REVIEW

by Assoc. Prof. Dr Veneta Tabakova-Komsalova, Plovdiv University "Paisii Hilendarski"

regarding a doctoral thesis for the award of the academic and scientific degree of "PhD"

in the field of higher education: ***4. Natural Sciences, Mathematics and Informatics*****,**
professional field: ***4.6. Informatics and Computer Sciences***
Doctoral programme: ***Informatics***

Author of the doctoral thesis: **Laska Delkova Kostadinova-Tsankova**
Thesis topic: ***"Modelling of an intelligent supply chain in smart farming systems"***
Supervisor: **Assoc. Prof. Dr Emil Doichev**

By Order No. RD-22-692 of 30 March 2026 of the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the academic jury to oversee the procedure for the defence of a doctoral thesis on the topic ***"Modelling of an intelligent supply chain in smart farming systems***" for the award of the academic and scientific degree of "Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Sciences, PhD programme in Informatics. The author of the thesis is **Laska Delkova Kostadinova-Tsankova** – a part-time PhD student at the Department of Computer Systems, supervised by Assoc. Prof. Dr Emil Doichev from the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Plovdiv.

This review has been prepared based on the documents submitted in accordance with the procedure and in compliance with Article 36(1) of the Regulations on the Development of Academic Staff at Plovdiv University, the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria and the regulations for its implementation.

I. General description of the submitted materials

The following documents were submitted under the procedure: an application to initiate the procedure, a curriculum vitae, minutes of the preliminary discussion, a statement from the academic supervisor, an abstract in Bulgarian and English, a declaration of originality and authenticity, a statement confirming compliance with the minimum national requirements, a list and copies of publications, as well as the thesis itself. The submitted set of documents is complete and complies with the regulatory requirements for admission to the defence.

The attached documents confirm that the thesis was discussed and approved for defence at a meeting of the Departmental Council of the Department of Computer Systems at the Faculty of Mathematics and Informatics, Plovdiv University "Paisii Hilendarski", held on 13 March 2026, and the supervisor has expressed a positive opinion regarding the completeness and readiness of the thesis for defence.

II. Brief biographical details of the doctoral candidate

Laska Delkova Kostadinova-Tsankova graduated with a master's degree in 'Computer Technologies' from Plovdiv University 'Paisii Hilendarski' in Plovdiv between 1994 and 1999. Between 1999 and 2002, she completed a second master's degree in 'Macroeconomics' with a specialisation in 'Organisation and Technology of Accounting' at Paisii Hilendarski University of Plovdiv. She also obtained a master's degree in finance and accounting, Financial Audit at Chernorizets Hrabar University, Varna, between 2018 and 2020. From 2022 to 2026, she is a part-time PhD student at the Department of Computer Systems, Faculty of Mathematics and Informatics, Paisii Hilendarski University of Plovdiv.

Her professional career began in 2017 as manager of the company Laska Insurance Fund – Plovdiv, and she is currently manager of ZOP CONSULTING EOOD, Plovdiv.

III. Relevance and significance of the doctoral thesis

The topic of the thesis is undoubtedly topical. It is dedicated to the management of supply chains in the context of public procurement and the supply of public institutions, where reliability, traceability, timeliness and compliance with regulatory requirements are of particularly high public importance.

The author provides a well-reasoned argument for the need for intelligent supply chain management through the integration of modern information technologies, artificial intelligence, machine learning, scenario planning and simulation modelling in the development of the 'ZEMELA' platform. The subject and object of the research, the main objective and specific tasks are clearly formulated: analysis of modern supply chains and their integration into smart agriculture platforms, development of a system model and architecture, and prototype implementation.

The scientific and applied significance of the project is also determined by its focus on a real-world case study – the supply of food products to childcare facilities within the Municipality of Plovdiv. This choice lends the research high practical value and creates conditions for the real-world testing of the proposed solutions.

