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IMPACT OF TECHNOLOGICAL PROGRESS ON THE LABOR MARKET

Abstract

The article discusses the issues of technological progress impact on labor market in developed countries and Kazakhstan, to what extent the expectations of mass unemployment are justified and what measures are taken by government employment agencies to mitigate transformational risks in the labor market. Scientific works devoted to quantitative assessment of automation and labor substitution have a very controversial methodology. The article presents the results of the analysis of different approaches and methodologies to assess the impact of automation on the labor market: the approach of measuring the routine of occupations based on the tasks included in the occupation, the application of economic models to determine the impact of automation on jobs and occupations, how the level of demand affects specific types of skills; the analysis of the results of extensive surveys is presented. Based on the methodology for assessing the risk of automation, it is determined to what extent certain occupations in Kazakhstan's employment structure are at risk of automation. It is concluded that the increase in unemployment due to automation, robotization and new digital solutions in the labor market of Kazakhstan is significantly lower than in developed countries. The impact of new technologies on the labor market remains relatively small, with the potential for both job losses and job gains. The authors conclude that most pessimistic forecasts are unfounded. However, emerging trends are becoming more and more concrete, requiring proactive measures to be taken in advance to prevent job losses. Digitalization is transforming existing occupations, requiring new skills to perform new tasks. Therefore, further innovation and economic growth depend on the level of human capital development.

Key words: labor market, technological progress, employment agencies, unemployment, jobs, automation, digitalization.

Introduction

Kazakhstan, as a country with developing economy and as part of global economy, is one of those countries that are feeling the effects of global technological progress, including the automation of the world of labor. The consequences of technological progress for the labor market are of great interest

both in the political and media environment, as well as among academic economists [1]. The risks associated with digitalization of economy raise concerns about the degree of its impact on the labor market. Society has been wondering for years whether the result of digitalization will be a reduction in employment and an increase in the number of unemployed. Given the fact that technology is intended to replace human labor, the impact of technological revolution on employment will be more negative.

All above mentioned raises concerns around assessing the impact of new technologies on the labor market. Experts often fall victim to pessimistic views on the future of jobs, declaring that half of the world's professions will disappear, robots will completely take over our jobs, all routine tasks will be automated and technological unemployment awaits us in the near future.

Main provisions

Large-scale technological innovation has always been a key driver of global change in human history. Digitalization is changing the structure of economy, labor and social paradigm at a rapid pace. All this helps a person to be more efficient, use his time more productively, develop creativity without wasting precious time on routine tasks.

Technological progress will come with a significant time lag due to various barriers – economic, technological, legal, ethical. The introduction of new technologies is impossible without qualified personnel capable of working with new equipment. Various government and bureaucratic processes can complicate digitalization in a country. Some professions will always remain safe from automation because human interaction is more important. Industrial revolutions have always been accompanied by the growth of new jobs, and "flexible" employees get more opportunities for their development.

Materials and methods

The purpose of the study is to analyze the impact of technological progress on the labor market, technological unemployment in the world and Kazakhstan, and what measures are being taken by the state to mitigate transformational risks in the labor market.

In international practice, there are different approaches and methodologies. One well-known approach is to apply economic models to determine the main channels of impact of automation on jobs and occupations, how the level of demand affects specific types of skills.

Other approaches rely on extensive surveys. Thus, the paper considers the results of expert surveys, where an attempt is made to understand how this or that profession will be automated to one degree or another, and which ones will appear in the near future.

An interesting approach is to measure the routine of practices based on the tasks included in the practice, that is, by assessing which tasks can be replaced by technologies. One of these approaches was proposed by researchers from the University of Amsterdam – E. Mikhailov and C. Tietjens, the essence of which is that the approach is built around the calculation of 6 indices for measuring the routine of occupations, which are included in the International Standard Classification of Occupations (ISCO-08). This approach is the most suitable for our conditions, since the National Classifier of Occupations of Kazakhstan (NCO) was developed on the basis of the international classification ISCO-08 and allows you to transfer the results to the national levels.

The study used methods of comparative analysis, and as well as systematized the main global trends in the labor market, due to automation and digitalization of economy, and widespread introduction of technologies. Unique data on the labor market from information systems of social and labor sphere have been used, which have enabled to make a real assessment. Official statistics, various reports of leading international organizations (UN, World Economic Forum, OECD, etc.) have been also used.

