

Blockchain Technology as The Basis for Economic Development During the Coronavirus Pandemic*

Aleksey V. BURKOV

Mari State University, Yoshkar-Ola, Russia

Correspondence should be addressed to: Aleksey V. BURKOV; alexey.burkov@gmail.com

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Abstract

Modern technologies are developing at a very high speed and affect almost all spheres of human life, including a huge number of modern technologies are used in various industries. But development does not stand still, and innovative developments are replacing outdated, difficult to use and ineffective equipment. In the past, instead of hard physical labor and manual tools, a person used the first machines, which greatly facilitated his work. As then, new technologies are also called upon to facilitate the work of people.

Keywords: Blockchain, Economy, Pandemic, Enterprise, Economic Development.

Introduction

Currently, humanity is thinking about how to make the work of workers even more convenient, simpler and safer. In 2011, the concept of the Fourth Industrial Revolution (Industry 4.0) was put forward at the Hanover Fair. It consisted in the use of modern technologies such as Big Data, Internet of Things (IoT), virtual and augmented reality, 3D printing, printed electronics, quantum computing and blockchain technologies.

Germany was one of the first countries to introduce these technologies into industry. Work efficiency has increased significantly. After the success of Germany, many developed countries began to introduce the above technologies in various industries and the result was not long in coming. Thus, on the example of various countries, mankind became convinced that the direction of Industry 4.0 is extremely profitable and effective, since reduces costs to a minimum by ensuring simple manufacturing of parts using 3D printing, complete transparency of production chains using blockchain technologies, simple and efficient processing and analysis of a huge amount of data using Big data technology, etc.

Our opinion on the implementation of Industry 4.0 technologies. is as follows: as the medal has two sides, so the Fourth industrial revolution has not only positive sides:

1. when all of the above technologies are introduced, many simple workers who are currently making parts with their own hands on conventional machines will lose their jobs due to the lack of the need for manual labor and 3D printers and other programmable machines will take their place; countries will receive a rise in unemployment;
2. the load on managers will increase, and there will also be an urgent need for highly qualified personnel with quality education; educational organizations must be ready for this, otherwise the country will receive unemployment among university graduates;
3. The introduction of Industry 4.0 technologies in production will lead to huge expenses in the field of data protection, because many enterprise data can be used by cybercriminals to commit crimes, steal information and money.

Industry 4.0 has more positive than negative effects, as with the introduction of all the most modern technologies, it will make modern production much safer, more efficient and more versatile.

Our principled position: The introduction of Industry 4.0 technologies in an enterprise should not be a Revolution. If an enterprise is being built from scratch, then such an approach is possible (new equipment, new and exact number of personnel, new technologies). If the technologies of Industry 4.0. are introduced at an already operating according to the "old" enterprise, then this should take place gradually and be an Evolution at the enterprise.

Materials and Methods

In Russia, many sectors of the economy are already beginning to switch to Industry 4.0 standards. Modern thanks to new technologies have great potential for innovation. They are most interested in the benefits that the transition of production to Industry 4.0 standards will bring, as well as significant support from the state for these enterprises.

In our opinion, the introduction of a full list of technologies at the enterprise should be phased in order to avoid such problems as: an increase in the unemployment rate, high financial costs and a lack of specialists capable of working with innovative equipment and technologies. Also, in our opinion, these enterprises will be strongly interested in blockchain technology to improve quality control of their products.

From open sources, one can learn that innovative enterprises are currently very interested in the introduction of innovative technologies and the fact that they face such tasks as: mastering new technologies, developing and releasing new types of products, and innovations in management.

In my opinion, all enterprises of the concern need the proposed blockchain technology, since they all work as one whole: common goals, common strategies, common solutions.

The introduction of blockchain technology at the enterprise will allow:

Implement stricter technical control due to data immutability. If the data is automatically received from sensors and from machine tools, then the human factor of distortion and further correction of the data is excluded.

Automate secure data processing using smart contracts. This allows for data analysis for informed management decision making.

Provide easy access to information for interested parties with "clearance", for example, automatically quick easy access to any data on the elements of the technological chain from the head office.

