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# Blockchain and employment problem in human capital research

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***Abstract:*** *Today, the world is at a crossroads of creating opportunities and risks through digital technologies that have redefined the way we live and work every day. Such technologies have become important as important assets that can make versatile processes more efficient and productive. They have become key factors of production along with traditional ones – land, capital, and labor. The use of digital technologies leads to an increase in labor productivity, employment and improving the level of well-being of the population, improving the quality of the environment, overcoming challenges in the fields of health, education and public administration.*

***Key Words:*** *blockchain, employment, human capital, problem.*

## 1. INTRODUCTION:

However, the processes of digitalization and adaptation of digital technologies are subject to deep doubts, which indicate the inconsistency of the transformations caused by the fourth industrial revolution.

Today, it is necessary to understand how digital technologies will change the lives of present and future generations and what changes to expect in the socio - economic and socio-political dimensions, and most importantly – what their impact will be (more positive or negative). There are concerns that digitalization will result in the "displacement" of workers in certain professions, which will lead to additional digital "gaps" and greater inequality among the population. Other challenges of digitalization that society is not ready for are violations of privacy and security.

Artificial intelligence is a combination of technologies that is already radically changing the world today. IS used in various fields and makes it possible to assess the quality of employees ' work, search for the causes of defects in manufactured products, replace manual labor with automated labor, and generate new knowledge that helps them make quick decisions. According to Western analysts, the total contribution of innovative developments to global GDP in 2018 was estimated at 1 15.7 trillion. By 2030, this figure is expected to grow by 14% thanks to AI technologies. Some countries have separate departments (ministries, committees, departments, etc.) that deal with IS issues (UAE, India). And some cities become centers of IS development and implementation (for example, Prague).

As for robotics, it is multidisciplinary. It affects many professions, from agriculture, industrial production to services and retail. According to the International Federation of robotics, as of the end of 2019, there were 2.7 million operating systems in the world. For example, Dubai, Singapore, and Tokyo are leaders in implementing humanoids for services such as hotel room service, surveillance, and Information Desk Management in government offices [13]. Visitors to Olympus Ada in Tokyo 2020. we could get help communicating in Japanese from humanoid translators. In Dubai, humanoid police officers are also being tested (they can replace 25% of the police workforce by 2030) [8].

At the same time, robots will not replace human labor in the near future, but they can "take over" a growing part of the production area. The growing share of activities performed by robots is likely to reduce the number of low-skilled low-wage jobs, creating a relatively small number of specialized jobs with higher salaries in maintenance and programming.

## 2. LITERATURE REVIEW:

Over the past few decades, the usual options for accessing capital have undergone dramatic changes [2]. Financing tools have become much more diverse. New flexible models of capital formation are being built, new sources of capital are emerging that stimulate innovation in the structure of fixed and borrowed capital, as well as piloting and

developing new ways to finance entrepreneurs and place Capital [1]. We are talking about income-based investments, repurchase of entrepreneurs ' debt obligations, online lending, crowdfunding and blockchain [3].

Opportunities that have become real thanks to modern technologies and financial innovations are highly likely to support this trend [2].

Technology plays an important role in the development of capital markets. All new tools, including crowdfunding, blockchain and internet banking, are based on modern computer and internet technologies. They make markets more accessible by breaking the rigid framework of traditional financing [4]. For example, blockchain – based technologies eliminate the need for intermediaries, solve the problem of peer-to-peer transaction trust, and launch a process that can revolutionize the core of capital market infrastructure systems [6].

Technology also provides new ways of crowdfunding, transforming the ways startups raise capital with the emergence of new forces that can potentially change the future of venture fundraising [7].

As tools such as AI and big data analysis are more widely used by financial institutions, we can expect technological breakthroughs in the capital markets to continue, providing entrepreneurs with more opportunities and platforms to access financial resources [8-11].

