

**REPORT ON THE ASSESSMENT OF THE SUITABILITY OF THE TOPIC,
CANDIDATE, AND MENTOR FOR THE PREPARATION OF A DOCTORAL
DISSERTATION**

I COMMITTEE INFORMATION

Body appointing the Committee: Dean of the Faculty of Technical Sciences, Novi Sad

Date of Committee appointment: 30. 04. 2026, by decision number 012-40/1769-2026

Composition of the Committee appointed in accordance with the *Rules of Doctoral Studies of the University of Novi Sad*:

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|----|--|-----------------------|--|
| 1. | Zarić Miroslav, PhD | Full Professor | Applied Computer Science and Informatics |
| | last name and first name | academic title | narrow scientific field |
| | Faculty of Technical Sciences, University of Novi Sad | Chair | |
| | institution of employment | role in the Committee | |
| 2. | Luković Ivan, PhD | Full Professor | Information Systems |
| | last name and first name | academic title | narrow scientific field |
| | Faculty of Organizational Sciences, University of Belgrade | Member | |
| | institution of employment | role in the Committee | |
| 3. | Rapaić Milan, PhD | Full Professor | Automation and Control Systems |
| | last name and first name | звање | ужа научна област |
| | Faculty of Technical Sciences, University of Novi Sad | Member | |
| | institution of employment | функција у комисији | |
| 4. | Kordić Slavica, PhD | Associate Professor | Applied Computer Science and Informatics |
| | last name and first name | academic title | narrow scientific field |
| | Faculty of Technical Sciences, University of Novi Sad | Member | |
| | institution of employment | role in the Committee | |
| 5. | Čeliković Milan, PhD | Associate Professor | Applied Computer Science and Informatics |
| | last name and first name | academic title | narrow scientific field |
| | Faculty of Technical Sciences, University of Novi Sad | Member | |
| | institution of employment | role in the Committee | |

II CANDIDATE INFORMATION

1. First name, name of one parent, last name: Lazar, Nebojša, Nikolić
2. Date of birth: 1.11.1992. Place and country of birth: Sombor, Republic of Serbia

II.1 Undergraduate or integrated studies

Start year: End year: Average grade during studies:

University: University of Novi Sad

Faculty: Faculty of Technical Sciences

Study program: Computer Sciences and Control Engineering

Degree obtained: Bachelor of Science in Computer Sciences and Control Engineering

II.2 Master's studies

Start year: End year: Average grade during studies:

University: University of Novi Sad

Faculty: Faculty of Technical Sciences

Study program: Computer Sciences and Control Engineering

Degree obtained: Master of Science in Computer Sciences and Control Engineering

Scientific field: Electrical and Computer Engineering

Final thesis title: Extensible platform for generating applications from textual DSL models

II.3 Doctoral studies

Start year:

University: University of Novi Sad

Faculty: Faculty of Technical Sciences

Study program: Computer Sciences and Control Engineering

Number of ECTS credits earned: Average grade during studies:

II.4 Overview of the candidate's scientific and professional papers

No.	authors, paper title, <i>journal</i> , volume (year), pages from-to, DOI or ISBN/ISSN	category
1.	L. Nikolić , V. Dimitrieski, and M. Čeliković, “An approach for supporting transparent ACID transactions over heterogeneous data stores in microservice architectures”, ComSIS, vol. 21, no. 1, pp. 167–202, 2024, doi: 10.2298/CSIS221210006N.	M23
<i>Related to the topic of the doctoral dissertation:</i> <u>YES</u> NO PARTIALLY		

No.	authors, paper title, <i>journal</i> , volume (year), pages from-to, DOI or ISBN/ISSN	category
2.	L. Nikolić and V. Dimitrieski, “Fed-agent – a Transparent ACID-Enabled Transactional Layer for Multidatabase Microservice Architectures”, presented at the 16th Conference on Computer Science and Intelligence Systems, Sep. 2021, pp. 489–492. doi: 10.15439/2021F46.	M33
<i>Related to the topic of the doctoral dissertation:</i> <u>YES</u> NO PARTIALLY		

No.	authors, paper title, <i>journal</i> , volume (year), pages from-to, DOI or ISBN/ISSN	category
3.	L. Nikolić , M. Letić, I. Dejanović, and B. Dragaš, “Adaptation of HTTP request-response messaging to arbitrary messaging pattern in RESTful service oriented architectures”, presented at the 8th International Conference on Information Society and Technology ICIST 2017, Serbia: Society for Information Systems and Computer Networks, Mar. 2018, pp. 290–295.	M33
<i>Related to the topic of the doctoral dissertation:</i> YES NO <u>PARTIALLY</u>		