This technology will give transparency of all technological chains to regulatory authorities (both enterprises and the state) However, the introduction of blockchain technology in an enterprise can cause the following problems:

Blockchain is a new technology that needs to be implemented as a whole for the entire enterprise. That is, the introduction of technology for all individual enterprises should be a logical continuation of the adoption of this technology at the highest management level.

If the formation of an enterprise starts from a "blank slate", then there is an opportunity to immediately foresee all technological innovations. New employees are immediately recruited who know how to work according to the new technological rules. All documents of the new plant have already been "sharpened" for the new organization of production. Summing up, we can say that the prospects for using blockchain technology both in Russia and around the world are quite high. This technology is an integral part of the digital economy. And since the technologies of the digital economy are considered priority areas for the development of the Russian economy, then in the coming years we can expect the introduction of blockchain technology in many areas.

Results

From open sources, we can find out that the introduction of modern elements of Industry 4.0 at the enterprise goes in the following directions:

1. Product lifecycle management.
2. Automation control.

If we consider a Concern (a set of several enterprises), then in its IT policy it proceeds from a set of standard solutions. In my opinion, blockchain should become one of such "standard solutions".

I can note that the Concern's enterprises are at different stages of automation and implementation of information technologies. The easiest way would be to implement Blockchain like any other new technology simultaneously with the creation of a new

production. We have chosen an already operating enterprise for our project and must take into account a number of difficult points, which we wrote about above.

I. Corporate level

The introduction of this technology should be phased and simultaneous for all enterprises of the concern, the implementation of which will consist of three stages:

Stage 1: Development of the basic principles for the introduction of new technology at the operating enterprise.

The Concern's enterprise must implement all Industry 4.0 technologies that are being implemented at the level of the Concern's modern enterprises.

Implementation on the Blockchain must be preceded by the implementation of the Consortium Blockchain at the Concern level.

Blockchain should become the next step in the development of the Automated Enterprise Management System, which is being implemented at the Concern's enterprises.

Blockchain implementation should not slow down or be a "stop" in the enterprise. The enterprise must continue to manufacture products as planned.

Stage 2: Development of standard solutions for all enterprises - unified automation of individual tasks.

Stage 3: Solving the problem of data integration, unification of interfaces and data exchange protocols. This stage should come after the end of the re-equipment of production, its automation and become the basis for the implementation, in fact, of the blockchain.

At this stage, there should be:

a) Unification of information resources (information exchange protocols, a unified control system for normative and reference information)

b) Unification of the format for the exchange of engineering data between development enterprises and production enterprises.

II. Enterprise level

Stage 1: Combining an automated enterprise management system with old technological chains

At this stage, we propose to carry out a complete re-equipment of production with automated and digital equipment, including:

Production chain management: it is necessary to introduce process control at the level of workplaces, workshops, sections in the old production:

a) automated warehouses for raw materials, tools, machine tools, scanners, measuring machines;

b) the ability to track objects of labor and tools;

c) a system of marking with a special mark (when the part was released, at which workplace, by which CNC program, from which material)

d) systems for reading markings.

The expected result is an increase in the speed of product release.

Quality control of the manufactured product: it is necessary to implement control and traceability of all changes associated with the manufacture of products. The system should automatically support all changes and make it possible to track any deviation from the documentation, establish on the basis of which decision the replacement was made.

a) control over the movement of materials, technological processes or routes, equipment, etc.

b) fixing any changes in the production process.

c) transparency of the grounds for the replacement made, ensuring the detection of the recurrence of the defect and the elimination of the causes of its occurrence.

The expected result is an increase in product quality.

Logistics of finished products: it is necessary to implement a product tracking system at all stages of the product life cycle from semi-finished products and parts through bar coding, coding with special tags.

The expected result is a reduction in the time it takes for the product to be received by the end consumer (or customer).

Stage 2: resolving the personnel issue. All employees who will work with automated equipment must undergo appropriate

training. A number of employees may be unemployed. The management of the enterprise must develop a plan for retraining people for their further employment.

Stage 3: Connecting the enterprise to the group's blockchain. Preparation of a technical base for data processing for data transmission to the Concern.

Discussion

Our project is dedicated to one of the Industry 4.0 technologies, blockchain technology. Concretizing the results of my work, we can note that it, like other innovative technologies, is very promising and useful for production.

