

REVIEW

from

Prof. Eng Raycho Ilarionov, DSc

Technical University of Gabrovo

of a dissertation

**for the acquisition of the educational and scientific degree "PhD" in
the field of higher education: 5. "Technical Sciences"**

**Professional field: 5.3. Communication and Computer
Engineering, PhD program: Automated Information Processing and
Control Systems**

Author of the dissertation: mag. eng. Velin Sabinov Hadzhiev

Dissertation topic:

**"Modelling of Data Structuring, Storage, and
Processing Operations on the Internet"**

1. Relevance of the problem developed in the thesis in scientific and applied

The rapid development of information technology, coupled with the increasing growth of data generated from different sources, poses challenges for its effective management, storage and processing. Modern information systems must provide not only high performance and scalability, but also flexibility and security to meet the diverse needs of business, science and society. In this context, storage and processing systems represent an innovative solution that combines the advantages of on-premises and cloud technologies. They offer adaptability and resilience, but also pose complex integration and management requirements.

The PhD student's work addresses current scientific and practical issues related to security, resilience and optimization of systems for structuring, storing and processing data. The PhD student has clearly defined the main goal and objectives and proposes well-founded solutions that are relevant to the scientific field and to practice.

I believe that the topic of the doctoral dissertation is extremely topical as it focuses on the solution of scientific and practical problems that are related to the development of modern information technologies.

2. Degree of knowledge of the state of the problem and creative evaluation of the literature

The PhD student demonstrates a thorough knowledge of the state of the art, which is evident from the comprehensive literature review covering 118 sources. The sources analyzed are contemporary and relevant, with a significant number published in the last decade. The literature review is based on academic articles, monographs and conference papers that address key aspects of hybrid storage and processing systems.

In this dissertation, the author critically evaluates existing data management architectures and methods. This evaluation is based on clearly defined criteria such as efficiency, scalability, security and adaptability. The considered technologies are analyzed not only as theoretical concepts, but also with respect to their applicability in real industrial and business scenarios.

Particular attention is paid to current trends in the development of architectures that combine local and cloud technologies. The author proposes different approaches, outlining the possibilities for their integration within modern information systems.

Based on the reviewed, the PhD student formulates a theoretical framework for developing a hybrid model that meets the contemporary needs of business and science.

I believe that the PhD student has demonstrated a high degree of knowledge of the state of the art and a creative approach to the evaluation of the literature.

3. Compatibility of the chosen research methodology with the stated aim and objectives of the thesis

The methodological basis of the dissertation is well developed and fully corresponds to the set goals and objectives. It combines theoretical analysis, simulation studies and empirical tests, which complement each other to ensure the reliability of the results obtained.

The PhD student performs theoretical modeling to integrate on-premises and cloud architectures, with an emphasis on security, scalability, and efficiency. Simulation models allow for a preliminary evaluation of the proposed solutions under different scenarios, and empirical tests validate the performance of the model under real-world conditions.

The inclusion of a SWOT analysis provides a structured assessment of the strengths and weaknesses of the selected models and specifically of the developed hybrid model for structuring, storing and processing data, while the development of a web-based system demonstrates the practical application of the proposed solutions.

I believe that the chosen methodology is logically sound, scientifically justified and fully corresponds to the stated aim and objectives of the dissertation.

4. General analytical characteristics of the dissertation

The dissertation is structured in four chapters with a total length of 156 pages, including an introduction, four chapters, general conclusions and a conclusion, scientific contributions, a list of publications on the topic of the dissertation and a list of references used. The work covers all aspects of the researched issues, demonstrating logical consistency and a properly proposed structure.

The introductory part justifies the choice of the topic, highlighting its importance in scientific and applied aspects. The relevance of the development is presented, related to the challenges of managing large volumes of data in the modern era of digitalization. The introduction sets the framework for the research by outlining the main thrust of the dissertation and its relevance to the development of information technology.

The first chapter is presented in 51 pages and is devoted to the detailed review of existing approaches and technologies in the field of cloud storage and data

processing systems. The PhD student has systematically presented the advantages and disadvantages of existing models and has clearly defined the aim and objectives of the research. ***The goal is to develop and optimize a hybrid model that integrates on-premises and cloud technologies.*** The formulation of the tasks - analysis, modelling, simulation and practical application - is logically related to the identified problems and objectives.

Chapter two is 24 pages long and focuses on the development of a model for structuring, storing and processing data. The PhD student presents a methodology for selecting and evaluating data structuring, storage and processing models that are aligned with modern requirements for scalability, security and performance. The hybrid model developed in this chapter is the result of a thorough analysis and creative approach. It integrates concepts from different models and proposes a hybrid architecture that optimizes resource management and minimizes data access time. Emphasis is placed on the reliability and fault tolerance of the model, making it suitable for real-world applications. The theoretical development is supported by mathematical analyses and visualizations that justify the choice of solutions and their effectiveness.

The third chapter is 23 pages long and is entirely devoted to simulation studies and the analysis of the results. In this part, the author investigates the effectiveness of the developed model through a SWOT analysis and a series of simulations covering different scenarios and conditions. The strengths and weaknesses of the model are analyzed, as well as opportunities to reduce the impact of weaknesses and key metrics such as: system performance; scalability as data volume increases; fault tolerance and data security. Simulation results are presented using tables that clearly and visually demonstrate the effectiveness of the proposed solutions. The qualitative analysis presented, complemented with quantitative data that validate the proposed solutions prove their applicability in a real environment.

