Entrepreneurship and Risks: Block chain-Based Management

Nataliia Smentyna, Valerii Nemchenko, Larysa Ivanchenkova, Nataliia Klievtsievych, Vasyl Buhas, Vitalii Minakov

Abstract: As the Blockchain technology evolves and more and more new projects with its use are being prepared for commissioning, it seems necessary to focus on less-discussed issues. Do Blockchain-based business models generate new types of risks for entrepreneurship and the industry as a whole? If so, what should be done to prevent and mitigate these risks? In the article, the authors investigate the applicability of Blockchain technology, except for the Bitcoin and Ethereum, mainly through the lens of business risk management. In particular, the authors propose to introduce smart contracts into the activity and consider the action using the example of trade finance.

Index Terms: bitcoin, blockchain technology, risk management, smart contract.

I. INTRODUCTION

As the blockchain technology evolves and more and more new projects with its use are being prepared for commissioning, it seems necessary to focus on less-discussed issues. Do blockchain-based business models generate new types of risks for entrepreneurship and the industry as a whole? If so, what should be done to prevent and mitigate these risks?

The successful implementation and operation of any new technology depend on the proper management of the risks associated with it. This is especially true when the technology is much more than just an application and is part of the organization's critical infrastructure, as is the case with Distributed Ledger Technologies (DLT) [1]. Soon, DLTs can become the basis for many of the leading platforms of organizations in many industries, including finance, auditing and medicine.

II. BLOCKCHAIN TECHNOLOGY

One of the new technologies that will determine our future is Block chain. Understand the boundaries of the use of technology block chain impossible, and they are truly endless and comprehensive. A block chain is an eternal digital distributed economic transaction log that can be programmed to record not only financial transactions but almost everything that has value [2]. The fundamental part of Blockchain is cryptographic algorithms [3].

Allowing digital information to spread, but not to be copied, the blockchain technology has created the basis of a new kind of Internet. The technology was originally developed for digital currency, Bitcoin, but the professional community is currently looking for other potential uses for this technology. The information stored in the Blockchain exists as a universal and consistently verifiable database. This way of using the network has apparent advantages. The blockchain database is not stored in any one place, which means that it keeps records really publicly, and they are easily checked. There is no centralized version of this information that a hacker could damage. Copies are stored on millions of computers simultaneously, and its data is available to everyone on the Internet.

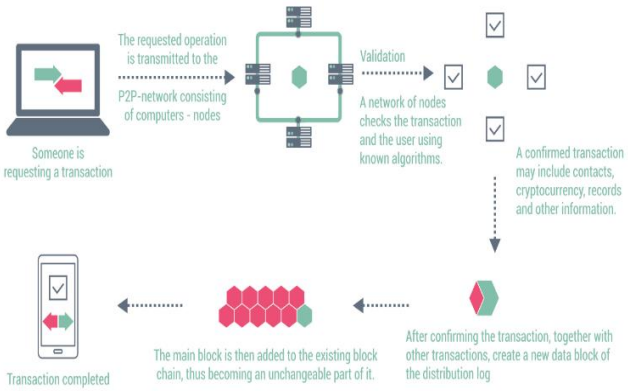

Fig. 1 Blockchain technology action scheme

Digital economy, innovative technologies, the solution of certain problems of the economy occupies the minds of many scientists [4-9] and understanding the mechanism of the Blockchain expands the horizons of its application, including with the support of other technologies – machine learning, the Internet of things and artificial intelligence.

A. The use of Blockchain: the main directions

The main benefits of the introduction of technology are:

- reduction in operating expenses (73% of respondents),
- reduction in settlement time (69% of respondents),
- *reduction of risks (57% of respondents),*
- growth in the possibility of obtaining additional income (51% of respondents).

Consider the Blockchain's basic directions (Fig. 2).