IV. Understanding of the problem

The PhD candidate demonstrates a very good understanding of the subject matter under investigation. In the first chapter, he presents a broad theoretical overview of supply chains. Contemporary requirements regarding sustainability, digitalisation and traceability are examined, as well as the specific aspects of logistics in the supply of food products to childcare facilities. Both theoretical concepts and current technological trends are presented.

The literature review is comprehensive and demonstrates an ability to critically analyse and synthesise a significant number of academic sources. The existing limitations of current solutions are correctly highlighted, which justifies the need for the proposed research.

All these factors demonstrate that Laska Kostadinova-Tsankova has a thorough understanding of the field under investigation, employs established methodological approaches, and is addressing a topical and significant problem.

V. Brief description of the thesis

The thesis comprises 212 pages and contains an introduction, five chapters, a conclusion, 64 figures, 19 tables and 234 references. The structure is logical and corresponds to the stated aim and objectives.

The introduction justifies the relevance of the topic, the subject and object of the research, the author's thesis, the aim, the objectives and the methodology. The focus on risk management in supply chains within public procurement and on the development of an integrated decision support system in a real-world logistics environment is correctly established.

The first chapter presents a broad theoretical overview of supply chains – definitions, historical development, main models, vulnerabilities, disruptions and technological trends. It examines contemporary requirements for sustainability, digitalisation and traceability, as well as the specificities of logistics in the supply of food products to childcare facilities.

The second chapter develops the conceptual framework of the study. A mixed-methods research approach is employed, comprising documentary analysis, semi-structured interviews, a questionnaire survey and observation of the actual process. It is encouraging to note that SWOT, BPMN, comparative and normative analysis are included. Together, these link strategic planning with operational implementation, ensuring that work processes are aligned with the company's objectives.

Chapter Three is among the most significant parts of the thesis. It develops an event-driven supply chain model as an extension of the 'ZEMELA' platform. The author proposes an adaptation of the existing base model by introducing new event types and parameters, takes into account the role of conflicts in planning, and develops event machines based on finite automata and the STRIPS concept.

Chapter Four is devoted to the technologies used and their integration. Flex, Prolog and the architecture of the Flex Expert System are presented, demonstrating their role in implementing knowledge, rules and logical inference within the proposed system.

Chapter 5 presents a prototype of a supply chain management system. The architecture, knowledge base, user interface, templates and sample sessions with the system are described. The demonstration scenarios show the generation of a delivery schedule through forward and backward linking, with the results confirming the model's functionality under the same set of facts.

The conclusion summarises the results achieved and outlines directions for future development – including expansion with blockchain technologies, simulation modules and adaptation of the architecture to other application areas.

VI. Assessment of scientific and applied scientific contributions

I accept that the thesis contains significant scientific, applied scientific and practical contributions.

The following results can be highlighted as scientific and applied scientific contributions:

- A conceptual event model and architecture for intelligent supply chain management have been developed as an extension of the 'ZEMELA' platform.
- A methodology for integrating the event model has been proposed, demonstrating the use of artificial intelligence, logical inference and adaptive behaviour in a real-world logistics environment.
- Key risks, constraints and organisational specifics in the supply of food products to childcare facilities under public procurement conditions have been identified.
- A methodological approach is proposed for assessing the effectiveness and sustainability of logistics processes through the use of performance indicators and risk analysis.
- A prototype supply chain management system has been implemented, based on a knowledge base, rules and event machines, with demonstrated applicability in practical scenarios.

Alongside contributions to professional field 4.6. Informatics and Computer Sciences, the work also contains **significant contributions to the field of economics**, insofar as the study examines the supply chain as an economic system and proposes solutions for enhancing the efficiency, sustainability and manageability of logistics processes in the public sector. In economic terms, specific contributions relate to: identifying and systematising administrative, contractual, logistical and financial constraints in public procurement; developing indicators for assessing performance and sustainability; analysing the effects of delays, complaints, payment terms and constraints arising from price changes; as well as justifying opportunities for optimising coordination between contracting authorities, suppliers and subcontractors.

