*Proceedings of the 33rd International Conference on Information Technologies (InfoTech-2019)*
*19-20 September 2019, Bulgaria*

# SYSTEMATIC LITERATURE REVIEW OF BLOCKCHAIN APPLICATIONS

## *Digest of paper*[1]

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**Abstract:** Blockchain technology has received extensive attention recently, but still a large of technical challenges such as scalability and security. This paper helps to find where recent studies have been focused on and provides a taxonomy of common programming pitfalls which may lead to vulnerabilities detection methods which will help to specify a future research. The study extracted 292 papers, most of which were found in IEEE, ACM and ScienceDirect Digital Libraries. After a detailed review process only 29 publications were considered based on defined inclusion and exclusion criteria.

**Key words:** blockchain technology; smart contract security; systematic literature review

## INTRODUCTION

Blockchains are digital technologies that combine cryptographic, data management, networking, and incentive mechanisms to support the checking, execution, and recording of transactions between parties [1]. A blockchain ledger is a list (‘chain’) of groups (‘blocks’) of transactions. Blockchain serves a public ledger and transactions stored in blockchain are nearly impossible to tamper. Blockchain has the key characteristics such as decentralization, persistency, anonymity and auditability. Blockchain technologies make decentralized consensus possible, i.e. agreement between untrusted players, without the need for central certification authority. Consensus is generated by cryptography-enabled algorithms running on a distributed network of peers and enabling (in the case of Bitcoin [2]) virtual currencies that do not depend on the existence of a central bank. More recently,

[1] The full paper is proposed for including in the IEEE Xplore Digital Library

blockchain technologies also support the decentralized execution of code, e.g. the Ethereum [3] blockchain, defining a new model of decentralized computation and enabling smart contracts. Smart contracts are scripts running in a decentralized manner and stored in the blockchain without relying on any trusted authority [4].

From our literature review process, we believe that blockchain technologies will be one of the next technologies revolutions. It could be applied into many fields including financial services, reputation system and public services. There are several reviews regarding blockchain technology mainly focused on technical aspects of the blockchain and its consensus protocol [5]; currency aspect of blockchain [1,6,7,8]; the role of blockchain for the IoT [4]; security issues of the blockchain [9,10]. Other reviews focus on blockchain-based smart contracts [11], attacks and vulnerabilities of smart contracts [12]. At this work we take a look at the current research on challenges and limitations of blockchain. Recommendations on future research directions are provided for researchers. This paper is structured as follows. Section 2 describes the systematic review process. Section 3 presents the findings of the analysis of all the primary studies selected and discusses the findings related to the research questions presented earlier. Section 4 concludes the research and offers some suggestions for future research.

## CONCLUSIONS

Recent years the blockchain technology field increased interest both from academia and from industry. We identified current research topics and provided a taxonomy of common programming pitfalls which may lead to vulnerabilities of blockchain. Using Systematic Literature Review, we have performed deep analysis on smart contracts security vulnerabilities detection methods which will help to specify a future research.

We found that there was a gap on application of blockchain in education. Blockchain applications for education are still in their infancy and the current implementations are in pilot stages. Many national and institutional research and projects are integrating the blockchain technology in interesting and innovative applications, such as: proof of learning, management of credentials and transcripts, management of student records, management of reputation, and payments.

As a future work, we will use blockchain for tracking intellectual property and rewarding use and re-use of that property. Using blockchain, we eliminate the intermediary, thus allowing anyone to publish openly, and accurately keep track of re-use without putting limitations on the source material.

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