BUCHAREST UNIVERSITY OF ECONOMIC STUDIES
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DOCTORAL THESIS

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Title of the doctoral thesis:

The Architecture of a Secured Decentralized Governance using Blockchain and Verifiable Smart Contracts

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ABSTRACT

This thesis is an analysis of blockchain technology, its potential for integration with existing technologies, such as mobile, and other industries such as finance and education. The research identifies smart contracts as the main factor for innovation and the spread of blockchain technology in other industries, therefore, an emphasis is placed on their development and security.

The security of smart contracts proposes new paradigms of interaction because they are public, immutable and can hold large amounts of money. Their security is all the more important as potential exploitations lead not only to the loss of those funds, but also completely undermine trust in blockchain technology and make it increasingly remote from being adapted on a large scale.

The central focus of this study is a conceptual framework for understanding blockchain technology, specifically for developing secure smart contracts using Solidity, a programming language designed particularly for Ethereum. The emphasis is placed on understanding the mindset required for developing secure smart contracts and addressing the unique security considerations in this context. This framework proposes an architecture for the development and implementation of a blockchain-based system for managing academic diplomas and facilitating the governance of the alumni community. The proposed system transforms the traditional processes of higher education institutions into a decentralized digital ecosystem, ensuring authenticity, transparency, and operational efficiency. The system architecture is structured into several interconnected layers, each addressing specific aspects of academic management.

The results of the study include a detailed description of the smart contract design, its analysis through static code review, gas consumption, and security auditing. The discussion section will highlight the original contributions of this research in terms of architecture, understanding vulnerabilities, and strategies for maintaining the security of the solution, as well as future developments, which include applying the architecture to different use cases.

In conclusion, this research aims to make a significant contribution to the understanding of blockchain technology integration with mobile systems by providing a complete architecture for smart contract development, its potential impact on security, and strategies for maintenance and future development.