Literature review

In the last decade, there have been many different predictions about the future of the labor market influenced by technological progress. Regarding the consequences of this process, specialists are divided into two groups.

Optimists believe that innovation may disrupt jobs in the short term, but that various offsetting effects avoid long-term negative effects on jobs.

Pessimists or “alarmists” believe that, under certain circumstances, new technologies can lead to a prolonged decline in the total number of workers in employment.

The works of “alarmist” economists predict the extinction of many professions and the replacement of workers by machines. Automation en masse will begin to displace people from production. Millions of jobs will be replaced by artificial intelligence. “Pessimists” believe that the world is entering an era of unprecedented high technological unemployment and that about half of all existing jobs will die out in the next 10–15 years, and the employees who occupied them will never be able to return to the labor market [2].

In 2013, an economist Carl Fry estimated that 47% of blue-collar jobs were in danger of disappearing due to the high likelihood of their functions being replaced by robots. The Bank of England predicted in 2015 that 35% of workers are at high risk of losing their jobs in the advent of robot era. In our opinion, in the future, the reduction in the demand for labor under the influence of technological progress is nothing more than a theoretical possibility that has never been implemented in practice so far. At the same time, technological progress has a greater impact on the structure of employment than on its level.

A prominent American trade unionist E. Stern argued that 58% of all jobs will eventually be automated [3]. It is stated that people will not have time to retrain for new specialties, replenishing the army of the unemployed and that the very concept of “work” will soon become a thing of the past and everyone will be made by “smart machines” [4]. The consequence of this will be the creation of a huge new “useless class”, which will not only be unoccupied, but which will not be able to be occupied [5]. There is no doubt that technological unemployment as a short-term phenomenon is always present in one way or another in modern labor markets.

In our opinion, such future scenarios assume displacement of a person, but they are based on the analysis of existing jobs and do not consider the possible creation of new types of professions. Nevertheless, such reports have become the starting point for creation by business community and state of an alternative reality of future technological changes.

In our opinion, different types of new technologies affect routine professions in different ways: computerization causes the vanishing of routine intellectual activities, while robotization causes the vanishing of physical ones. In addition, according to Graetz G., Michaels G, “robotization, unlike computerization, leads to a decrease in demand for unskilled and an increase in demand for highly skilled labor, but not to a drop in demand for medium-skilled workers” [6]. Otherwise, robotization should be expected to improve the structure of jobs, and not its polarization.

In this connection, the topic of market segmentation and polarization is of interest, the pioneer of this topic is Acemoglu, who found that the share of employment in medium-skilled professions is shifting to a cohort of high- and unskilled professions [7]. This is confirmed in the studies of David & Dorn, who, using a spatial equilibrium model, found that information technologies were adapted in “routine” occupations, there was a redistribution of unskilled workers in the service sector, which is difficult to automate [8]. We can agree with this, because if the demand for services is not automated, the replacement of routine tasks by technology in the production of goods will increase employment and wages for low-skilled workers in the service sector.

Results and discussion

The term “technological unemployment” itself was introduced back in the 1930s by J. M. Keynes, who said that this unemployment “is due to the fact that the emergence of new technological opportunities that save on labor outstrips the emergence of new ways to use this labor” [9].

In the course of economic development, there have been three fears of the emergence of technological unemployment: the first with the industrialization in England in the 19th century, the second with the automation of production in the 1960s, and the third with the start of the computer revolution in the 1990s. However, this did not happen and pretty soon it was forgotten.

Previous global changes in the world production have not increased poverty or reduced jobs. There was a disappearance of some professions in the labor market, as well as short-term unemployment, which is necessary for retraining for new jobs.

The first three industrial revolutions were based on steam, electricity and electronics power, respectively. The fourth will be based on the results of electrical revolution, the further development of information technology, the Internet, cybernetworks and their autonomous learning and integration

of production processes. Supporters of the onset of the fourth industrial revolution talk about its characteristic features, which are expressed in speed (exponential growth of development), scale (changes will affect every area of production) and the impact of systems (transformation of all industries).

Some experts believe that the consequences for the labor market associated with the fourth industrial revolution will be catastrophic and technological unemployment is inevitable, because the changes taking place are so fast that they can outpace the ability of society to respond to them. Many professions were previously considered "safe" because they were difficult to automate, but today artificial intelligence can even create music or paintings.

