

The Impact of Digitalization on Labor Productivity

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Abstract—The purpose of the article is to analyze domestic and foreign literature in order to assess the state and impact of information and communication technologies on labor productivity.

Keywords— Digitalization of the economy, information and communication technologies, information technologies, technological structure, labor market, labor productivity.

I. INTRODUCTION

A small percentage of labor productivity growth can make a big contribution to the well-being of the country and improve the standard of living of the population. McKinsey & Company experts believe that 1% growth per year for several years up to 2024 would allow an additional \$3,500 increase in income (per capita) of the US population.

In modern society, the development of information technologies continues to cover more and more areas of life and significantly affect the labor market, a person, and his activities. Having arisen in the second half of the 20th century, the concepts of "cybernetics", later "informatization" and "information technologies" became widespread by the end of the century and in the 21st century were transformed into information and communication technologies (hereinafter ICT) and have an impact on many aspects of human activity. Today, it is possible to define information and communication technologies as a set of methods, processes and software-supporting technical means that allow collecting, processing, storing, distributing, displaying and using information in the interests of its users.

Based on the definition presented above, we believe that the category of "information and communication technologies" is the most general, determining the ongoing changes in the economy and public life due to the development and introduction of information technologies. ICTs have accumulated previously obtained achievements of cybernetics, informatization, information technologies, including artificial intelligence (AI).

II. THE MAIN PART

Numerous studies of scientists in foreign countries and the Russian Federation in the field of changes in the economy, in the labor market confirm the fact that ICTs contain a huge potential for economic growth and transformation of public life. Their use allows you to get significant benefits in the

scientific field, production, healthcare, education, public administration, as well as they are able to influence the objects of the social sphere and improve the quality of life of the population. According to scientists' forecasts, by 2030 there will be a gradual transition to a new technological order in the world, the basis of which will be the use of "smart" technologies in all spheres of human activity. First of all, they will be projects at the intersection of information, nano-, bio- and cognitive technologies that will become drivers of development.

Labor productivity growth is one of the main factors in improving the competitiveness of the economy. In recent years, more and more attention has been paid to the issues of reserves for productivity growth and labor transformation by domestic and foreign authors.

The author's hypothesis. The introduction of ICT in most cases ensures the growth of labor productivity in the economy.

Russian scientists note the diverse nature of the impact of ICT on the economy:

- promotes transparency, accelerates business processes;
- digital asymmetry is growing, the structure of the labor market is changing;
- reduces the demand for low-skilled labor and the growth of unemployment in this part of the labor market, and increases the demand for highly skilled labor;
- increases the requirements for working personnel regarding digital competencies.

The ongoing changes are characterized by high rates and greatly change the nature of work and lifestyle of most people, their ways of life. This is also felt in the Russian Federation, in which companies of the third or fourth technological order still retain their positions, while the digital economy is recognized as the sixth technological order. Therefore, as Pavel Khristenko (CEO of ANO "Digital Productivity Technologies") notes, "the introduction of software products implies the preservation of labor productivity growth. For example, the introduction of ERP-class systems allows you to increase the volume of products by an average of 32%, accelerates the processing of orders by 62%. The introduction of BI-systems strengthens the management decision-making system, which together leads to an increase in productivity. In other words, the introduction of ICT in Russian enterprises can significantly increase labor productivity" [1].

The Russian Federation has adopted and is implementing the state program "Digital Economy of the Russian Federation", the purpose of which is "to create an ecosystem

of the digital economy of the Russian Federation, in which digital data is a key factor of production in all spheres of socio-economic activity and in which effective interaction, including cross-border, business, scientific and educational community, the state and citizens is ensured" [2].

On the one hand, the introduction of digital technologies makes it possible to optimize business processes without additionally involving personnel, which is attractive for business. On the other hand, it leads to the emergence of new specialties and fields of activity, which is attractive to the state, because it reduces the burden on the budget by reducing unemployment.

Scientists continue to debate about possible ways to further accelerate the growth of labor productivity. And more and more attention is being paid to ICT. According to Robert J. Gordon, the achievements of AI are "impressive, but do not make a revolution", as did the invention of electricity or the internal combustion engine.

Erik Brynjolfsson, director of the Digital Laboratory for Economics at Stanford University, notes that the lack of momentary growth in labor productivity may disappoint, but the growth of this indicator is a matter of time.

Today, the main place of application of ICT, as a rule, is large business. US experts note that advanced technologies are not widely used, since two-thirds of American companies are small businesses. The American experience of the introduction of ICT shows that in the Russian Federation there is a huge "field" in the form of state corporations for the introduction of advanced ICT, and as a result, solving the problem of labor productivity growth by 5%, defined in the national project "Labor Productivity and employment support" for 2019-2024.

