

# The Impact of Digitalization on the Forms Change of Employment and the Labor Market in the Context of the Information Economy Development

Olha Popelo<sup>1</sup>, Iryna Kychko<sup>2</sup>, Svitlana Tulchynska<sup>3</sup>, Zhanna Zhygalkevych<sup>4</sup>, Olha Treitiak<sup>5</sup>

<sup>1</sup> Chernihiv Polytechnic National University, Chernihiv, Ukraine

<sup>2</sup> Chernihiv Polytechnic National University, Chernihiv, Ukraine

<sup>3</sup> National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine

<sup>4</sup> National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine

<sup>5</sup> Chernihiv Polytechnic National University, Chernihiv, Ukraine

## Summary

The authors of the article investigate the impact of digitalization on the forms change of employment and the labor market in the modern conditions. It is substantiated that digitalization processes directly affect the change of forms of employment and the range of occupations in the labor market, as well as the change of jobs. The positive and negative consequences of changing forms of employment for the economy in the process of digital transformation are analyzed, which include: reduction of personnel costs by employers; dissemination of non-standard, informal employment (electronic freelance, electronic outsourcing, start-employment); enabling employees to manage their working hours; increasing unemployment and imbalance of supply and demand in the labor market; reduction of productivity of enterprises, as a result of reduced productivity of workers with non-standard forms of employment, or with a negative indirect impact on productivity. A model for managing the process of digitalization in the labor market of Ukraine under different scenarios of their implementation, namely evolutionary and forced is devoted. To recognize the possible change in the level of employment in connection with the implementation of the forced scenario of digitalization in Ukraine, a model for estimating probable changes in the labor market is proposed. The directions of development of the state strategy of prevention of risks of reduction of number of workplaces in the course of digitalization are outlined.

## Key words:

*Digitalization, digital transformations, employment, labor market, information economy.*

## 1. Introduction

The authors in this study use the term "digitalization" in a broad sense, i.e. as a process of creating a new product in digital form with new functionality and consumer properties. If "digitization" in the narrow sense is aimed at improving existing business models and changing business processes, then "digitalization" allow you to get a significant leap in business and new competitive advantages.

Digital transformation, affecting business processes, has ambiguous consequences, namely: significant motivating

factors for the installation of modern equipment, software; fundamental changes in management approaches; corporate culture; external communications; creating a personalized and attractive service infrastructure; reduction of traditional jobs; rising unemployment, the emergence of new professions; increasing the requirements for social guarantees for the unemployed. All this and more requires in-depth research to identify the impact of digital transformations on the change of forms of employment.

## 2. Literature Review

Many scientists have devoted their research to studying various issues of digitalization processes, their impact on the labor market, innovation and information economy development, including: Borisova V.V., Panfilova E.E., Raza H. (2021); Bottalico A. (2021); Butko, M., Pishenin, I. (2019); Bühner C., Hagist C. (2017); Eichhorst W., Hinte H., Rinne U., Tobsch V. (2017); Fabre R.G. (2019); Garafonova O., Rasskazov O. (2021); Gretchenko A.I., Gretchenko A.A. (2021); Kholiavko, N., Djakona, A., Dubyna (2020); Kuznetsova A., Selezneva A., Askarov A., Askarova A., Gusmanov R. (2021); Lazarenko I., Saloid S. (2020); Lishchuk E.N., Chistiakova O.A., Boronina E.S., Churikova A.A., Kapelyuk Z.A. (2021); Revko, A. (2020); Simonova M., Lyachenkov Y., Kostikova E. (2021); Shkarlet, S. (2019); Vasilescu M.D., Serban A.C., Dimian G.C., Aceleanu M.I., Picatoste X. (2020); Vladimirov I.S., Kamchatova E.Y., Burlakov V.V. (2021) and others.

The aim of the research of Italian scientist Bottalico A. is to review current changes in the logistics labor market in the light of digitalization and automation processes that affect working conditions, work profiles, training systems and skills. In the light of these new scenarios, the study outlines an explanatory framework for the analysis of the logistics labor market in the context of

digitalization with its features, problems and trends (Bottalico A., 2021).

