Blockchain as an Imperative of Labor Relations Digitalizing

Ruslan Dolzhenko[1,2,*]

[1]Ural State University of Economics, 620144 Ekaterinburg, Russia
[2]Ural Institute of Management - Branch of RANEPA, Ekaterinburg, Russia

Abstract. The article is devoted to the study of the prospects of using technology of blockchain, which allows you to consolidate information about transactions in a system of record chains distributed among users. Labor relations are one of the most widespread and regulated forms, which requires the provision of guarantees for entities. It is blockchain that can be the technology that will significantly change the world of work, save it from routine operations, formalization, losses, and costs that do not create value for the subjects. To identify the prospects of this technology a corresponding study was conducted. To understand the development prospects, we conducted a series of in-depth interviews with experts in the field of blockchain application, which allowed us to identify key obstacles, conditions for the success of implementation, the effect of the application in the field of labor relations. The study showed that at present under existing unstable conditions, subjects cannot clearly define the "rules" of relations and follow them for a long time. It is necessary to train all subjects of economic relations in the basics of the digital economy, IT technologies, and only after that proceed to the implementation of the blockchain in mass relations.

1 Introduction

In recent years, digital technologies have become one of the imperatives for the society and economy development. Blurring the lines between the physical and digital worlds forces us to reconsider all types of relations, pushes them to rethinking, study and search for directions of use in modern conditions. Despite the active introduction of digital technologies in all areas of public life, their capabilities, advantages and disadvantages in relation to the sphere of labor relations have not been studied enough, and the implementation is linked with a large number of issues.

Experts emphasize the importance of digitalization, but also remind of the possible risks associated with the widespread adoption of digital technologies. In particular, one of the topical issues is understanding how the labor market, labor relations, interaction between employees and employers, the human resource management system, the widespread use of technologies such as distributed ledgers, namely blockchain and smart contracts, can be

* Corresponding author: snurk17@gmail.com

affected. The digitalization of processes in these areas, based on encrypted and secure blockchain chains which are filled in accordance with the system of rules and algorithms, in the perspective eliminates the need for many traditional tools for recording various aspects of labor relations: employment contracts, employment books, traditional remuneration systems, certificates of education, etc. These areas of digital technologies' use in the system of labor relations have not yet been covered by research works (despite the interest in the topic of blockchain and the increasing number of publications in Russian and foreign journals, there are no published works about blockchain and labor yet, despite for the availability of applied projects in this area), which allows not only to seize the initiative in local science, but also to form a new concept that can become the basis for transforming the system of labor relations in the digital economy.

The purpose of our work is to study the prerequisites, opportunities, and restrictions on the use of the distributed ledger system (blockchain) in the system of labor relations, human resource management in the views of technology ambassadors.

Primarily, it is required to set the theoretical framework for our study, which boundaries are determined by the capabilities of the digital economy due to the fact that the data used in it can serve as material used in the distributed ledger system. The term "digital economy" was adopted at the end of the 20th century, when the possible widespread use of digital technologies in public life have become clear, and it was first used by Nicholas Negroponte [Negroponte, 1995].

As the technology, the blockchain technology has been around for over 10 years, interest in it began with the creation of Bitcoin, which was invented by Satoshi Nakamoto [Nakamoto, 2008]. Bitcoin is by far the most successful form of blockchain practical application. The first peak of interest came in 2009, when Bitcoin was fully launched and the second in 2013 when a new blockchain network called "Etherium" was launched.

The Ethereum got the smart contract concept widespread, which is understood as a computer algorithm used to automate digital transactions between entities [Genkin, 2017]. In the context of blockchain technology, this algorithm allows you to write to the blockchain upon the number of conditions determined by the parties. It was the first time this term was adopted, but only with the advent of the Ethereum blockchain environment, created by our fellow-countryman V. Buterin, it began to be actively used among blockchain practitioners and researchers. For details on the content of this tool, see G. Wood [Wood, 2014]. The technology of smart contacts in the future allows you to embed in any relationship using the blockchain algorithms that will automate them and protect them from errors.

Under the blockchain, we will understand the network for processing transactions with the set of rules ("trust protocol"), with the help of which participants can come to a common vision of the transaction log and fix the network status at any given time.

Internationally, the understanding of blockchain as a way of ordering and verifying transactions in a distributed ledger is widespread, where each record is maintained and verified using the network in accordance with a cryptographic audit log [Seibold, 2016].

The key features of the blockchain that determine the uniqueness of the technology are presented in Figure 1.

