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**TRENDS AND CONSEQUENCES OF INTRODUCTION OF AUTOMATION
AND DIGITALIZATION OF ENTERPRISES, INDUSTRY, AND ECONOMY**

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Abstract

The authors consider the problems, trends and consequences of automation of processes in various sectors of the economy, including industry. These activities are becoming more and more relevant in the current era of digitalization and the formation of the digital economy both abroad and in Russia. Currently in the process of automation, which includes robotics and automation of technological processes (production machines); development in the field of artificial intelligence; open systems (Blockchain); big data concept; software algorithms and systems (software); neural networks – it is not possible to adequately assess the consequences and possibilities of qualitative changes in the activities of enterprises in its implementation. The purpose of this research is to study the trends and consequences of the automation introduction and of the implementation of

Trends and consequences of introduction of automation and digitalization of enterprises, industry, and economy pág. 16

enterprise, industry and economy digitalization processes. Accordingly, the objectives of the research are: to identify the main directions and problems of the introduction of automation, to study the current state of the labor market in the world, to consider the Blockchain technology and its advantages in various fields.

Keywords

Digital economy – Digitalization – Automation – Blockchain – Institutionalization

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Introduction

Currently, the development of the economy based on the use of digital technologies has become a leading global trend. It is becoming generally recognized that the digital economy is a driver of growth and development¹. In the context of increasing competition, business entities are looking for, new tools to improve efficiency in terms of reducing the cost of the business processes servicing.

Large enterprises and integrated structures, the public sector and corporations eventually become overgrown with a number of bureaucratic procedures, which increases the burden on the staff, complicates and reduces the productivity of employees. Thus, the organizational structure is becoming more complicated, forming additional inefficient costs for the maintenance of staff.

With the development of the IT market and computer technology in general, more and more software products are created that replace human resources and create a threat of job release and increase unemployment in general, replacing the entire industry professions.

The purpose of this research is to study the trends and consequences of the automation introduction and of the implementation of the enterprise, industry, economy digitalization processes. Accordingly, the objectives of the research are: to identify the main directions and problems of the introduction of automation, to study the current state of the labor market in the world, to consider the Blockchain technology and its advantages in various fields.

Methods of research

Dialectical method of scientific knowledge was applied in the research of the role of automation, the computational and analytical methods of observation, measurement, analysis and comparison of indicators characterizing unemployment in the world.

Analysis of research trends and publications

Many Russian and foreign scientists and practitioners are engaged in the study of automation and tools categories of the digital economy: Davidson, Harmer, Marshall, Kosten Byrne, Mitchell, Thomas, Goldhammer, John, Nash, Phelps, Shorrocks, Davies,

¹ V. E. Reutov; D. D. Burkaltseva; V. M. Yachmeneva; M. V. Algina; E. A. Smirnova y A. S. Tyulin, "Features of socio-economic systems' transformation processes management", Amazonia Investiga. Vol: 8 num 22 (2019): 467-474; O. L. Korolev; N. V. Apatova y A. P. Krulikovsky, "Big data as a factor of change of decision-making processes in the economy. St. Petersburg: State Polytechnic University Journal", Economics Vol: 10 num 4 (2017): 31-38. Available online: https://elibrary.ru/html_article.asp; J. F. Nash Jr., Ideal Money and Asymptotically Ideal Money. 2014. Available at: <http://sites.stat.psu.edu/~babu/nash/money.pdf>; J. Phelps, Pyramids are Tombs. Traditional corporate structure, like the 20th century, is history. 2015. Available at: http://pyramidsaretombs.com/Company_Organisation/?chapter=116; T. Piketty y A. Goldhammer, Capital in the Twenty-first Century (Cambridge Massachusetts: Belknap of Harvard UP, 2014) y S. P. Savinsky, "Cryptocurrencies and their regulatory and legal regulation in China", Money and credit num 7 (2017): 65-67. Available at: https://www.cbr.ru/publ/MoneyAndCredit/savinskiy_07_17.pdf

Lluber, Belyatskaya, Knyazeva, Kupriyanovsky, Kurenkov, Bubnov, Dunaev, Sinyagov, Namiot, Lipatov, Vorobjov, Utkin, and others².

Russian scientists also consider the issues of digitalization of the economy and industry, study the use of tools of the digital economy and the state regulation of cryptocurrencies³.

We will analyze the publications in these areas of research.