The aim of the study of Kuznetsova A., Selezneva A., Askarov A., Askarova A. and Gusmanov R. is to test the hypothesis that the development of the digital economy contributes to changes in the structure of the labor market, layoffs and growing demand for information technology. Correlation-regression analysis shows that there is a positive relationship between the level of computer and Internet use by employees in organizations and the percentage of part-time employees. Scientists argue that digitalization through entrepreneurship education penetrates into almost all spheres of society and leads to increased economic efficiency and productivity, changing the structure of employment (Kuznetsova A. et al., 2021).

The main purpose of the work of Borisova V.V., Panfilova E.E. and Raza H. are the identification of key trends that determine the structural and qualitative changes in the labor market in a crisis economy after the coronavirus crisis and at the same time intensify the processes of digitalization of business. The main result of the authors' research is the development of guidelines for effective interaction between universities, business and government agencies to train professionals who are in demand in the labor market and who have digital competencies to work in a transforming business (Borisova V.V. et al., 2021).

The article of Vladimirov I.S., Kamchatova E.Y. and Burlakov V.V. analyzes the trends of digitalization of the labor market in the fourth industrial revolution. Scientists have identified new specialties and competencies that will be relevant in the future, as well as barriers to retraining. The conclusion about the future prospects of the labor market in the conditions of crisis is made and the anti-crisis measures based on methods of planned economy are offered (Vladimirov I.S. et al., 2021).

The results of the study of Russian scientists Gretchenko A.I. and Gretchenko A.A. is a classification of problems of digital transformation of world, national and regional economy; structured causal relationship between the volatile state of the economy and structural shifts and cyclical downturns; the possibility of eliminating the causes of the unstable labor market with the help of digital technologies. The scientific and practical significance of the study is determined by a real set of new competencies in the management of the labor market by materializing the basic provisions of the digital organization in Russia (Gretchenko A.I. et al., 2021).

The article of Lishchuk E.N., Chistiakova O.A., Boronina E.S., Churikova A.A. and Kapelyuk Z.A. raises pressing issues related to digitalization and its impact on the development of the rural labor market. Institutional, infrastructural and technological aspects of digitalization in rural areas are considered. The authors predict that a change of occupation that will require employees to

acquire additional competencies that are in demand in the digital economy seems most likely (Lishchuk E.N. et al., 2021).

The study of Simonova M., Lyachenkov Y. and Kostikova E. analyzed changes in the structure of supply and demand in the labor market, which are determined by changes in consumer preferences and technological innovations. The study of the labor market was carried out on the example of the Samara region in order to identify the impact of information technology on changes in supply and demand. It was concluded that the labor market is saturated with qualified professionals with competence that does not meet modern conditions (Simonova M. et al., 2021).

The authors Vasilescu M.D., Serban A.C., Dimian G.C., Aceleanu M.I. and Picatoste X. from Romania argue that the impact of digitalisation on the economy, society and quality of life involves significant challenges in the labor market. The aim of the study is to analyze the perception of EU citizens about digitalization and to identify differences between specific socio-demographic groups. As a result, the agreed patterns of socio-demographic characteristics and perceptions of digitalization were determined (Vasilescu M.D. et al., 2020).

The study by Spanish researcher Fabre R.G. summarized some ideas that were presented during the discussion on the competitive impact of artificial intelligence on the labor market, some proposed answers and the main difficulties that affect them. The author concluded that further political convulsions should be expected after artificial intelligence disorders on the structure of the youth labor market (Fabre R.G., 2019).

This paper of German scientists Eichhorst W., Hinte H., Rinne U. and Tobsch V. assesses the importance of digitalization in Germany and other developed countries, emphasizing the potential or actual impact of this process on the labor market. Given the available empirical evidence, the transformation of occupations and forms of employment has been documented, as well as the role of the platform economy, including the phenomenon of self-employment (Eichhorst W. et al., 2017).

German scientists Bühner C., Hagist C. believe that digitalization has the opposite effect on labor markets, and the relationship between technology and the labor market in the digital age may change. Based on the study, it can be noted that the conflict will develop not only between capital and labor, but also between young and old workers, as rationing will disproportionately affect young people (Bühner C. et al., 2016).

### 3. Methodology

In this study, the authors used general scientific and specific methods of scientific knowledge, which made it possible to investigate the impact of digital transformations on changing forms of employment and the labor market in terms of a systematic approach and cognitive paradigm.

