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HOW WILL ARTIFICIAL INTELLIGENCE AFFECT THE LABOR MARKET?

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Abstract
Purpose: Identify problems associated with the introduction of artificial intelligence technologies into the economic sphere and their impact on the labor market. Design/methodology/approach: The article analyzes the emerging barriers to the development of digitalization and artificial intelligence both in the labor market and in the economy. When conducting the research, general scientific and problem-oriented research methods were used, including observation and generalization. Findings: As a result of the analysis, it was revealed that the introduction of artificial intelligence into production and technological processes at the initial stage will have a negative impact on the labor market and on the situation in the economy and society. Originality/value: Directions for action to minimize the negative consequences of the spread of artificial intelligence and robotics in the economy are proposed.

Keywords Artificial intelligence • Economic growth • Smart economy • digitalization • labor market • robotization of labor • new technologies.

Introduction

Currently, on a global scale, digital technologies such as artificial intelligence, the Internet of things (Internet of things), big data (Big Data) are rapidly entering all fields. The widespread introduction of cyber-physical systems to the organization and service of production and human needs, including life, work and leisure, is called the fourth industrial revolution. A number of experts look at this as a challenge and emphasize that everyone in the society should have an understanding of digital technologies and be able to use them effectively, which is the main element of economic development.

A significant part of the authors interprets the concept of “artificial intelligence” (AI) as a technological process or a branch of modern science that studies the intellectual thinking abilities of a computer, robotics or analytical system. Not so long ago, people imagined “artificial intelligence” in the form of a humanoid android or a powerful supercomputer. Today, “artificial intelligence” refers to complex mathematical algorithms and computer systems capable of performing tasks that previously required human participation: learning, visual, auditory recognition, image and video processing, etc. Perhaps the main difference between artificial intelligence and other systems based on self-learning algorithms is the ability to make decisions independently and communicate with people. The goal of artificial intelligence is to create technical systems that can perform actions that require meaningful information processing, which is the main function of the human brain, and solve problems that do not require calculations. These tasks include proving theorems, solving problems, translating from one language to another, writing music, and solving complex creative problems in social practice and science.

Table 1 The main goals of artificial intelligence.

Artificial intelligence goals	
Creation of analytical systems that have intelligent behavior, can learn independently or under human supervision, make predictions and build hypotheses based on an array of data	Implementation of human intelligence in a machine - the creation of assistant robots that can behave like people: think, learn, understand and perform assigned tasks.

2 Materials and Method

In accordance with the generally accepted approach, to date, humanity has experienced 3 industrial revolutions:

1) the beginning of the use of hydraulics to mechanize production;
2) use of electricity;
3) introduction of electronics for production automation[1].

With the achievement of significant progress in the development of nanotechnology, biotechnology, artificial intelligence, the Internet of Things, robotics and 3D printing, the eve of the so-called “Fourth Industrial Revolution” has come.

This thesis is confirmed by a series of innovations and breakthroughs that have shown the power and effectiveness of AI in various fields, including medicine, trade, finance, media, crime fighting, and many more. etc[2]. The use of technologies using elements of artificial intelligence should presumably lead to an increase in labor productivity by up to 40% in sectors of the national economy and the service sector. These innovative technologies will contribute to the optimal use of human and production resources, further economic development, and GDP growth.

Artificial intelligence, combined with robotics and advanced online technologies, already today effectively copes with many tasks that previously could only be performed by people. For example, AI has already been actively introduced into the field of medicine, where smart programs help make diagnoses and select treatment methods. AI is also used in journalism, online education, recruitment, real-time translation functions. And in general, modern digital technologies are capable of implementing or significantly simplifying many processes.

But at the same time, the rapid development of AI has highlighted the fact that, while machines help people solve their problems, they will also create new problems that will affect the economic, legal and ethical foundations of our society.

Domestic and foreign experts note that we should expect significant negative consequences from robotization associated with a reduction in jobs in industrial production, agriculture, and in certain sectors of the service sector at the level of 8–47% for various countries (for Russia 15–20%). It is expected that the rate of decline in professions may be at least 1–3 annually. First of all, professions based on repeating algorithms and scripts will disappear: salesperson, translator, recruiter, news journalist, train driver, courier and warehouse logistics workers, bank

1 Savchuk T. Threats from the future: can robots completely replace humans? URL: https://ru.krymr .com/a/28676115 .html (дата обращения: 20 .10 .2020) .
2 Which industries benefit most from AI development today? URL: https://snob .ru/science/ iskusstvennyj-intellekt-i-potrebnosti-biznesa/?utm_referrer=https%3A%2F%2Fzen.

employee (accepting loan applications or providing basic information), call center operator, etc.

