

**INFORMATION SUPPORT FOR THE FOREIGN  
ECONOMIC ACTIVITIES MANAGEMENT SYSTEM  
BASED ON ELECTRONIC ADMINISTRATION  
TECHNOLOGIES<sup>1</sup>**

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**ABSTRACT**

The article is focused on the mechanism of the blockchain technology functioning. The advantages of using this technology in international supply chains as well as in the process of their customs regulation are analyzed. The necessity of using the blockchain in the customs administration process is identified and justified. The model for the joint use of blockchain, Smart contract and the Internet of Things is proposed as the basis for carrying out the foreign economic activities. The article assesses the supply chain customs administration process, implemented by the blockchain platforms and reveals the positive aspects of Smart contract and the Internet of Things usage in the foreign economic activities.

**KEY WORDS:** management system, blockchain, distributed database, Smart contract, the principle of consensus, supply chain, customs administration.

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<sup>1</sup> Original scientific article

## INTRODUCTION

Consistent integration of the Russian economy into the international economic space through accession to the WTO, the creation of the EAEU and the commitment to liberalize foreign trade relations requires qualitative improvement of customs administration, as it is one of the main elements of the foreign economic activity regulation.

The experience of foreign countries proves the need for the effective technologies that ensure simultaneous protection of national interests and international trade facilitation.

On September 2016, the World Economic Forum has presented a report (Technology Tipping Points and Societal Impact) on the information technology development directions, and in particular, the blockchain technology. According to the specialists, the full integration of public sector and the blockchain may occur by the 2023, and the highest level of blockchain and bitcoin development can be achieved by the 2027[1].

Russian government structures pay special attention to the possibilities of using the latest information technologies, including the blockchain. Currently, our country is implementing ambitious projects of Sberbank and Federal Antimonopoly Service, "Digital Ecosystem", aimed at the public-private interaction improvement.

Today, most of the international trade is carried out through the global supply chain, which complicates the work of the Customs. Thereby, there is a need to create the Electronic Customs, which will enhance the efficiency of the Customs administration.

According to the Russian Customs Service Development Strategy, the improvement of information and technical support is one of the main strategic directions for the Customs Service development.

The FCS plans to establish the blockchain-network similar to the existing technologies, such as «Hyperledger» used by the Walmart and IBM, or the British system «Everledger». The first technology is used by the US State authorities to control the meat products movement, the second is used for the diamonds' certification, and dataset digitization is for each type of the precious stones.

According to the FCS, the blockchain should increase the data transparency level. Moreover, the Customs expect is to ensure the information availability at every stage of the goods movement from the manufacture up to their release for the domestic consumption, and up to the moment when the goods are sold to the consumer [2].

### PROSPECTS OF THE BLOCK CHAIN TECHNOLOGY USAGE AS THE CUSTOMS ADMINISTRATION INSTRUMENT

Block chain is the way to store the data or digital register of transactions, contracts and other kinds of information. Records are combined into the block chain, the database, which is linked cryptographically and chronologically into the chain using complex mathematical algorithms. Each block is associated with the previous one and contains a set of records. New blocks are always added strictly to the end of the chain [3].

It is absolutely impossible to change the information because each block in the chain contains the information about its predecessor. Each block has a "hash", which is in fact is a collection of the verified information, transformed into a mathematical code. The algorithm for matching and adding blocks, is in the figure1:

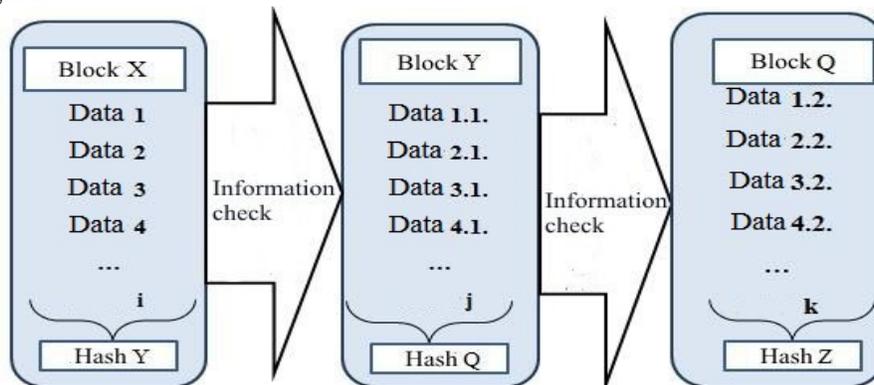


Figure 1. The algorithm for adding blocks to the blockchain database

The encryption process, known as hashing, is performed by a large number of different computers running on the same network. If, as a result of their