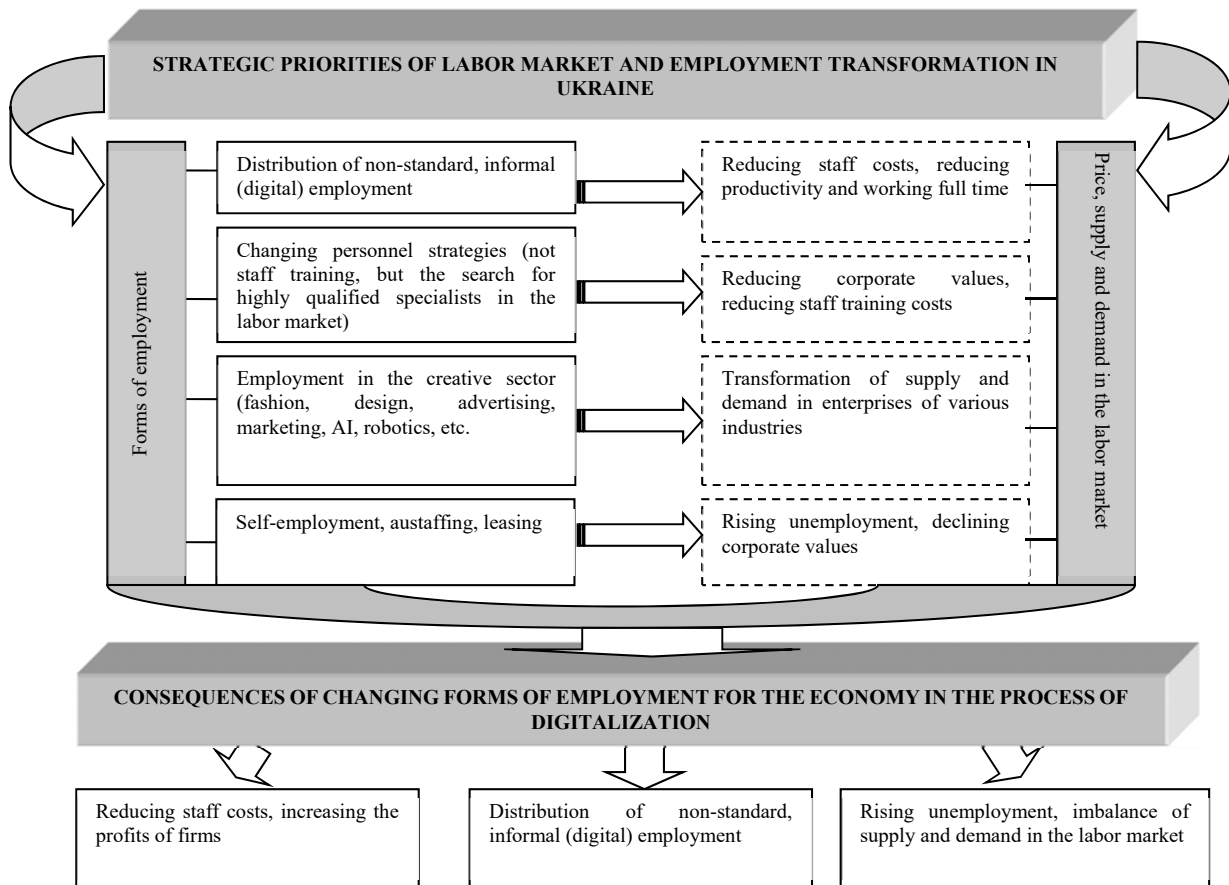
### 4. Results

Digitalization processes directly affect:

- changing forms of employment and the range of occupations in the labor market, for example, the spread of employment through online platforms, on demand through mobile applications, etc. According to the forecast, by 2035, 95% of production processes will be automated, and 50-70% of jobs will cease to exist [9]. At the same time,

new professions will emerge, such as solar technology specialist, personal web manager, ecosystem auditor, robot consultant, virtual reality architect, 3D printing engineer, and more. Significant employment growth is expected in sectors such as AI, robotics, etc.;

- change of jobs, i.e. the performance of official duties by some employees does not require a permanent stay at the workplace, opportunities are created for the permanent stay of the employee online, for flexible work schedules. The concept of the workplace is changing. Yes, digital workplaces can be e-mail, instant messaging, corporate social networks, tools for virtual meetings, and so on. At the same time, the requirements for technical equipment of workplaces are increasing. The digital workplace requires access devices (smartphones, tablets), communication, telecommunication tools in the workplace, including audio, video and web conferencing. The consequences of changing forms of employment for the economy in the process of digital transformation are presented in Figure 1.