No.	authors, paper title, <i>journal</i> , volume (year), pages from-to, DOI or ISBN/ISSN	category
4.	M. Letić, K. Nenadić, and L. Nikolić , “Real-time map projection in virtual reality using WebVR”, in 2018 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija: IEEE, May 2018, pp. 1439–1443. doi: 10.23919/MIPRO.2018.8400259.	M33
<i>Related to the topic of the doctoral dissertation:</i> YES <u>NO</u> PARTIALLY		

III ASSESSMENT OF THE SUITABILITY OF THE TOPIC

Assessment:

III.1 formulation of the thesis title

The proposed thesis title, “An approach for supporting transparent ACID transactions in microservice architectures”, aligns with the thesis content and accurately reflects the essence of the candidate's proposed research topic.

The Committee considers the proposed thesis title suitable.

Is the thesis title suitable?	YES	NO	PARTIALLY
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III.2 subject matter (problem) of the research

The research focuses on creating an approach to managing distributed transactions in microservice architectures (MSAs) that supports the properties of atomicity, consistency, isolation, and durability (ACID), regardless of the selected database management system (DBMS). The proposed approach is expected to be transparent and easy to use. This way, to develop high-consistency transactions within MSA, it will not be necessary for the development team to understand in detail how the proposed approach and the software solution that implements it function, nor will significant adaptation of the source code be required in order to apply this approach and software solution.

For the purpose of evaluating the proposed approach and other identified research in the field, three criteria were introduced: 1) the supported level of consistency, 2) support for synchronous and asynchronous processing, and 3) impact on the code and system architecture. The first criterion is important because high-consistency systems prevent data problems that may arise from concurrent processing. Such problems are difficult to identify and correct. The second criterion is important because the freedom to choose the type of processing is necessary in larger systems with different workload profiles. The third criterion is important because adapting existing solutions to a new approach to distributed transaction management requires significant effort and planning by the development team. In addition, the adopted approach may significantly change the manner of development, to the extent that it becomes one of the most important aspects that the development team must become familiar with.

Based on the analysis of available literature sources already conducted, it follows that there are currently no approaches that meet the following desired values of the introduced criteria: 1) a high level of consistency, 2) support for both synchronous and asynchronous processing, and 3) a transparent/minimal impact on the code and system architecture. The candidate's approach is aimed at achieving all desired values for the three introduced criteria. The proposed approach is expected to support high-consistency ACID transactions for both synchronous and asynchronous processing, so it can be used without additional training and without requiring the development team to be aware of transaction management mechanisms. The approach is not limited to any specific technologies, and the research includes the planned implementation of a concrete software solution based on it.

The Committee notes that the subject matter of the research is suitable, as the research area of distributed transaction management in MSA is relevant and timely since many modern software solutions are based on this architecture and require transactional data processing. In addition, a gap has been identified that the proposed research aims to address to improve the current state of the field. The subject matter of the research enables the achievement of significant scientific results and opens new research directions in the relevant, narrow scientific field.

Is the subject matter of the research suitable?	YES	NO	PARTIALLY
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III.3 familiarity with the problem area based on the selected literature, with a bibliography

A microservice architecture (MSA) has become an important approach to application development. It emerged in response to the continuous growth in data volume, system complexity, and the size and number of teams developing a system simultaneously. The use of MSA brings a number of technological and organizational improvements. Technological improvements include increased system fault tolerance and better horizontal scaling, while organizational improvements include increased agility in the system development process and easier cooperation between development teams.

The main characteristic of MSA is the use of a large number of execution-independent, small (micro) services that implement system functionality through communication and orchestration. The opposite of MSA is monolithic software development. Monolithic software may also consist of multiple logical, tightly coupled units called modules, but these are located within a single program. One of the main differences between microservices and monoliths is how transactions are managed. A transaction is a logical unit of data processing, consisting of one or more operations, and is one of the most significant concepts in implementing business logic because it directly affects the preservation of data consistency. Transactions in monolithic applications never leave the boundaries of a single program and are reduced to function or method calls. On the other hand, transactions in MSA rely on inter-process communication, often over a network, between two or more logically separate and independently executed microservices. This means that transaction execution in MSA is distributed, which introduces challenges such as the need for data replication, higher fault tolerance, more frequent hardware failures, and the need to manage the system's distributed state [25].

Currently, in the field of MSA, there are many different approaches and solutions for managing distributed transactions [6,11-23]. Two approaches stand out as the most commonly used [3-5]: the Two-Phase Commit Protocol (2PC) and Saga [6], with Saga being used more often, especially in MSA [3-5]. These approaches differ completely in how they implement distributed transactions. On the one hand, 2PC relies on synchronous communication and distributed resource locking in order to achieve high consistency at the cost of performance [1]. On the other hand, Saga sacrifices high consistency in favor of convergent consistency to improve performance.

