OPINION
for dissertation
for the acquisition of an educational and scientific degree "Doctor"

Area of higher education:	4. Natural Sciences, Mathematics and Informatics
Professional field:	4.6. Informatics and Computer Science
Doctoral program:	Informatics
Dissertation topic:	Smart Contract Platforms
Author of the dissertation:	Jivko Stefchev Jeliazkov
Scientific supervisors:	Prof. Hristo Kostadinov, PhD
Author of the opinion:	Prof. Nina Hristova Dobrinkova, PhD
	Institute of Information and Communication Technologies at BAS
Based on:	Order of the Director of IMI No. 91/18.11.2025

The opinion has been prepared in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Application, and the Regulations on the Conditions and Order for Acquiring Scientific Degrees and Occupying Academic Positions at BAS and IMI-BAS.

The main documents for the doctoral procedure have been submitted – the text of the dissertation in English, the dissertation abstract in Bulgarian, the publications on which the dissertation is based, the order confirming the completion of the doctoral program, and a report on the fulfillment of the minimum requirements for obtaining the Doctoral degree (PhD).

GENERAL DESCRIPTION OF THE DISSERTATION

The dissertation is written in English and comprises 124 pages of main text, 56 bibliographic references, and 6 pages of appendices with explanatory notes.

The "subject of the research" is the development of a prototype software system with a distributed architecture based on blockchain technology, which demonstrates the operation of the main modules, the connections between them, and the communication protocols ensuring fast and secure transaction processing.

The "goal of the dissertation" is to define an innovative blockchain-based SDLC (Systems Development Life Cycle) design that overcomes the existing classical challenges of this process and is integrated into the architecture of a practical system for the generation of provably random numbers. In this way, the development of a simple yet robust prototype has been achieved, based on an innovative architecture that describes in detail the operational environment..

In the first chapter of the dissertation, "Smart Contract Platforms," presents the theoretical foundations of Distributed Ledger Technology (DLT), their characteristics, and the various types of

classifications. The definitions and fundamental principles underlying the operation of DLT-based methods for ensuring secure communication in such systems are examined. The main challenges associated with the use of blockchain platforms and the technological means for their implementation in systems are analyzed. The chapter is well structured, and the review of the concepts used in the dissertation, as well as the key elements of the functioning of DLT technologies, is comprehensive..

In the second chapter, "Research Incentivization Based on a Smart Contract Platform," describes a distributed system for incentivizing scientific research. Chapter 2 of the dissertation provides information on the EOSIO blockchain technology (an open-protocol blockchain), presenting a decentralized system based on a public blockchain for incentivizing measurable and provable achievements across various fields. This chapter presents the system architecture (Fig. 17) and its operation using the high-performance, open-source EOSIO blockchain platform..

In the third chapter, "A DLT-Based System for Managing SDM Processes," Jivko Jeliazkov presents the traditional domain of the SDLC. An innovative blockchain-based SDLC design is described, and an analysis is provided of blockchain technology and its application to addressing problems arising during the phases of software deployment, configuration, updating, and maintenance at the end customer (System Deployment and Maintenance – SDM).

In the fourth chapter, "Publicly Verifiable Random Number Generator – Usage and Prototype," describes the architecture of a practical system for the generation of provably random numbers and the results of the development of a simple yet robust prototype. The prototype is implemented on the Vaulta blockchain using the Vaulta Web IDE. In this way, the operation of the innovative architecture is demonstrated, with a detailed description of the working environment, including interfaces, smart contracts, modules and agents, communication protocols, and others. The prototype demonstrates that the EOSIO blockchain technology is suitable for the creation of distributed applications that leverage the advantages provided by blockchain technologies as a platform for smart contracts..

The dissertation is original and independently developed by the author. The sources used are correctly cited.

ASSESSMENT OF THE DISSERTATION ABSTRACT

The abstract is presented in Bulgarian, in accordance with the law requirements. It adequately reflects the main goals, methods, and results of the research. It provides sufficient information to understand the significance of the development and successfully summarizes the author's key contributions.

CONTRIBUTIONS OF THE DISSERTATION

The main contributions of the dissertation, as described by the doctoral candidate, are:

1. An analysis of existing solutions for smart contract platforms based on blockchain technology and distributed ledger technologies (DLT) is performed.
2. The most popular modern distributed storage technologies are reviewed, along with their advantages and disadvantages when considered as the basis for a smart contract platform. EOSIO is chosen as the platform for subsequent applications.
3. A distributed R&D incentive system is described, in which rewards are determined for finding the unique or best solution to a given problem.
4. A distributed enterprise software lifecycle management system using EOSIO technology as a smart contract platform is described and analyzed.

5. A distributed system using a set of verifiable random number generation algorithms built on a smart contract platform based on EOSIO as a base blockchain is described.
6. A prototype working with Vaulta/EOSIO technology for generating provable random numbers, based on the innovative architecture, is presented, and the environment in which it works is described in detail: interfaces, smart contracts, data models and communication protocols.
7. The results of the development of new systems based on smart contract platforms are summarized, and analyses of the various scenarios successfully solved by the innovative architecture are conducted. The advantages are demonstrated, especially in the areas of traceability, security and definition of responsibilities.

– **As a scientific contribution,** I believe that the created architecture of a system with an implemented EOSIO high-performance open source blockchain platform, which is validated in a prototype, with a corresponding interface, can be accepted.

– **As scientific-applied contributions,** in my opinion, the following can be considered: the performed comprehensive analysis of existing solutions for smart contract platforms based on blockchain technologies. The identification and analysis of the main advantages and disadvantages of the EOSIO platform. The development of a specific product validating all defined concepts and technologies for working with open source blockchain technologies, implemented in enterprise software lifecycle management systems..

PUBLICATIONS AND OTHER ACTIVITIES RELATED TO THE DISSERTATION TOPIC

Jivko Jeliazkov presents two publications related to the topic of the dissertation, both co-authored with the scientific supervisor. The articles are published in a book series published by Springer – Studies in Computational Intelligence (with SJR), indexed in Scopus, which meets the minimum requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Application for acquiring the Doctoral degree (PhD). The publications reflect essential elements of the research on the dissertation.

Both publications were presented at international conferences, which gave the presented results visibility in a wider expert community.

CRITICAL NOTES

The dissertation is up-to-date and the work done in it is well structured with clear texts and examples. The 56 bibliographic references used clearly show that the doctoral candidate has done the necessary preliminary research before proceeding with his work. The scientific contributions can be optimized by summarizing them in one main scientific contribution (the development and validation of the system with blockchain technology and the creation of a validating prototype) and several accompanying scientific-applied contributions, which would summarize the analyses, developments and optimizations made in the implementation of the scientific contribution. However, I believe that the contributions provide clarity about the work done and clearly describe the quality of the scientific and applied work done by the doctoral candidate.

CONCLUSION

The dissertation complies with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Application, and the Regulations

on the Conditions and Order for Acquiring Scientific Degrees and Occupying Academic Positions at BAS and IMI-BAS for acquiring an educational and scientific degree “doctor” in a professional field 4.6. Informatics and Computer Science, doctoral program “Informatics”. Jivko Jeliazkov possesses theoretical knowledge and professional skills for conducting independent scientific research.

I give my positive assessment of the presented dissertation work and propose to the Honorable Scientific Jury to award **Jivko Stefchev Jeliazkov** the educational and scientific degree “Doctor” in area of higher education 4. Natural Sciences, Mathematics and Informatics; professional field 4.6. Informatics and Computer Science; doctoral program “Informatics”.

15.12.2025

Sofia, Bulgaria

Signature:

Prof. Nina Dobrinkova, PhD