Among domestic scientists on labor productivity, employment in the context of the sixth technological order, the following works stand out: Odegov and Pavlova [3]. I. Voskoboinikov and V. Gimpelson consider the problem from the perspective of the impact of structural shifts in the Russian economy on the increase in aggregated labor productivity [4]. The issues of new requirements for employees in terms of digital competencies, overcoming digital asymmetry and increasing labor productivity are considered in the works of M. Rozhdestvenskaya and P. Yarina [5], M. Dudin, S. Shkodinsky, I. Prodchenko [6]. Studies of the impact of ICT on productivity from the point of view of labor quality were undertaken by I. Korogodin. I. Aliyev considers labor productivity issues through the prism of self-organization of workers, identification of workers [8]. A wide range of problems of the impact of ICT on labor productivity is also considered in the works of A. Porokhovskiy [9], N. Dneprovskaya and E. Makarenko [10], O. Evgrafova, V. Melnikova, A. Pavlyukevich [11], Masych M.A. [12] et al.

B. Slavin [13], E. Sheenko [14], A. Urmantseva [15], M. Zhuravleva and I. Lavrova [16] and others paid attention to the issues of digitalization.

Summarizing the research results of Russian and foreign scientists, it can be concluded that the introduction of ICT simultaneously gives both positive and negative results. For example:

- the characteristics of the labor market are changing. French economist Jean Pisani-Ferry notes that technological progress makes an accountant unemployed, helps a surgeon to be more productive and does not affect the work of a

hairdresser. That is, ICTs help highly intelligent labor, and in industries associated with routine and repetitive, low-skilled labor, there is a reduction in jobs. According to his forecast, by 2027, "the largest job cuts will occur in manufacturing (by 23.9%), in agriculture (by 14.8%) and in the transport industry (by 9.3%);

- the educational systems of the countries train specialists with outdated knowledge and do not have time to rebuild to prepare for the professions of the future. The modern system of higher education trains specialists (bachelor's degree) only to use technologies that are not capable of developing modern technologies. Therefore, in "advanced" innovation-receptive industries, there is a shift in focus during professional retraining and requirements for hiring personnel from classical selection criteria (education, work experience, salary, etc.) to applied factors, such as developments of ready-to-implement projects, developed and implemented projects in recent years;

- forms of employment are changing - there is a job for people with disabilities (for example, "Taobao villages" in China, where at least 10% of residents are engaged in electronic commerce), or opportunities for earning, education and communication remotely via the Internet;

- methods and methods of solving practical management problems using ICT in enterprises and industries are being improved [17].

Examples of the use of modern digital technologies show different results. So, the American company Anthem has 45 million customers. 75% of their requests were processed in digital channels, such as a web site, a mobile voice assistant application. At the same time, Anthem does not reduce the staff working with clients. The company is changing the methods of evaluating the effectiveness of the staff, which include, among other things, the number of resolved customer issues and satisfaction with the service (CSI).

Often the effect of new technologies is not immediately obvious. Personal computers appeared in the 1980s. But only in the second half of the 90s their mass use led to economic growth. PCs have become cheaper, more powerful, more accessible, and the Internet has appeared.

María Teresa Ballestar, Ester Camina, Ángel Díaz-Chao [18] confirm the assumption that digitalization has a positive effect on productivity in organizations, but at the same time reduces the demand for personnel. The authors drew conclusions based on the results of a study on the impact of robotics, digitization and innovation on productivity and employment on the database of 5511 Spanish manufacturing companies for the period 1991-2016. Their results confirm the growing impact of robotics and technological innovations on productivity since the 2000s. At the same time, the results also showed negative effects from robotization, primarily in employment issues.

It is increasingly possible to see robots at several industrial enterprises, the production of which is intended for a variety of sectors. Automation of labor is a logical consequence of the technological revolution. Many perceived the robotization of organizations with great suspicion, believing that machines would displace human capital from the production chain. Others, on the contrary, saw this as a fantastic opportunity to place employees where they really should be: in the most creative departments, far from routine and routine work.

The impact of robotics on the world of work worries many people who fear that technology will have a negative impact on society. Therefore, at the initial stage we are at, it is necessary to find out what are the possible advantages and limitations associated with robotics. So far, no significant research has been conducted in this area.

The use of robotics in various business sectors entails significant improvements in the production system. To begin with, those entrepreneurs who have decided to bet on this technological option significantly increase the security of their companies. The robot is capable of performing all kinds of tasks. It doesn't matter how routine or painful they can become. Thus, wear and tear or putting an employee at risk is prevented by developing risky actions. This employee can also be transferred to another department of the company.

According to the entrepreneur, the presence of robots significantly reduces production costs. Robotics is capable of performing all kinds of tasks due to its high adaptability. The process that allows the robot to perform other types of work is carried out thanks to the computer reprogramming of this technological equipment. In addition, each robotic system is able to increase the productivity of the enterprise and maintain it over time. All this is achieved by maintaining the highest quality standards. It doesn't matter what kind of work this machine has to do, because the robot will perform its role with millimeter precision and without any incident in relation to the same work performed by humans.