**Fig. 1.** Consequences of changing forms of employment for the economy in the process of digital transformation

Source: compiled by the authors

The positive aspect of digitalization is the ability of employees to manage their work schedule, which in turn

contributes to productivity growth. Increasing productivity in digital employment, working online can reduce working

hours and increase free time. In turn, free time is a stimulus for productivity growth. Important in this context is the rationalization of work and rest, which, as we know, involves the introduction of new, progressive work schedules and so on. Since working conditions are both a need and a motive, they do not indirectly affect the quality

of work and the level of employee productivity and encourage more efficient work.

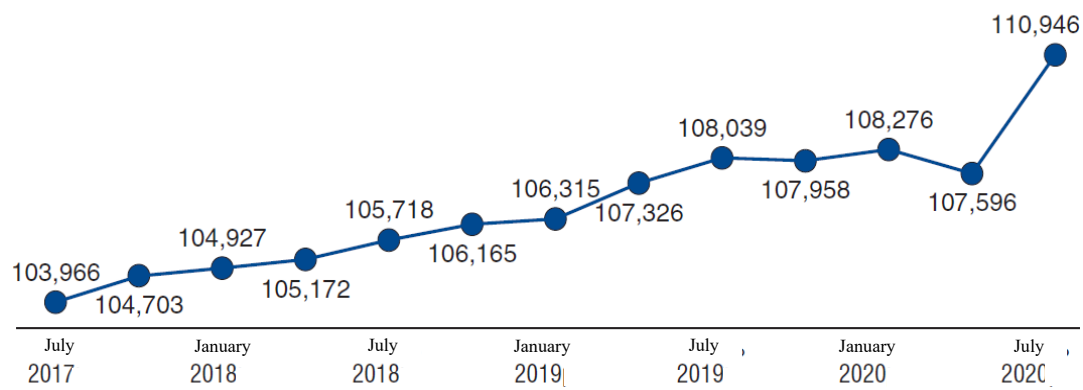
Table 1 presents the data on aggregate productivity in developed economies, which is characterized by declining dynamics.

Figure 2 shows as an example the annual growth rate of total productivity in the United States.

**Table 1:** Labor productivity in Ukraine and in the world

	Ukraine		World	
	Production per employee (for PKS in 2011 prices), \$	Annual growth rate of production per employee (at constant GDP prices in 2011 according to the CPM),%	Production per employee (for PKS in 2011 prices), \$	Annual growth rate of production per employee (at constant GDP prices in 2011 according to the CPM),%
2001	4 827,2	10,7	19 274,2	0,7
2002	5 065,1	4,9	19 465,1	1,0
2003	5 513,6	8,9	19 740,2	1,4
2004	6 192,8	12,3	20 232,2	25,0
2005	6 317,3	2,0	20 672,7	2,2
2006	6 799,7	7,6	21 241,4	2,8
2007	7 320,6	7,7	21 795,4	2,6
2008	7 528,3	2,8	21 943,4	0,7
2009	6 610,9	-12,2	21 500,6	-2,0
2010	6 831,2	3,3	22 211,2	3,2
2011	7 197,1	5,4	22 682,3	2,1
2012	7 261,7	0,9	23 006,6	1,4
2013	7 178,7	-1,1	23 381,4	1,6
2014	7 443,6	3,7	23 762,1	1,6
2015	6 712,1	-9,8	24 152,7	1,6
2016	6 959,9	3,7	24 492,4	1,4
2017	7 202,3	3,5	24 947,2	1,9
2018	7 449,1	3,4	25 354,2	1,6
2019	7 766,9	4,3	25 699,6	1,4
2020		4,3		1,7

Source: compiled by the authors according to the data Statistics on labor productivity ILOSTAT, <https://ilostat.ilo.org/topics/labour-productivity>.



**Fig. 2.** Labor productivity in the United States

Source: compiled by the authors according to the data United States Nonfarm Labor Productivity. – Trading Economics, <https://tradingeconomics.com/united-states/productivity>.

Digitalization contributes to the spread of non-standard, informal (digital) employment, in particular "work on demand", "work on Internet platforms". Under the influence of automation there is a reduction in the

number of full-time employees. In the short term, this process will only intensify.