Forecasts from various analytical studies are mostly pessimistic and assume an increase in unemployment. But this concern is unfounded. Artificial intelligence could be the greatest job engine in history. Thanks to the use of AI, some specialties will change, new professions will emerge in which people will be significantly more effective than artificial intelligence. The following will be in demand: training people, emotional and cognitive labor, flexible strategic management, managing human relations within a separate company, research, machine learning, engineering and information technology, etc. And as a result, it will be necessary to train and employ many specialists.

According to economists, in the short term there will be a problem with replacing specialists and a shortage of vacancies. This effect is called skills and technologies mismatch - the discrepancy between technologies and workforce skills.

In many industries, manufacturing and services, there is already a shortage of professionally trained specialists. Google, Facebook, Apple, Amazon, Uber and other big tech companies are willing to pay millions of dollars for AI experts who urgently need talent to work on facial recognition, digital assistants and self-driving vehicles.

The technology industry must help society adapt to the changes that will affect the socio-economic landscape. Teaching new technical skills to people whose jobs will be taken over by AI in the future will be one manifestation of such efforts.

Whatever the future, a person who is focused on personal and professional development, on a conscious attitude towards the environment, who is ready to use the latest digital technologies in their work and boldly meet changes, should not be afraid of the new. Only professions become obsolete, and specialists with a unique set of competencies will always be in demand.

3 Results

According to research by the World Economic Forum (WEF), technology will be one of the main factors affecting business in the next five years. The overwhelming majority (75%) of the organizations that participated in the survey indicated that they are committed to the widespread use of big data, cloud computing and artificial intelligence technologies.

The Fourth Industrial Revolution has accelerated the pace of adoption of technologies and shifted the frontier between humans and machines across sectors and geographies. Technology is altering the way we work, but also changing job content, skills in need, and which jobs are being displaced. Understanding how technologies will impact labour markets is crucial for determining whether people will be able to transition from declining occupations to the jobs of tomorrow.

Relative adoption of technologies. Future of Jobs Survey results highlight expected future trends in technology adoption across industries. Figure 1 presents the technologies according to companies' likelihood to adopt them by 2027. As in previous years, big data, cloud computing and AI feature near the top of this list, with approximately 75% of companies looking to adopt these technologies in the next five years. The data also shows the impact of the digitalization of commerce and trade, with platforms and apps likely to be adopted by 86%

of companies and e-commerce and digital trade likely to be adopted by 75% of businesses. The second ranked technology is education and workforce technologies, with 81% of companies looking to adopt this technology by 2027.