Regardless of the advantages of high-consistency transactions, engineers are willing to sacrifice consistency because of suitability for development within MSA. The main reason for this is to increase team independence and eliminate the problems of excessive resource contention and distributed locking that occur in high-consistency approaches [1]. In addition, enabling ACID properties in MSA is made more difficult by the fact that not all DBMS offer ACID transactions, and even when they do, these are supported with different levels of isolation, i.e., consistency. Since each microservice may use a different DBMS and that choice is independent of the rest of the system, ensuring ACID properties across all microservices is a major challenge.

Generally accepted reference implementations of Saga and 2PC do not exist [3-5]; rather, like the other analyzed approaches, development teams implement them through their own software solutions for managing distributed transactions, adapted to specific architectures and technologies [11-24]. This decision affects the system architecture and the source code of microservices and is observed across many industry projects. There is a need for an approach and an accompanying software solution that can be incorporated into software across different architectures and whose application does not require additional training for the development team or significant changes to microservice source code.

The proposed research will be based on the generally accepted principles of Design Science Research Methodology (DSRM). An analysis of the distributed transaction management domain in MSA is planned, followed by the definition of a new approach. After that, the implementation of a concrete software solution based on the defined approach is planned.

In the application for the doctoral dissertation topic, the candidate provided a list of literature to be used in the research, in accordance with the 10-25 bibliographic unit limit. The listed literature is relevant to the research area, and the bibliographic units clearly indicate the current relevance of research in the

field. The listed bibliographic units also point to several other related bibliographic units relevant to the research area that the candidate should study in further research. The following literature is listed:

- [1] P. Fan, J. Liu, W. Yin, H. Wang, X. Chen, and H. Sun, “2PC*: a distributed transaction concurrency control protocol of multi-microservice based on cloud computing platform,” *J Cloud Comp*, vol. 9, no. 1, p. 40, Dec. 2020, doi: 10.1186/s13677-020-00183-w.
- [2] W. Zhou, Y. Gao, X. Zhou, and G. Li, “Cracking SQL Barriers: An LLM-based Dialect Translation System,” *Proc. ACM Manag. Data*, vol. 3, no. 3, pp. 1–26, Jun. 2025, doi: 10.1145/3725278.
- [3] H. Knoche and W. Hasselbring, “Drivers and Barriers for Microservice Adoption – A Survey among Professionals in Germany,” *Enterprise Modelling and Information Systems Architectures (EMISAJ)*, p. 1:1-35, Jan. 2019, doi: 10.18417/EMISA.14.1.
- [4] R. Laigner, Y. Zhou, M. A. V. Salles, Y. Liu, and M. Kalinowski, “Data management in microservices: state of the practice, challenges, and research directions,” *Proc. VLDB Endow.*, vol. 14, no. 13, pp. 3348–3361, Sep. 2021, doi: 10.14778/3484224.3484232.
- [5] J. Soldani, D. A. Tamburri, and W.-J. Van Den Heuvel, “The pains and gains of microservices: A Systematic grey literature review,” *Journal of Systems and Software*, vol. 146, pp. 215–232, Dec. 2018, doi: 10.1016/j.jss.2018.09.082.
- [6] M. Štefanko, O. Chaloupka, and B. Rossi, “The Saga Pattern in a Reactive Microservices Environment,” in *Proceedings of the 14th International Conference on Software Technologies*, Prague, Czech Republic: SCITEPRESS - Science and Technology Publications, 2019, pp. 483–490. doi: 10.5220/0007918704830490.
- [7] A. M. Del Esposte, F. Kon, F. M. Costa, and N. Lago, “InterSCity: A Scalable Microservice-based Open Source Platform for Smart Cities,” in *Proceedings of the 6th International Conference on Smart Cities and Green ICT Systems*, Porto, Portugal: SCITEPRESS - Science and Technology Publications, 2017, pp. 35–46. doi: 10.5220/0006306200350046.
- [8] M. Mazzara, N. Dragoni, A. Bucchiarone, A. Giaretta, S. T. Larsen, and S. Dustdar, “Microservices: Migration of a Mission Critical System,” *IEEE Trans. Serv. Comput.*, vol. 14, no. 5, pp. 1464–1477, Sep. 2021, doi: 10.1109/TSC.2018.2889087.
- [9] J. Lotz, A. Vogelsang, O. Benderius, and C. Berger, “Microservice Architectures for Advanced Driver Assistance Systems: A Case-Study,” in *2019 IEEE International Conference on Software Architecture Companion (ICSA-C)*, Hamburg, Germany: IEEE, Mar. 2019, pp. 45–52. doi: 10.1109/ICSA-C.2019.00016.
- [10] G. Fan, L. Chen, H. Yu, and W. Qi, “Multi-objective optimization of container-based microservice scheduling in edge computing,” *ComSIS*, vol. 18, no. 1, pp. 23–42, 2021, doi: 10.2298/CSIS200229041F.
- [11] V. Arora, F. Nawab, D. Agrawal, and A. E. Abbadi, “Typhon: Consistency Semantics for Multi-Representation Data Processing,” in *2017 IEEE 10th International Conference on Cloud Computing (CLOUD)*, Honolulu, CA, USA: IEEE, Jun. 2017, pp. 648–655. doi: 10.1109/CLOUD.2017.87.
- [12] G. Zhang, K. Ren, J.-S. Ahn, and S. Ben-Romdhane, “GRIT: Consistent Distributed Transactions Across Polyglot Microservices with Multiple Databases,” in *2019 IEEE 35th International Conference on Data Engineering (ICDE)*, Macao, Macao: IEEE, Apr. 2019, pp. 2024–2027. doi: 10.1109/ICDE.2019.00230.
- [13] J. Cowling and B. Liskov, “Granola: Low-Overhead Distributed Transaction Coordination,” in *2012 USENIX Annual Technical Conference (USENIX ATC 12)*, Boston, MA: USENIX Association, Jun. 2012, pp. 223–235. Available: <https://www.usenix.org/conference/atc12/technical-sessions/presentation/cowling>
- [14] H. Yamada, T. Suzuki, Y. Ito, and J. Nemoto, “ScalarDB: Universal Transaction Manager for Polystores,” *Proc. VLDB Endow.*, vol. 16, no. 12, pp. 3768–3780, Aug. 2023, doi: 10.14778/3611540.3611563.
- [15] C. Tang, Z. Wang, J. Li, and H. Chen, “Sonata: Multi-Database Transactions Made Fast and Serializable,” *Proc. VLDB Endow.*, vol. 18, no. 10, pp. 3449–3462, Jun. 2025, doi: 10.14778/3748191.3748207.