Blockchain is a new type of automated control solution that has the following advantages:

1. Immutability of data. If the data is automatically received from sensors and from machine tools, then the human factor of distortion and further correction of the data is excluded.
2. The entered data is difficult to lose, because they are stored on multiple nodes of the blockchain network.
3. Easy access to information for interested parties with "clearance", for example, automatically quick easy access to any data on the elements of the technological chain from the head office.
4. Since all data is stored in one system, all data is presented in one format from all enterprises of the group, regardless of the level of process automation.
5. Transparency of all technological chains before the regulatory authorities (both enterprises and the state).
6. Decentralization of data storage, there is no single center for collecting and storing data, all data is stored on multiple network nodes. It is impossible for an attacker to change the data, because they are duplicated on hundreds of computers on the network.
7. Continuous synchronization of all data on multiple computers on the network.
8. Since when entering and storing data, modern complex methods of encryption and user authentication are used, there is a constant confirmation of the reliability of data sources, including those collected automatically from machines, tools and finished products.
9. Blockchain allows you to automate secure data processing using smart contracts. This allows for data analysis for informed management decision making.
10. Reliability in the exchange of engineering data between development enterprises and production enterprises.
11. Blockchain allows you to store software control programs in a single repository in PDM; the data of this system can be uploaded to the blockchain and thus protected from illegal changes.

Based on the information I have collected, we can conclude that the implementation of technologies that meet Industry 4.0 standards at the Concern's enterprises should take place at two levels, consisting of several stages. In my opinion, it is most expedient to start work at the corporate level, as this will facilitate the subsequent implementation at each of the enterprises of the concern. The work plan itself, in my opinion, should look like this:

I. Corporate level

Stage 1: Development of standards for the modernization of ready-made enterprises. Since the modernization of a ready-made enterprise is much more difficult than building an enterprise that meets all standards from scratch, you should consider all the risks (We describe the risks below) and calculate all the costs.

Stage 2: Development of common solutions for all enterprises. Since the introduction of blockchain technology must be carried out at all enterprises of the concern at the same time, it is necessary to develop a concept that could be based on when introducing modern technologies to an operating enterprise.

Stage 3: Bringing all enterprises to a single standard for interfaces and data exchange. This stage should be completed after a complete re-equipment of already operating enterprises and should consist in bringing to a unified standard in the field of information resources and data exchange.

II. Enterprise level

Stage 1: Combining old technological chains with modern technologies. At this stage, it is necessary to replace outdated aspects of production with modern ones.

Stage 2: Preventing the growth of unemployment due to the replacement of manual labor by machine labor. At this stage, it is necessary to minimize the risk of an increase in unemployment due to the replacement of manual labor of ordinary workers with machine labor.

Stage 3: Connecting the enterprise to the blockchain network. At this stage, it is necessary to prepare the technological base of the enterprise for connecting the entire concern to the blockchain.

The implementation of blockchain technology may be accompanied by the following risks:

1. Personnel risks - the introduction of technology must be accompanied by the willingness of employees to use this information environment. If the plan for preparing employees of the enterprise to work with the new technology lags behind the plan for implementing the technology, then this can lead to disruptions in the production chain.
2. Financial risks - the company must spend additional financial resources to implement this technology, despite the fact that the financial benefit from its implementation is not obvious to investors.
3. Technological risks - the enterprise must have a suitable technological base for the implementation of blockchain technology, if the preparation of the enterprise is not completed before the start of implementation, this can lead to problems.

Conclusions

Based on the work done, the following conclusions can be drawn:

1. The process of introducing new technology to an enterprise directly depends on the development of its technological level: a new enterprise, which is being built from scratch, is equipped from the very beginning not only with novelties of labor tools and technical means, but also with personnel of appropriate qualifications, as well as information technologies. If an enterprise has been operating for a long time and its deep modernization is required, the introduction of a new technology should be phased.
2. If an enterprise is part of a large enterprise association, then the introduction of new technology should be carried out with the development of an implementation plan at the level of the top management of the association, that is, at the corporate level.
3. When introducing new technologies, it is necessary to take into account not only the significant advantages of these technologies, but also the possible risks.

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