technological, product, marketing, financial, and organizational components. This makes it possible to specifically investigate the directions, features, forms, methods, tools, levers of influence of global digitalization on the transformation of the RPU. With the goal of substantiating the outline of the guidelines for the development of the RPU, in our opinion, it is necessary to take into account the following specific features of its functioning:

a) reduction of the workforce in 2010-2021 (in particular due to labor migration), employed population, increase in the unemployment rate;

b) regional differentiation of employment with the concentration of labor resources in Dnipropetrovsk, Kyiv, Lviv, Odesa, Kharkiv regions and the city of Kyiv; agricultural (18%), industrial (16%), wholesale and retail trade (22%), education (9%) remain the leading employment sectors for the population aged 15-70 with a tendency to decrease employment in each of these sectors;

c) the growth of the role of the ICT sector in employment, which is the fourth in terms of employment of the population (9%) after the agricultural sector with a share of 24% in 2020;

d) insufficient level of qualification of human resources and the predominance of employees with incomplete higher (20%), vocational and technical (26%), complete general secondary education;

e) inconsistency of the acquired educational and professional level of the employees with the vacancies in different professional groups, which leads to an insufficient level of specialized skills;

f) lack of significant development of technology parks as centers of attraction for highly qualified workers, reduction in the number of NDR performers (researchers, technicians and support staff), whose share in the total number of employed population was 0.54% in 2018;

g) dynamic development of IT clusters, in particular, stable growth of the employment level by 10-12% annually and the number of technological and service companies operating in the global market of IT products and services;

h) the development of the digitalization potential of enterprises in various sectors of the economy of Ukraine (increased access to the Internet, websites, the provision of interactive services, cloud computing, etc.) and their needs for ICT specialists, which contributes to the development of ICT skills of the personnel of domestic companies, the transformation of RPU according to an indicator of the level of personnel qualification and acquisition of digital skills.

CONCLUSIONS

The study of the digitalization globalization role in the transformation of LMU gives the basis for the following conclusions:

Firstly, digitalization contributed to the formation of a digital labor market in Ukraine, the spread of self-employment and outsourcing as a key form (model) of business organization in the dynamic IT market, the priority resource of which is personnel.

Secondly, Ukraine's digitalization strategy and, at the same time, the dynamic development of the private IT sector, in which IT clusters are rapidly developing, contribute to positive structural shifts in the LMU: regions are formed - centers

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of gravity of human resources (Lviv IT cluster, Kyiv IT cluster), which attract highly qualified specialists not only in the IT industry but also in related sectors.

Thirdly, the IT sector contributes to the spread of new forms (models) of business organization - freelance/self-employment, and outsourcing, which have a positive effect on entrepreneurial activity in Ukraine and the development of the potential of human resources.

Fourthly, European integration contributed to decentralization, liberalization, simplification of the conditions for conducting economic activities, and the transition to a market-based digital model of the economy, which, under the condition of dynamic digitalization of the public sector (in particular, the digitalization of the provision of administrative services), will ensure the synergy of structural shifts of the LMU with the tendency to increase entrepreneurial activity, the flexibility of work and increase in the level of wages.

Fifthly, despite a number of positive structural changes, the RPU is characterized by systemic problems related to imbalances in the supply and demand of labor, the mismatch of the professional and qualification level of the structure of inflow and outflow of labor in the labor market, the inconsistency of volumes and structures of workforce training by educational institutions by fields of knowledge, needs of the economy by types of economic activity, professional groups and economic districts.

Sixthly, to determine the quantitative parameters of the level of digitization of the RPU system and its structural elements, it is advisable to use the proposed, respectively, synthetic and segmental Indices. This will contribute to the concretization of measures to substantiate the national strategy and sectoral prospective directions of digitalization of the RPU.

In general, the comprehensive use of the advantages of global digitalization at LMU is an innovative direction for its transition to a qualitatively new scientific and technical level of functioning. This will lead to an increase in the role of the LMU as an important condition for ensuring stable national economic development and strengthening its international competitiveness.

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Румянцев А., Побоченко Л., Пічкурова З., Толпежнікова Т., Ковбич Т., Ляшов Д.

УПЛИВ ГЛОБАЛЬНОЇ ДИДЖИТАЛІЗАЦІЇ НА РОЗВИТОК РИНКУ ПРАЦІ УКРАЇНИ

У статті досліджується ринок праці України (РПУ) як системне утворення, суть якого полягає в поєднанні пропозиції робочої сили та попиту на неї, що зорієнтований на її ефективне використання. Визначені особливості його розвитку в умовах глобального поширення та інтенсивного використання цифрових технологій у світовому господарстві. Обґрунтовується доцільність урахування таких сучасних трендів розвитку світового, регіонального та вітчизняного ринку праці, як: а) суттєві зміни на світових ринках товарів, послуг, капіталів, робочої сили та інтелектуальної власності, обумовлені різними можливостями використання країнами світу національного, регіонального, міжнародного науково-технічного потенціалу, б) структурні зрушення між сегментами національних та світових ринків праці в сторону появи нових галузей і сфер виробництва, які формуються на основі використання досягнень 4-ї індустріальної революції, в) диджиталізаційна трансформація регіональних ринків праці, особливо тих, які формуються в межах інтеграційних об'єднань, членами яких є високорозвинуті країни, наприклад Європейський Союз, г) несвоєчасне правове, інституціональне й фінансове реагування на прийняття відповідних заходів, спрямованих на підтримку та прискорене впровадження в практику інноваційних змін умов праці висококваліфікованих фахівців, д) зниження ефективності витрат на освіту, що знаходить конкретний прояв у підготовці значної маси недостатньо кваліфікованих фахівців, е) нездатність вітчизняного ринкового механізму оперативно реагувати на потреби щодо підвищення якості робочої сили в контексті нових цифрових та технічних навичок працівників, є) значний відтік кваліфікованих фахівців за межі нашої держави в умовах агресії РФ проти України.

Запропонована економіко-математична модель розрахунку синтетичного Індексу диджиталізації РПУ. Здійснено розрахунок величини сегментного Індексу диджиталізації РПУ в його галузевому секторі. Аналізується інноваційна складова диджиталізації РПУ, зокрема зайнятість і діяльність технопарків, підприємств інноваційно-технічної ІТ-сфери, ІТ-кластерів. Сформульовані висновки щодо стану та перспектив оптимального використання впливу глобальної диджиталізації на розвиток РПУ.

Ключові слова: глобалізація, диджиталізація, робоча сила, ринок праці України, синтетичний Індекс диджиталізації РПУ, технопарки, ІТ-кластери

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