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NataliiaSmentyna, Department of Economics, Law and Business Management, Odessa National Economic University, Odessa, Ukraine
ValeriiNemchenko, Department of Accounting and Audit, Odessa National Academy of Food Technologies, Odessa, Ukraine
LarysaIvanchenkova, Department of Accounting and Audit, Odessa National Academy of Food Technologies, Odessa, Ukraine
NataliiaKlievtsievych, Department of Economics, Law and Business Management, Odessa National University of Economics, Odessa, Ukraine
VasylBuhas, Department of Management, Kyiv National University of Technologies and Design, Kyiv, Ukraine
VitaliiMinakov, Department of Mechanical Engineering, The Odessa State Academy of Building and Architecture, Odessa, Ukraine

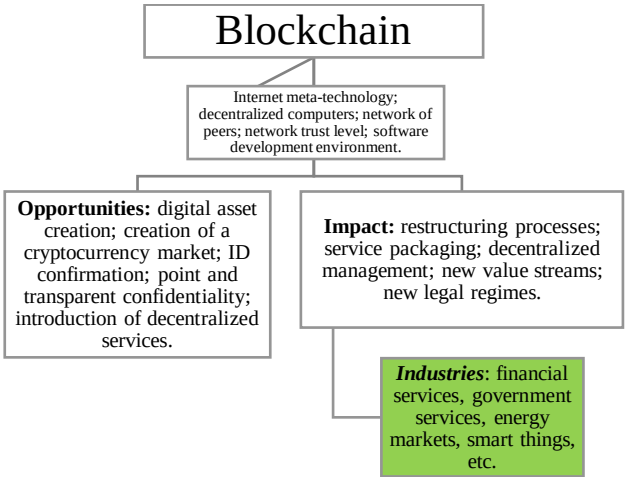

Fig. 2 The main directions for using blockchain technology

Internet meta-technology; decentralized computers; network of peers; network trust level; software development environment. To confirm information distributed registries are used today. Common applications include:

1. confirmation/identification of the person;
2. transfers of funds and virtual currency units;
3. registration of property rights, including real estate;
4. certification of transactions;
5. automation of contract execution;
6. confirmation of the origin and identification of individually-defined things (for example, precious stones or musical instruments);
7. safe and anonymous voting without the possibility of falsifying the results.

The most common use of the Blockchain is when making anonymous payments in virtual currency and recording data about payments in blocks created by the miners. The functional properties of distributed registries determine their use in financial markets, in particular, in the implementation of cross-border interbank payments (for example, within the SWIFT system and its analogues), in the execution of clearing and settlement operations [10].

Besides, decentralized databases are used to verify transaction information in the Blockchain in order to obtain a "signature", that is, authorization by the parties and users. The "continuity" of the blocks speaks about the validity of the transaction, pointing to the inseparable cryptographic connection between them [11].

Thus, the verification of facts of legal significance with the help of the Blockchain can be carried out automatically, which opens up innovative opportunities for all market participants. Interaction costs are minimized, operational risks are reduced, bringing counterparties to a new level of efficiency and trust. The application directions of the Blockchain can be positioned by following from the most apparent (payment) function to the complex service of registering transactions using a decentralized signature:

1. virtual currencies – application: making transfers and payments, commission payments, crowdfunding, microfinance operations outside the chain of transactions [3];
2. certification of legally significant circumstances – use: user identification (for example, when holding general meetings in organizations), confirmation of property rights, confirmation of participation rights (corporate rights), voting, tracking expenses, cadastral registration, digital signature with automatic date indication ;
3. "smart" contracts – application: escrow, payment of conditional remuneration under an employment contract, registration of trust management (registration of hereditary trusts), automatic arbitration clause, insurance;
4. decentralized autonomous organizations (DAO) – use: design of global value chains (global value chains), distribution of corporate rights, logistics, asset pool management.

B. Example of using Blockchain: Exonum platform from Bitfury Group

Bitfury Group launches its open source framework for developing Exonumblockchains, which will allow companies and government organizations to implement secure blockchain solutions. The technology is planned to be used to validate election results and protect the copyright of content creators in the digital space. Exonum will help "translate" the system of public services in Ukraine in the blockchain-environment. And the platform is already used in Georgia, where the registration of property rights is implemented based on Exonum.There are many solutions on the market that allow businesses to create their own distributed registries (DLT) or use this technology for their needs. However, DLT, in its essence, strongly resembles a distributed database, which lacks the security advantages offered by a real blockchain. The history of a distributed registry can be rewritten by conspiracy of a group of nodes; moreover, such a system does not have the tools to conduct an automated audit. Exonum, in turn, is a solution for building an authentic and functional blockchain, ensuring security, transparency and controllability. Exonum is an entirely open solution, so not only the entire library of code is available to users, but also the client software for managing the Blockchain. Exonum is based on the Rust programming language – one of the safest programming languages to date. At the same time, Rust is faster than Java, Go, C and C ++ and is continuously being improved. Exonum uses a unique algorithm of the Byzantine consensus, which guarantees data security (even in case of knots failure due to malfunctioning or malicious activity) and does not require mining blocks. The algorithm allows the Blockchain to process about 3 thousand transactions per second. The Exonum platform also offers work with smart contracts in a corporate environment. Exonum's smart contracts, like Ethereum and Fabric, are the business logic added to the Blockchain, but they have more excellent performance (and memory security thanks to Rust) compared to competitors. Thus, this example demonstrates the possibility of using blockchain technology in business and entrepreneurship.