## 3. MATERIALS:

In recent years, blockchain (distributed ledger) technology has become popular, which allows you to create and exchange unique digital records without the need for a centralized trusted party. Using a "smart" combination of cryptography and peer - to - peer networks, the blockchain guarantees transparent and accurate storage and dissemination of information among a group of people, ensures the security and tracking of each transaction, and protects against fraud. Among the advantages of technology:

- the ability to accurately copy and transmit relevant information to many people at no marginal cost. Blockchain allows you to transfer reliably unique digital objects without the risk of falsification or double sending;
- ensuring transparency, verification capabilities and "immutability" of data;
- the ability to conduct transactions that can be performed without human intervention. Smart contracts based on blockchain technology can be designed to transfer any part of information or asset under any conditions. The code before executing such a contract is stored in the blockchain, is available for inspection and works without delays;
- inclusivity (extended accessibility). It is enough for the user to perform transactions thanks to the basic software, storage, and connection.

As with other digital technologies, blockchain is characterized by certain uncertainties.

## 4. METHOD:

There is legal uncertainty about transactions based on this technology; the deployment of new infrastructure based on blockchain technology requires effective management systems; there are no unified standards for information and technical compatibility of various technologies or ways to apply blockchain. The possibility of transmitting the data itself is also questionable, since today the regulatory support of countries around the world regarding permission to transfer data outside the country is quite different [9].

Drones combine three technologies: IoT through built - in sensors that collect information and transmit it over the Internet for analysis; advanced battery technology (allows drones to work) and cognitive computing (allows drones to operate autonomously). One well-known example of the application of this technology is the following: Amazon announced a trial of drone delivery of small parcels in partnership with Posti (Finland's National Postal Service), in order to improve the efficiency of delivery to rural settlements [3].

However, economic, logistical and security problems indicate that drone deliveries are unlikely to lead to a significant decrease in demand for road cargo transportation. Even if drones replaced a quarter of all shipments currently made by cargo, it would only reduce the overall traffic rate by 1%. Since the performance of drones is about 94% lower than that of trucks, it will take 15 drones to replace one vehicle [8].

Today, drones are used to take photos of land, inspect buildings and crops. Drones are particularly suitable for monitoring the integrity of large remote infrastructure, such as oil and gas installations, wind farms, and solar power plants.

## 5. DISCUSSION:

Accelerated digitalization of the economy, transformation of consumer behavior patterns and improving the quality of life in the digital environment contribute to the growing urbanization of territories. The concentration of population in global megacities, as well as cities that are consumers of digital technologies, creates a threat of territorial digital inequality.

Unfortunately, the introduction of digital technologies underlies the stratification of society, which is followed by the emergence of social classes of the digital elite and digital "outcasts". Since the benefits of digital technologies are significant and increase the number of people and the number of companies becoming their consumers, an important challenge and task for policymakers is to expand access and provide everyone with such technologies.

The inability to ensure social integration can negate the positive aspects of digital technologies. For example, older people may not benefit from the introduction of "smart" health care because they have low literacy rates and insufficient digital skills to be fully involved in digitalization processes on an equal footing. It is advisable to make efforts to improve the skills of older people. The challenge is to make this transition as flexible and fast as possible at the same time. Training should be accompanied by the development of a new network of professional contacts and the provision of access to new opportunities that help to overcome the difficulties associated with belonging to a particular community.

It may also be advisable to expand the information and communication social infrastructure that can neutralize the territorial imbalances of digital development. Traditional social infrastructure provides access to services provided in close proximity to the location of residents, while information and communication social infrastructure provides access to geographically uncertain services (telemedicine, distance education, trade, etc.). Thanks to digitalization, elements of the local and remote service sectors are beginning to interact with each other, with households and elements of traditional social infrastructure.

Through the use of digital technologies, it is possible to achieve social cohesion, inclusivity and solidarity. However, there is a risk that not all groups of the population will be able to take advantage of digital technologies, since:

1) some groups of the population have insufficient "digital intelligence" or do not have access to modern digital connections and digital equipment, and

2) "smart" solutions can be used by groups of people to create "digital communities with a closed type", which can become a threat to social cohesion and inclusivity.