- [16] A. Dey, A. Fekete, and U. Rohm, “Scalable distributed transactions across heterogeneous stores,” in 2015 IEEE 31st International Conference on Data Engineering, Seoul, South Korea: IEEE, Apr. 2015, pp. 125–136. doi: 10.1109/ICDE.2015.7113278.
- [17] M. Patiño-Martínez, R. Jiménez-Peris, B. Kemme, and G. Alonso, “MIDDLE-R: Consistent database replication at the middleware level,” *ACM Trans. Comput. Syst.*, vol. 23, no. 4, pp. 375–423, Nov. 2005, doi: 10.1145/1113574.1113576.
- [18] P. Kraft et al., “Epoxy: ACID Transactions across Diverse Data Stores,” *Proc. VLDB Endow.*, vol. 16, no. 11, pp. 2742–2754, Jul. 2023, doi: 10.14778/3611479.3611484.
- [19] P. Bailis, A. Ghodsi, J. M. Hellerstein, and I. Stoica, “Bolt-on causal consistency,” in *Proceedings of the 2013 ACM SIGMOD International Conference on Management of Data*, New York New York USA: ACM, Jun. 2013, pp. 761–772. doi: 10.1145/2463676.2465279.
- [20] E. Daraghmi, C.-P. Zhang, and S.-M. Yuan, “Enhancing Saga Pattern for Distributed Transactions within a Microservices Architecture,” *Applied Sciences*, vol. 12, no. 12, p. 6242, Jun. 2022, doi: 10.3390/app12126242.
- [21] C. Wu, V. Sreekanti, and J. M. Hellerstein, “Transactional Causal Consistency for Serverless Computing,” in *Proceedings of the 2020 ACM SIGMOD International Conference on Management of Data*, Portland OR USA: ACM, Jun. 2020, pp. 83–97. doi: 10.1145/3318464.3389710.
- [22] T. Lykhenko, R. Soares, and L. Rodrigues, “FaaSTCC: efficient transactional causal consistency for serverless computing,” in *Proceedings of the 22nd International Middleware Conference*, Québec city Canada: ACM, Dec. 2021, pp. 159–171. doi: 10.1145/3464298.3493392.
- [23] L. Hai-Xiang, L. Xiao-Yan, L. Chang, D. Xiao-Yong, L. Wei, and P. An-Qun, “Systematic definition and classification of data anomalies in DBMS (English Version).” *arXiv*, Oct. 27, 2021. doi: 10.48550/arXiv.2110.14230.
- [24] V. Gadepally et al., “The BigDAWG polystore system and architecture,” in 2016 IEEE High Performance Extreme Computing Conference (HPEC), Waltham, MA, USA: IEEE, Sep. 2016, pp. 1–6. doi: 10.1109/HPEC.2016.7761636.
- [25] H. N. S. Aldin, H. Deldari, M. H. Moattar, and M. R. Ghods, “Consistency models in distributed systems: A survey on definitions, disciplines, challenges and applications.” *arXiv*, Feb. 08, 2019. doi: 10.48550/arXiv.1902.03305.