C. Blockchain-Based Risk Management

Blockchain offers a mechanism for registering transactions in a chain of distributed blocks, the contents of which are confirmed by users.

A transaction is a user-approved data structure that reflects the will of the users and the subject matter of the transaction. For example, a transaction describes the number of bitcoins transferred or information about assets. Each new transaction falls into an existing block, where it is recorded together with other transactions, or a new block if the volume of existing blocks is exhausted. When added to a block, the transaction is confirmed by users. The confirmation serves as proof that the transaction is valid and cannot be cancelled. Writing a transaction to one of the interconnected blocks allows you to set the date of its completion with a minute. The data encryption algorithm and the assignment of a unique code to each block reduce the likelihood of fraud. So, for more excellent reliability, each subsequent link in the chain contains information about the previous link or block. Increasing the number of checked blocks increases the safety of all past transactions, because every time a new block is created, users check the validity of the complete chain of transactions: from beginning to end. The longer the chain of interconnected blocks, the less likely the falsification. The mechanism by which transactions in the Bitcoin blockchain are confirmed is called "proof of work". The confirmation of the chain of interconnected blocks by the users themselves is a characteristic property of the Blockchain, which conditions the trust of the participants in the distributed data chain. Besides, the process of entering information about transactions into the Blockchain is not controlled by the state. The computational power required to register data and create a new unit is provided by users. Thus, the main value of the Blockchain is manifested in an increased level of protection against falsification of data contained in a distributed registry. Any attempt to make changes to the content recorded in the block of information is detected and stopped by users confirming the validity of the record at the time of its entry. Validation is performed automatically. A valid version of the chain is stored on users' computers. Also, when registering data on the Blockchain, not only the subject and content of the transaction are confirmed, but also the time of its conclusion.Consequently, there is no need for intermediaries confirming the validity of the transaction. Registration and verification of the transaction is carried out by blockchain users themselves. The transaction costs of the interaction of counterparties and the search for financial intermediaries are reduced. The seamless connection of blocks in a chain of transactions minimizes the likelihood of data substitution, eliminating the need for third-party confirmation of a transaction.

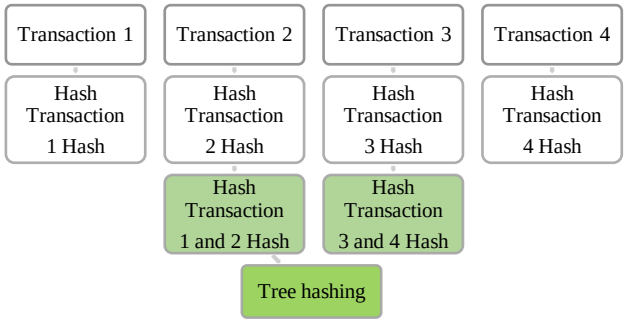

Fig.3 Assigning a hash code to newly formed blocks

Thus, the Blockchain functional is determined by the technical properties and cryptographic algorithms underlying it. The main feature of the Blockchain is consensus, i.e., confirmation of data reliability by all users of the distributed BBlockchain. The decision on the security of the data is made when checking the relationship between the blocks in a distributed data chain. Validation of transactions is possible at the expense of technology. Accordingly, the costs of financial intermediaries and experts are replaced by the value of computing power for comparing the various units in the chain. The special properties of the Blockchain allow market participants to work together with large amounts of data without the additional cost of confirming their accuracy. For example, the Blockchain provides registration of information about rights to assets, confirmation of the validity of liabilities and ensuring their fulfilment. Information on property rights and actual owners of assets may be entered into a distributed registry. The Blockchain technically improves the efficiency of working with data, simplifying the process of their disclosure and tracking for the system participants. The need to access centralized registries and databases fades into the background. With the successful functioning of the Blockchain, sending requests to public authorities, providing expensive mediation services to harmonize data is not necessary. Understanding how to ensure proper operation of distributed registries is in the interests of market players and government agencies. Identifying the risks of using the Blockchain will require an examination of the blockchain software environment (API), the procedure for registering transactions, their format and structure.