Lack of trust in digital technologies and uncertainty are the main problems that users face. They may be hesitant to use digital technologies because they are unsure of their potential to meet their own needs, and information and evidence that can reduce this uncertainty is often difficult to understand. The development of digital infrastructure is subject to much greater uncertainty than for conventional innovative products. Initially, no one knows the critical parameters of digital technologies or how they relate to the desired performance indicators of future products, and potential users can not always determine their needs in terms of using new technologies. In June 2020, the international company PricewaterhouseCoopers, as part of the study "the future is near: urban Readiness Index", conducted a survey of residents of 10 major cities around the world regarding their readiness for innovative changes.

The ability of cities to implement technological solutions and products in various social spheres was evaluated (in the top five: Singapore (62% of readiness), London (59%), Shanghai (55%), New York (53%) and Moscow (53%)).

The city's readiness was assessed by a number of parameters: infrastructure readiness (availability of basic infrastructure), regulatory and technological readiness, as well as the readiness of residents to use technologies. The survey results revealed a problem: the population of the world's largest cities is not ready to fully live in smart cities, while the pace of digital technology adoption in the urban environment is growing rapidly. This problem requires a solution that consists not only in the education and skills of local residents, but also in a balanced approach to preparing and adapting the population to live in such cities, and making it attractive to the absolute majority of residents.

Digital protectionism. Data is an intangible asset that forms the basis for the development of the global economy in the future and significant political capital. The growing importance of data has prompted more than 80 countries around the world to adopt national laws protecting the collection and use of their citizens data by companies and governments. Concerns about data privacy, property rights, and security breaches may worsen the level of trust in the digital economy.

In response, countries are resorting to digital protectionism, which seems like a simple solution, but in reality, threatens to increase costs and reduce access to digital services that are vital for the economic development of any country and individual city. Digital protectionism has various forms: from restrictions on cross - border data exchange (diagram "cumulative number of restrictions on cross-border data flows" [5]), Doru-Chen on the use of local data processing tools and requirements for local share capital, foreign licensing requirements that are difficult to meet, and even tariffs for cross-border "electronic operations" [13].

## 6. RESULT:

An important basic trend in access to business finance is democratization and decentralization of capital markets as manifestations of technological opportunities, as well as deregulation in the financial sector. The expansion of non-bank and alternative lenders into the sphere of activity of traditional banks can be considered a good example of such opportunities. Some of these players are alternative financial institutions that specialize in financial services, [11] and

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some, such as tech giants Google, Amazon, Apple, and Samsung, provide financial products in addition to their core business.

Social and cultural shifts are also affecting capital markets. Impact investing, that is, an approach to investing that seeks to achieve both financial benefits and measurable social or environmental positive impacts, has become a relatively new trend that is gaining momentum.

As of the end of 2021, the volume of the impact investment market was estimated at 502 billion US dollars [11], while in 2013 conservative estimates of this market were only 25 billion US dollars [12]. As part of this trend, access to funding for initiatives with positive social and environmental impacts will be greatly simplified.