Linking the model to the actual procurement **process** for childcare facilities **also makes a** significant **economic contribution**, as this creates the conditions for reducing transaction and logistics costs, improving stock and delivery planning, increased transparency and traceability, and a reduction in the risk of organisational and financial losses in the execution of public procurement contracts.

The contributions formulated by the author are, for the most part, well-founded and correspond to the presentation in the thesis. Alongside the results in the field of information technology and computer science, the interdisciplinary contribution of the work to the economic issues of supply chain management, including the analysis of efficiency, risk, coordination and sustainability in the context of public procurement, should be explicitly acknowledged. Particular emphasis should be placed on the endeavour to link the theoretical model with a real-world applied case study, which enhances the value of the research.

VII. **Personal contribution of the PhD candidate**

The content of the thesis and the abstract clearly demonstrate the doctoral candidate's significant personal involvement in carrying out the research. The doctoral candidate independently analysed existing solutions and technologies and formulated the research objectives and tasks. Furthermore, he developed a conceptual event model and architecture for intelligent supply chain management, proposed a methodology for integrating the event model, identified key risks, constraints and organisational specifics, proposed a methodological approach for assessing the effectiveness and sustainability of logistics processes, and implemented a prototype supply chain management system.

All these activities demonstrate a high degree of independence and scientific maturity on the part of the doctoral candidate. I have no doubts regarding Laska Kostadinova-Tsankova's personal contribution to the doctoral research conducted and to the attainment of the relevant scientific-applied and applied results. **I have found no plagiarism in the doctoral thesis in accordance with the procedure established by law.**

VIII. **Publications and fulfilment of minimum national requirements**

Publications on the topic of the thesis have been presented, which ensure the necessary scientific publicity for the results obtained. The abstract and the thesis state that the list of publications comprises 10 titles, of which 2 are cited in the thesis, and the attached report on the minimum national requirements records a total of 86 points.

Of particular significance are the two publications indexed in Scopus, which meet the requirements for Group G and directly reflect results related to the thesis. The supervisor also certifies that the PhD candidate has met the minimum national requirements and has submitted two publications on the topic.

IX. Abstract

The abstract adequately and accurately reflects the content, structure, aim, objectives, methodology, main results and contributions of the doctoral thesis. An English-language version is also provided, which contributes to the wider visibility of the work.

X. Critical comments and recommendations

Alongside the undoubted merits of the work, a number of comments and recommendations may be made:

- In the first chapter, the overview-descriptive approach predominates in places; a stronger critical synthesis by the author of the theoretical frameworks examined would further enhance the scientific rigour of the exposition.
- The empirical verification of the proposed model could be further expanded with a broader range of case studies, suppliers and clients, as well as with a clearer quantitative comparison against alternative or baseline solutions.
- The text contains isolated linguistic, stylistic and editorial inaccuracies, which do not significantly detract from the quality of the work but could be rectified in a future publication.

The comments made are of a recommendatory nature and do not call into question the academic quality of the thesis or the author’s ability to conduct independent research.

XI. **Conclusion**

The submitted thesis contains up-to-date research, a clearly formulated objective, a logically structured framework, a well-founded methodology, achieved scientific and applied scientific results, and practical applicability. The topic is significant both for professional field 4.6. Informatics and Computer Sciences, and in terms of the economic aspects of supply chain management, the efficiency of public procurement, and sustainable logistics planning in the public sector.

On the basis of the above, I give a positive assessment of the doctoral thesis “Modelling of an Intelligent Supply Chain in Smart Farming Systems” and propose that the distinguished academic jury award Laska Delkova Kostadinova-Tsankova the academic and scientific degree of “Doctor” in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Sciences, doctoral programme “Informatics”.

Date: 27 April 2026 Reviewer: .....

/Assoc. Prof. Dr Veneta Tabakova-Komsalova/