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**ЭКОНОМИКА ТРУДА И ЧЕЛОВЕЧЕСКИЙ
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LABOR MARKET TRANSFORMATIONS IN DEVELOPING COUNTRIES

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Abstract. The article analyzes the current global economic and technological trends affecting the transformation of the labor market and the formation of new socio-economic relations in the context of the formation of the digital economy. The author draws attention to the changes in the nature of labor and forms of labor activity, the requirements for professional skills and abilities. It is shown how the changes associated with the digitalization of the economy directly affect the issues of training and retraining of the most in-demand specialists. Two forecast scenarios for the digital future of the labor market are presented. Excerpts from the latest reports of authoritative international economic organizations and well-known consulting agencies are given.

Keywords: labor relations; labor market; digital economy; robotization; artificial intelligence; personnel development; creation of new jobs; training; retraining

RIVOJLANAYOTGAN DAVLATLARDA MEHNAT BOZORI TRANSFORMASIYASI

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Annotatsiya. Maqolada raqamli iqtisodiyotning shakllanishi sharoitida mehnat bozori transformatsiyasi va yangi ijtimoiy-iqtisodiy munosabatlarning shakllanishiga ta'sir ko'rsatuvchi hozirgi global iqtisodiy va texnologik tendensiyalar tahlil qilinadi. Muallif mehnat tabiati va mehnat faoliyati shakllarining o'zgarishiga, kasbiy ko'nikma va malakalarga qo'yiladigan talablarga e'tibor qaratadi. Iqtisodiyotni raqamlashtirish bilan bog'liq o'zgarishlar eng talabchan mutaxassislarni tayyorlash va qayta tayyorlash masalalariga qanday ta'sir ko'rsatayotgani ko'rsatilgan. Mehnat bozorining raqamli kelajagi uchun ikkita prognoz ssenariysi taqdim etilgan. Nufuzli xalqaro iqtisodiy tashkilotlar va taniqli konsalting agentliklarining so'nggi hisobotlaridan parchalar keltirilgan.

Kalit so'zlar: mehnat munosabatlari; mehnat bozori; raqamli iqtisodiyot; robotlashtirish; sun'iy intellekt; kadrlarni rivojlantirish; yangi ish o'rinlarini yaratish; trening; qayta tayyorlash

ПРЕОБРАЗОВАНИЯ РЫНКА ТРУДА В РАЗВИВАЮЩИХСЯ СТРАНАХ

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Аннотация. В статье анализируются современные мировые экономические и технологические тенденции, влияющие на трансформацию рынка труда и формирование новых социально-экономических отношений в условиях формирования цифровой экономики. Автор обращает внимание на изменения характера труда и форм трудовой деятельности, требования к профессиональным навыкам и умениям. Показано, как изменения, связанные с цифровизацией экономики, напрямую влияют на вопросы подготовки и переподготовки наиболее востребованных специалистов. Представлены два прогнозных сценария цифрового будущего рынка труда. Приведены выдержки из последних отчетов авторитетных международных экономических организаций и известных консалтинговых агентств.

Ключевые слова: трудовые отношения; рынок труда; цифровая экономика; роботизация; искусственный интеллект; развитие кадров; создание новых рабочих мест; обучение; переподготовка

Introduction

The development of the digital economy, based on the production, distribution, and consumption of information, is causing significant socio-economic shifts, particularly in labor relations. Both the types of professional activities and the nature of work are evolving. In the digital economy, the accumulation of material wealth is no longer society's primary goal; instead, intangible values and interests take precedence.

The new nature of work is linked to the enhancement of employee qualifications, ongoing training, and creative communication. The development of the labor market driven by digital technologies leads to the modernization of labor relations. Employers and workers increasingly rely on information and communication technologies (ICT), resulting in new behavioral norms.

Until now, the domestic labor market has largely remained unchanged despite the influence of digital technologies. However, the accelerating digitalization of the economy presents new challenges for industries and the state that have not been encountered before. The issues of employment in the digital economy are gaining new significance, with human and social capital emerging as key sources of wealth. This shift requires a conceptual change from a focus on "profit maximization" to "utility maximization."

Thus, the emergence of the digital economy necessitates a rapid response to labor market changes, investments in human capital, and new strategies to adapt to these conditions, alongside proactive measures from the state.

One notable change in labor relations within the digital economy is the rise of remote work, allowing employees to work from home rather than

commuting to an office. Additionally, new types of work have emerged, such as working during vacations (e.g., on a train or plane) or for foreign employers without relocating (e.g., offshore programmers).

The evolution of labor relations in the digital economy often involves replacing permanent staff with temporary workers, as many tasks can now be performed remotely, even across national borders. A significant trend in recent years is the rapid increase in the number of freelance employees. For example, in the United States alone, there were 57.3 million freelancers (including part-time workers) in 2017, representing 36% of the country's working population.

As a result, the new employment relationships contribute to:

A significant reduction in transaction costs (e.g., office rent, recruitment, transportation).

The introduction of flexible work arrangements and staffing.

Increased labor productivity by removing office-related obstacles.

Enhanced motivation through increased trust between employers and employees.

Improved customer service, available around the clock without overtime costs.

In the digital economy, not only is the nature of work changing, but the entire system of labor relations is evolving. In the traditional economy, there are vertical economic ties of management and subordination between employees and employers. In the digital sector, managers act less as traditional bosses and more as coordinators of work performed by individuals who may be geographically distant from one another. Consequently, vertical ties are increasingly replaced by horizontal ones, diminishing the dependence of employees on their employers.

This increased independence fosters a unique partnership between employees and managers, necessitating a corresponding rise in trust. Employees themselves curate a portfolio of tasks, negotiating the volume, deadlines, and compensation for their work. The skills and credibility of contractors allow them to consistently replenish their order portfolios. Thus, there is a marked shift away from the philosophy of "one job for life" towards the desire to independently manage a portfolio of work.