Analyzing the above, we conclude that the best way to manage business risks using the blockchain technology is to implement smart contracts.

In 1994, the term "smart" contract was introduced by the American lawyer and specialist in the field of cryptography Nick Szabo. A smart contract should be understood as a computer program, the automatic execution of which corresponds to the conditions contained in the Blockchain fixed in the program code. Such, compiled in the form of program code, instructions are automatically executed upon the occurrence of contractually agreed events. Therefore, withdrawal from the contract is impossible even technically. The code is endowed with legal force and works on a principle that is fundamental to the right: "Code is law" [13]. In the Blockchain, *smart contracts* are most often developed in the high-level Solidity programming language and then compiled into bytecode, processed and stored in the blockchain block. If we look at the bytecode of any contract, we will be able to see a long string in the hexadecimal system:

$$0x6060605052600264010870005055604051611b$$
$$54580380611b518339947$$

At first, glance, to understand what makes a smart contract is not possible. Nevertheless, there are already many free tools that allow you to restore opcodes (machine instructions with a unique identifier) from bytecode (a sequence of bytes executed by the interpreter).

For example, you can use ByteCodeTo Opcode Disassembler [12]. As a result, we can get the more readable code:

$$[1]\ PUSH1\ 0x60$$

$$[3]\ PUSH1\ 0x50$$

$$[4]\ MSTORE$$

$$[6]\ P$$

$$5\ 0x0108700050$$

$$[13USH1\ 0x02$$

$$[12]\ PUSH]\ SSTORE$$

$$[15]\ PUSH1\ 0x40$$

$$[16]\ MLOAD$$

$$[19]\ PUSH2\ 0x1b54$$

...

Already when viewing opcodes, we can isolate and analyze instructions that produce mathematical operations. But for most developers, the analysis of opcodes, due to its complexity, can say little. Here is an example of how you can manage risk with a smart contract in the area of trade finance (Fig. 4-5).

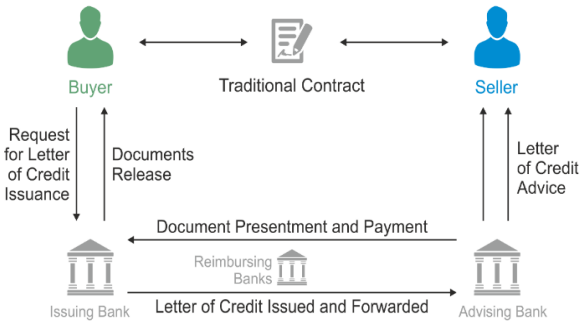

Fig.4 Current state

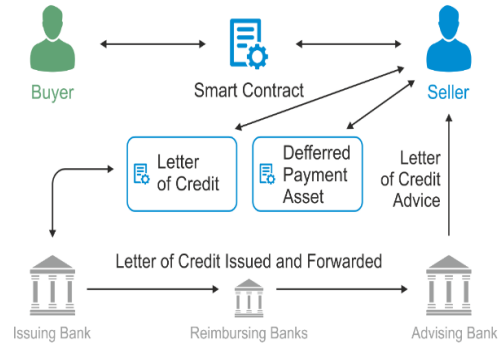

Fig. 5 Future state

The conditions for the execution of the letter of credit recorded in the smart contract will be checked automatically, which will speed up the process and increase the efficiency of trade.

III. CONCLUSION

The new technology of the Blockchain has brought confidence in the distributed systems to the data circulating between the nodes of such systems and has aroused considerable interest in the business sector and other areas directly related to accounting activities. Nowadays, institutions are making a technological breakthrough. The future of institutions behind smart contracts is an agreement code that is interpreted not by a living person, but by a computer. Smart contracts can get rid of intermediaries in the form of banks, lawyers, notaries, and so on, because they independently verify the terms of the transaction and confirm it, thereby significantly reducing business risks.

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