calculations, they all receive the same result, the block is assigned a unique digital code or "hash", mentioned above. Once the registry is updated and a new block is created, the information cannot be changed. Distortion of any element of the information array entails the assignment of the other code. Thus, it is impossible to forge the database. For the users, only adding the new entries will be available [3].

Reliability of the information will be provided by the software algorithms controlling the compliance of the operations such as transportation, transaction, real estate transaction or business correspondence, with their mirror reflections. Fig.2 shows the order of ensuring the information reliability by the mathematically checking of the primary information about the goods available for the supplier, with its mirror reflections, received by the manufacturer, the carrier and the warehouse.

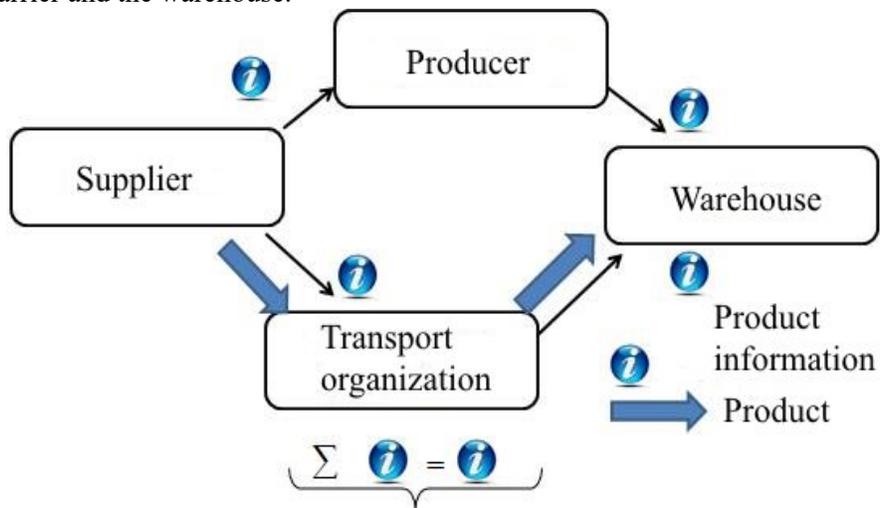


Fig. 2. Algorithm of the information identity mathematical verification

Thus, information on the two commodities flows is available for all of the blockchain participants. As a result, the mathematical algorithms can verify the reflection of one action in several sources and block the operation in case of the code mismatch detection.

In addition to the autonomous reliability control carried out by the registry, the participants themselves provide the information reliability. As it is shown in the Fig.3, the information is added to the blockchain in the chronological order. At the end of a certain period, all nodes perform their cryptographic verification, while the discrepancies in this information are eliminated. As the new block is created, it is impossible to change or delete the information about the goods and the supply chain, since all sections of the blockchain have the copy [4].