Importantly, digital employment creates new opportunities for both urban and rural residents. Workers who previously needed to relocate to the capital for office work can now live anywhere with internet access.

Analysis and results

Thus, employment in the digital sphere provides an individual with numerous advantages (Fig. 1).

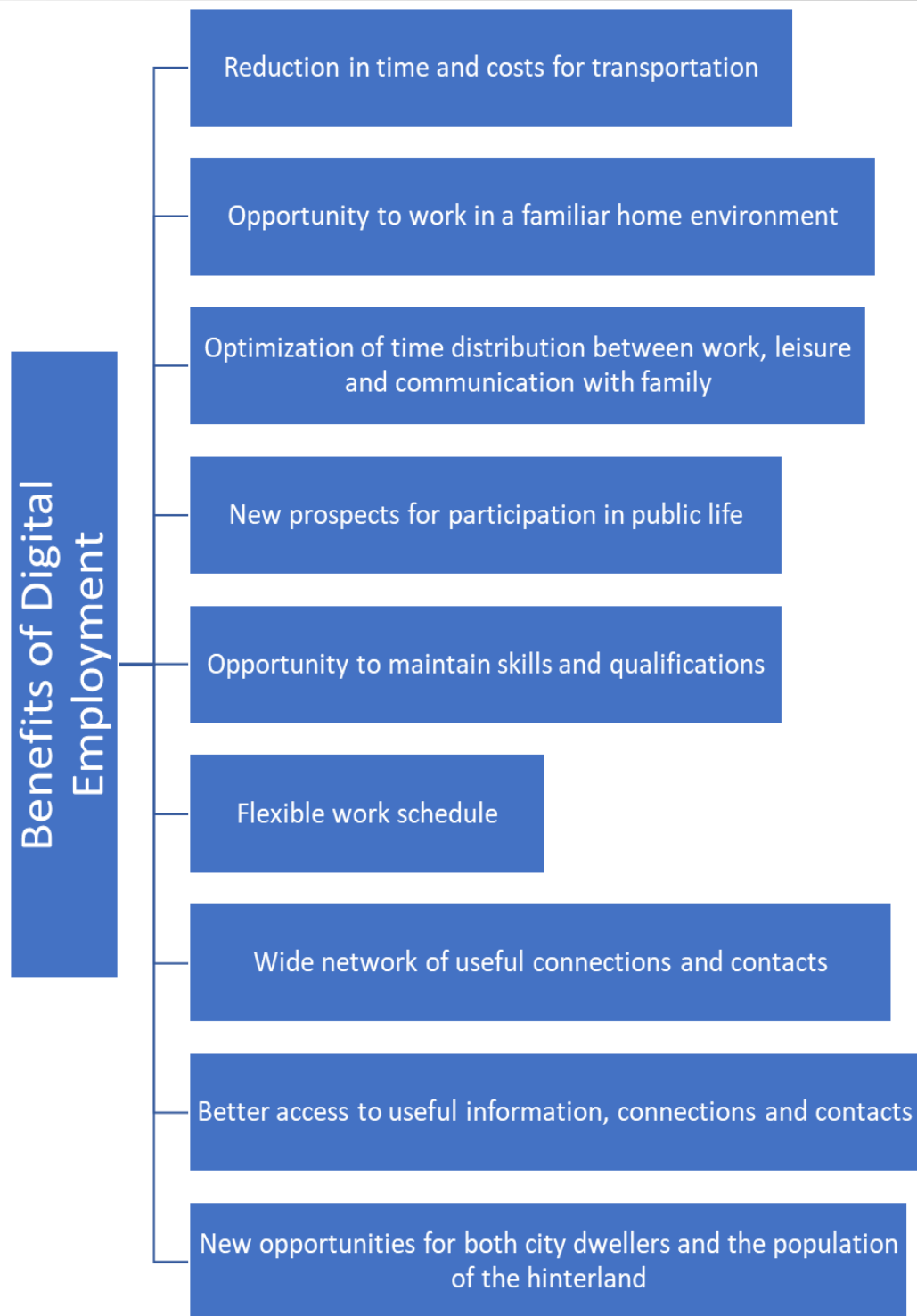


Fig. 1. The advantages of employment in the digital sphere

For employers, the so-called "soft skills" of potential candidates have recently become a priority: personal qualities and social skills, for example, the ability to work in a team, curiosity, initiative, critical thinking, self-management, the ability to solve complex problems, interact with different people, and set priorities correctly.

At the same time, as noted by some heads of large organizations, the role of formal diplomas and educational certificates has significantly decreased. Top companies such as Google, Apple, and IBM, as well as the international

consulting giant Ernst & Young, do not require higher education diplomas when applying for a job — relevant experience is enough. But this is not always mandatory. The main thing that the candidate must do is to show that he really fits the vacancy he's applying for.

New working conditions require new skills – digital skills. "Digital skills" are usually understood as a set of skills in using digital devices, communication applications and networks to search for and manage information, create and distribute digital content, interact and collaborate, and solve problems in the context of effective and creative self-realization, learning, work and social activity in general.

According to the classification adopted in Canada, digital skills cover several categories:¹

1. Foundational skills, including basic literacy, writing, document use, and numeracy, without which only low-skilled jobs can be successfully completed. Before you start working with digital technologies, you need to have a set of these skills.

2. Transversal skills, which include mostly transferable and soft skills such as teamwork, lifelong learning, problem-solving, and relationship development. Without these "flexible" skills, the technical potential of an employee cannot be fully realized.

3. Digital technical skills relate to the use of a computer and software, the application of network security measures, and others. These skills are critical to the effective functioning of today's digitally enabled workplaces.