But the problem is that today there are vastly different assessments of the impact of digitalization and automation on jobs, and they have mostly been focused on countries with more developed economies.

Table 1 looks at various estimates of the impact of automation on jobs. So, between 30 and 50% of jobs in Europe and the USA could be automated over the next 10-20 years. According to an estimate based on 29 countries, about 30% of jobs worldwide will be at risk of automation. Others predict a more modest effect – from 8 to 14% for different professions.

Table 1 – Various estimates of the impact of automation on jobs

Automation potential	Forecast horizon	Source
47% of all US employees are at high risk of automation	Next 10-20 years	Frey & Osborne [2]
9% of total employment in the US and 21 OECD countries are at high risk of automation	Next 10-20 years	Arnts et al. [10]
50% of work activities worldwide can be automated	By 2055	McKinsey Global Institute [11]
47% of jobs in 32 OECD countries are at high risk of automation	Next 10-20 years	Nedelkoska and Quintini [12]
14% of EU jobs face very high risk of automation	Next 10-20 years	Pouliakas [13]
30% of jobs worldwide are at high risk of automation, while 44% of workers with low levels of education are at risk of automation	In 3 waves: 2020, mid-2030s	PwC [14]
8.5% of the global manufacturing workforce, mostly in low-income regions in developed countries, could lose jobs as a result of robotization	next 20 years	Oxford Economics [15]
Note: Table compiled by the authors.		

The OECD estimates that 52% of jobs in Kazakhstan are highly or significantly at risk of automation, up 5% from the OECD average of 47%. Of these, about 17% are at risk of a high degree of automation (probability > 70%), about 35% – a significant degree (probability of 50–70%) [16].

Other researchers are trying to identify those tasks that can be automated, and then estimate what proportion of current jobs consists of these tasks. In general, automation more often leads to the fact that employees will be freed from routine tasks, paying more attention to non-routine operations.

But the problem with this approach is that it is difficult to assess how technologies will develop in the future and what tasks they can replace.

In this case, the names of professions may not even change. More than half of all production operators will interact with robotic mechanics, which will help workers complete complex and routine tasks with a high degree of accuracy. Interaction, programming and control of robots will become the central tasks of each operator.

Operators will be forced to develop a wide range of skills related to working with information technology, analyzing data generated by machines, and working with analytical tools to assess the condition of robots. For manufacturing engineers, process optimization, electronic systems and software management skills will be key, and more traditional mechanical engineering skills will also play an equally important role.

A McKinsey [11] study shows that less than 5% of professions in the US can be fully automated with the current level of technology development. However, 62% of professions have at least 30% of

automated tasks (Figure 1). Consequently, the employees' labor in production becomes more diverse and intellectual. At all stages of a career, they face new challenges and responsibilities that require new skills.

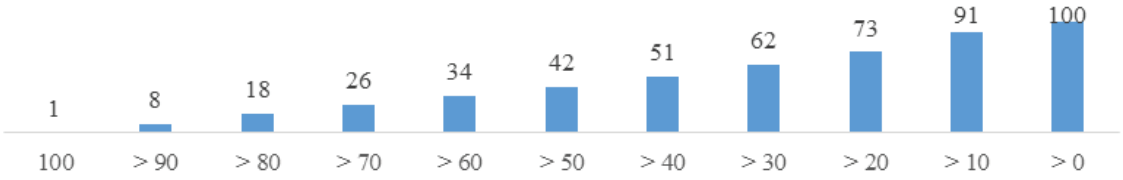

Figure 1 – The potential of task automation on the example of the USA

Note: Compiled by the source [11].

Digital transformation and its impact on employment, both quantitatively and qualitatively, still remain heterogeneous across industries.

Based on expert surveys, Kazakhstani researchers predicted professions that will be automated or will appear in the near future. Kazakhstan has already developed an "Atlas of New Professions and Competences" on the Electronic Labor Exchange (enbek.kz), where, based on the opinions of 55 experts from nine priority sectors, using the methodology of forecasting the future based on technological foresight, 239 new, 95 transforming and 129 disappearing professions were identified in next 5–10 years.