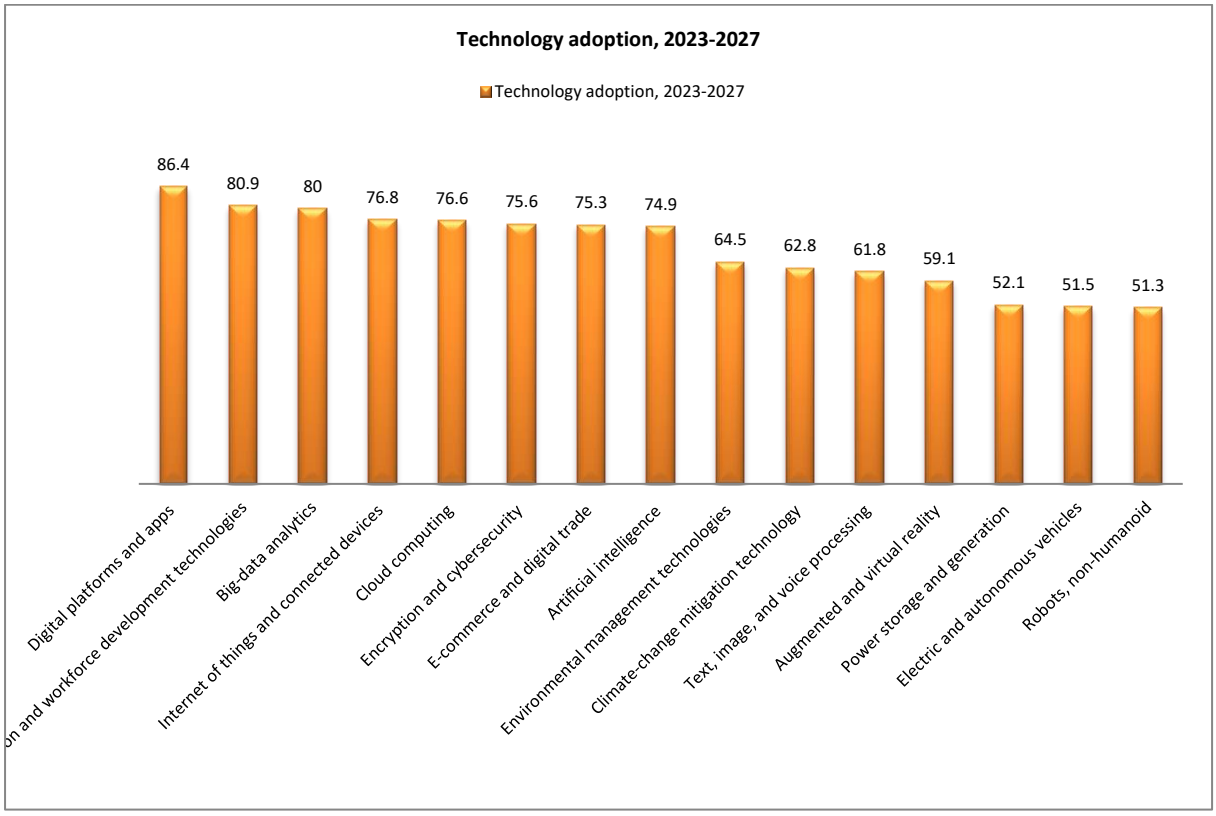

Fig. 1[3] Technology adoption, 2023-2027. Technologies ranked by the share of organizations surveyed who are likely or highly likely to adopt this technology over the next 5 years.

Expected impact of technology adoption on jobs. The Future of Jobs Survey also probes the expected impact of technology adoption on employment. Figure 1 shows that all but two technologies are expected to be net job creators in the next five years. Big data analytics, climate change and environmental management technologies, and encryption and cybersecurity are expected to be the biggest drivers of job growth. Agriculture technologies, digital platforms and apps, e-commerce and digital trade, and AI are all expected to result in significant labourmarket disruption, with substantial proportions of companies forecasting job displacement in their organizations, offset by job growth elsewhere to result in a net positive. Generative AI has received particular attention recently, with claims that 19% of the workforce could have over 50% of their tasks automated by AI and job losses making headlines, while others expect the technology to enhance jobs. Only robots, whether humanoid or non-humanoid, are forecast to have a net negative overall impact on employment in our data, with roughly equal cohorts of companies expecting growth, displacement and neutral impact. The shares of oragnizations surveyed which forecast a neutral impact are not plotted.

[3] Source World Economic Forum, Future of Jobs Survey 2023.