Currently, such forms of digital employment as e-freelance (work remotely using ICT), e-outsourcing

predominate in Ukraine, and by levels of difficulty - basic (translation, work in call centers, site administration, etc.) and start-up employment (creation startups, service, etc.). Electronic outsourcing involves the involvement of specialists for design or one-time work. In times of crisis, in order to save on maintenance costs, outsourcing is intensified, and specialists from other countries with lower salaries are involved (IT outsourcing, remote call centers, etc.).

The increase in the use of information and communication technologies is an important factor in the growth of non-standard forms of employment, along with structural changes and expansion of the services sector. Non-standard forms of employment can benefit businesses in terms of cost reduction and flexibility, especially if employees perform well-structured tasks. The benefits of digital transformations for employees and consumers are investigated (Fig. 3).

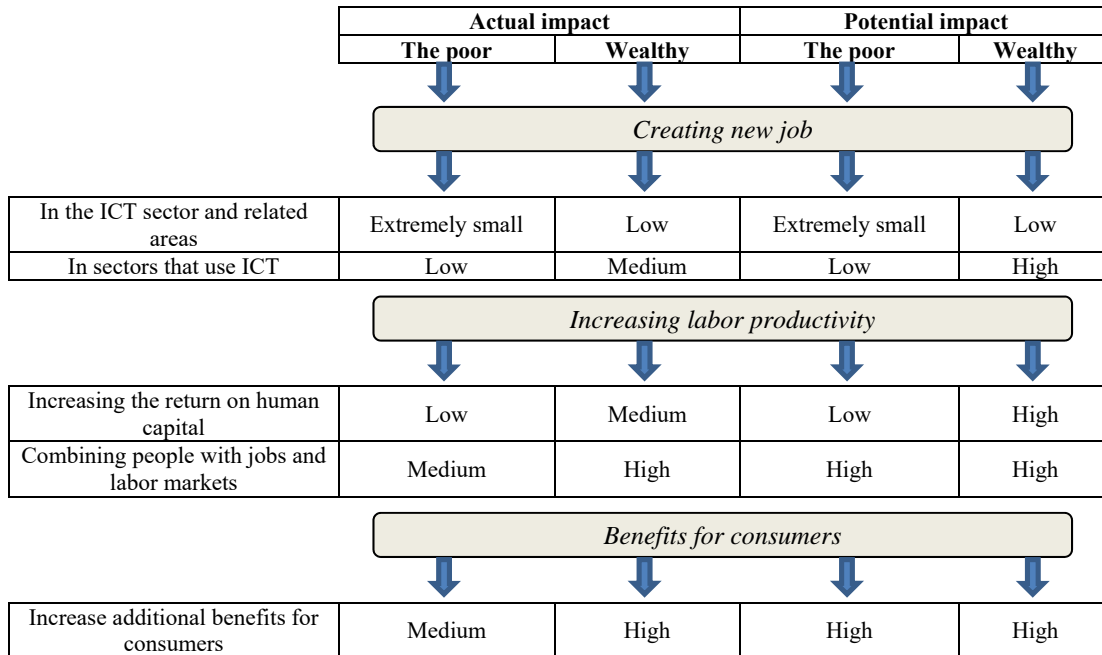


Fig. 3. Benefits of the digital technologies for employees and consumers

Source: compiled by the authors according to the data Digital dividends. World Development Report 2016 - The World Bank Group. <https://openknowledge.worldbank.org/bitstream/handle/10986/23347/210671RuSum.pdf>.

However, despite cost reductions and increased flexibility in the short run, the use of non-standard forms of employment in the long run may lead to lower productivity, due to lower productivity of workers with non-standard forms of employment, or with a negative indirect impact on productivity employees. Therefore, the task at the state level is to stimulate the productivity of the employed population, which in turn will reduce the informal sector of the economy and informal employment, respectively.

The source of productivity growth is the technical and technological improvement of production under the influence of scientific and technological progress. Due to scientific and technological progress, labor productivity is growing so fast that it is possible to produce more consumer goods with less labor. This can be done by attracting investment, stimulating innovative measures to increase productivity.

The efficiency of enterprises may also decrease due to the fact that the process of accumulation of knowledge and transfer of this knowledge to new employees is disrupted, if most employees are temporarily employed, they are hired on lease, out staffing, and so on.