Based on the approach to measuring the routine of activities, the researchers were able to assign initial groups of occupations to specific task categories: non-routine analytical (NRA), non-routine interactive (NRI), routine cognitive (RC), routine manual (RM), and non-routine manual (NRM).

In order to measure the routineness of professions using the example of structure of employment of the population of Kazakhstan, an analysis was carried out only for 414 initial groups of occupations (level 4 of the NCO) and 1206 groups of occupations (level 5 of the NCO), covering 8.5 million employees, since several groups of occupations were additionally included in the NCO to meet local needs.

All groups of occupations were divided into 6 segments according to the share of routine tasks. Based on indexes values of routine tasks share, we can make a certain assessment in relation to each profession.

In Kazakhstan, 22% of occupational groups, which employ 587 thousand people, or 7% of employees, in whose activities the share of routine tasks exceeds 70%, are at high risk of automation.

Based on the widely used methodology for assessing the risk of automation, it is possible to determine which professions in the employment structure of Kazakhstan are at risk of automation to one way or another.

If we consider the top 10 occupations at high risk of automation, then these are workers of various professions, which employ 0.5 million people, or 6.3% of the total employed population. Basically, these are medium-skilled professions [16].

So, the top ten are:

- operators of industrial and stationary equipment with a total number of employed 461.4 thousand people, which account for 5.4% of the total employment in Kazakhstan.
- assemblers and testers of products (25.7 thousand people, 0.3%),
- postmen, couriers and other employees of related occupations (18.4 thousand people, 0.2%),
- agents for customs clearance and escort of cargo and goods (11.3 thousand people, 0.1%),
- moulders, welders, rollers and workers of related occupations (8.1 thousand people, 0.1%),
- printing workers (6.6 thousand people, 0.1%),
- manual packers (6.1 thousand people, 0.1%),
- manufacturers of dairy products (2.1 thousand people, 0.02%),
- artisans (2.1 thousand people, 0.02%),
- blacksmiths, punchers and press workers (1.4 thousand people, 0.02%).

The top ten professions that cannot be replaced by robots in the medium and long term include employees of pedagogical activity – teachers of primary and secondary schools and educators in preschool education with a total number of employed 167.8 thousand people (2% share in total employment), executives, lawyers, marketing and PR specialists, IT developers, research analysts and production engineers.

It should be noted that the polarization of labor is not typical for Kazakhstan, that is, there is no reduction in the percentage of workers of medium qualification. However, there is a complication of those jobs where low-skilled labor is used today, the number of jobs has decreased by 75 thousand since 2018, they have moved into the category of mid-level jobs, and part of the medium-skilled jobs has moved into the category of highly skilled.

Compared to foreign countries, Kazakhstan has one of the lowest shares of high-skill jobs, as well as the highest rate of low-skilled labor in the structure of jobs (17%).

High-skill workers are the "engines" of progress, capable of creating technology, innovation, value addition and increasing productivity. But today in Kazakhstan, the largest number of employed people (61%) work in professions with medium and low skill levels, which greatly affects their income.

Therefore, it is important not only to create high-quality jobs, but also to increase labor productivity through the development of technologies, optimization of business processes, investment in human capital, etc.

At the same time, there is an inefficient use of human capital in the country. Employees with vocational education work in low-skilled jobs. Thus, in trade, 84% of those employed have a vocational education, but only 66% of jobs are at high and medium skill levels, where formal education is required. And in construction, employees without education, on the contrary, work in skilled jobs. Such workers may have received on-the-job training, training centers, etc., however, the mismatch between the skill level of workers and the job they occupy affects their productivity and income.

Automation primarily affects jobs of medium complexity.

The tasks of medium-skilled employees are often routine, repetitive, and they are the easiest and most cost-effective to automate. "Routine" work requires clear instructions for completing tasks, while "non-routine" work is characterized by flexibility, creativity, problem solving skills and communication skills.

Jobs of low complexity are often unprofitable to automate due to the low cost of human labor. Tasks of a high level of complexity are difficult to fully automate, since they involve many non-routine, creative and managerial tasks. This phenomenon is called labor market polarization.

But again, the polarization of labor in all countries occurs in different ways, as well as in the context of industries. If in developed countries and industry the polarization of employment structure is obvious, then in other countries and service sector its effect is much less pronounced or absent at all.