4. Digital information processing skills – high-level cognitive skills in relation to information processing, such as finding, synthesizing, evaluating, applying, creating, and communicating information. This includes the abilities necessary to obtain special qualifications and professions in the field of ICT.

A study of the impact of new technologies on the labor market shows that the system and criteria for finding new employees are changing. In particular, when hiring personnel, the advantage will be given to those candidates who are focused on obtaining new knowledge and skills, strive to keep abreast of the products of the technological revolution, and do not focus only on the traditional model of training with a narrow specialization. There is an increasing need for candidates with skills and experience in different areas that may not even overlap.

The new conditions of competition force companies to treat personnel differently. Competition in the field of finding and attracting the most talented and qualified specialists has noticeably increased, as well as the focus of employers on retaining the best employees. Human capital, especially

¹ Asliturk, E. Skills In The Digital Economy: Where Canada Stands And The Way Forward. March, 2016 / E. Asliturk, A. Cameron, S. Faisal // The Information and Communications Technology Council, Ottawa, Canada. – Mode of Access: <https://www.ictc-ctic.ca/wp-content/uploads/2016/05/Skills-in-the-Digital-Economy-Where-Canada-Stands-and-theWay-Forward-.pdf>. – Date of access: 06.11.2018.

specialists with digital skills, is becoming a key resource in a firm's competitive strategy.

According to a study by Ecorys UK Ltd commissioned by the British government, as early as 2022, approximately 22% of new jobs in the global economy will be created thanks to "digital professions".² In the near future, the focus will be on recruiting people with the right digital skills. In fact, 73% of recently surveyed companies are already having serious trouble finding digital talent.³

Clearly aware of this trend, many companies, together with leading universities and colleges, are actively developing special educational and training programs. In recent years, various courses and online training programs have become especially popular, not only for potential applicants for new jobs and professions, but also for improving the digital skills of company personnel.

Finally, in the digital economy, the recruitment process itself is changing. According to forecasts, in the future, an HR specialist is an analyst who manages the collection and processing of large databases and makes key decisions. And the collection of data on the Internet through open sources of information is carried out by a robot. And this is no longer a fantasy, but a reality. The Stafory startup is already completely replacing the recruiter: artificial intelligence (AI) "scans" resumes on recruiting sites, data from social networks, carries out initial calls to candidates, interviews them with a human voice, supplements resumes, makes recommendations for hiring and transfers them to the HR departments of companies.

Two vectors of labor market development in the context of digitalization of the economy can be assumed. The first scenario, optimistic, is based on the fact that the labor market in the digital economy needs creative people who are able to think creatively. In general, production will not need people, but they will be necessary for the field of "human-oriented" services, since robots in the near future will not be able to replace creativity, invention, design, programming and maintenance of themselves, organization and commissioning of production. Technologies for online control of robotic equipment will be developed, which will require a large number of online operators. As such, the adoption of AI and robots in the manufacturing sector should be seen as an extension of technical capabilities. In addition, digital technologies will allow older workers and workers with disabilities to better integrate into the market, while machines will perform dangerous and routine work. People will be able to use their freed up time more actively for other work or leisure, for creativity and the provision of innovative services. With

² Digital skills for the UK economy // UK Government. – Mode of Access: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492889/DCMSDigitalSkillsReportJan2016.pdf. – Date of access: 06.11.2018.

³ People strategy for the digital age: A new take on talent – 18th Annual Global CEO Survey // PricewaterhouseCoopers. – Mode of Access: https://www.pwc.fr/fr/assets/files/pdf/2015/07/pwc_ceo_survey_talent_people_strategy_forthedigitalage.pdf. – Date of access: 08.11.2018.

the timely development of educational programs and their implementation with the help of the state, the transition from old professions to new ones will become less painful. The personnel of the "digital era" will ensure the production, storage, processing and sale of information, create unique knowledge, as well as manage it.

New digital technologies have a number of features that have a positive impact on the labor market. Firstly, the use of modern digital portals for job search allows candidates to improve career opportunities thanks to access to an extensive database of current vacancies. Thanks to the Internet and special web services, the transparency of information on both employing companies and potential candidates has increased significantly. In the United States, more than 130 million people are registered on the LinkedIn platform, which represents a significant proportion of the working population of the United States. In turn, various social networks play a significant role, from which you can learn a lot of useful information about employers and employees.

Secondly, digital platforms contribute to increased productivity, as they provide a more accurate match of the applicant's profile to the proposed vacancy. In addition, they can reduce unemployment, as well as reduce shadow employment and job search time. Examples include digital platforms such as Uber and YouDo, whose business models are based on an effective correlation between supply and demand levels in the labor market.

Thirdly, the introduction of modern digital tools in all spheres of life contributes to the emergence of new professions and jobs. In the past, a large part of the population initially worked in the primary sector (production of raw materials, e.g. agriculture and mining). During the first industrial revolution, this trend changed: a significant part of the able-bodied population moved to the secondary sector (manufacturing). However, from the beginning of the world wars to the present day, there has been a trend towards the development of the tertiary sector (service), which today employs 70% of workers. According to some authors, the fourth and fifth sectors will soon appear, which include information services and services that require high intellectual standards.⁴

A 2015 study in Australia found that 60% of university students are enrolled in occupations that will be largely automated in the next 10 to 15 years. According to analysts of the World Economic Forum, 65% of children who went to the first grade in 2018 will eventually receive professions that do not yet exist. Some specialties are waiting for serious modernization. The foreman of the future will have to master a wider range of skills and knowledge, for example, to be able to diagnose a construction site with the help of complex engineering equipment and software analysis. Companies will

⁴ Wisskirchen, G. Artificial Intelligence and Robotics and Their Impact on the Workplace. April, 2017 / G. Wisskirchen, U. Bormann, A. Muntz, G. Niehaus and others // IBA Global Employment Institute. – Mode of Access: <https://www.ibanet.org/Article/NewDetail.aspx?ArticleUid=012a3473-007f-4519-827c-7da56d7e3509>. – Date of access: 07.11.2018.

be able to save money by using one qualified professional who can control both production and economic processes.