The digital economy is now extremely popular both in Russia and abroad. Activity around this area, on the one hand, and the lack of a single conceptual field, on the other

² I. S. Bagdasaryan; E. N. Sochneva y A. A. Keil, "Development of cryptocurrency market in Russia", Postulate Vol: 12 num 14 (2016). Available online: <https://elibrary.ru/item.asp?id=28152223>; S. Davidson; M. Harmer y A. Marshall, The New Age of Ecosystems. The New Age of Ecosystems. IBM Institute for Business Value. 2015. Available at: <http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=GBE03617USEN&appname=skmwww>; D. Kosten, Bitcoin Mission Statement. Or What Does It Mean Sharing Economy and Distributed Trust? 2015. Available at: <http://ssrn.com/abstract=2684256>; J. F. Nash Jr., Ideal Money and Asymptotically Ideal Money. 2014. Available at: <http://sites.stat.psu.edu/~babu/nash/money.pdf>; J. Phelps, Pyramids are Tombs. Traditional corporate structure, like the 20th century, is history. 2015. Available at: http://pyramidsaretombs.com/Company_Organisation/?chapter=116; T. Piketty y A. Goldhammer, Capital in the Twenty-first Century (Cambridge Massachusetts: Belknap of Harvard UP, 2014); V. V. Pshenichnikov y A. V. Babkin, Digital money as a product of the development of information and telecommunication technologies. Proceedings of the 2017 International Conference "Quality Management, Transport and Information Security, Information Technologies", IT and QM and IS. 2017. 267-273 y A. Shorrocks; J. Davies y R. Lluber, Credit Suisse Global Wealth Databook. 2013. Available at: <https://publications.credit-suisse.com/tasks/render/file?fileID=1949208D-E59A-F2D9-6D0361266E44A2F8>

³ L. M. Borsch; S. Yu. Tsohla; N. A. Simchenko; O. S. Reznikova; D. D. Burkaltseva; S. V. Gerasimova; M. S. Abibullayev y M. B. Ibragim, "Development of the Eurasian economic union in the context of international changes", Revista inclusiones Vol: 6 num especial (2019): 134-149; V. E. Reutov; D. D. Burkaltseva; V. M. Yachmeneva; M. V. Algina; E. A. Smirnova y A. S. Tyulin, "Features of socio-economic systems' transformation processes management", Amazonia. Investiga. Vol: 8 num 22 (2019): 467-474; O. M. Korobeynikova; D. A. Korobeynikov; L. V. Popova; O. V. Savina y R. Sh. Kamilova, "The current state of the payment infrastructure and development of payment systems in Russia and the Volgograd region", Revista Espacios Vol: 38 num 62 (2017); S. V. Kulikov y O. V. Ryzhkova, Problems of management of cryptocurrencies. Available at: <https://elibrary.ru/item.asp?id=26575978>; RBC. The number of unemployed in the world reached a record 192.7 million people. Available at: <https://www.rbc.ru/economics/23/01/2018/5a66ac219a7947d7e7cae052>; S. P. Savinsky, "Cryptocurrencies and their regulatory and legal regulation in China", Money and credit num 7 (2017): 65-67. Available at: https://www.cbr.ru/publ/MoneyAndCredit/savinskiy_07_17.pdf; N. Simchenko y S. Tsohla, "Revisiting the issue of the place of economic experiment in the study of the economic dynamics cycle", Journal of Advanced Research in Law and Economics num 6 Vol: 20 (2016): 1485-1493; Z. Varnaliy; S. Onishchenko y A. Masliy, "Threat prevention mechanisms of Ukraine's economic security", Economic Annals-XXI. Vol: 159 num 5-6 (2016): 20-24; Yu. N. Vorobyov, "Theoretical-methodological bases of financial methods of regulation and stimulation of the economy of the country and its regions", Nauchny vestnik: finansy, banki, investitsii num 3 Vol: 36 (2016): 5-16; E. I. Vorobyova, "Enhancing the role of public finances in the financial system of the Russian Federation", Nauchny vestnik: finansy, banki, investitsii num 1 Vol: 34 (2016): 21-26 y N. G. Vovchenko; O. B. Ivanova; E. D. Kostoglodova y T. F. Romanova, "Institutional aspects of provision of sustainability of the budget system of the Russian Federation", Asian Social Science num 11 Vol: 20 (2015): 235-243.

hand, lead to the emergence of a huge number of seemingly incompatible opinions and, as a consequence, to the impossibility of the dialogue. Many experts tend to understand the phenomenon of “Digital” economy very narrowly, paying attention only to the certain points. Total digitalization, automation and implementation of appropriate technologies is a natural process, and therefore inevitable. At the same time, today no one has a complete picture of the future (neither the nearest nor the distant), which means that the result of the upcoming changes is not predetermined⁴.