Intermediate-skill occupations include, for example, cashier, driver, office support staff, carpenter, and fitter. But these professions are not expected to disappear, but to become more complex and move to a higher category of jobs, to the "knowledge economy", where a combination of complex professional, digital and "soft" skills is required. This places serious demands on the quality of the workforce, leading to a gap between the skills that employers want and those that potential professionals have.

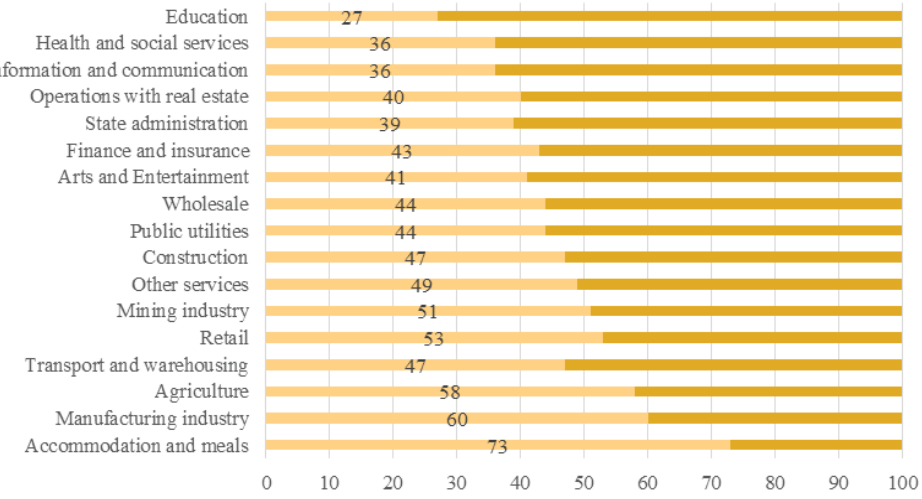

Figure 2 – Technical potential of automation in different sectors on the example of the USA, in %

Note: Compiled by the source [11].

Prior to the coronavirus pandemic, services and hospitality, as well as manufacturing industries, were the most likely to automate working hours (Figure 2).

And in such areas as education and healthcare, a human specialist will always remain in the first place, while technologies will only be his "assistants".

In many ways, the process of digitalization of industry takes place at the level of individual firms that adhere to different corporate cultures and policies for building a business model. Companies can only implement certain types of technologies that are able to "help" the enterprise cope with short-term negative shocks caused by economic crisis.

For example, large U.S. finished goods suppliers have had to accelerate the pace of automation due to a surge in demand for their products during the pandemic. Retailers such as Amazon, Walmart and Target have adopted industrial robots to transport and deliver products. Japanese pharmaceutical company Takeda has implemented an automated document management system in its production to cope with increased demand during the sale of a coronavirus vaccine.

The impact of Industry 4.0 on developed and developing countries is not the same, which implies the use of different measures of influence on current processes.

The uneven plane of economy of different countries implies unequal access to high technologies and investments and deepening of economic inequality between countries. Automation requires large capital investments, so in the absence of sources of "long-term fixed capital investment", capabilities and speed of automation in developing countries are significantly inferior to developed countries. Such inequalities will directly affect the structure of employment, the negative consequences of which will differ from country to country.

According to international studies, global employment as a result of robotization of economy showed a drop of 1.3% between 2005 and 2014. If developed countries suffered the least from this (-0.5%), then in developing countries the value reached 14% [17]. Such a difference in values is associated not so much with the economic situation of countries, but with the automation of economy in developed countries.

The fact is that the more robots are present in enterprises, the less likely that the enterprise will seek to outsource production, which significantly reduces the potential for creating new jobs in developing economies. According to the Reshoring Initiative, a quarter of a million jobs have been returned to the USA since 2010 as a result of reshoring and foreign direct investment in the country, in 2022 this number could reach 400 thousand jobs, which is 35% more than a year earlier [18].

If in developed countries the complexity of jobs is expected from medium to high level, then in developing countries Industry 4.0, on the contrary, leads to an increase in the number of jobs of medium complexity. At the same time, the source of their occurrence is the complication of those jobs where low-skilled labor is used today.