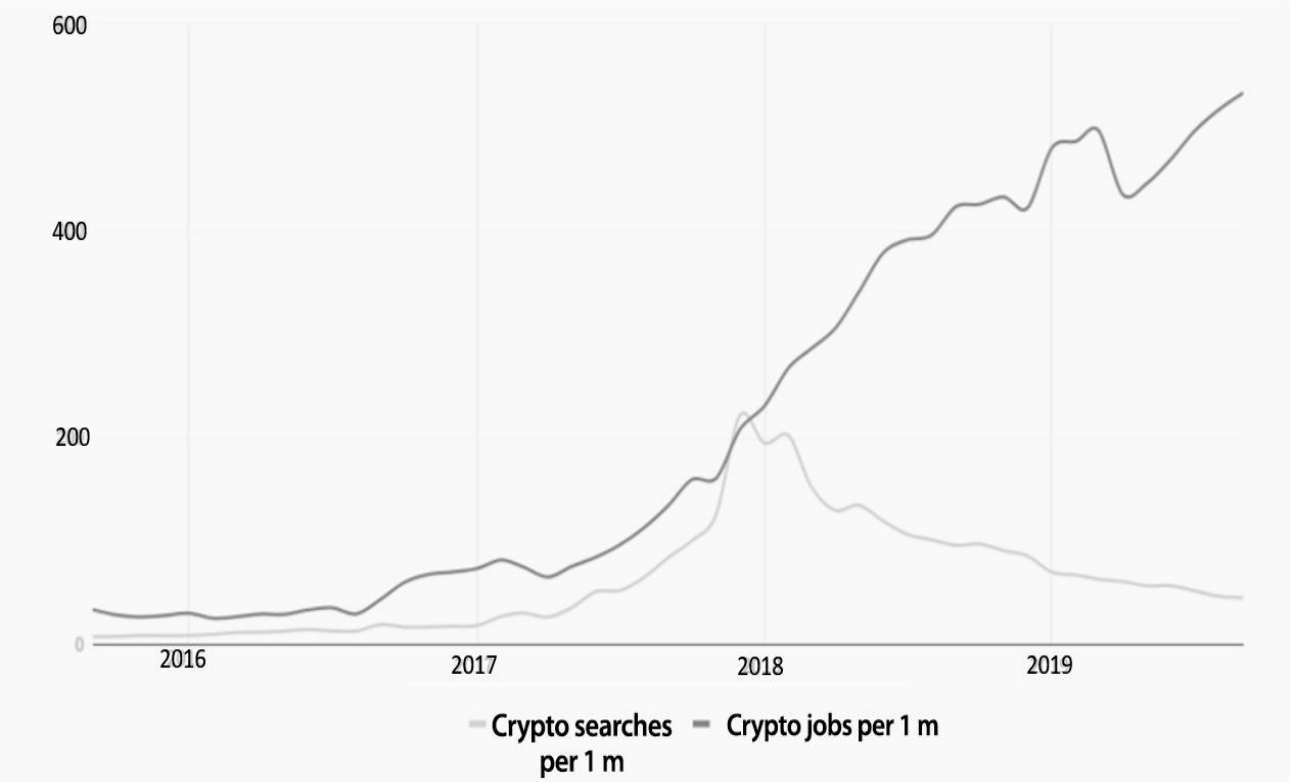


Figure 1. Blockchain and employment

The spread of online job search (including online employment) creates additional opportunities for a new generation of workers to study, work and change the direction of their own career development in short steps, without being tied to one chosen specialty all their lives. In the future, the adaptation of such a trend in the labor force will create conditions for employers to pay not based on the fact of the position held, but on the skills of the worker that he applies, including as an element of the "global labor chain".

A significant tool for the long-term development of online employment can be temporary employment using blockchain technology. Temporary employment contracts play a crucial role in the current global economic and social context. Growing international competition, slow economic growth, and high unemployment have led to greater job flexibility in many countries and institutions.

The diffusion of non-standard contractual agreements is also greatly facilitated by technological innovations that have been actively developing in recent years. Dynamic temporary online employment can become an important and flexible business tool for responding to market fluctuations caused by economic policies and seasonal factors. According to the ILO [1], contract agreements are a feature of the modern global labor market.

At the same time, this type of activity requires a special form of protection of Labor participants in the global labor market, taking into account all aspects and risks of online employment, both for employers and employees. A blockchain-based employment system can ensure the rights of all temporary employment actors by providing employees with fair legal pay (including taxes) and employer insolvency risk insurance. At the same time, such a system can help the employer process contracts in a fully automated and fast procedure.