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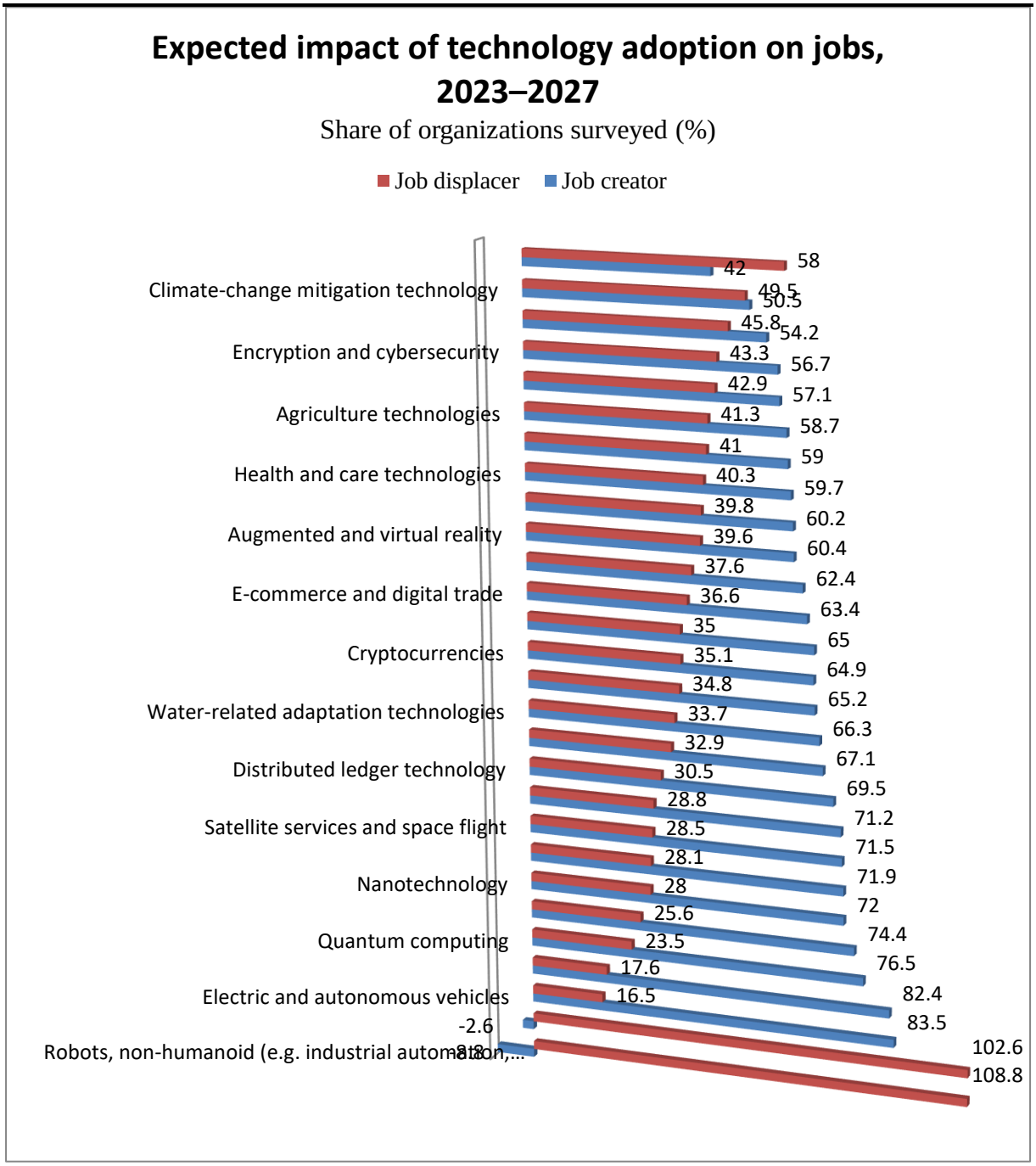

Fig. 2[4] Expected impact of technology adoption on jobs, 2023–2027. Share of organizations surveyed that expect each technology to create or displace jobs, ordered by the job creation net effect.

While respondents operating in different industries show differing preferences for technologies, there are a few industries that show much higher overall expectations to adopt new technologies while some are more cautious. The Electronics and Chemical and Advanced Materials industries are planning to adopt more technologies than average, while the

[4] Source World Economic Forum, Future of Jobs Survey 2023.

Employment Services, Insurance and Pension Management, and Real Estate industries are the least inclined to adopt new technologies.

Environmental management technology is one of the technologies with the most differentiated uptake across industries, with 93% of Oil and Gas employers expected to adopt the technology, followed by Chemical and Advanced Materials (88%) and Production of Consumer Goods (86%). In contrast, just 26% of Employment Services employers expect to adopt this technology, followed by Education and Training (36%) and Insurance and Pension Management (42%). Similarly, augmented and virtual reality is likely to be heavily adopted by organizations in Electronics (80%); Research, Design and Business Management services (77%); and Energy Technology and Utilities (75%) industries, compared to Mining and Metals (46%); Accommodation, Food and Leisure services (42%); and Agriculture, Forestry and Fishing (30%) industries. Sectoral data on technology adoption is also included in Appendix B.

Looking specifically at robots, Future of Jobs Survey data highlights the Electronics (83%), Energy Technology and Utilities (72%), and Consumer Goods (71%) industries as likely top adopters. Data from the International Federation of Robotics shows that the number of industrial robots per 10,000 workers has continued to rapidly increase over the last five years across countries. Industrial robot density has nearly doubled over the last five years, reaching 126 robots per 10,000 workers on average. Regarding robots' impact on employment, the strongest sectoral picture emerges for the adoption of non-humanoid robots, wherein 60% of companies operating in the Production of Consumer Goods and the Oil and Gas industry foresee job displacement, and 60% of companies operating in Information and Technology services foresee job creation in the next five years.