The works of a number of scientists are devoted to the problems of creating a unified digital platform of the digital economy. The ways of creating the information society and the development of the digital economy as its digital ecosystem are discussed. The problems of the impact of cryptocurrency technology on the financial sphere of the digital economy are studied. The possibility of using Blockchain technology as a unified digital platform of the digital economy of the future is substantiated, the issue of expanding the fields of application of Blockchain technology is considered⁵.

The beginning of the 21st century brought the development of digital technologies on the basis of the information revolution and the globalization of the economy. Information in the company and business processes has become the main resource. In the hands of man, it is transformed into knowledge, and social and economic relations are increasingly transferred to the network space. The key factor of digital transformation in the activities of the market participants is the development of the digital culture. At the present stage, the institutional structure of the transformational society has its own characteristics and requires the formation of the digital economy, which is currently an urgent task⁶.

⁴ A. V. Babkin; D. D. Burkaltseva; D. G. Kosten y Yu. N. Vorobyov, “The emergence of digital economy in Russia: its essence, features, technical normalization, the problems of development”, St. Petersburg: State Polytechnic University Journal. Economics Vol. 10 num 3 (2017): 9-25; D. Burkaltseva; N. Apatova; E. Nalivaychenko; O. Boychenko; A. Yanovskaya; A. Betskov; H. Kilyashanov y O. Guk, “Features and new opportunities of the republic of Crimea tourism industry”, Revista Inclusiones. Vo: 7 num Especial (2020): 325-336; D. D. Burkaltseva; O. G. Blazhevich; O. A. Gabrielyan; L. V. Savchenko; T. N. Skorobogatova; O. A. Guk; E. V. Vovk y M. A. Abubakarov, “Development of the financial security of the state: neutralization of threats”, Revista inclusiones. Vol: 6 num especial (2019): 294-312; D. D. Burkaltseva; L. M. Borsch; S. V. Gerasimova; S. A. Zotova y O. A. Guk, “Regional Aspect: Laying Institutional Groundworks”, European Proceedings of Social and Behavioural Sciences. Vol: 50 num 33 (2018): 263-271. Doi: <https://dx.doi.org/10.15405/epsbs.2018.12.33> y A. V. Keshelava y V. G. Budanov. Introduction to the Digital economy (Moscow, 2017). Available at: <http://qps.ru/HzJbE>

⁵ A. V. Babkin, Digital transformation of economy and industry: problems and prospects (SPb.: Publishing house of Polytechnic University, 2017), 807. Available online: <https://elibrary.ru/item.asp?id=29936527>; V. P. Bauer, Problems on the way of creation of the unified digital platform of digital economy. (Moscow: Academy of natural Sciences, 2017), 39. Available online: http://raen.info/upload/000/files/project/47_68-2/25.pdf; P. Byrne y M. Mitchell, The Story of Deep Capture. 2014. Available at: <http://www.deepcapture.com/wp-content/uploads/2009/08/deepcapture-the-story-v1.pdf> y D. Kosten, Bitcoin Mission Statement. Or What Does It Mean Sharing Economy and Distributed Trust? 2015. Available at: <http://ssrn.com/abstract=2684256>

⁶ P. V. Kupriyanovsky; N. A. Utkin y D. E. Namiot, “Digital economy = data model + big data + architecture + application?”, International Journal of Open Information Technologies Vol: 4 num 5 (2016): 1-13; V. P. Kupriyanovsky; P. V. Kurenkov; G. V. Bubnova; O. N. Dunaev; S. A. Sinyagov y D. E. Namiot, “The Economics of innovation digital railroad. Experience of Great Britain”, International Journal of Open Information Technologies Vol: 5 num 3 (2017): 79-99; V. P.

The results of the research of the Russian scientists reflect both the prospects of the digital economy and the issues of the digital transformation of the economy and industry. The research reflects the theory of the digital economy in the context of globalization, the features of the regional and sectoral economy, the introduction of the concept of industry 4.0, the digitalization of business and e-Commerce⁷.