Digitalization causes a change in personnel strategies. Instead of traditional training and staff development within the organization, companies prefer a strategy of finding specialists with the required level of qualification in the labor market. Such a change in strategy does not require the organization to pay attention to training professional skills, and hiring employees with the necessary skills.

The impact of digitalization is also manifested in the presence of heterogeneous incentives for the development of different industries. Thus, there are increasing incentives for the development of enterprises in the creative sector, especially in the field of computer programming, design, marketing, telecommunications,

advertising, artificial intelligence, music, photography and more. Employment in enterprises of traditional industries (transport, agriculture, industry) is significantly reduced. Incentives for the development of e-commerce are increasing, which includes: e-exchange of information, e-capital movement, e-commerce, e-money, e-marketing, e-banking, etc.

According to the authors, there are two possible scenarios for the digital transformation of employment in Ukraine - evolutionary and forced. The evolutionary scenario (scenario 1) assumes a reduction of traditional jobs by 30%, and forced - by 45%. The model of managing the process of digitalization in the labor market of Ukraine in different scenarios of their implementation is presented in Figure 4.

In the forced scenario, there is a decrease in social guarantees, motivational incentives in the labor market. Under the forced scenario (scenario 2) of digitalization in

Ukraine there are risks and opportunities to change the level of employment:

- dismissal of workers from traditional sectors of the economy (industry, agriculture, transport, trade) in connection with structural changes, reducing the share of traditional industries in GDP and increasing the share of services;
- dismissal of employees in connection with the processes of automation and implementation of robotics (VP av., rob.);
- dismissal of employees in connection with the disappearance of some professions;
- increase in the number of employees in connection with the emergence of new professions;
- dismissal of workers as a consequence of digital employment;
- dismissal of employees in connection with the spread of outsourcing, leasing of employees.