Fourthly, thanks to modern technologies, it is possible to work remotely, which makes it possible to increase the efficiency of employment of specialists from regions with low local demand.

Finally, digital technologies help employees acquire new knowledge and skills through distance e-learning to improve their own qualifications or master new professions.

According to a pessimistic forecast, in the course of digitalization of production, things will become more in contact with each other (the industrial Internet of Things), and alienation between people, on the contrary, will increase. As a result, digitalization can lead to a negative effect affecting those employed in the production of products and the provision of services, when the chain of product creation is reduced to a minimum, design, 3D printing and delivery will be enough. According to some experts, by 2030 the workforce will be quantitatively smaller, it will be older, more formally educated, and there will be a tendency for 50% of professions to die out.

To confirm or refute this forecast, let's consider global trends in the labor market in the digital economy. First of all, they are associated with the restructuring of many sectors of the economy in the direction of automation, digitalization, as well as with the strengthening of the role of information technology in most industries. According to experts, all this will lead to a restructuring of the structure of the labor market and a change in the type of employment of individual specialists.

J. Rometty, CEO of IBM, which is already experiencing robotization and its impact on the labor market, is optimistic about the future: she believes that robots will take jobs, but at the same time, new types of jobs will appear, people will work in symbiosis with AI, the use of which Gartner predicts companies will grow by 70% in 2018 to reach \$1.2 trillion.⁵ Scientists from the University of Utrecht and the ZEW Center for European Economic Research in Germany believe the same: although labor automation reduces the number of jobs, at the same time makes goods cheaper, increases the purchasing power of people and creates new jobs in other industries, for example, in trade.⁶ Of course, the number of vacancies for low-skilled personnel will decrease, but this only means that significant investment in education will be required - both from the corporations themselves and from the state.

Despite some gloomy forecasts, it can be expected that most of the people currently employed in automated jobs will be transferred to other industries. New models of labor relations, which will become generally accepted as a

⁵ Gartner Says Global Artificial Intelligence Business Value to Reach \$1.2 Trillion in 2018. Available at: <https://www.gartner.com/newsroom/id/3872933> (accessed: 07.11.2018).

⁶ Mukhamedzyanova D. Robotizacija 2017: kogda mashiny oterut u ljudej rabotu [Robotization 2017: when cars will take people away from work]. Available at: <https://hightech.fm/2017/01/08/robots-6/amp> (accessed: 05.11.2018) (in Russian).

result of the use of AI, digitalization and global integration of the labor market, will provide the younger generation with a chance to have more free time and create an individual working atmosphere. Even if some of these new jobs mean a loss of tax benefits and Social Security, they will at least help avoid unemployment.

The McKinsey Global Institute's latest study on labor market outlooks argues that even in an automated environment, demand for workers can increase as levels of economic development increase, fueled in part by productivity gains from technological advances. Rising incomes and consumption, especially in developing countries, improved health care in aging societies, increased investment in infrastructure and energy, and other trends will create additional demand for workers that can help offset workplace automation.⁷

Today, the industrial sector employs 320 million workers worldwide and only 2.1 million robots (Figure 2). According to ABI Research, the market for manufacturing robots will grow by 16% per year, and by 2025, the level of shipments will triple.

Despite the tremendous growth in factory automation, the density of industrial robots varies by region. On average, in 2015, the density was 66 units per 10,000 workers, and by the end of 2017 it had increased to 74. Individually, we see an uneven picture: in the EU countries, this figure is 99, in Asia – 63, in South and North America – 84.⁸ Robotization reached its maximum in 2010–2016: the average annual growth rate reached 9% in Asia, 7% in South and North America, and 5% in Europe.

The top ten most robotic countries in the world in 2017 included Belgium, Denmark, Germany, Italy, Japan, Singapore, the United States, Taiwan, Sweden, South Korea and Japan. The fastest development of robotization of production is in China. Now the country ranks 23rd in the ranking, but by 2020 it should enter the top ten with 150 robots per 10,000 personnel. In 2017, there were 630 industrial robots per 10,000 workers in South Korea, mainly engaged in the production of electronics and cars. Japan is the world leader in the production of industrial robots: the country provides 52% of the world market. In 2016, Japanese enterprises produced 153K industrial robots, which is a record number.⁹

⁷ Jobs Lost, Jobs Gained: Workforce Transitions In A Time Of Automation. December, 2017 // McKinsey Global Institute. – Mode of Access: <https://www.mckinsey.com/~media/BAB489A30B724BECB5DEDC41E9BB9FAC.ashx>. – Date of access: 07.11.2018.

⁸ Statistics of the world density of industrial robots // MENTAMORE. – Rezhim dostupa: <https://mentamore.com/robototexnika/statistika-mirovoj-plotnosti-promyshlennyx-robotov.html>. Accessed on 05.11.2018.

⁹ Robot density rises globally: IFR Press Release, Frankfurt, Feb 07, 2018 // International Federation of Robotics. – Mode of Access: <https://ifr.org/ifr-press-releases/news/robot-density-rises-globally>. – Date of access: 05.11.2018.