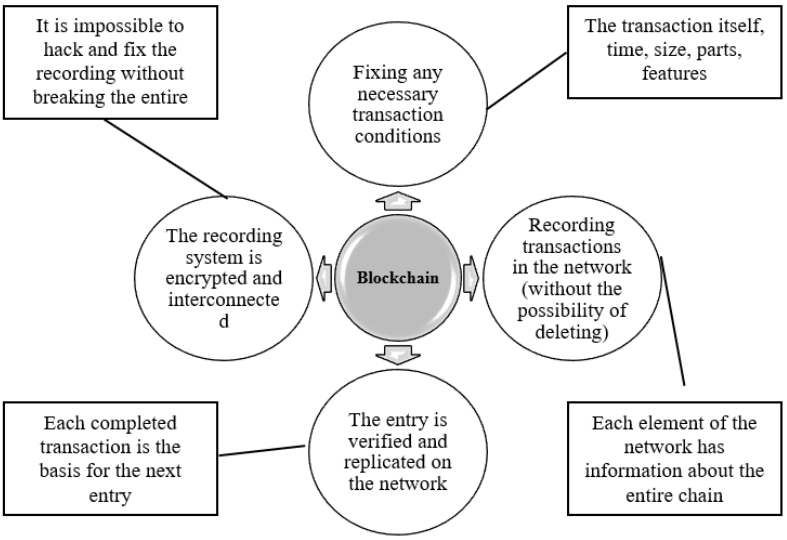

Fig. 1. Blockchain features that define its scope

The interest in blockchain has only grown in recent years. Scientists have only begun to study this topic in the last few years. The distribution of publications by year in the Web of Science and RSCI on the topic of blockchain is presented in Table 1.

Table 1. The number of scientific works on blockchain technology indexed in the Web of Science for the period from 2013 to 2019

Year of publication	Number of publications in WoS	Share of publications	Number of publications in RSCI	Share of publications
2013	2	0.06%	0	0.00%
2014	10	0.29%	0	0.00%
2015	22	0.63%	11	0.24%
2016	133	3.79%	112	2.40%
2017	578	16.48%	832	17.83%
2018	1588	45.27%	2489	53.34%
2019	1175	33.49%	1222	26.19%

As can be seen from the Table, even more works had been written in Russian language in Russia than abroad. However, the major part of these publications is of low-quality conference abstracts. Already in 2019, a decrease in interest in this topic in the country was shown. In recent years, the blockchain has been actively studied by scientists, primarily IT specialists. Currently, the major part of the scientific work in high-level scientific journals, indexed in foreign databases, is carried out by authors from the USA and China. Collectively, Russian scientists have published 13 times fewer articles in similar journals compared to researchers from these countries.

Selective examples of the blockchain technology use indicate that it has not yet received proper distribution. In this regard, it is important to understand what awaits this technology, what factors hinder its development, what are the prospects for use in the field of labor relations? To answer these questions, we used the expert opinion of people with experience in using blockchain.

2 Materials and Methods

In order to assess the possibilities of using the distributed ledger technology (blockchain) in the system of labor relations to record and protect transactions between labor subjects, we conducted a series of in-depth interviews with experts in the field of blockchain to understand the possibilities of introducing this technology into the practice of labor relations from the perspective of different subjects (workers, employers, government authorities, trade unions, etc.).

The purpose of the study was to collect and analyze qualitative information to assess the prospects for using blockchain in the labor relations system.

The study included a structured interview with experts in the field of blockchain use, which were identified as persons who have implemented / use this technology in their projects over the past 3 years. In total, 11 experts from Moscow, Yekaterinburg, Prague, St. Petersburg, Kazan, California, who worked with one of 8 projects in this area, were interviewed. Information about the projects in which experts were involved is shown in Table 2.

Table 2. Information on blockchain projects with which experts in the field of blockchain worked

Project	Website	Project Focus	Year of establishment
Evolution Space	https://evoluspace.ru/	The new business model based on blockchain, in which the right to the result of labor belongs only to the employee, as well as the income from it.	2019
Chronobank	https://chronobank.io/	A blockchain-based platform designed to modernize the current infrastructure of the labor market and the format of relationships between employers and employees, as well as to neutralize intermediaries in the form of recruitment agencies.	2016
Disciplina	https://disciplina.io/ru/	The project designed to achieve qualitative changes in the fields of education and recruiting, solve existing issues and create new tools for teachers, students and employers.	2014
Exonum platform	https://exonum.com/index	The leading blockchain infrastructure developed to provide transaction efficiency and security.	2016
IPCHAIN	https://ipchain.ru/	The network bringing together major owners and aggregators of digitized results of intellectual activity.	2017
Emercoin	https://emercoin.com/ru	The decentralized anonymous blockchain service system for business and private users.	2013
Humaniq	https://humaniq.com/	The cryptocurrency, which provides access to banking services via smartphones, targets the general population, regardless of their income.	2017
Airalab	https://airalab.org/	The company's activities are aimed at the development of blockchain technology and the development of its applications for real life in the field of smart cities, smart factories, robot economy.	2017