The literature considers the impact of “big data” on the decision-making process. The approaches to the definition of the “big data” concept are studied, the structure of this concept is revealed, including the methods of collection, storage, access to data, mathematical methods of analysis, hidden patterns and rules of their use. The influence of “big data” on the decision-making process is investigated, the models allowing to take into account these features are considered⁸. The influence of the Internet on the current economy, comparison of such modern concepts as “Internet Commerce”, “e-Commerce”, “Internet economy”, “electronic economy”, etc. is analyzed. The analysis of the structure and specific features of the Internet economy, as well as the role and place of Internet technologies in modern economic science is carried out. It is established that the emergence of the Internet economy and its development forms a number of significant changes in the economy and leads to the change in the traditional provisions of the economic theory and practice⁹. The study of the use of modern information technologies in the tax administration system of Russia shows that in this aspect the FTS has reached a high level and already provides users with a large number of services¹⁰. Taxation of cryptocurrencies is considered on the example of the European Union and Japan¹¹.

One of the essential infrastructure elements of the digital economy is electronic money, which appeared as a product of the long-term evolution of types and forms of money¹².

However, the problems of the automation processes implementation in general and the ways to resolve the consequences have not been studied by scientists yet.

Kupriyanovsky; S. A. Sinyagov; S. I. Lipatov; D. E. Namiot y O. A. Vorobyov, “The Digital economy – the smart way to work”, International Journal of Open Information Technologies Vol: 4 num 2 (2016): 26-33 y T. A. Panova, Banks and cryptocurrency technologies. Available at: <http://docplayer.ru/34160676-Banki-i-tehnologii-kriptoalyut.html>

⁷ V. P. Kupriyanovsky; P. V. Kurenkov; G. V. Bubnova; O. N. Dunaev; S. A. Sinyagov y D. E. Namiot, The Economics of innovation digital railroad...

⁸ O. L. Korolev; N. V. Apatova y A. P. Krulikovsky, Big data as a factor of change of decision-making processes in the economy”, St. Petersburg: State Polytechnic University Journal. Economics Vol: 10 num 4 (2017): 31-38. Available online: https://elibrary.ru/html_article.asp

⁹ K. N. Fedoseeva y O. V. Boychenko, Place and role of Internet technologies in modern economy. In the collection: Actual problems of social and economic development of the society proceedings on the materials of the II scientific-practical conference. Branch of the KGMTU in Feodosia. 2017. 195-199. Available at: https://elibrary.ru/html_article.asp?id=30050685

¹⁰ K. N. Fedoseeva y O. V. Boychenko, Place and role of Internet technologies in modern...

¹¹ E. A. Schreiber y A. V. Varnavsky, “Tax regulation of cryptocurrency”, Scientific and Practical Electronic Journal of the Alley of Science num 10 (2017). Available at: http://alley-science.ru/domains_data/files/17_June/NALOGOVOE%20REGULIROVANIE%20KRIPTOVALYUT.pdf

¹² V. V. Pshenichnikov y A. V. Babkin, “Electronic money as a factor in the development of the digital economy. St. Petersburg State Polytechnic University Journal”, Economics Vol: 10 num 1 (2017): 32-42. Available at: <http://qps.ru/yslof>

The current state of the labor market in the world

The automation has a significant impact on the labor market. Table 1 shows the current state of the world labor market.

	Unemployment (mln.people)			Unemployment level (%)		
	2016	2017	2018	2016	2017	2018
IN THE WORLD	197,7	201,1	203,8	5,7	5,8	5,8
Developed economies	38,6	37,9	38,0	6,3	6,2	6,2
Emerging market economies	143,4	147,0	149,2	5,6	5,7	5,7
Developing economies	15,7	16,1	16,6	5,6	5,5	5,5
	The share of vulnerable employment (%)			Share of the working poor (%)		
	2016	2017	2018	2016	2017	2018
IN THE WORLD	42,9	42,8	42,7	29,4	28,7	28,1
Developed economies	10,1	10,1	10,0			
Emerging market economies	46,8	46,5	46,2	25,0	24,3	23,7
Developing economies	78,9	78,7	78,5	69,9	67,9	66,7

Note: the data for 2017-2018 is an estimated forecast. The proportion of the working poor is defined as the proportion of the working population living in poverty and extreme poverty, i.e. with the income or consumption of less than 3.10 US\$ per person per day. The developed economies are not included in the aggregate figures for the working poor^{13,14}

Table 1
The current state of the labor market in the world

The number of unemployed and the unemployment rate are expected to remain high in the short term, while the labor force will continue to grow. The global unemployment rate is projected to increase slightly in 2018 to 5.8% (from 5.7% in 2017) or 3.4 million unemployed worldwide (as a result, the overall unemployment rate will slightly exceed 201 million in 2018). With the global unemployment rate expected to remain at a relatively stable level in 2018, the growth rate of those in search of employment will outpace the creation of new jobs, adding another 2.7 million unemployed worldwide.