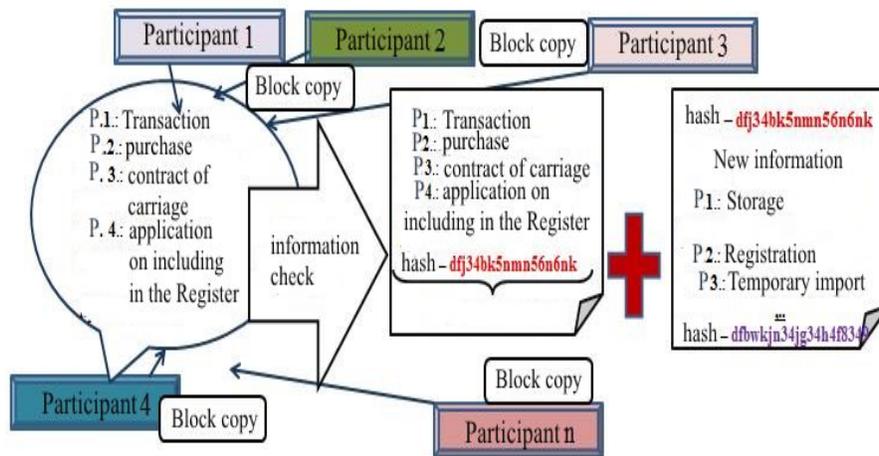


Fig. 3. The order of the blockchain participants' interaction

Thus, this mechanism will allow the Customs authorities to trust the information on goods and supply chain presented by the traders.

According to the classification made by the Ethereum platform creator, Vitaly Buterin, blockchains are divided into three types; the private block chain, the register belonging to a consortium, and the public blockchain [5].

Public blockchain is a system that allows any entity to obtain the information from the database, to enter the new information, to conduct the transactions and to participate in the block matching process.

Consortium-blockchain is a register with the coordination process controlled by the pre-selected range of the organizations. Each block can be entered into system only if there is an agreement among the majority of organizations. The ability to access the distributed registry is also decided by the management team.

The Private blockchain has no principle consensus. Written authorizations are centralized by one organization, which decides which of the block is to be entered into the chain by itself, and what information should be publicly available [5].

The distinction between the private and the public blockchain platforms is extremely large, therefore each of the technologies has its advantages and disadvantages, Fig. 4.

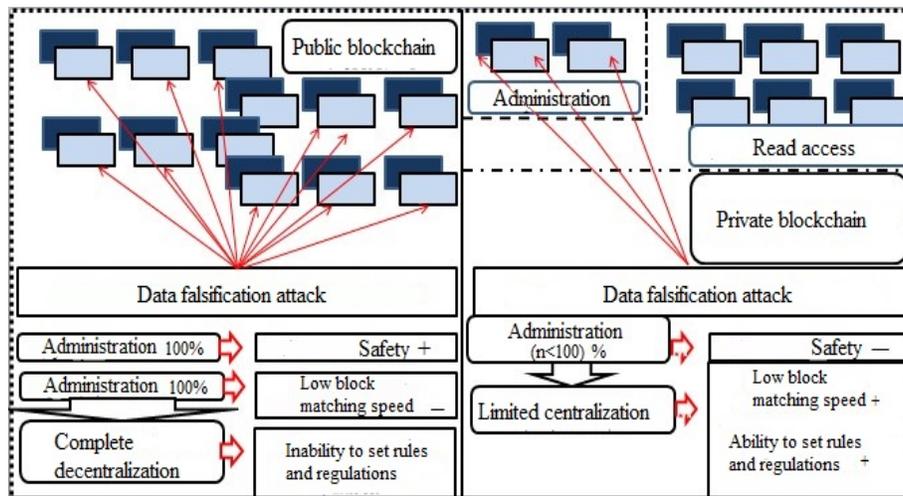


Fig. 4. The advantages and disadvantages of various blockchain platforms

The advantages of the publicblockchain include a wide range of management, which ensures that the registry is protected in case of the information fraud attacks. However, the low speed of blockalignment and the impossibility of legislationadaptationarethe obvious drawbacks.

Private blockchain is less reliable due to the limited range of control links. However, there are such advantages as the high speed of processing blocks and the ability of participants to interact on the basis of the norms and rules.

As a result of the blockchain capabilities review, we may conclude that this technology should be used in the Customs administration. The potential of the distributed registers makes it possible to create a private state blockchain, based on EAEU legislation, which gives the Customs an opportunity to address the requests directly to the foreign economic activity global space. This will allow the Customs authorities to directly extract the reliable information from the distributed registry, which will significantly reduce the administrative costs.

Thus, the blockchain technology introduction will allow the Customs officials to interact with the traders through the transparent exchange of reliable information that has been repeatedly verified by all the registry nodes. It will solve the problem of duplication and unreliability of information and will speed up the Customs control.