The candidate has demonstrated that they have researched the relevant literature on distributed transaction processing in MSA in a high-quality, comprehensive manner, thereby ensuring the successful continuation of the research.

Is the selection of literature appropriate? **YES** **NO** **PARTIALLY**

III.4 research objectives

The objective of the research is to enable the management of distributed transactions within MSA in such a way that it supports ACID properties for transactional Online Transaction Processing (OLTP) workloads, regardless of the selected DBMS, and has minimal impact on the existing architecture, design, and source code of microservices, i.e., that it is transparent. In this work, an approach will be proposed, and a solution will be developed to evaluate the approach.

Based on the submitted bibliography, the presented motivation, and the described research method, the Committee notes that the objective is suitable, relevant, and adequately defined, and that the proposed research is justified.

Are the research objectives appropriate? **YES** **NO** **PARTIALLY**

III.5 expected results (hypotheses)

Theoretical contributions include the study of existing approaches and software solutions and the definition of a new approach for managing distributed transactions in MSA that enables ACID properties in a non-invasive manner, regardless of the chosen DBMS.

The development contribution includes a software solution for managing distributed transactions based on the new approach.

Application contributions will be presented through the solution's implementation in a demonstrative e-commerce environment and the assessment of the approach based on the results achieved.

The social contributions of developing a non-invasive approach for managing distributed transactions in MSA include accelerating the development of MSA systems, which will lead to greater prevalence of MSA, higher-quality solutions, and faster development. The proposed approach has an indirect impact across many areas where MSA is applied, such as finance, e-commerce, smart cities, and driver assistance.

The Committee considers the stated expected results realistic and suitable because they constitute an important research outcome and provide a basis for further research and practical applications.

Do the expected results represent a significant scientific contribution? YES NO PARTIALLY

III.6 work plan (based on the research phases and indicative dissertation contents from Form 1)

The proposed work plan includes research activities that will be carried out in the following phases:

- T1. Study of theoretical foundations
 - A1. Study of transaction processing and concurrency control schemes.
 - A2. Study of distributed transaction processing.
 - A3. Study of consensus protocols.
 - A4. Study of current practices in MSA.
- T2. Identification of challenges and shortcomings of existing approaches and solutions
 - A1. Collection and study of literature and industrial studies on distributed transaction management and data management in MSA.
 - A2. Identification of challenges from industrial studies on distributed transaction management and data management in MSA.
 - A3. Comparison of existing approaches and solutions based on the identified challenges.
 - A4. Identification of shortcomings of existing approaches and solutions and formulation of a new approach.
- T3. Development of a new approach
 - A1. Specification of the requirements of the new approach.
 - A2. Definition of the project timeline and identification of project phases.
 - A3. Selection of a common use case to which the new approach will be applied.
 - A4. Development of a minimal solution based on the new approach that works with simple objects.
 - A5. Extension of the solution with support for complex objects.
- T4. Testing of the implemented solution
 - A1. Definition of the solution testing strategy.
 - A2. Definition and implementation of a demonstrative environment.
 - A3. Selection of existing approaches and solutions for comparison.
- T5. Evaluation of the implemented solution
 - A1. Definition of comparison tests and the strategy for measuring results.
 - A2. Implementation or application of existing solutions for the purpose of comparison.
 - A3. Execution of tests and collection of comparison results.
- T6. Publication of research results
 - A1. Summarization of research results.
 - A2. Writing a research paper and publishing it at a conference.

- A3. Writing a new research paper based on feedback from the conference.
- A4. Publication of a scientific paper in an international scientific journal.

The Committee notes that the work plan is suitable and adequately defined.