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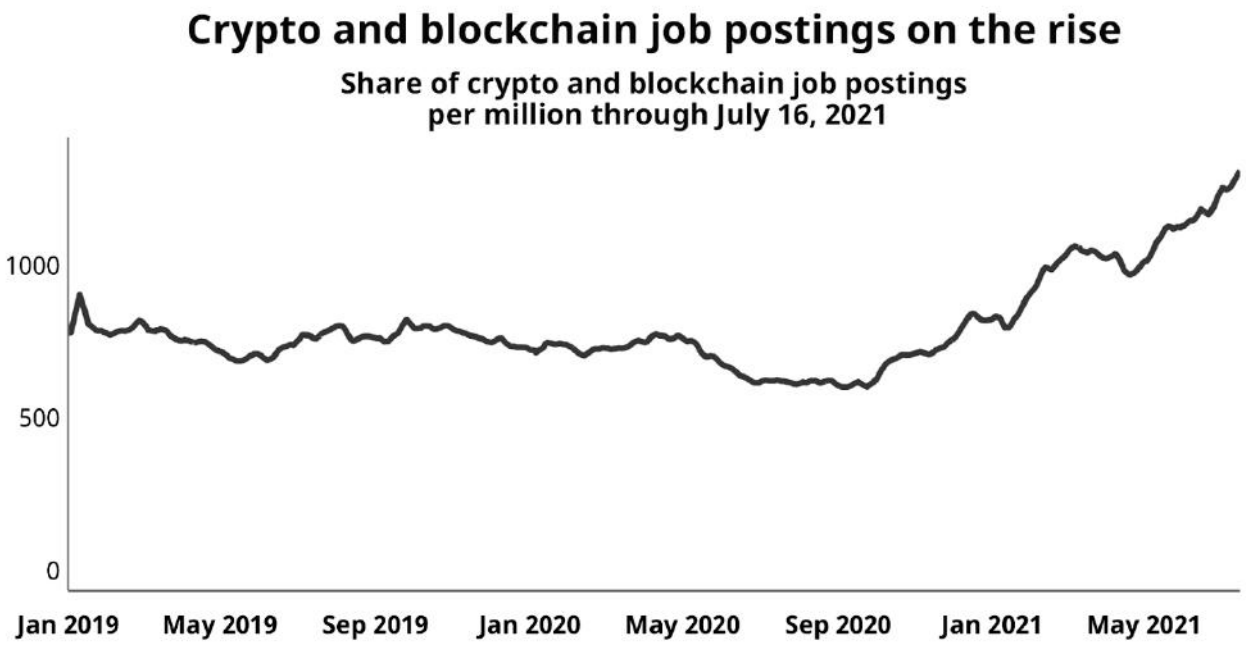


Figure 2. Crypto and blockchain job posting every month

Blockchain technology is based on a decentralized technical database for efficient transaction management. It stores these transactions on a Peer-to-Peer network. This technology is also a state register: transactions consist of encrypted data that is verified and approved by nodes participating in the network, and then added to the block and recorded in the blockchain scheme. The blockchain is shared between all nodes of the network, the same information is present on all nodes, and therefore becomes unchanged if such a change is not agreed upon by most nodes of the network – a decentralized autonomous system (DAS) – and even in this case, the procedure history will remain unchanged.

Ahram T. [2] studied the use of smart contracts in combination with intelligent multi-agent systems and Internet of things devices to provide self-aware contracts with a high degree of automation for equal cooperation. The smart contract connects to an automated protocol for initiating and terminating a lease agreement. Innovative regulation of the labor market and related payments [3] provides for the use of cryptographic technologies for the development of a non-volatile and inflationary digital asset. In this case, the average hourly rate of human labor can act as a universal standard of payments, as the most important unit of economic value.

Projects such as Chronobank [4] are aimed at replacing the HR industry, with a particular focus on improving short-term hiring of workers to perform piecework projects (in the field of cleaning, warehousing, e-commerce, etc.). In such a project, the use of blockchain helps an independent employee quickly find a job and receive payment through the decentralized structure of cryptocurrencies without involving traditional financial institutions.

To solve such problems, in particular, a decentralized employment system (D-ES) or a decentralized accounting technology (DAT) can be used [5], which consists of a block-sequential system and an internet environment. Thanks to Decentralized Application Platforms that allow us to develop smart contracts, a discrete event management system can be defined that runs inside the blockchain.