#### «BLOCK-CHAIN-IoT-SMART CONTRACTS» MODEL AS THE BASIS OF THE FOREIGN ECONOMIC ACTIVITY CUSTOMS ADMINISTRATION

The complexity of the Customs foreign economic activity administration process, caused by the wide spread of the global supply chains, requires the introduction of the new mechanisms and innovations. Technological changes are necessary both in the foreign trade regulation sphere and in the global supply chains functioning. The "Blockchain-IoT-SmartContracts" model can become the basis for the Customs foreign economic activity administration. Fig.5 schematically presents the model of interaction between the traders and the Customs bodies.

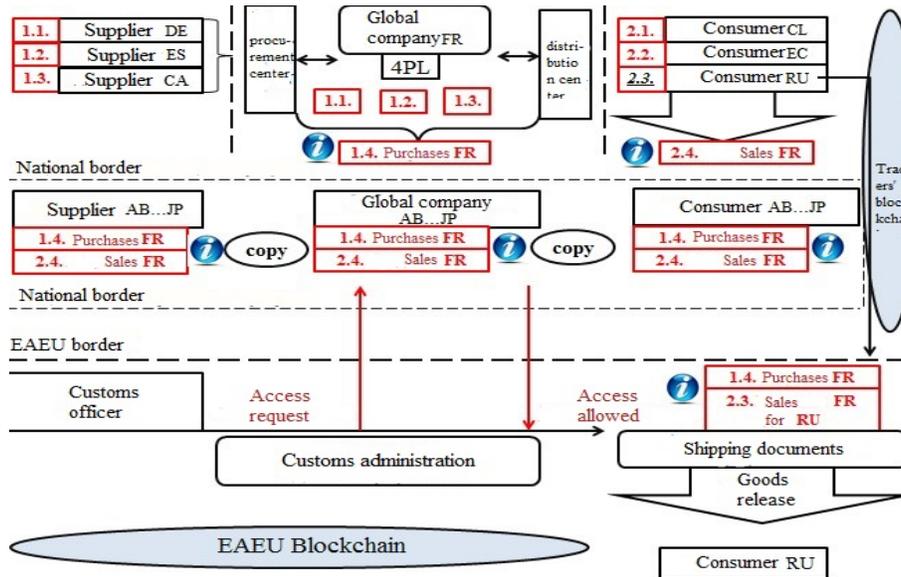


Fig. 5. Interaction model in the framework of distributed registries

This model reflects the foreign economic activities in the form of the global supply chain of the focal firm "FR", which is engaged to the production of the product X and is a participant of the publicblockchain. In the production process of "FR" the two sets of information may be formed: "Purchases 1.1. - 1.3 "and "Sales 2.1.-2.3".

According to the principles of the blockchainplatforms, both arrays are distributed to all of the members of the registry, regardless of the nationality.

Then the suppliers, global companies, consumers and their intermediaries verify the identity of the primary and the secondary information with the help of the computing facilities, and then, add it to the block, preserving its copy at home.Thus, there is a reliable database of information about the trading and production activities of the firm "FR".The sphere of the foreign economic activity state regulation is presented in the form of the private blockchain platform of the EAEU Customs bodies.The reason for the interaction of the public traders' blockchain and private Customs register is the import of goods X to EAEU Customs territory, as a result, two blocks of information enter into the

Customs body. The block "Purchases 1.4.", contains the information on technical characteristics, the country of origin, the composition and other qualitative indicators. The block "Sales 2.3." may contain the detailed information about the goods at all of the stages of the route, including transportation, storage and other operations[6].

Therefore, the implementation of the Customs control and the execution of Customs operations will be reduced to a request in the foreign trade register. If the declared information fully corresponds to the primary array of information, the release of the goods will be allowed. Thus, this blockchain - based interaction model will help to accelerate the movement of goods as well as to reduce the number of required documents. This mechanism can become much more efficient with the usage of such technologies as smart contracts and the Internet of things [7].

Smart contracts are the computer programs that perform the operation depending on the actions of the other object without the human intervention. For the traders it is important that smart contracts can monitor the fulfillment of transportation conditions, storage and use of the goods in a supply chain [8].