We have not considered the blockchain sphere of application due to the fact that the faced opportunities, prospects, problems, limitations are important to us.

3 Results and Discussion

In the course of interviews with experts in the field of blockchain, at first instance, it emerged that each of them has ambitious ideas about the role this technology can play in social and economic relations, and at the same time, extremely low expectations from the possibilities of their implementation. There is a clear gap between opinions about what potential is in distributed ledgers and how it is currently being used. Almost all of them noted that in its current form, this technology does not have many prospects. To attract funds for the development of projects, crowdfunding mechanisms are used in relation to users using certain services in which the blockchain is built. In addition, almost everyone noted that the limiting factor was the insufficient development of information technologies, which do not allow to promptly deploy a network with a large number of users.

According to the interviewed experts, the skills of employees who will deal with this issue are extremely important for the implementation and use of blockchain, therefore, constant training of employees / performers in this direction is necessary. This is the most common answer. Clarifying questions about the advisability of regulatory regulation of the scope of blockchain use showed that, in the opinion of the interviewees, it does not matter at all, and in some cases, it is an obstacle to innovations in this area. The platforms, programming languages, and tools used are not enough to deploy the blockchain.

In the framework of in-depth interviews with experts in the field of blockchain, we tried to determine the priority areas for the introduction of technology in the field of work with human resources, for this purpose, the key elements of the human resource management system were identified. They were defined as follows: recruitment, human resource document flow, human resource assessment, human resource development, human resource motivation, career management.

Each expert was asked to rank each of the elements on a scale from 0 to 10 (from “useless blockchain use” to “maximum need for blockchain implementation”), distributing 10 points at their discretion among the proposed options. A summary of the assessment results is shown in Figure 2.

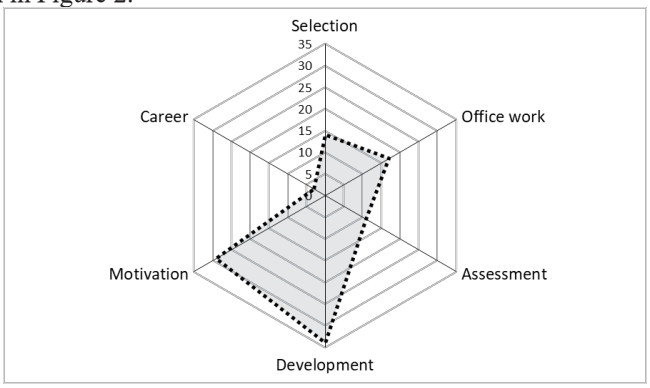

Fig. 2. The results of the assessment of the appropriateness of implementing blockchain in certain elements of the human resource management system

As the figure shows, from the point of view of experts, it is advisable to first introduce blockchain into the system of development and remuneration of employees. During the interview, the experts were asked control questions, according to the answers to which it was possible to conclude that they are aware of what each of the proposed subsystems is, what are the features of its digitalization, etc. Most of them understood human resource development as training, working with talents. 4 experts directly pointed out that the most promising form of blockchain use in this case is digital diplomas registered in the chain of

distributed ledgers. Note that one of the interview participants is engaged in a specific project of introducing blockchain into the education system, his opinion is: “Linking any training that a person has gone through to his electronic passport, recording in the blockchain chain makes it possible to completely abandon the system of paper documents on education, diplomas, certificates, training completion certificates, and then they will simply not be needed!”. 2 projects plan to shift to the payment of wages using the blockchain, 1 respondent is considering this possibility.

Next, we tried to find out what the main common problems are hindering the development of blockchain, according to experts. The consolidation of the opinion options is shown in Figure 3.

