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# MODELS AND TOOLS OF BLOCK CHAN TECHNOLOGIES COMPONENTS AND THEIR USE IN INFORMATION SYSTEM

**ABSTRACT**
for master's degree in technical sciences

Specialty 1-45 80 02 Telecommunication systems and computer networks

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## INTRODUCTION

Blockchain technology has assumed great importance, especially in financial systems, industry, law and etc. Research topic connecting with using blockchain technology in education is relevant and actual.

## GENERAL DESCRIPTION OF WORK

**Communication with major scientific programs and themes**. The dissertation research is performed within the research project «New technologies of information management and e-marketing» № State registration 20162075 from 03.06.2016.

**The aims and objectives of the investigation.** The purpose of the master's work - to explore the methods and means of elements of block chain technology and use it in education documents.

To achieve this goal it is necessary to solve the following related tasks:

- an analysis of information means block chain technology;
- provide an analysis of models and tools of block chain technology;
- submit block chain technology in education documents.

**The object and subject of investigation.** The object of the research is the methods and means of block chain technology elements.

The subject of research is the use of block chain technology in education.

**The main provisions of the investigation.** for the defense:

1. Analysis of the methods and means of block chain technology.
2. Analysis of the models and tools of the use block chain technology.
3. Presents the approach and model block chain technology in education documents.

**Testing results of the investigation**. The main provisions of this study were presented at the XVII Belorussian-Russian scien.-technic. conf. «Technical Tools of Information Defense» (Minsk, 11 June 2019) in 2019, seminar «Coding and digital signal processing in infocommunications» (Minsk, April 2020). Minsk: BSUIR, 2020, 56 scientific cong. of PhD, Master and students of BSUIR (Minsk, April 2020). Minsk: BSUIR, 2020.

**Publication of the results**. The results of the study published three scientific papers (abstracts). Including 3 - in the materials of scientific conferences and seminar.

**The structure and scope of the thesis.** Structural parts of the thesis: introduction, general characteristics of the work, three chapters, conclusion, bibliography, consisting of 26 titles, 15 pictures, 1 table.

## SHORT DESCRIPTION OF WORK

The first chapter discusses the basic concepts of blockchain (BC) technology. Blockchain is a multi-functional and multi-level information technology designed for reliable accounting of various assets, covers all areas of economic activity and has many applications: finance, economics and monetary settlements, as well as operations with tangible and intangible assets. The technological aspects of blockchain are divided into three categories: blockchain 1.0, 2.0, and 3.0. Blockchain 1.0 is a currency. Blockchain 2.0 is about contracts. Entire classes of economic, market, and financial applications based on blockchain work with various types of financial instruments – stocks, bonds, futures, mortgages, legal titles, smart assets, and smart contracts. Blockchain 3.0 is an application. They apply to the areas of public administration, health, science, education, culture and art.

Each of the BC blocks in the database contains an array of specific data, and all the blocks are connected to each other. Each link in the chain contains a specific key. Until it is decrypted, the block (link) will not close. In crypto currency, mining is responsible for decryption, using the power of video cards and processors that perform computing operations, the main purpose of which is to search for a cryptographic signature to a block in the form of a hash. As soon as it is selected, the block is closed.

The second chapter discusses individual models and algorithms of the blockchain technology. Two main algorithms that ensure the efficiency and reliability of the blockchain are the Proof of Work or PoW algorithms, which confirm the work done, and Proof of Stake or PoS, which confirms the share. All consensus algorithms are based on a single principle – forming a tree of hash function values (Merkle tree). Transactions in the network of BC participants are processed by computing nodes and formed according to certain rules into blocks for adding to the unified register as the extreme element of the chain.

The existence of a mechanism for verifying the authenticity of educational documents that is resistant to malicious manipulation is a rather urgent task that goes beyond the sphere of education, and possible solutions to this problem are proposed

to be considered in this paper.

In the third chapter, we propose an approach to using blockchain technology to confirm the authenticity of educational documents, which consists of two main stages: the issue of a digital document of education and verification. The role of a trusted third party in the issue and verification process has been established.

Models of the process of obtaining a digital document and confirming the authenticity of a document on education based on the technology of distributed registers have been developed, which allow to eliminate the limitations and disadvantages of existing approaches. the formulated approaches can be applied in various areas of public administration.

## CONCLUSION

1. The analysis of the concepts, applications, and essence of block chain (technology distributed registries - TDR) is carried out.

2. The main stages of distributed registry technology (TDR) are highlighted:

- TDR version 1.0 is related to the use of crypto currencies for financial transactions;

- TDR version 2.0 extends its applicability to digital contracts, supplementing or replacing traditional forms of agreements;

- TDR version 3.0 refers to the expansion of the use of technology in non-financial institutions – the sphere of public administration, health, education, etc.

3. The two main algorithm that provides the capacity and reliability of the block chain is the Proof of Work algorithms or PoW - confirmation of completed work and Proof of Stake or PoS, proof of stake.

4. Presents a generalized model of governance in education with the technology of the block chain. An approach to using block chain technology to confirm the authenticity of educational documents is proposed, which consists of two main stages: the issue of a digital document about education and its verification. The role of a trusted third party in the issue and verification process has been established**.**

## AUTHOR PUBLICATIONS

1. Visniakou U.A Analysis of the block chain use / U.A.Vishniakou, R.Kh.Khudier // reports of XVII Belorussian-Russian scien.-technic. conf. «Technical Tools of Information Defense» (Minsk, 11 June 2019). − Minsk : BSUIR, 2019. – P 13.

2. Visniakou U.A. Analysis and applications of information security in corporate information system, cloud computing and blockchain / Visniakou U.A., AL-Musawi Hani H.J., Z.R.AL-Attar Abdulraouf, R. KH. Khudier // Reports of int. seminar seminar «Coding and digital signal processing in infocommunications» (Minsk, April 2020). Minsk: BSUIR, 2020. (in publication).

3. Visniakou U.A. Defense tools in corporate information system, cloud computing and blockchain / Visniakou U.A., AL-Musawi Hani H.J., Z.R.AL-Attar Abdulraouf, R. KH. Khudier // Reports of 56 scientific conf. of PhD, masters and students of BSUIR (Minsk, 21 May 2020). Minsk: BSUIR, 2020. (in publication).