Is the work plan appropriate? **YES** **NO** **PARTIALLY**

III.7 research methods and samples

The candidate plans to conduct research based on the generally accepted principles of Design Science Research Methodology (DSRM). The stated research method includes six activities, which the candidate will apply as follows:

- *Activity 1: Problem identification and motivation.* In this activity, the research problem is defined and discussed alongside the context in which MSA has become one of the leading styles in application development. In addition, challenges in MSA are presented, along with an argument for the value of the proposed research. This is done by addressing problems in working with distributed transactions and data management within MSA. In this activity, an overview of the current state of the field is provided, along with its characteristics and potential improvements.
- *Activity 2: Definition of solution objectives.* The requirements and characteristics of the new approach to managing distributed transactions in MSA are specified in detail, addressing the identified problems, shortcomings, and potential improvements in current solutions and approaches.
- *Activity 3: Design and development.* The new approach is formalized, and a software solution for managing distributed transactions based on that approach is implemented.
- *Activity 4: Demonstration.* The proposed solution is applied in an experimental environment that includes an e-commerce software solution. The e-commerce software solution is designed to faithfully represent a realistic, typical use case.
- *Activity 5: Evaluation.* The new approach is compared with other approaches in the experimental environment.
- *Activity 6: Communication.* The research results are presented at international scientific conferences and in journals, as well as through the doctoral dissertation. The research and development results are presented to engineers developing MSA-based software solutions.

The Committee notes that the proposed research method is fully appropriate and provides an excellent basis for achieving the set research objectives. In addition, the selection of the concrete problem domain and the case study on which the research results will be analyzed and evaluated has been appropriately made, in accordance with the set research objectives.

Are the method and sample appropriate? **YES** **NO** **PARTIALLY**

III.8 location, laboratories, and equipment for research work

The physical location of the experimental research is not relevant to the set objectives and expected research results. The solution implementation and comparisons will be conducted in a cloud-based experimental environment in one of the regions offered by a cloud computing service provider. The research and practical verification of the achieved results within this doctoral dissertation will be carried out at the Faculty of Technical Sciences, University of Novi Sad.

The Committee notes that appropriate resources for experimental work have been provided and that this aspect of the application is suitable.

Are the conditions for research work appropriate? **YES** **NO** **PARTIALLY**

III.9 methods of statistical data processing and other relevant data

The implementation of the software solution corresponding to the approach will be quantitatively evaluated by collecting results from multiple executions of distributed transactions across three versions of the experimental software system: one using the distributed transaction management solution based on the proposed approach, one using 2PC, and one using Saga. The results will be analyzed using standard statistical methods, primarily the median and percentiles, and then used to compare these three approaches.

The Committee considers this decision justified, finds that it adequately demonstrates the achievement of the quantitative aspects of the research objective, and assesses this aspect of the thesis application as suitable.

Are the proposed methods appropriate? **YES** **NO** **PARTIALLY**

IV ASSESSMENT OF THE SUITABILITY OF THE CANDIDATE

Requirements defined for the candidate by the study program:

Pursuant to Article 20, paragraph 4 of the Rulebook on Enrolment, Studying in Doctoral Academic Studies and Acquiring the Title of Doctor of Science, or Doctor of Arts, a student acquires the right to apply for a doctoral dissertation topic if he or she has passed all examinations prescribed by the study program and defended the Theoretical Foundations of the Doctoral Dissertation.

Rationale:

The candidate Lazar Nikolić has fulfilled all teaching obligations prescribed by the doctoral study plan and the Computer Sciences and Control Engineering study program. He has successfully completed the exams required by study program and fulfilled the obligation to defend the Theoretical Foundations of the Doctoral Dissertation, thereby earning 120 ECTS credits. In addition, he completed an additional course in mathematics (DAU004, Selected Topics in Mathematics 2).

Within his scientific and research work to date, the candidate has published, as author or co-author, one paper in category M23 and three papers in category M33.

The main results of the candidate's work are the development of an approach and a software solution for managing distributed transactions in MSA, which enables ACID properties non-invasively, regardless of the choice of DBMS.

Based on the above, the Committee notes that the candidate, Lazar Nikolić, meets the formal requirements and possesses the necessary competence to prepare the proposed doctoral dissertation.

Does the candidate meet the defined requirements? **YES** **NO**

V ASSESSMENT OF THE SUITABILITY OF THE PROPOSED MENTOR

V.1 Biography of the mentor (up to 500 words):

Vladimir Dimitrieski, PhD, Associate Professor at the University of Novi Sad - Faculty of Technical Sciences, has been proposed as the mentor of the doctoral dissertation. Vladimir Dimitrieski has more than 50 published papers in international and national journals and at international and national conferences. He has conducted the majority of his research in the domain of databases and information systems, particularly in developing and applying model-driven engineering methods in that domain, as well as in developing methods for information system integration.