Blockchain technology is also expected to have a direct impact on the labor market, primarily on intermediaries and document managers who can be forced out of the service market by automated systems. Since the technology consists in the possibility of reliable storage of information not in a centralized database, but in a decentralized system, there is no need to check information with the participation of Labor, respectively, the need for human resources to work with information is minimized. This also means in the long run a decrease in demand for the work of notaries, auditors, employees, administrators, lower-level civil servants, etc.

Key BNPS make large - scale investments in blockchain. The total number of jobs related to this technology more than doubled in 2020 (to almost 5 thousand at the end of the year). For example, in English – speaking countries, Accenture Consulting Company opened 537 such positions, IBM – 237, consulting company and business incubator ConsenSys-157 [6].

Regulation of international labor migration can be potentially improved by creating universal registers of migrants using blockchain technology, which will allow them to monitor their movements more effectively. However, today, the potential of using this technology in the field of regulating international labor migration can be characterized as belonging to the group of expectations (observation domain) and is still significantly underestimated, compared to its

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use in relation to other forms of IEO: the group of Breakthrough Changes (disruptive domain) - international trade in goods and services, international finance; the group of evolutionary development (evolution domain) - international economic integration.

The use of blockchain in a number of major programmatic activities in the field of migration and asylum can help improve not only their cost-effectiveness, but also, at least, the degree of transparency and accountability. For example, thanks to blockchain, the EU can improve the management efficiency of the European Center for asylum, migration and integration (AMIF), both in terms of transferring funds from the European Commission to relevant non-governmental organizations (NGOs) to member states, and in terms of direct project management with online access to cost reporting as they are developed.

The McKinsey Global Institute estimates that digitalization, automation, and AI technologies could generate an additional 13 trillion USD the largest companies by market value-Apple, Microsoft, Amazon and Alphabet – operate today in the digital markets. In addition, according to Forbes, 34% of companies have undergone digital transformation, and 85% of business leaders said that they have two years to make significant progress in digital transformation, otherwise they will lose in the competitive struggle and suffer financial losses.

Today, it is possible to determine the clear impact of digitalization on the socio-economic sphere. Digitalization has the greatest economic impact on supply chains in all sectors of the economy, including procurement, production, coordination between networks of operational units, logistics and customer relations. By digitalizing the supply chain, companies can solve the problem of inventory management and improve product quality. Using a digital approach, you can increase competitive advantages by improving customer service or reducing the negative impact on the environment.

Competition for new export markets today depends on digital technologies. The increased globalization of World Trade stems not only from the liberalization of trade policies, but also from significant advances in technology in communications, transport and storage.