The increase in unemployment and the increase in the number of unemployed in 2018 will depend on the deterioration of the situation in the labor market in developing countries, due to the numerous recessions registered in 2017 and continuing to damage the labor markets in 2017. The number of unemployed in the developing countries is

¹³ RBC. Levchenko. Angle. The world of the unemployed. Available at: <http://tv.rbc.ru/archive/levchenko/5a6f47e89a7947652e6fe8b2>

¹⁴ World Employment and Social Outlook: Trends to 2017 International Labour Office. Geneva: ILO. 2017. Available at: http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_541211.pdf

expected to increase by about 3.6 million between 2017 and 2018, during which the unemployment rate in developing countries will rise to 5.7%, compared to 5.6% in 2016. The situation is difficult in Latin America and the Caribbean, where the unemployment rate is expected to rise from 0.3% to 8.4% in 2018, mainly due to the rising unemployment in Brazil¹⁵.

In the developed countries in 2018 the unemployment, on the contrary, should be reduced from 6.3% to 6.2%. In Europe, especially in its Northern, Southern and Western parts, the unemployment will continue to decline, but overall growth will slow down, and the structural unemployment will show signs of worsening. The situation is similar in Canada and in the United States. Thus, in Europe and the North America, the level of long-term unemployment is consistently high compared to pre-crisis indicators, and in Europe it continues to grow despite the decline in the unemployment rate. The share of unemployed people, who have been looking for work for 12 months or more, reached 47.8% in the second trimester of 2017, compared to 44.5% for the same period in 2014. In the second trimester of 2017, about two-thirds of this group – a total of about 6 million people – were unemployed for more than two years¹⁶.

Also, in 2018, the unemployment rate is expected to increase in the developing countries, the unemployment rates in 2017 and 2018 will vary within 5.5%. However, for many developed and developing countries, the main problem will still be the low level of employment, as well as the high proportion of self-employed and unpaid family workers classified as vulnerable.

The automation is the use of technical means, economic and mathematical methods and control systems that release a person from part or all of the direct participation in the processes of obtaining, converting, transmitting and using energy, materials or information¹⁷.

The main areas of automation are robotics and automation of technological processes (production machines); development in the field of artificial intelligence; open systems (Blockchain); bigdata; - software algorithms and systems; neural networks.

Automation trends in the modern world

Automation always means temporary loss of jobs. And today, the consequences of the introduction of automation in full remain unexplored.

In the process of automation, the following may lose their jobs¹⁸:

1. sellers (in Japan and Sweden there are already points of sale without “live sellers”, in Auchan there are self-service cash desks, where the participation of cashiers is excluded. The most striking example of automation is vending machines);

¹⁵ International Labour Organization. Available at: <http://www.ilo.org/moscow/lang--en/index.htm>

¹⁶ RBC. Levchenko. Angle. The world of the unemployed. Available at: <http://tv.rbc.ru/archive/levchenko/5a6f47e89a7947652e6fe8b2>

¹⁷ Big Encyclopedic dictionary. Available online: <https://dic.academic.ru/dic.nsf/enc3p/46706>

¹⁸ T. N. Belyatskaya, L. P. Knyazeva. E-economy: theory, models, technology (Minsk: BSUIR, 2016).

2. drivers: taxis and cars with the use of “autopilot” technology. Leaders in the development of the “autopilot” artificial machine learning are Google and Tesla;

3. lawyers;

4. specialists of other professions, in particular, in the field of document flow, and those who perform routine work.

Professions that automation, in our opinion, will affect in the last turn:

1. people of creative professions (artists, designers, authors of texts), although the texts are already written by artificial intelligence;

2. specialists in the field of living systems (doctors, but primarily from the category of narrow specialties, as well as psychologists, and those engaged in similar areas);

3. narrow specialists - not because it is impossible, but because it will be economically unprofitable.