By 2030, professions that will be in high demand in developed and developing countries will include nursing services, medical professionals, creative industry workers, STEM professionals, managers of large enterprises, as well as transportation services, and the least demand or gradual job cuts will affect areas such as sales and customer service, office workers and operators, repair and maintenance of equipment, manufacturing and warehouse work. At the same time, it is important to note that the decline in demand will most of all affect countries with developed economies, in which there is a high readiness to introduce advanced technologies.

Thus, an increase in the demand for certain professions in developed countries does not mean the same increase in demand for such workers in developing countries, and vice versa.

Despite the fact that many workers today can be replaced by robots, their labor is still cheaper than acquiring a robot. Therefore, until technologies become more affordable in all industries and countries, especially for small and medium-sized enterprises, it is too early to talk about the total replacement of humans by robots.

76% of robots in the world are concentrated in only five countries, which include China (44%), Japan (10%), USA (8%), South Korea (8%) and Germany (6%) [16].

According to the Industrial Development Report 2022, in general, since the beginning of the 2000s, the number of installed robotic equipment in industrial sectors of economically developed countries began to grow rapidly, and by 2021 there were 6 installed units of robotic equipment per

1000 employees in enterprises (Figure 3). This is due to the fact that in the industrial sector, routine tasks are most concentrated. In 2020, the fleet of industrial robots in the world totaled more than 3 million units, and compared to the previous year, the growth amounted to 10% [19].

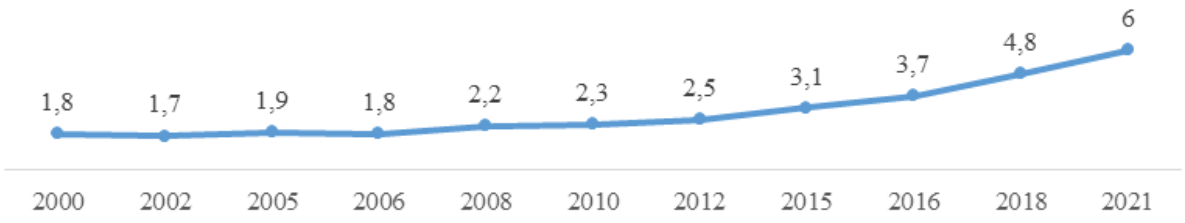

Figure 3 – Number of robots per 1000 employees in the industrial sector of developed countries, units

Note: Compiled by the source [20].

According to Reportlinker analysts [21], the volume of the global market for industrial robots in 2022 will be $15.7 billion. According to experts, the shortage of skilled labor in the manufacturing industry and the growing implementation of the concept of Industry 4.0 is one of the main factors for the deployment of industrial robots and increasing demand for them. Sales of industrial robots are projected to grow by 14.3% annually to reach $30.8 billion by 2027. The use of industrial robots is constantly expanding: if previously the main consumer of industrial robots was the automotive industry, now there is an increase in their application in the food, pharmaceutical, electrical/electronic and other manufacturing industries, indicating new development trends and ways of applying robotics.

Often, forecasts may not take into account the fact that technological progress, on the contrary, is a source of new job creation. This has been confirmed by past technological revolutions. New waves of technological progress will indeed change the formats of labor and types of jobs. For example, since 2010 in the UK, e-commerce has created 16 times more jobs than was lost in the retail sector. Thus, according to some forecasts, by 2025, the automation of economy in the best scenario outcome will lead to the creation of more than 12 million jobs.

The automation of industries has a multiplicative cross-sectoral effect. Studies show that between the late 1990s and 2010, large European enterprises reduced the number of jobs by 10 million units (out of 180 million available at that time) through the active integration of technology into production process to perform routine manual tasks. However, as a result of increased competitiveness, these enterprises were able to create 9 million jobs. Moreover, increased labor productivity and profit growth created an additional 3 to 12 million jobs, which led to an increase in new job creation in certain sectors of economy in the amount of 2 to 11 million [22].

In the USA, each new technology job is estimated to create 4.9 additional jobs in related and service industries, and in emerging economies 6–9 times more than in the USA [16].

Increased adoption of robots will also lead to the creation of new jobs, such as the smart factory manager who oversees the automated workspace, as well as the robot team coordinator and robot debugger [19].

It is essential to remember that humanity is not able to predict large-scale global events and results of all forecasts can simply come to naught. Over the past two years, the world has already faced two unexpected events that significantly affect the economy, business and society as a whole.