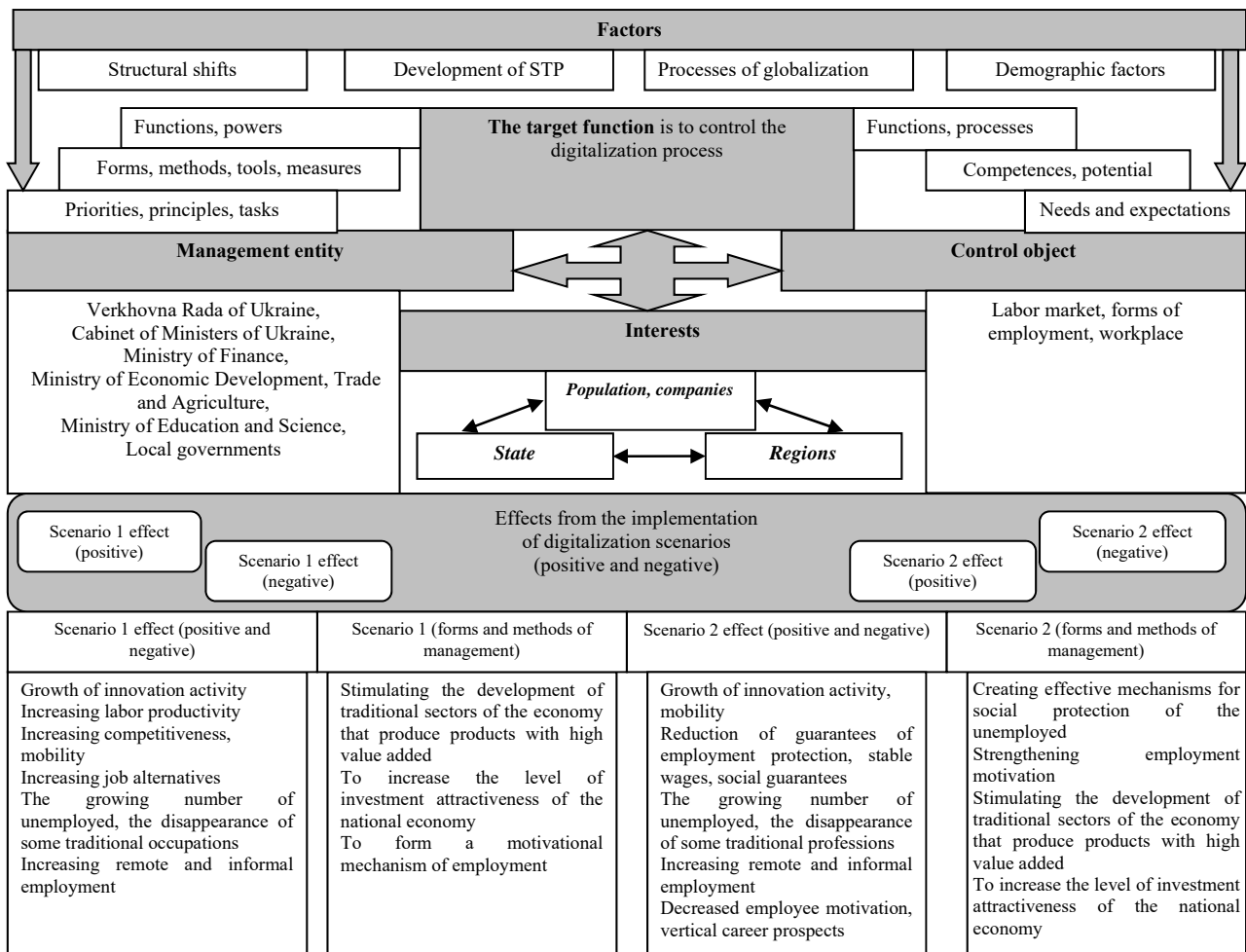


Fig. 4. Model of management of the digitalization process in the labor market of Ukraine under different scenarios of their realization  
Source: developed by the authors.

In the implementation of the forced scenario of digitalization, state stimulation of economic and business development, formation of consumers (business, state, citizens) motivations, demand and needs in digital technologies, in particular: initiatives to ensure the affordability of digital technologies for consumers. Due to the development of specialized technology parks, industrial parks, digital infrastructure, there will be a rapid IT industry, there will be a need to increase the digital literacy of the population. There is a development of the virtual (electronic) labor market as a result of the spread of Internet technologies and the development of digital technologies. Internet employment is realized mostly in the field of IT. It is characterized by short-term employment agreements, a low level of social protection or its complete absence, independent regulation of leisure and work time.

To recognize the possible change in the level of employment in connection with the implementation of the forced scenario of digitalization in Ukraine, we can form a model to assess the likely changes in the labor market. Under the implementation of the forced scenario (scenario 2), it will look like this (Formula 1):

$$Le = \begin{pmatrix} DE_{ti} \\ DE_{ar} \\ DE_{dp} \\ DE_{ep} \\ DE_{de} \\ DE_{ol} \end{pmatrix} \quad (1)$$

where DE – indicator of the probability of change in the level of employment (Le) in Ukraine due to the forced implementation of digitalization processes,

DE<sub>ti</sub> – release of workers from traditional industries (industry, agriculture, transport, trade),

DE<sub>ar</sub> – dismissal of employees in connection with the processes of automation and implementation of robotics,

DE<sub>dp</sub> – dismissal of employees in connection with the disappearance of some professions,

DE<sub>ep</sub> – increase in the number of employees due to the emergence of new professions,

DE<sub>de</sub> – dismissal of workers with increasing digital employment,

DE<sub>ol</sub> – dismissal of employees in connection with the spread of outsourcing, leasing of employees.

The evolutionary scenario (scenario 1) is more moderate for Ukraine and envisages the use of preventive measures to curb the growth of unemployment through appropriate measures:

- stimulation through credit, tax, organizational mechanisms of development of traditional for Ukraine sectors of the economy, especially for enterprises that produce products with high value added, which is especially important to reduce unemployment;

- guaranteeing at the state level social benefits for unemployment for the entire period of job search, as well as providing services at the state level for retraining of dismissed workers.

## 5. Conclusions

As a result of developing a model for managing the process of digitalization in the labor market of Ukraine in different scenarios of their implementation, the authors tend to focus on the forced scenario. Nevertheless, in the authors' opinion, it is necessary to introduce measures to prevent the risks of job losses in the digitalization process. The state strategy for early prevention of risks of job losses in the digitalization process has several levels of implementation:

- firstly, educational (at the level of the state, regions, individuals), ie the creation of academic programs for planned training for new specialties;

- secondly, motivational (at the level of firms, regions, state) strengthening the motivational function of employment and its impact on productivity;

- thirdly, economic (at the level of firms, regions, states) to increase the level of investment attractiveness of the national economy.

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