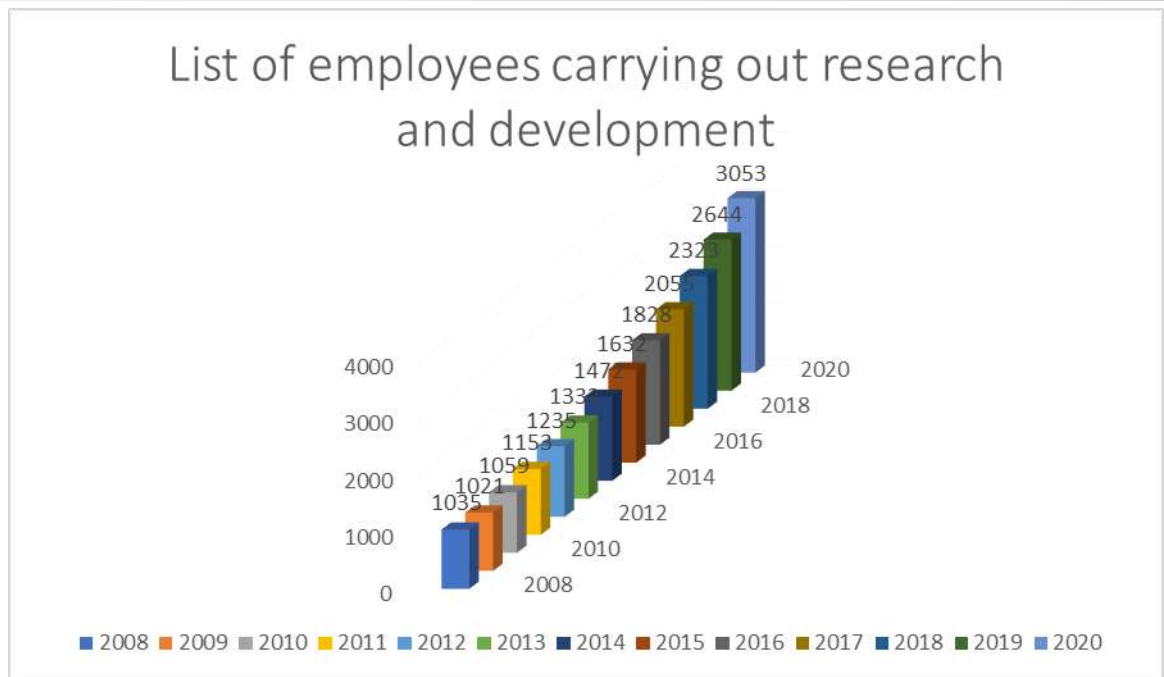


Fig. 2. The list number of employees performing research and development.¹⁰

Robots are vastly superior to humans in endurance, accuracy, and speed. In other words, they are more productive and have little to no scrap (if set up correctly). And this means that robotization, which increases productivity and reduces the cost of production, will generally be an unconditional benefit and a driver of economic development.

Experts from the Moody's rating agency are confident that the introduction of robotics will help solve demographic problems in the labor market of Western Europe and Japan (an increase in the share of the population over 65 years old with a decrease in the percentage of the labor force).¹¹ China, South Korea and the United States are also among the leaders in the introduction of industrial robots. Life expectancy is increasing in all three countries, and it is the introduction of robotics that will mitigate the consequences of the demographic crisis.

However, a study of recent studies shows that most experts do not share the rosy expectations for factory automation. The pace of global robotization indicates that we are gradually moving towards unmanned industry. Some reviews claim that more than half of all existing jobs will either change or disappear entirely.¹²

¹⁰ Statistics of the world density of industrial robots // MENTAMORE. – Rezhim dostupa: <https://mentamore.com/robototexnika/statistika-mirovoj-plotnosti-promyshlennyx-robotov.html>. Accessed on 05.11.2018.

¹¹ Nag, A. Robots May Help Defuse Demographic Time Bomb in Japan, Germany / A. Nag // Bloomberg. – Mode of Access: <https://www.bloomberg.com/news/articles/2017-05-29/robots-may-help-defuse-demographic-time-bomb-in-japan-germany>. – Date of access: 05.11.2018.

¹² Inception Report for the Global Commission on the Future of Work. 2017 // International Labour Organization. – Mode of Access: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_591502.pdf. – Date of access: 06.11.2018.

It is not possible to give any quantitative estimates of how many jobs will be lost by people, and to speculate about which of the human professions will finally disappear. In this regard, the statement of experts from the World Economic Forum is indicative: "current estimates of (future) global job losses due to the digitalization process vary greatly, from 2 million to almost 2 billion by 2030."¹³

According to a report by the United Nations Conference on Trade and Development, robotization will be the first to take two-thirds of jobs from residents of developing countries, including Ethiopia, Nepal, Cambodia, China and Bangladesh.¹⁴ By 2024, robots will put one in four people in Russia unemployed (according to the recruiting portal Superjob), by 2025 - 7% of Americans (Forrester Research report), by 2026 - 40% of Canadians (report by the Brookfield Institute for Innovation and Entrepreneurship), and by 2035 they will occupy half of jobs in Japan (report by the Nomura Research Institute).

Researchers from the University of Oxford suggest that in the United States, 47% of professions are vulnerable to automation.¹⁵ Based on this study, the U.S. Council of Economic Advisers concluded that 83 percent of jobs that pay less than \$20 an hour will be automated first.

According to the estimates of the consulting company McKinsey, in the coming years, with the help of existing technologies, it will be possible to automate human labor worth 2 trillion.

By 2036, 2 to 50 percent of man-hour work could be automated, and by 2066, that share could reach 46 to 99 percent¹⁶. The World Economic Forum's The Future of Jobs Reports 2018 says that the proportion of human work in terms of man-hours will fall from 71 percent in 2018 to 48 percent by 2025.¹⁷ Machines and algorithms will increase their contribution to specific tasks by an average of 57%. For example, by 2022, 62% of information retrieval, processing, and communication tasks will be performed by machines, compared to 46% today (Figure 3).