The problems of introduction of automation are legal and institutional collapse, the uncertainty of liability in the event of occurrence of an event (e.g., failure of the autopilot).

Blockchain technology and its advantages

Blockchain technology can transform business processes. However, Blockchain technology remains experimental as many problems of its use are not yet resolved.

Interest in Blockchain continues to grow: in 2016, many banks, exchanges and fintech-companies announced the launch of their own projects for the development of technology. According to the report presented at the World economic forum in 2016, more than \$ 1.4 billion have been invested in the study of Blockchain and its applications in the financial services industry over the past three years¹⁹.

Experts state that due to their political, economic, political, humanitarian and legal advantages, Bitcoin and Blockchain technology are turning into a powerful subversive innovation that can radically change most aspects of society. For ordering and convenience, we divide the various (existing and potential) technological aspects of the Blockchain revolution into three categories: Blockchain 1.0, 2.0, 3.0.

Blockchain 1.0 is a currency. Cryptocurrencies are used in various applications related to money, for example, transfer systems and digital payments.

Blockchain 2.0 is contracts. Whole classes of economic, market and financial applications based on Blockchain work with different types of financial instruments – stocks, bonds, futures, mortgages, legal titles, smart assets and smart contracts.

¹⁹ Distributed Ledger Technology: Implications of Blockchain for the Securities Industry. FINRA. Available at: https://www.finra.org/sites/default/files/FINRA_Blockchain_Report.pdf

Blockchain 3.0 is an application that goes beyond monetary settlements, finance and markets. They cover the areas of public administration, health, science, education, culture and the arts.

Next, we give a brief description and definition of Blockchain technology.

Blockchain is a digital register, which chronologically and publicly takes into account all transactions in the Bitcoin network²⁰. In other words, the Blockchain is a distributed and decentralized database formed by the participants of the ecosystem, in which it is impossible to falsify data due to the chronological recording and public confirmation by all participants of the transaction network, as well as full control of the system participant over the digital asset.

The main feature of the Blockchain is the use of algorithms for mathematical calculation and the exclusion of the “human-being” and the human factor in the decision-making system.

The main advantages of Blockchain:

1) trust to the algorithm (the Blockchain algorithm with the initial open source code, which can be viewed by each crawler of the Internet, which is characteristic of full trust to the system);

2) decentralization of the system (the system does not require trust in the company or the individual);

3) immutability of the data. For the transaction to be considered reliable, its format and signature needs to be checked and confirmed by the data stored at other members of the system (see figure 1). After that, the transaction is written down into the “block” (a special structure for recording transactions/groups of transactions in the system), in which such related actions are located, so that they can be quickly rechecked. Blocks are built into the chain that contains information about all operations ever performed in a particular database. The copy of the database (or part of it) is simultaneously stored on the computers of the system participants and is constantly synchronized. Although the information in the blocks is not encrypted and is in the public domain, it is impossible to change the information in one block without its confirmation by the chains of other blocks. The distribution of the database and its many copies do not allow changing all the chains connected with the block being changed at the same time, which makes it impossible to fake information.

²⁰ Oxford Dictionaries Community. Available at: <http://www.oxforddictionaries.com/>