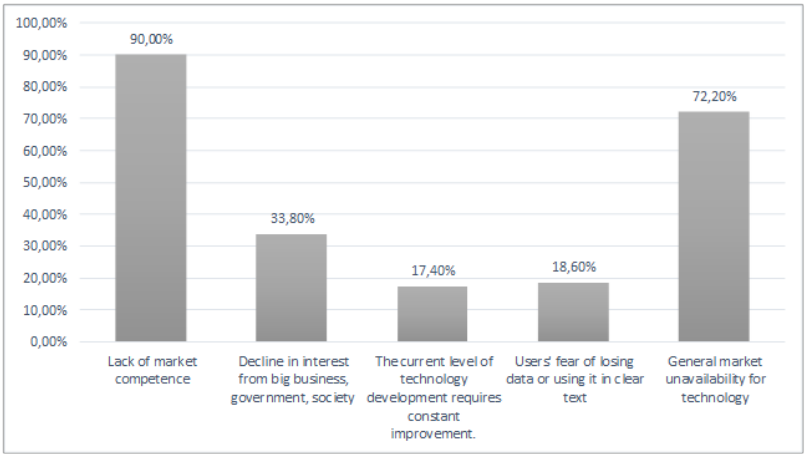

Fig. 3. Problems that are currently blocking the development of blockchain

The key issue (under which we proposed to understand the discrepancy between opportunities, needs and the current state of business), which, according to experts, prevents the use of blockchain for the current period, is the lack of competencies in the market. In fact, the educational service market does not teach this area of activity, with the exception of point projects that have recently been launched, in most cases experts are forced to independently study new items in this area, get acquainted with the literature, primary documentation, most of which has not been translated into Russian. For example, in universities one can find individual courses within master's programs, or narrow CPE programs, but this is clearly not enough to gain a critical mass of human capital in this area. The first master's program "Distributed Ledger Technology" on this topic was opened in 2019 at the Moscow Institute of Physics and Technology (MIPT).

4 Conclusions

The study indicated that the major part of our formulated hypotheses in the course of preliminary theoretical study of the topic were confirmed, and a few did not find confirmation, but made it possible to identify the layer of features that should be taken into account in the future.

Considering the interviews with experts, it was determined that the prospects for using the blockchain in the coming years will be insignificant. Until the critical mass of specialists involved in projects using blockchain is recruited, it makes no sense to talk about large-scale implementation of the technology both in the country as a whole and in individual large companies. First of all, there is a lack of competencies at the interface, it is

not the programming skills themselves that are important, but understanding how blockchain can be used in various areas of public life.

In order to use blockchain effectively, it is principally required to train company leaders in the basics of the digital economy, to show how digitalization of processes, fixing digital traces and translating them into data for analysis can increase the business efficiency. After the business understands the benefits of transition to these technologies, it is possible to offer specific options, one of which may be blockchain technology. Already its current economic and organizational advantages make it possible to optimize many business processes and achieve an effect for specific companies. As one of the experts, whose project is related to the sphere of personnel management, noted, the total volume of personnel services in the world market is more than 15 billion dollars. Basically, it is associated with the recruiting function, in which the reliability of data about candidates is important, which means that you need to constantly check information about the length of service, experience, education of potential employees. A specialist spends almost 10% of the time for filling a vacancy on such work, asks for confirmation, checks documents, and calls previous jobs. The use of blockchain solutions will make it possible to "reduce" these costs. In the medium term, the market for these validation and education services could range from $ 500 million to $ 1 billion. Even without taking into account the overall growth of the market, the maximum potential for replacing this area with blockchain solutions will be $ 1.5 billion in monetary terms.

In addition, it may mean that the profession of a recruiter, which is one of the most demanded in this area (along with a specialist in HR workflow), may simply disappear in the medium term. Are these reasons enough to pay more attention to blockchain technology? The opinion of the experts interviewed during the study confirm that the attention should be paid immediately. But previously, people need to be taught new technologies, and educational programs need to be transformed at an accelerated rate. The interest in technology peaked in 2017, but prior the educational solution for the master's level was implemented only this year, 2019, and the release will be carried out only in 2021. During this period, new solutions, projects will definitely appear, changes will be made to technical solutions several times.

One of the priority areas of the blockchain use is the education, fixing the facts of its receipt, as well as confirmation during employment. However, now this area is characterized by the presence of various constraining factors that cannot be overcome by individual entities in the blockchain technology market. The state has already come to the realization of the possibility of using digital labor contracts and electronic work books, the next step is digital passports based on blockchain technology, to which any facts and transactions that are important for subjects in the markets can be linked. But for this purpose, it is necessary at least to determine the conditions for the existence of such system and ways to protect its elements from changes and shocks.

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