¹³ Digital Transformation Initiative. Unlocking \$100 Trillion for Business and Society from Digital Transformation. Executive Summary, May, 2018 // World Economic Forum. – Mode of Access: <http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-executive-summary-20180510.pdf>. – Date of access: 07.11.2018.

¹⁴ UNCTAD Policy Brief: Robots and Industrialization // UNCTAD. – Mode of Access: https://unctad.org/en/PublicationsLibrary/presspb2016d6_en.pdf. – Date of access: 08.11.2018.

¹⁵ Frey, C.B. The Future of Employment: How Susceptible Are Jobs To Computerisation? / C.B. Frey, M.A. Osborne // University of Oxford. – Mode of Access: https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf. – Date of access: 09.11.2018.

¹⁶ Aptekman, A. Digital Russia: New Reality. July 2017 / A. Aptekman [et al.]. – Moscow: McKinsey, 2017. – 133 p.

¹⁷ The Future of Jobs Reports 2018 // World Economic Forum. – Mode of Access: http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf. – Date of access: 02.11.2018

Table 1

Estimates of the impact of digital technology on employment¹⁸.

Organization	Predictive Assessment
OECD	OECD average: 9% of jobs at high risk of automation over the next five years. Low risk of full automation, but a significant proportion (50-70%) of automated tasks at risk
World Bank	Two-thirds of all jobs in developing countries are subject to automation
World Economic Forum	Global job losses by 2030 – from 2 million to 2 billion people
International Labour Organization	ASEAN 5: 56% of jobs at risk of automation in the next 20 years
University of Oxford	47% of workers in the U.S. are at high risk of replacing jobs with automation
Pricewaterhouse Coopers	38% of jobs in the US, 30% in the UK, 21% in Japan and 35% in Germany are at risk of automation
McKinsey	60% of all professions have at least 30% of technically automated activities
Roland Berger	Western Europe: By 2035, 8.3 million jobs will be lost in manufacturing, but 10 million new jobs will be created in services
Klaus Schwab	Eliminate about 5 million jobs in the world's 15 largest developed and developing countries by 2020

New OECD research (Figure 4) in 2018 shows that 14% of all jobs in the 32 countries analyzed are at high risk of automation. Another 32% of jobs could be significantly transformed in the near future.¹⁹

The OECD report says that the level of automation varies significantly between countries. In general, jobs in Anglo-Saxon countries, Northern Europe, and the Netherlands are less automated than jobs in Eastern and Southern European countries, Germany, Chile, and Japan. The researchers found that 33% of jobs in Slovakia have a high risk of automation (more than 70%). Next are Slovenia and Greece, where 25% and 23% of jobs have a high risk of automation, respectively. Norway, on the other hand, is in a better position. Norway is in a better position, with only 6% of jobs in the Nordic country at high risk of automation, followed by 7% in Finland and 8% in

¹⁸ Inception Report for the Global Commission on the Future of Work. 2017 // International Labour Organization. – Mode of Access: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_591502.pdf. – Date of access: 06.11.2018

¹⁹ Putting a face behind the jobs at risk of automation. March, 2018 / OECD. – Mode of Access: <https://community.oecd.org/servlet/JiveServlet/previewBody/132202-102-1-231244/OECD%20-%20Automation%20policy%20brief%202018.pdf>. – Date of access: 04.11.2018

Sweden. In the U.S., about 10 percent of jobs are at high risk, and only nearly 40 percent of jobs in the country are either at high risk of automation or at risk of significant change.