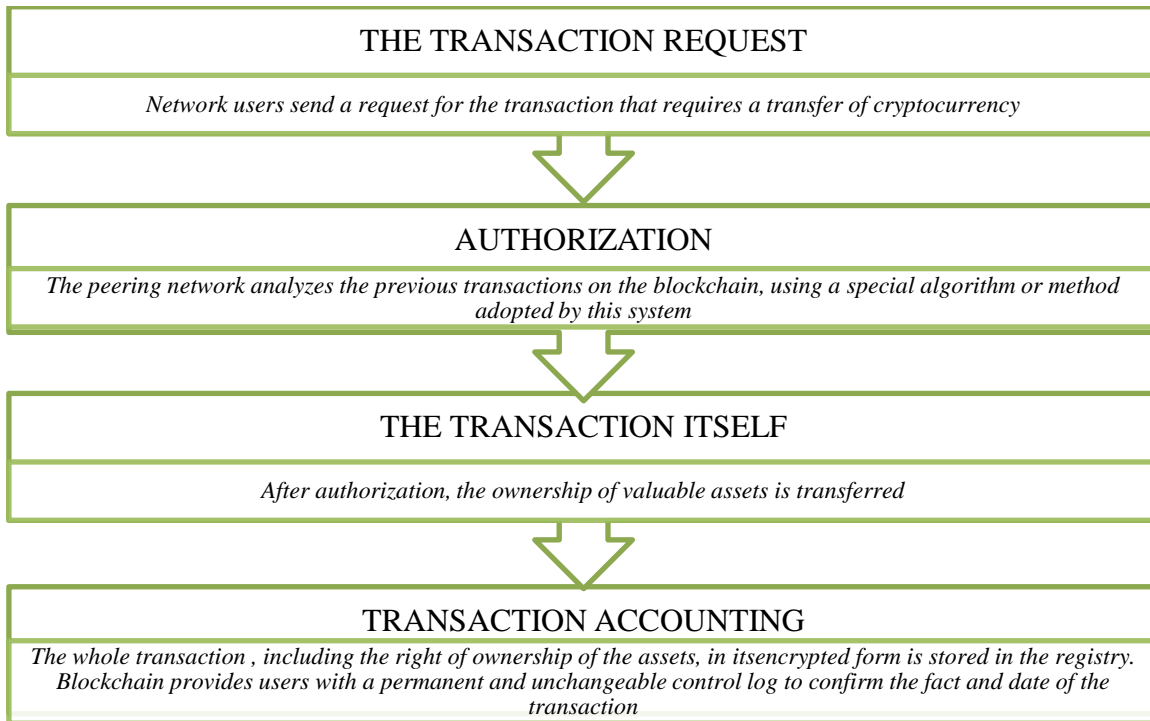


Figure 1
Dynamics of implementation of the Blockchain²¹

4) No intermediaries between the participants. In the modern world, all transactions with money, documents and other data are subject to mandatory verification and confirmation of authenticity by banking institutions, notaries, brokers and other participants of the market of intermediary services. The use of the Blockchain system calls into question the existence of these intermediaries, as the system will make the work of such bodies not reliable, because information about transactions cannot be compromised, due to the property of the chronological record of transactions, as well as the system of “smart contracts”.

5) Transparency of the system. Everything recorded in the Blockchain system is very easy to check and verify the correctness of the records. You only need to go to the “main register” and track the entire history of transactions. In other words, everyone can see how much money is in each account and where they move.

Thus, the introduction of Blockchain is by definition a complex process, but the basic idea of the technology is simple: a distributed registry or a database running simultaneously on a set (sometimes we are talking about millions) of nodes distributed around the world between different users and organizations. The uniqueness of the Blockchain lies in the immutability or irreversibility, which is guaranteed by the cryptographic protection system. In favor of trust in the Blockchain, the fact that any changes in the data in the block chain are possible only if the network participants confirm the legitimacy of the transaction in accordance with the general rules and protocols.

²¹ O. N. Epifanova; D. D. Burkaleva y A. S. Tyulin, The Use of blockchain technology in the public sector. In the collection: Electronic currency in the light of modern legal and economic challenges, the collection of materials of the International scientific and practical conference. 2016. 88-97.

Blockchain has emerged as the technology to run Bitcoin in circulation, and at first was used only to control the cryptocurrency. However, since its introduction in 2009, the scope of application has expanded significantly. The same technology can be used in the field of: voting; car leasing and sales; network technologies and the Internet of things; forecasting; car sharing; stock trading; document flow²²; insurance.

The use of the Blockchain in the document

The Federal customs service of Russia, creating its network, uses foreign experience – the experience of “Hyperledger”. Hyperledger experience can be used to control all goods and cargo crossing the Russian border. The Blockchain system is already successfully used by the Chamber of Commerce and Industry of the Russian Federation, and judging by the positive experience gained, it will effectively allow customs to prevent smuggling and counterfeit cases, as well as to track the authenticity of certificates for goods²³. The authors also propose to use the Blockchain technology, for example, in the document flow in the Universities, where, in particular, it is possible to solve the problem of reporting of the teaching staff / students (Fig.2).