AI and big data. While AI and big data ranks only 15th as a core skill for mass employment today, it is the number three priority in company training strategies from now until 2027, and number one priority for companies with more than 50,000 employees. AI and big data is also the most strongly prioritized skill in the Insurance and Pensions; Management, Media, Entertainment and Sports; Information and Technology Services; Telecommunications; Business Support and Premises Maintenance Services; and Electronics industries.

Among technology skills, the ability to efficiently use AI tools now exceeds computer programming by humans, networks and cybersecurity skills, general technological literacy skills, and design and user experience by some margin. In the next five years, AI and big data will comprise more than 40% of the technology training programmes undertaken in surveyed companies operating in the United States, China, Brazil and Indonesia. The next most emphasized technology skill is design and user experience, though this receives less than half the strategic prioritization of AI and big data in most countries and industries, and only exceeds it in Spain and Latvia, among the countries covered by this year's survey. Although a minority of companies believe that AI and big data has been overemphasized as a core skill and will decline in importance to workers, a net 59% of companies predict it will grow in importance, and many companies see it as a strategic priority. Though generative AI has the potential to displace jobs, the focus placed on training workforces to exploit AI and big data indicates the opportunities for new roles which harness its potential to help achieve business goals.

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These findings are also reflected elsewhere in the Future of Jobs Survey. Big-data analytics also ranks top by some margin among technologies which are seen as likely to create jobs if they are adopted, with 65% in agreement that they will stimulate labour-market growth and just 7% predicting contraction (see Chapter 2). Specialized roles in AI and big data are estimated to grow by 30-35% (see Chapter 3). Big-data analytics is the thirdmost likely technology for companies to adopt by 2027, with 80% of companies planning to integrate it more deeply into their operations, and 75% of companies planning to integrate AI techniques such as machine learning and neural networks.