First, the COVID-19 pandemic, which has given rise to new patterns of consumer behavior and business affecting future labor demand, will also push “job migration” in many countries. Compared to pre-pandemic projections, the movement of workers both within and between occupations could increase by 10–35%. In the UK, China, USA, Spain, Germany, India, France and Japan, the number of “lost” jobs could be up to 66 million [23]. This can mainly affect those professions whose tasks require the physical presence and Interaction of an employee, but can be replaced by machines.

Secondly, the tense geopolitical situation against the background of growing conflict between Russia and Ukraine, which also affects the labor market and demand for professions, and at present the future is becoming even more uncertain.

In addition, all assessments of the impact of automation on jobs as well as do not take into account the public recognition of automation. For instance, part of work of a nurse can be automated, but this option may be rejected, since an important advantage of inpatient care is interaction with a person. Or mass layoffs due to automation, which at the moment will seem cost-effective, can lead to an increase in social tension. Therefore, such decisions should be made carefully and consider further consequences.

Thus, it is difficult to predict future of work, change in jobs in each industry and even in each individual profession will occur in different ways. However, there are general trends that are characteristic of the automation process.

The main challenge of new industrial revolution is to ensure the mobility of labor resources – professional, territorial, intercompany.

It also points to a gap in time, where automation is changing jobs and tasks faster than professionals themselves can adapt.

To solve the problem of skill gaps, conditions are necessary for adaptation of employees to new working conditions. Labor resources should be ready for territorial and sectoral mobility, where there will be a high need for personnel. In order not to join the ranks of the unemployed under the pressure of technological progress, employees must retrain and constantly master new knowledge and skills to meet the demand of employers.

If in the previous era, the requirement is a clearly fixed set of skills that an employee possesses, then in the new upcoming era, the development of cross-functional, digital, cognitive, psycho-emotional and other so-called soft skills, such as critical thinking, problem solving skills, cognitive flexibility and personnel management is most valued. For many businesses, this will lead to formation of a demand for corporate culture transformation, in which such skills are more valued. Therefore, the emphasis on retraining personnel to develop smart skills is becoming even more relevant in the context of technological progress.

The characteristics of unemployment in Kazakhstan reflect some of the systemic problems in the labor market – low employment opportunities for low-skilled employees and older people, imbalance of qualifications. Accordingly, it is this category of the population that needs social support the most.

The digitalization of work activity additionally requires them to develop digital skills, and as well as makes it easier to receive support from the state in electronic format.

The implemented measures to promote employment in Kazakhstan have always included the direction of increasing the level of human capital skills, seeing in this not only an increase in labor productivity, but also an increase in the income level of the population through rewarding their qualifications. Thus, the already completed state program “Enbek” (2017–2021) provided for training in the framework of TVET and short-term courses in educational institutions and centers. Over the entire period of the program, 96.8 thousand people were sent to college education, 214 thousand unemployed – to short-term education, of which 190 thousand completed training, after which 69% were employed in permanent jobs [16].

Conclusion

The technological revolution opens up many new opportunities for the labor market. Thanks to remote work opportunities, freelancing, platform employment, many Kazakhstanis have been able to find a job, although previously they might have faced certain difficulties in the traditional labor market. Digitization is creating new jobs, but it is also transforming existing jobs as well, requiring new skills from employees to perform new tasks. Therefore, further innovation and economic growth depend on the level of development of human capital. In this connection, it is necessary to constantly improve the level of qualification, acquire new knowledge throughout life.

In order to increase the competitiveness of the country in the digital age, it is necessary to create and maintain quality jobs in high-performance industries with higher income levels for workers.

In order to reduce the risks associated with labor automation, it is necessary to create new jobs and ensure that employees have new skills that are in demand in the labor market. This will require a careful combination of education, labor market, social protection and workplace policies. The issue of the impact of new technologies on the labor market, technological unemployment in the world and Kazakhstan is still remains open.