A smart contract cannot be performed improperly, since all of the processes are controlled by the mathematical algorithms[7].

Thus, neither the seller nor the buyer needs to specify the risks, and the neutral account will take a responsibility to minimize them [8]. The buyer credits an account, and the smart contract transfers money to the seller's account only after the goods arrive or after the other discussed condition is met. In addition, the process of implementing a smart contract is allowed for all of the members of the blockchain, including the Customs.

The Internet of things allows the traders to control the entire supply chains and to monitor the state of the product. Thus, before the goods leave the place of departure, it is possible to check whether the storage conditions are appropriate, whether the package is labeled correctly, and to find out whether it was opened [9].

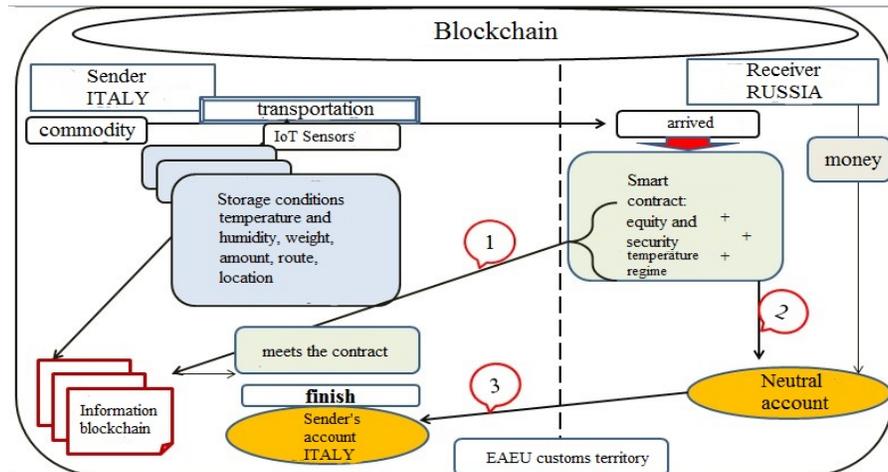


Fig.6 The mechanism of sharing the technologies of blockchain, smart contract and the Internet of things in the Customs supply chain administration process

In this case the distributed register serves as an information integrator, where the information comes from both participants and from the sensory and wireless Internet of things equipment such as sensors, cameras, temperature and humidity indicators, GPS-navigators, other mobile systems that directly transmit information about the state of the goods, integrity, temperature regime, route, location in the warehouse and other circumstances.

According to the scheme, the participants of the blockchain platform receive the information about the goods during all the way from Italy to Russia. Currently, large organizations with 4PL operators are actively implementing the Internet of things equipment. However, the difference between the modern use of sensory devices and their operation in conjunction with the blockchain system is that in the first case, the addressee of the information can change it before the submitting of the accompanying documents to the Customs authority. Blockchain will allow the sensors to send the information directly to the registry block, and it will not be possible to change or delete it.

This condition is extremely important for the operation of the other technology of the «Blockchain-IoT-Smart Contracts» complex that is a smart contract.

Firstly, according to the scheme, this technology fixes the list of the requirements for the goods, their transportation and storage, which is obligatory for the sender to perform. Secondly, the smart contract forms a neutral account. The funds stay in this account until the goods cross the Customs border and become subject to the smart contract control. The mathematical algorithm will eliminate the neutral account and return money to the recipient if the requirements are violated, for example, the quantity of goods does not match.

## CONCLUSION

Thus, the «Blockchain-IoT-SmartContracts» will allow the traders to avoid the costs of the intermediaries hiring, to minimize the risks associated with the obligations non-fulfillment under the transaction, track the goods at all of the stages of the supply chain and to ensure its safety. Customs authorities will be able to significantly reduce the administrative costs, since the distributed registry will allow the officials to directly extract the reliable information from the databases. This will simplify the interaction with the traders, solve the problem of the information duplication and unreliability, and to speed up the monitoring. The successful implementation of these projects requires the cohesion of the public and the private sector in joint efforts to solve the conceptual problems of the blockchain technology, as well as the creation of the supranational bodies and committees for the regulation of the distributed registries.

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