Those who are afraid of robotics are partly right when they reject its introduction into the economic structure, believing that it will lead to job cuts. The reality is that many workers may lose their jobs due to the efficiency and productivity of these machines, but it should also be noted that this opens up broad prospects for future generations. This opportunity is undoubtedly provided through education.

Many people and institutions are wondering about the impact of robotics and process automation on the work environment. About half of all paid activities today can be largely replaced by automation. That is, the machine could more effectively and efficiently perform various stages of work performed by a person, but not at all. It is only about redefining jobs and orienting academic and vocational training to the needs of the labor market.

Changes are happening and will happen slowly, but this does not mean that you need to look the other way. If society does not adapt to this new paradigm, the risks will become a reality. The worst thing about this is that the citizens will be the losers. In fact, according to the Organization for Economic Cooperation and Development (OECD), automation of industrial processes can lead to the destruction of about 12% of existing jobs. All of them, or the vast majority, will correspond to manual work, such as work related to any type of assembly line. In other words, machines would replace humans in those mechanical and repetitive tasks in which reason and creative processes hardly have a place.

In the face of pessimists/optimists. They all see numerous opportunities for further progress in automation and robotics, in particular, the labor market. For its investors, technological development has always been accompanied by the emergence of new tasks and new goals. They believe that they have no reason to lose jobs, but instead, as a result of the automation of organizations, new roles will appear.

In fact, they point out that the development of new technologies has always served to create new jobs, both existing and adapted to the current and future time. They believe that someone will have to take over the development, programming and maintenance of, among other things, this equipment. All this would not have happened if companies had not relied on robotics, but continued to use the old production model. The only thing that will be required is training. This is the only threat to those people who could get a job where too much technical knowledge is not required of them.

Optimists also believe that there are many jobs that require human intelligence and cannot be done by robots. In other words, these machines will never be able to replace all people, no matter how many artificial intelligences that already exist today develop.

Similarly, there are doubts about the recognition of robotics in certain sectors, for example, in the service sector. Is it really preferable to be looked after by a robot rather than a human? There are high hopes for artificial intelligence and automation of many tasks, but can any of these machines really be autonomous in decision-making?

Finally, it should be remembered that various administrations will seek to reduce the impact of automation on various sectors of the economy. It is necessary to provide employment for the able-bodied population in order to ensure, for example, the stability of the pension system. There may be enough technology that robots can replace millions of workers around the world, but neither society nor the system will accept this.

Conclusions regarding the impact of robotics on labor productivity can be formulated as follows:

- the concept of "unemployment-free recovery", in which the industry comes out of recession with fewer resources and needs fewer employees, is only short-term. The introduction of robots into the labor market is likely to mean an increase in the number of jobs by the most efficient and competitive companies;

- the service sector will absorb most of the employees displaced by robots. However, a robot-driven industry will require some of those service workers whose jobs have disappeared due to the use of robotics. In particular, it is expected that service robotics can take on some employment opportunities in human tasks in sectors such as banking, fast food chains and retail gas stations. However, some of these people from the service sector will find work in a new industry controlled by robots;

- while automation is expected to displace workers from the production process, production will increase, resulting in lower unit costs, creating an entirely new market, which in turn will require more workers to deliver the product to the consumer. This frees up employees for other, often new, jobs outside of production;

- the most critical view of robotics argues that automated systems will not only remove low-skilled labor from the service sector, but also affect more skilled work functions, and the long-term impact on job losses among workers may be much more serious than most expect.

This nuance is extremely important, because although robots can perform some jobs more efficiently than people in the service sector, it is necessary to be careful with the employment and motivation of employees. Resources form

the basis of a competitive advantage for any organization, and if motivation decreases, the use of robots is unlikely to compensate for the loss of productivity that may entail the presence of an unmotivated workforce.

Consequently, from now on, many organizations need to start solving this problem in order to make an optimal transition that will allow them to know how to solve future problems related to the introduction of robotics. This is achieved only on the basis of information and excellent practices that, combining the management of occupational risk prevention and personnel management, take into account how these changes can affect the mental health of employees. Just as we talk about managing generational diversity in companies, we should start to get familiar with the new impact management of robotics.

The effects of complementarity from the use of industrial robots, innovation, digitalization and human capital reduce the level of employment, but provide an increase in labor productivity and the emergence of new professions.

Therefore, we can conclude about the positive, mainly, impact of ICT on the economy of the organization, industry and country.

III. CONCLUSION

The development of ICT leads to an increase in labor productivity both in the sphere of producing ICT and in the sphere of using them. ICTs make it possible to improve the company's management processes, provide a more effective mechanism for market distribution, stimulate development, influence social changes in society, positively affect the prospects for business development and create a foundation for the development of innovations. In the end, sooner or later this leads to an increase in the productivity of individual companies, industries and countries.

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