He has validated and applied part of his research through participation in research projects in the domain of Industry 4.0, such as:

- "NASIA - Network for Anomaly Detection and Incident Management in IoT Environments", a multilateral project between Germany, Serbia, Greece, Poland, and the Czech Republic, funded by the German Federal Ministry of Education and Research.

- "NIRO - Network for Intelligent and Self-Adapting Integration of Machines and Information Systems", a multilateral project between Germany, Serbia, Croatia, Hungary, and Slovenia, funded by the German Federal Ministry of Education and Research.
- "Self-adaptive interfaces for the integration of information systems and devices", a bilateral project with the Federal Republic of Germany, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.
- "Finding effective methods and architectures for integrating modeling spaces with applications in different problem domains", a bilateral project with the Federal Republic of Germany, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.
- "Model-based intelligent systems for software product development and business support", Ministry of Education, Science and Technological Development of the Republic of Serbia.

Vladimir Dimitrieski is a member of the program committee of several international professional events (KES Intelligent Decision Technologies, Federated Conference on Computer Science and International Workshop on Enterprise Integration, Interoperability and Networking) and a regular reviewer for several prominent SCI-listed journals (Knowledge-Based Systems, Computer Science and Information Systems, Journal of Computer Languages and Computer Languages, Systems & Structures).

According to the latest metrics, Vladimir Dimitrieski's h-index is 7 (WoS) and 8 (Scopus), and the number of hetero-citations is 137 (WoS) and 200 (Scopus). Among Vladimir Dimitrieski's published papers, the following paper stands out in particular:

Terzić B, Dimitrieski V, Kordić S, Milosavljević G, Luković I, "Development and Evaluation of MicroBuilder: A Model-Driven Tool for the Specification of REST Microservice Software Architectures", *Enterprise Information Systems*, 12 (2018) 1034-1057, DOI: 10.1080/17517575.2018.1460766 (Computer Science, Information Systems: 80/155, IF 2018 = 2,122)

which, according to the Google Scholar citation index, has been cited 73 times to date, excluding self-citations.

V.2 References of the mentor from the scientific field to which the doctoral dissertation topic belongs:

No.	authors, title, journal, volume (year), page numbers from-to, DOI or ISBN/ISSN	category
1.	Marko Vještica, Vladimir Dimitrieski , Milan Pisarić, Slavica Kordić, Sonja Ristić, Ivan Luković, "Production processes modelling within digital product manufacturing in the context of Industry 4.0", <i>International Journal of Production Research</i> , Taylor & Francis Group, London, England, United Kingdom, ISSN: 0020-7543, Vol. 61, No. 19, 2023, pp. 6271-6290, DOI: https://doi.org/10.1080/00207543.2022.2125593 .	M21a+
2.	Elena Akik, Marko Vještica, Vladimir Dimitrieski , Milan Čeliković, Slavica Kordić, Sonja Ristić, "Interacting with Vector Databases by Means of Domain-Specific Language", <i>Open Computer Science</i> , De Gruyter, Warsaw, Poland, ISSN: 2299-1093, Vol. 15, No. 1, 2025, Art. no. 20250036, DOI: https://doi.org/10.1515/comp-2025-0036	M22
3.	Marko Vještica, Vladimir Dimitrieski, Milan Pisarić, Slavica Kordić, Sonja Ristić, and Ivan Luković, "Multi-level production process modeling language", <i>Journal of Computer Languages</i> , Elsevier, Amsterdam, The Netherlands, ISSN: 2590-1184, Vol. 66, 2021, pp. 101053, DOI: https://doi.org/10.1016/j.cola.2021.101053 .	M22
4.	Branko Terzić, Vladimir Dimitrieski , Slavica Kordić, Gordana Milosavljević, Ivan Luković, "Development and Evaluation of MicroBuilder: A Model-Driven Tool for the Specification of REST Microservice Software Architectures", <i>Enterprise Information Systems</i> , Taylor & Francis, ISSN: 1751-7575, DOI: 10.1080/17517575.2018.1460766, 2018.	M22