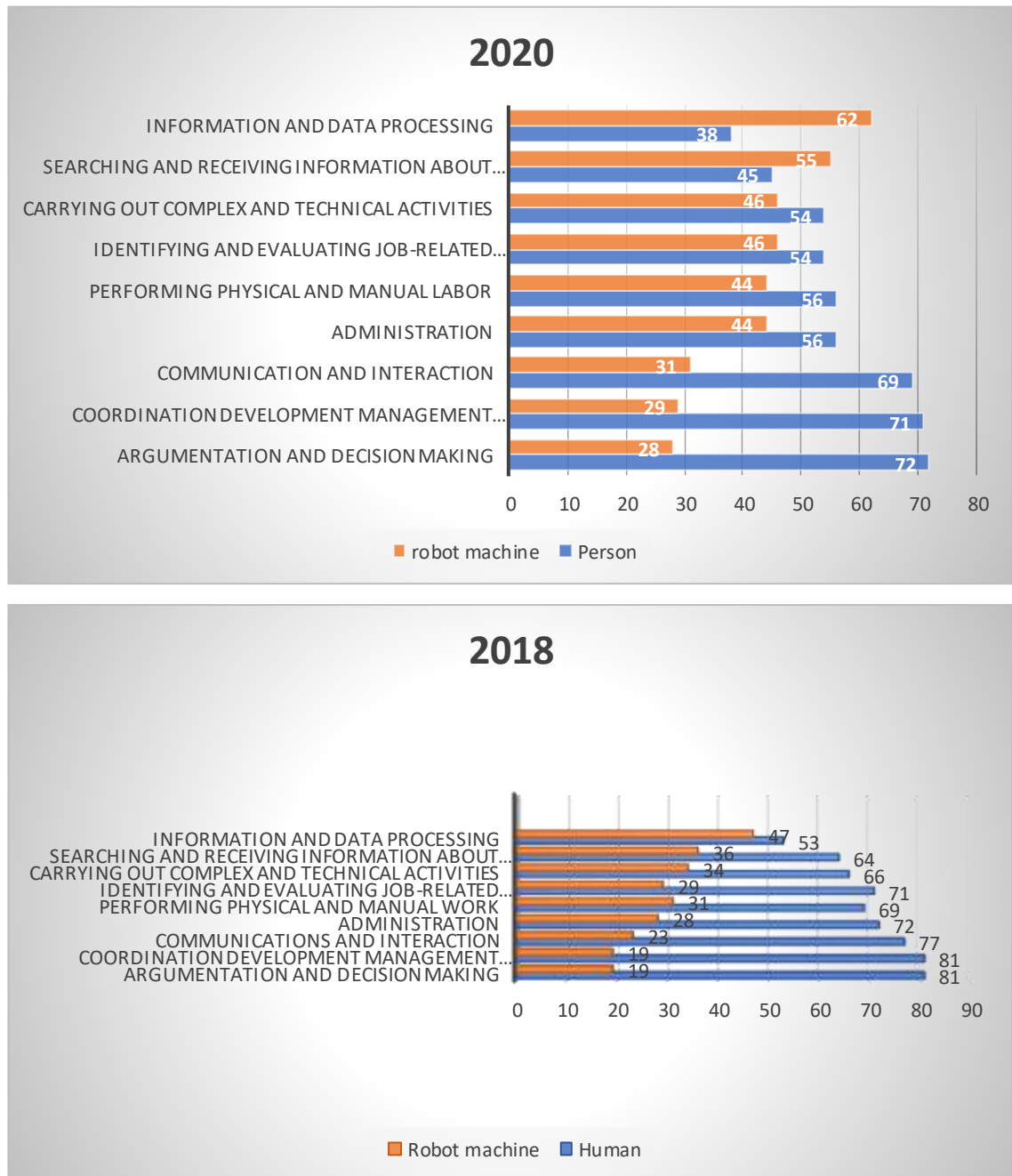


Fig. 3. The redistribution of labor between man and machines²⁰.

According to researchers at the McKinsey Global Institute, about half of all jobs in the world have the technical potential to automate by adapting technologies that already exist, but the proportion of jobs actually automated by 2030 are will be from zero (10 million units) to 30% (800 million units), on average - 15% (400 million units), due to technical, economic and social

²⁰ The Future of Jobs Reports 2018 // World Economic Forum. – Mode of Access: http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf. – Date of access: 02.11.2018

factors influencing decision-making²¹. This share varies widely across countries, with

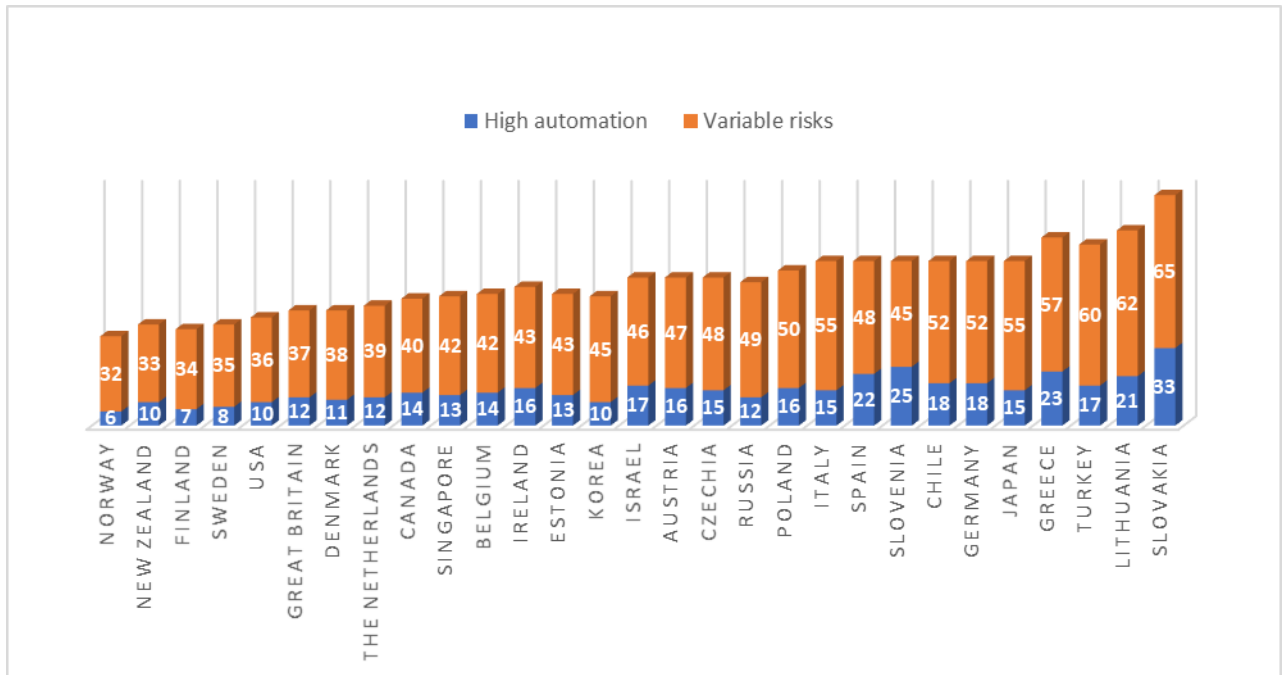


Fig. 4. The percentage of workplaces in OECD countries at risk, by risk, %²²

Advanced economies are more susceptible to automation than developing countries, reflecting higher wage levels and thus greater economic incentives for automation. Even if there is sufficient work to achieve full employment, major transformations must be implemented by 2030 that could match the historical shifts seen in agriculture and industry. McKinsey's scenarios suggest that by 2030, between 75 million and 375 million workers (3-14% of the global workforce) will need to learn new professions as their roles evolve alongside increasingly powerful and "smart" machines.²³

As a moderate short-term scenario, we refer to the estimate by Klaus Schwab, President of the World Economic Forum, who opines that robotics and artificial intelligence will eliminate about 5 million jobs in the 15 largest