The fourth chapter contains 25 pages and is highly practical. In it, the author presents the development of a web-based system that implements the theoretical and simulation results. The system is designed to meet the basic principles of cloud architectures: flexibility in the integration of new modules; security and data protection. It provides an easy-to-use interface and supports the idea of opening databases to a wide range of users, which is innovative in the context of modern data management technologies. The PhD student describes the architecture and functionality of the system, including technical details and examples of its use in different applications. The development is a practical proof of the applicability of the model and demonstrates the author's ability to translate theoretical concepts into workable solutions.

The general conclusions in the dissertation summarize the formulated conclusions and, on their basis, the scientific contributions are defined.

5. Evaluation of the contributions to the dissertation and their significance

The PhD candidate has proposed Scientific and Applied Contributions as follows

Scientifically applied contributions:

1. A comprehensive review of contemporary literature in the field of data modeling, structuring, storage, and processing on the internet has been carried out.
2. A comprehensive analysis of architectures for data structuring, storage, and processing in cloud environments has been conducted. This analysis serves as the foundation for developing sustainable and scalable systems that meet the requirements for database accessibility for a wide range of users.

3. A methodology has been developed for selecting and evaluating models for data structuring, storage, and processing, offering a systematic approach to adapting these models to specific requirements for data structuring, storage and processing.
4. Models for data structuring, storage, and processing were evaluated and analyzed, with a focus on applying the developed methodology for their assessment. Software tools were utilized to provide an objective evaluation of critical aspects such as efficiency, sustainability, and scalability of the models.
5. A hybrid model has been created that combines key functionalities of the selected models, addressing specific requirements for data structuring, storage, and processing, while ensuring database accessibility for a wide range of users. The developed data flow diagram demonstrates the model's effectiveness in various practical scenarios.
6. A detailed SWOT analysis of the hybrid model has been conducted, confirming its potential for integration into real systems and highlighting its flexibility and resilience across various solutions.

Applied contributions:

1. A method for optimizing data operations has been developed, integrating best practices and proven techniques for data structuring, storage, and processing. Its applicability has been demonstrated through simulations and tests in real conditions.
2. The effectiveness of the proposed hybrid model has been validated through empirical testing, which includes assessments of performance, resilience, and scalability.
3. Based on the method for optimizing data operations, a web-based system for data structuring, storage, and processing has been developed, offering access to databases for a wide range of users. Tests conducted in real-world scenarios confirm its practical effectiveness.

6. Assessment of the degree of personal involvement of the PhD student in the contributions

I accept the formulated claims for scientific and applied contributions to the scientific field under consideration. The author has justified their significance and role within the research. Each contribution is well argued, based on research and supported by empirical and theoretical evidence.

The PhD student demonstrates a thorough knowledge of the subject and a high degree of independence in the development of the thesis.

The detailed description as well as the presentation and analysis of the results show that the development is the author's personal work.

7. Assessment of the dissertation publications

The PhD student defended his thesis with 9 scientific publications. The publications are presented in the following categories:

1. 4 of them are in Bulgarian, published in the country:
2. 5 of them are in English, presented at international scientific conferences abroad:

The Ph.D. student has participated in prestigious IEEE international forums such as International Conference on Electrical and Electronics Engineering (ELECO), International Conference on Computing Communication and Networking Technologies (ICCCNT). One of the publications is an independent paper presented at an international scientific conference abroad.

The PhD student has declared 3 citations of his work in refereed journals. This shows that the results of the research are recognized in the scientific community.

The publications are logically related to the main topic of the dissertation and cover a wide range of research questions, presenting results related to theoretical models, simulation analyses and practical applications of hybrid systems.

Based on the submitted materials, the PhD student meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for the Acquisition of Scientific Degrees and the Occupancy of Academic Positions at TU-Gabrovo.

8. Has there been a direct economic impact from the results of the thesis?

The author has not deposited any implementations of the scientific achievements in practice. No direct economic impact is indicated.

The PhD student has demonstrated the application of the theoretical developments by creating a web-based system that materializes the proposed solutions.

9. Recommendations for future use of the contributions.

The contributions of the dissertation can find application in both the scientific and practical spheres. The developed hybrid model and the web-based system can be implemented in organizations working with large volumes of data, such as healthcare, finance and logistics. Therefore, I suggest the PhD student to try to find a practical application and protect his intellectual property.

10. Assessment of the compliance of the abstract with the requirements for its preparation, as well as its adequacy of coverage of the main provisions and scientific contributions of the dissertation.

The abstract to the dissertation is 43 pages long and follows the structure of the dissertation. It is well formatted. It presents the main elements of the research carried out and the results obtained. It adequately reflects the content of the dissertation and the scientific contributions.

11. Critical notes on the dissertation

The thesis could include more specific examples of the potential economic impact of the developments. Some parts of the dissertation, particularly in the analysis of the results, could be more clearly structured to avoid fragmenting the main conclusions. The text contains minor spelling and stylistic errors that could be corrected in a subsequent revision.

These remarks do not detract from the dissertation, given that the doctoral student has yet to encounter science.

12. Reasons and a clear conclusion

I don't know the PhD student. My conclusion is based on the materials provided to me.

The dissertation meets the requirements for relevance, required length, structure and publications. The doctoral candidate has demonstrated knowledge of the research problem and skills for its solution.

I believe that the presented dissertation meets the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria. The achieved results give me reason to propose to the esteemed jury to award the educational and scientific degree "Doctor" to Mag. Eng. Velin Sabinov Hadzhiev in the field of higher education - 5. "Technical Sciences", Professional field: 5.3. "Communication and Computer Engineering", PhD program: "Automated Information Processing and Control Systems".

01.02.2025

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(Prof. Eng. Raycho Ilarionov, DSc)