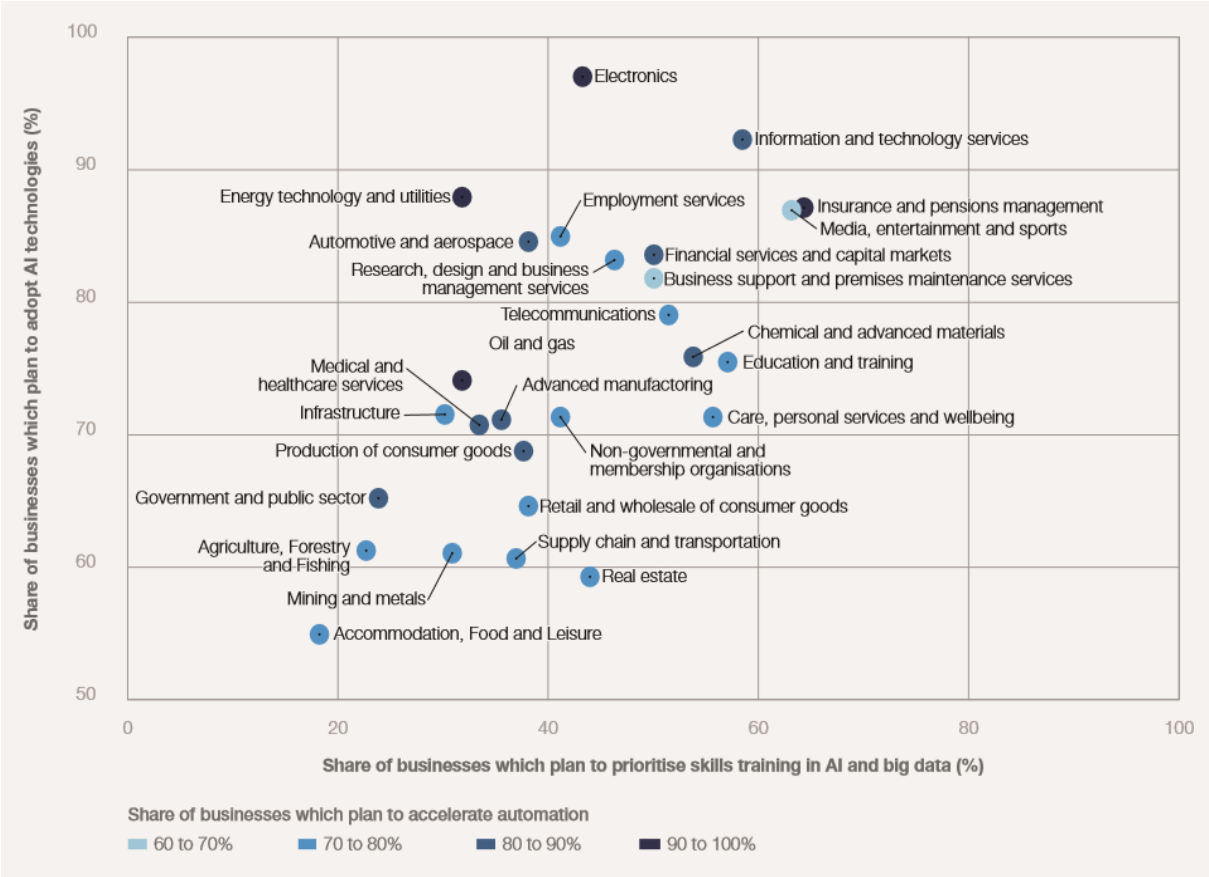

Fig. 3[5] Artificial intelligence strategies, 2023 to 2027. The probability that organizations surveyed will prioritise skills training in AI and big data versus the probability that they will adopt artificial-intelligence technologies and the likelihood of them pursuing automation as a business strategy.

As Figure 3 demonstrates, there is widespread increase in prioritizing AI strategies across sectors. However, the need for employees to be trained to exploit and interpret AI and big data is correlated neither with the amount of direct investment in AI foreseen in the next five years, nor with the likelihood that a company will pursue automation as a business strategy.

[5] Source World Economic Forum, Future of Jobs Survey 2023.

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4 Conclusion

Let us summarize and outline the main expected positive and negative consequences of robotization and production automation on the labor market:

1) growth in labor productivity;

2) increasing demand for specialists with high-tech knowledge and skills;

3) uneven implementation of automation processes in sectors of the national economy, incl. h. taking into account territorial socio-economic characteristics;

4) the disappearance of some professions, the emergence of new ones;

5) loss of jobs and, probably, an increase in the importance of measures taken by the authorities in response to this.

To fill the shortage of highly qualified specialists in the field of AI, it is necessary to develop modern models and systems for personnel training. Several approaches can be proposed for this:

• funding from the state of higher educational institutions in terms of creating new scientific directions for the implementation of training programs for specialists in the field of digital technologies;

• creation of programs for professional retraining of personnel to train them on the job;

• in state and municipal structures, at manufacturing enterprises, in the field of large and medium-sized businesses, apply a system of training specialists independently by introducing their own AI educational programs in the field of activity.

To minimize negative social consequences on the part of the government, the following measures will be optimal:

• expanding government control and investment in the field of AI;

• improving the state system of education and training with an emphasis on the most in-demand specialties;

• adaptation of the legal framework and social security system to the conditions of growing numbers of unemployed and increasing inequality in the level of income of the population.

The transformation of jobs and skills have significant impacts on businesses, governments and workers worldwide. It is crucial to develop insight forecasts, identify the appropriate talent to promote growth, and make informed decisions on managing the significant disruptions to jobs and skills for employers and workers alike.

This year's edition of the Future of Jobs Report presents a mixed picture with regard to the 2023-2027 outlook for the global labour-market landscape. Global macrotrends and disruptions create an ever-more complex environment for policy-makers, employers and workers to navigate, and uncertainty and volatility remain high. Thus, while, in early 2023, pessimistic predictions regarding the jobs impact of the green transition and generative AI dominate the media headlines, these areas have also been identified as some of the largest drivers of future job creation by Future of Jobs Survey respondents. While the report finds – for the second time since its inception – a net negative global employment outlook, these displacements are likely to be highly concentrated in an identifiable set of job categories, enabling targeted support and proactive redeployment strategies. While skills disruption remains high, it has somewhat stabilized from the height of the COVID-19 pandemic. And while companies continue to identify access to skilled talent as the single biggest barrier to business transformation,

expectations regarding workforce strategies show an increasing level of nuance, pragmatism and proactive engagement.

This last point reflects a core tenet of the Future of Jobs Report since its inception: that the future of work can be shaped for better outcomes and that it is the policy, business and investment decisions made by leaders today that will determine outcomes and the future space for action.

Accordingly, we hope that this report will contribute to an ambitious multistakeholder agenda to better prepare workers, businesses, governments, educators and civil society for the disruptions to come, and empower them to navigate these social, environmental and technological transitions.

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