5.	Vladimir Dimitrieski , Slavica Kordić, Sonja Ristić, Heiko Kern, and Ivan Lukovic, "Mapping-Based Approach to Integration of Technical Spaces", Computer Science and Information Systems, ComSIS Consortium, Novi Sad, Serbia, ISSN: 2406-1018, Vol. 22, No. 1, 2024, pp. 279-310, DOI: https://doi.org/10.2298/CSIS240701009D .	M23
6.	Lazar Nikolić, Vladimir Dimitrieski , and Milan Čeliković, "An Approach for Supporting Transparent ACID Transactions over Heterogeneous Data Stores in Microservice Architectures", Computer Science and Information Systems, ComSIS Consortium, Novi Sad, Serbia, ISSN: 2406-1018, Vol. 21, No. 1, 2024, pp. 167-207, DOI: https://doi.org/10.2298/CSIS221210006N .	M23
7.	Vladimir Dimitrieski , Milan Čeliković, Slavica Aleksić, Sonja Ristić, Abdalla Alargt, and Ivan Luković, "Concepts and Evaluation of the Extended Entity-Relationship Approach to Database Design in a Multi-Paradigm Information System Modeling Tool," Computer Languages, Systems & Structures (COMLAN), Elsevier, ISSN: 1477-8424, pp. 299-318, 2015, DOI: 10.1016/j.cl.2015.08.011	M23
8.	Marko Vještica, Vladimir Dimitrieski , Milan Pisarić, Slavica Kordić, Sonja Ristić, Ivan Luković, "Towards a Formal Specification of Production Processes Suitable for Automatic Execution", Open Computer Science, De Gruyter, Warsaw, Poland, ISSN: 2299-1093, 2020.	M23

V.3 Requirements defined for the mentor in accordance with the Rules of Doctoral Studies of the University of Novi Sad for the field to which the doctoral dissertation belongs:

Pursuant to Article 7, paragraph 1 and Article 8, paragraph 5 of the "Rules of Doctoral Studies of the University of Novi Sad", adopted at the session of the Senate of the University of Novi Sad held on 25.2.2021, which entered into force on 5.3.2021 and has been applied since 1.4.2021, a University or faculty teacher employed at the faculty implementing the doctoral study programme may be appointed as a mentor, as may a teacher employed at another university, faculty or scientific institution who has the necessary scientific or artistic competence in the field of the doctoral dissertation topic, whereby, for the field of technical and technological sciences, the mentor must have at least five papers published in the previous ten years in journals with an impact factor from the SCI or SCIE list.

Rationale:

Vladimir Dimitrieski is an Associate Professor in the narrow scientific field of Applied Computer Science and Informatics and is actively engaged in research on databases and information systems. The candidate's doctoral dissertation is also being applied for in this field. Vladimir Dimitrieski has 11 published papers in the SCI list, presenting research on model-driven engineering, domain-specific languages, databases, and information systems. He has participated in international projects closely related to the stated fields and actively serves on program committees for various international conferences and as a reviewer for SCI-listed journals.

Based on all scientific and professional results, as well as results in the teaching process, the Committee notes that Prof. Vladimir Dimitrieski, PhD, fulfills all formal, professional, and pedagogical requirements necessary for the mentor of this doctoral dissertation. The Committee notes that Prof. Vladimir Dimitrieski, PhD, is suitable as the mentor of the proposed doctoral dissertation in the proposed narrow scientific field.

Does the mentor meet the requirements?

YES

NO

VI CONCLUSION

The topic is suitable	YES	NO	PARTIALLY
The candidate is suitable	YES	NO	
The mentor is suitable	YES	NO	

Rationale on the suitability of the topic, candidate, and mentor (up to 500 words):

In order to form the stated conclusions, the Committee thoroughly examined the submitted application of the candidate, assessed the significance of the references related to the research topic, the references of the proposed mentors and the candidate, as well as the previous engagement and results of the proposed mentors and the candidate in the stated research field. Based on all the facts presented in this Report, the Committee concludes the following:

- a) that the proposed topic is suitable for a doctoral dissertation,
- b) that the candidate, Lazar Nikolić, Master Engineer of Electrical and Computer Engineering, is suitable for the preparation of the proposed doctoral dissertation,
- c) that Vladimir Dimitrieski, PhD, Associate Professor at the Faculty of Technical Sciences, is suitable as the mentor of the proposed doctoral dissertation, and

The Committee is pleased to

PROPOSE

to the Teaching-Scientific Council of the Faculty of Technical Sciences in Novi Sad, to adopt the stated conclusions of the Committee and

approve Lazar Nikolić to prepare the proposed doctoral dissertation and appoint Vladimir Dimitrieski, PhD, as mentor.

Place and date:

Novi Sad, 16. 06. 2026.

1. Miroslav Zarić, PhD, Full Professor
_____, Chair

2. Ivan Luković, PhD, Full Professor
_____, Member

3. Milan Rapačić, PhD, Full Professor
_____, Member

4. Slavica Kordić, PhD, Associate Professor
_____, Member

5. Milan Čeliković, PhD, Associate Professor
_____, Member

NOTE: *A Committee member who does not wish to sign the report because he or she does not agree with the opinion of the majority of Committee members is obliged to enter into the report an explanation, i.e., the reasons why he or she does not wish to sign the report, and to sign it.*