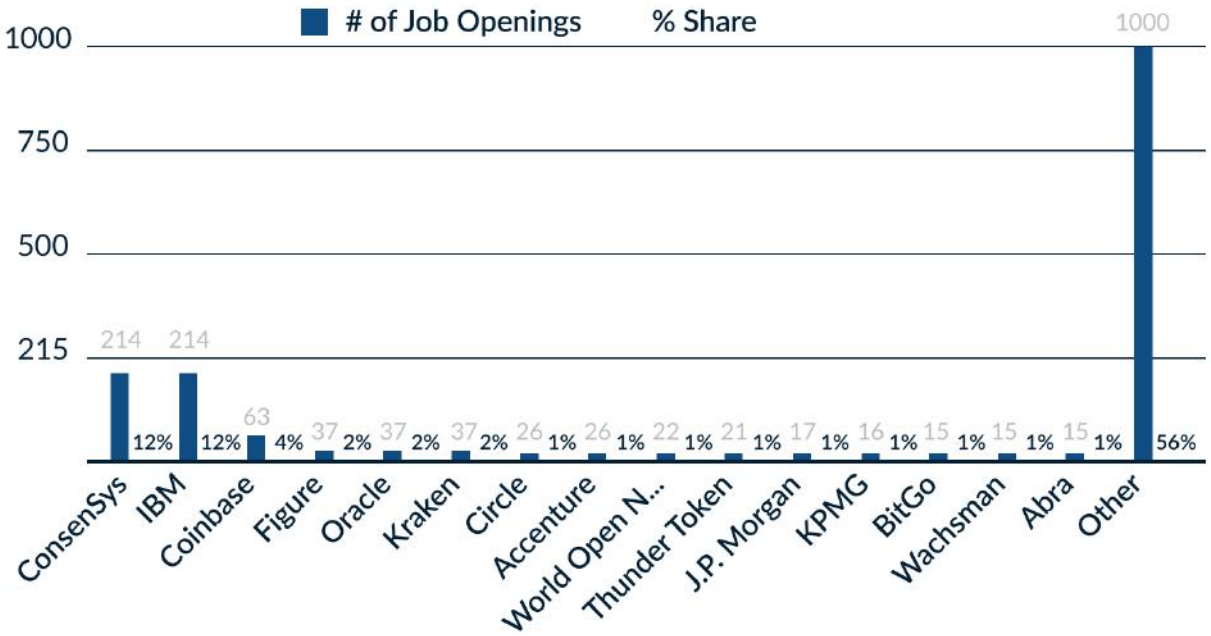


Figure 3. Top employers for crypto blockchain jobs in 2022

The accelerated introduction of digital technologies due to the COVID - 19 pandemic has intensified international trade in goods and services. Since the physical movement of goods and people is limited, digital trade today plays a crucial role in maintaining trade flows, starting with cross - border e-commerce and digital payment systems, ending with teleconferences with business partners around the world and replacing physical documents with electronic ones, transactions with goods and services that support digital technologies.

Digitalization also affects the logistics system, which is based on flexibility and convenience with a focus on customer preferences:

- Personalized delivery: online retailers implement the solution flexibly. Customers can choose the payment method, time and place of delivery, or they can pick it up in person.

Due to the increase in the number of e-commerce transactions, the number of parcels increases, which creates the need for “smart” solutions to prevent congestion and, accordingly, reduce the level of environmental pollution. The

solution was large logistics interchanges: suppliers send parcels to centers, from where they are distributed throughout the city, and “smart” software combines parcels from different shippers.

A promising direction is the digitalization of industrial production methods and the way people and equipment/machines/logistics systems communicate/ cooperate. Digitalization of supply chains and the availability of complex real - time information systems allow companies to make production more efficient. Digital technologies "promise" more flexible production options, which allows you to focus on the needs of customers (inset “features of digitalization of production processes” [12]).

Digital technologies can affect performance:

- 3D printing can eliminate the need for assembly at some stages of production by printing already assembled mechanisms.

The combination of new sensors, Big Data Analytics, Cloud Computing, and IoT improves the performance of automated machines and intelligent systems.

By being faster, more accurate, and more consistent than humans, robots can significantly improve productivity on industrial assembly lines. Robotics can improve logistics and reduce the price of goods [8].

Digitalization can extend its potential to improve social well - being. Inequality (the population may have different (limited) access to resources and services) can be overcome through the introduction of digital technologies, which will lead to the provision of access to educational and medical services, monitoring of air quality and interaction of residents with business and government [9].

Digital technologies can promote social integration, create better access to quality education, and offer new opportunities for skill development, such as expanding access to knowledge for low - income or poor neighborhoods, supporting new pedagogy with students, promoting teacher-student collaboration, and providing faster and more detailed feedback on the learning process [9].

Researchers have found that low - income users spend more time online than the average population with better living conditions. They browse websites in the field of education (access to free or cheap knowledge) and search for information on employment, health and healthy nutrition, as well as use online sales platforms (services that allow consumers to negotiate the best prices for products). At the same time, digital technologies have a huge potential for innovation and improving the quality of teaching [11].