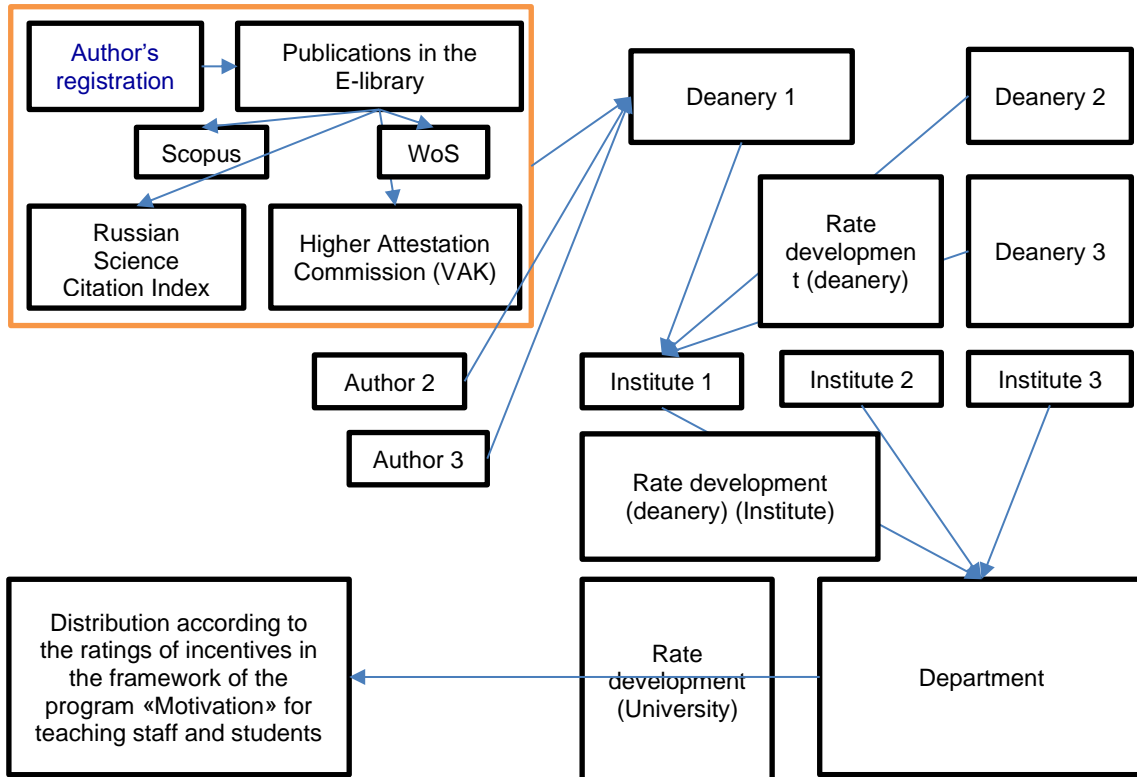


Figure 2
System of authorization of scientific and teaching staff reporting in the University.
Source: proposed by the authors

²² List of the largest industries where blockchain can be used. Press Center. Available at: <http://mcem.ru/articles/cpisok-krupnejshikh-otraslej-gde-mozhet-ispolzovatsya-blokchejn>

²³ The Russian Customs will transfer the document flow to the Blockchain. Available at: <https://bitnovosti.com/2018/01/26/rossijskaya-tamozhnya-perevedet-dokumentooborot-na-blokchejn/>

Thus, by introducing Blockchain technology, it is possible to identify and verify qualitatively and to generate scientific reports within Universities much faster.

If we look further, there is a need for a consolidated ranking of all Universities and its institutional support.

Conclusion

In the process of automation, which includes robotics and automation of technological processes (production machines), developments in the field of artificial intelligence, open systems (Blockchain), bigdata, software algorithms and systems (software); neural networks – it is not possible to evaluate the consequences and possibilities of its implementation at the moment.

At the moment, the main problems of the implementation of automation are the institutional and legal norms, namely, the uncertainty of responsibility in the case of the event.

Blockchain technology – as one of the areas of automation and the digitization tool of economic and technological processes – is able to transform the established business processes. Blockchain remains an experimental technology – many problems of its use have not been solved yet. The basic idea of the technology is simple: it is a distributed registry or database running simultaneously on many (sometimes millions) nodes distributed across the world between different users and organizations. The uniqueness of the blockchain lies in the immutability or irreversibility, which is guaranteed by the cryptographic protection system. New ways of using technology are being developed: banks, payments and money transfers, cyber security, education, voting, car leasing and sales, network technologies and the Internet of things; insurance, forecasting, online music, car sharing, stock trading, document flow.

The authors also propose to use the Blockchain technology in the document flow in the Universities, where in particular, it is possible to solve the problem of the teaching staff and students reporting.

Further research should be directed to the preparation of the roadmap for the stages of human capital release, taking into account the trends of automation implementation and the justification of the retraining directions.

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