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ТЕХНОЛОГИЯЛЫҚ ІЛГЕРІЛЕУДІҢ ЕҢБЕК НАРЫҒЫНА ӘСЕРІ

Аңдатпа

Мақалада технологиялық ілгерілеудің дамыған елдер мен Қазақстанның еңбек нарығына әсері, жаппай жұмыссыздықтың болжамдары қаншалықты ақталады және еңбекпен қамтушы мемлекеттік органдар тарапынан еңбек нарығындағы трансформациялық тәуекелдерді жеңілдету үшін қандай шаралар қолданылады деген мәселелер қарастырылады. Еңбекті автоматтандыру мен алмастырудың сандық бағалауларына арналған еңбектер даулы әдіснамаға ие. Мақалада автоматтандырудың еңбек нарығына ықпалын бағалауға арналған түрлі көзқарастар мен әдіснамалар талдауының нәтижелері келтірілген; автоматтандырудың жұмыс орындары мен мамандықтарға әсерін анықтауда экономикалық модельдерді қолдану, сұраныс деңгейінің нақты дағдылар түріне әсері қаралады; ауқымды сауалнамалар нәтижелерінің талдауы ұсынылады, сабаққа қосылған міндеттер негізінде сабақтардың бірсарындылығын өлшеу тәсілдері қарастырылды. Автоматтандыру қаупін бағалау әдіснамасы негізінде Қазақстанның жұмыспен қамту құрылымындағы қайсыбір кәсіптердің белгілі дәрежеде автоматтандыру қаупіне ұшырайтыны анықталды. Қазақстанның еңбек нарығында автоматтандыру, роботтандыру және жаңа цифрлық шешімдердің пайда болуына байланысты жұмыссыздық деңгейі дамыған елдерге қарағанда төмен деген тұжырым жасалды. Жаңа технологиялардың еңбек нарығына ықпалы салыстырмалы түрде үлкен емес, демек ол жұмыс орындарының қысқаруына да, ұлғаюына да септігін тигізуі мүмкін. Авторлар пессимистік болжамдар негізсіз деген тұжырымға келеді. Алайда, бұл бағытта қалыптасып келе жатқан трендтер барған сайын нақты сипат алуда, бұл жұмыс орындарын жоғалтудың алдын алуға бағытталған озық шараларды ертерек қабылдауды талап етеді. Цифрландыру бар кәсіп түрлерін трансформациялайды, жұмысшылардан жаңа міндеттерді орындау үшін жаңа дағдыларды талап етеді. Сондықтан ілгерідегі инновациялар мен экономикалық өрлеу адами капиталдың даму деңгейіне байланысты.

Тірек сөздер: еңбек нарығы, технологиялық прогресс, жұмыспен қамту органдары, жұмыссыздық, жұмыс орындары, автоматтандыру, цифрландыру.

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ВЛИЯНИЕ ТЕХНОЛОГИЧЕСКОГО ПРОГРЕССА НА РЫНОК ТРУДА

Аннотация

В статье рассматриваются вопросы влияния технологического прогресса на рынок труда в развитых странах и в Казахстане, насколько оправданы ожидания массовой безработицы и какие меры принимаются государственными органами занятости для смягчения трансформационных рисков на рынке труда. Научные работы, посвященные количественной оценке автоматизации и замещения труда, имеют очень спорную методологию. В статье приведены результаты анализа разных подходов и методологий по оценке влияния автоматизации на рынок труда: рассмотрен подход по измерению рутинности занятий на основе включенных в занятие задач, применение экономических моделей на предмет определения воздействия автоматизации на рабочие места и профессий, как уровень спроса влияет на конкретные виды навыков; представлен анализ результатов обширных опросов. На основе методологии по оценке риска автоматизации определено, в какой мере те или иные профессии в структуре занятости Казахстана подвержены риску автоматизации. Сделан вывод, что рост безработицы в связи с автоматизацией, роботизацией и новыми цифровыми решениями на рынке труда Казахстана значительно меньше, чем в развитых странах. Влияние новых технологий на рынок труда остается относительно небольшим, причем оно может способствовать как сокращению, так и увеличению числа рабочих мест. Авторы приходят к выводу, что большинство пессимистических прогнозов необоснованны. Однако намечающиеся тренды в этом направлении приобретают все более конкретные очертания, что требует заблаговременного принятия опережающих мер, направленных на предотвращение потери рабочих мест. Цифровизация трансформирует существующие профессии, требуя от работников новых навыков для выполнения новых задач. Поэтому дальнейшие инновации и экономический рост зависят от уровня развития человеческого капитала.

Ключевые слова: рынок труда, технологический прогресс, органы занятости, безработица, рабочие места, автоматизация, цифровизация.