²¹ Jobs Lost, Jobs Gained: Workforce Transitions In A Time Of Automation. December, 2017 // McKinsey Global Institute. – Mode of Access: <https://www.mckinsey.com/~media/BAB489A30B724BECB5DEDC41E9BB9FAC.ashx>. – Date of access: 07.11.2018

²² Putting a face behind the jobs at risk of automation. March, 2018 / OECD. – Mode of Access: <https://community.oecd.org/servlet/JiveServlet/previewBody/132202-102-1-231244/OECD%20-%20Automation%20policy%20brief%202018.pdf>. – Date of access: 04.11.2018

²³ Jobs Lost, Jobs Gained: Workforce Transitions In A Time Of Automation. December, 2017 // McKinsey Global Institute. – Mode of Access: <https://www.mckinsey.com/~media/BAB489A30B724BECB5DEDC41E9BB9FAC.ashx>. – Date of access: 07.11.2018

developed and developing countries by 2020, which equates to approximately 1.25% of the total number of jobs in these nations²⁴.

The main trend in the labor markets of both developed and developing countries is the disappearance of professions that provide standardized services. Automatic cash registers are already replacing cashiers worldwide, and conductors in public transport are becoming obsolete. In major cities, terminals for coffee and food, as well as parking payment machines, can be found everywhere.

Looking to the near future, machines are poised to replace many professions, as the market economy and growing competition compel enterprises to continually enhance efficiency. The Future of Jobs Report 2018 cites examples of disappearing professions, including data entry operators, accountants, auditors, tax inspectors, postal workers, bank employees, financial analysts, sales agents, brokers, cashiers, assembly line workers, car and van drivers, shop assistants, statisticians, and financial and insurance specialists.

One of the most striking illustrations of how mass digitalization can radically alter an entire industry is the road freight sector. Analysts predict that the transition to unmanned cargo convoys could save the global road freight industry about \$168 billion annually, including \$35 billion in fuel savings. This sharp decline in fuel consumption is expected to have a similarly positive effect on reducing road accidents, while about \$70 billion will result from a significant reduction in labor personnel.²⁵

According to a 2018 OECD report, low-skilled workers and young people are the most vulnerable to automation, as student and entry-level jobs carry a higher risk compared to those held by experienced workers. Routine jobs with low skill requirements and often low wages are at the greatest risk, while a broader range of jobs, from professionals to social workers, are at the lowest risk.

Researchers have found that the risk of job loss due to automation is higher for men than for women. According to PricewaterhouseCoopers, 35% of occupations typically held by men are at risk due to automation, while the probability for women is only 26%. In sectors such as trade and transport, where lower levels of education and social skills are prevalent, men are predominantly employed, making these areas more susceptible to robotization. Conversely, fields like education, health care, and social services, where women are more represented, are less likely to be affected by automation. This is supported by a study from Oxford, which found that in construction—where 97% of jobs are held by men—the risk of job loss due to

²⁴ Atkinson, R.D. In Defense of Robots / R.D. Atkinson // National Review. April 17, 2017. – Mode of Access: <https://www.nationalreview.com/2017/04/robots-jobs-industrial-future/>. – Date of access: 07.11.2018

²⁵ Self-driving trucks: what's the future for America's 3.5 million truckers? // The Guardian. – Mode of Access: <https://www.theguardian.com/technology/2016/jun/17/self-driving-trucks-impact-on-drivers-jobs-us>.

automation is 70%. For women, who make up 93% of nurses, the probability is just 0.009%.²⁶

The likely consequences of work automation will include income stratification, increased unemployment, and a decline in living standards, particularly in areas with limited employment opportunities, such as single-industry towns. Researchers predict that robotization will create a societal divide: on one side, there will be qualified professionals—engineers and developers—and on the other, low-skilled workers. Kurt Vonnegut captured this societal issue in his 1952 novel "The Mechanical Piano."

Income polarization is expected to continue in advanced economies, where demand for high-paying jobs will grow faster than employment among middle-wage workers, assuming the current income structure remains unchanged. Increased investment and productivity gains through automation could generate enough economic growth to ensure full employment, but this is contingent on the majority of laid-off workers finding new jobs within a year. Delayed job searches are likely to result in increased frictional unemployment in the short term, potentially escalating social conflicts.

However, there is no need to fear the "withering away" of many familiar professions. According to The Future of Jobs Report 2018, while 75 million current jobs may be eliminated by 2022 due to the evolving division of labor between humans and machines, an additional 133 million new jobs will also be created. Despite these significant changes, the overall employment outlook remains positive, as jobs requiring strong human skills will continue to be in demand. Robots will not replace scientists, engineers, actors, managers, teachers, and social workers.

Conclusion

In conclusion, the widespread digitalization of business processes and entire industries in the coming decades will lead to the partial replacement of human labor with machine labor, resulting in a significant share of the workforce being released. This shift will create new challenges for companies and states. At the same time, digital technologies and platforms can positively impact the labor market by facilitating personnel searches, reducing job-seeking time, increasing employee productivity, improving workforce engagement through remote work, and providing access to quality education.

To achieve positive outcomes, policymakers and business leaders must leverage the benefits of automation while managing the workforce transitions driven by the digital economy. The forthcoming changes in the labor market will challenge existing educational and training models, as well as business approaches to developing professional skills. Therefore, ensuring sustainable demand for labor is a top priority. Another crucial priority is to rethink the

²⁶ Frey, C.B. The Future of Employment: How Susceptible Are Jobs To Computerisation? / C.B. Frey, M.A. Osborne // University of Oxford. – Mode of Access: https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf.

transition caused by digitalization and safeguard the incomes of workers affected by automation.

Coordinated action from the state, businesses, and educational institutions will be essential to prepare for these anticipated changes, as well as to retrain and employ displaced personnel.

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