The development of AI, IoT, and “big data” can change the nature of communication between technology and workspaces. Thanks to digitalization, a large number of tasks can be performed by machines in the near future, and the goals of the project can become digitalized and be at risk of extinction, which will lead to an increase in the unemployment rate.

However, there are a number of studies that are less skeptical about digitalization processes. In particular, the results of OECD studies show that ICTs do not lead to an increase in the unemployment rate. If digital technologies are successfully implemented, thanks to organizational changes and good management practices, ICTs can contribute to increased productivity, which gradually affects lower prices and/or the emergence of new goods, higher demand and higher employment, thus compensating for the initial movement of jobs. Employees who have the skills to adapt to changes in the workplace are less likely to lose their jobs. In addition, with increased productivity and the introduction of technology, new and additional jobs are likely to be created (inset “digital technologies vs jobs”).

However, progressive automation and the use of robotics will result in a real replacement for physical/manual work. Due to the introduction of digital technologies, most existing jobs may disappear and people will be forced to retrain in order to remain able to work. The most likely “candidates” for disappearance are the following professions: insurance agents and cargo transportation agents, packaging and filling machine operators, procurement clerks, real estate brokers, cashiers, installers of electromechanical equipment, shop sellers, office managers, postal service workers, truck operators.

Professions such as architects, public relations managers, mechanical engineers, pharmacists, psychologists, analysts and computer system administrators, HR managers, teachers, doctors and Surgeons, social workers, and cooks are less likely to disappear.

The potential "disruption" of the labor market can be characterized by the following trends.

Unemployment. If skills cannot adapt to a changing environment, the consequence may be the threat of structural unemployment.

One IBSG study addressed the issue of reducing and increasing employment levels due to technological changes. For example, from 2000 to 2010, the number of travel agents in the United States decreased by 44 thousand, but the IT sector added about 600 thousand jobs.

The only way to avoid the inevitable “shift” of jobs associated with digitalization is to move on to learning and acquiring skills that will ensure uninterrupted access to innovative services, as well as skills that cannot be automated or processed by anyone else, including customer service (chart “global demand for skills and abilities in 2025”).

To benefit from the digital economy and adapt to new professions and qualifications, the education system must focus on promoting common ICT skills, including digital literacy and critical thinking.

Infrastructure has always been particularly important for reducing poverty: access to minimal infrastructure services is an important criterion for determining the well-being of the population. In the world, a large proportion of the population is below the poverty line, does not have access to clean water and lives in unsanitary conditions, with extremely limited levels of mobility and communication. People with such living conditions have more problems with health, education (its essence) and fewer employment opportunities. Such settlements are located mainly outside cities in developing and Least Developed Countries and lack sufficient and adequate infrastructure.

Digital technologies of the Fourth Industrial Revolution are spreading at a faster pace than those of previous revolutions, which are just beginning to unfold in certain parts of the world. The least developed economies, absorbed in everyday problems today, are not ready to understand the digital solutions that shape the future. In particular, 17% of the world's population (1.3 billion people). people) still have to" survive " the second industrial revolution (characterized by the advent of electricity), 1.15 billion people do not have access to reliable telephone services, 2.5 billion - people do not have access to basic sanitation services, almost 800 million - to water resources, and 4 billion people do not have permanent access to the Internet (a major component of the Third Industrial Revolution).

## 7. CONCLUSION:

In addition to managing funds, blockchain technology can help with monitoring and reporting at all key stages of migration management. These include: migrant integration programs; remittances (both in terms of the possibility of significantly reducing operating costs and facilitating accurate identification of senders and recipients of such transfers); monitoring the cycle of Return of migrants upon deportation or readmission all the way from the country of destination to the country of origin.

However, data collection and transmission systems themselves, both using traditional technologies and using blockchain and artificial intelligence, should be considered only as one of the prerequisites for the successful formation and implementation of migration policies. These innovations can only outline potential advantages in the medium and long term, in terms of economy, transparency and accountability, in migration management, but they cannot replace the existing strategic vision in shaping regional migration policy, taking into account the system of migration interests of the countries of the region.

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