

## REVIEW

"From Assoc. Prof. Dr. Stamen Iliev Antonov  
on the dissertation work  
of Eng. Mariyan Iliev Rahnev  
on the topic:

*„Network-centric approach in modeling and optimization of contemporary  
transport technologies in logistics“*

For obtaining the educational and scientific degree of “Doctor”  
in the field of higher education: “Technical Sciences”  
Professional direction: 5.13. “General Engineering”  
Doctoral program: “Engineering Logistics”

### **1. General description of the dissertation work**

The total volume of the dissertation work is 126 pages, structured into an introduction, three main chapters with conclusions at the end of each chapter, and a conclusion section. It includes 34 figures, 11 tables, and cites and utilizes 135 literary and informational sources.

### **2. Relevance of the problem**

The investigation of transportation logistics systems, the use of a systems approach in organizing and managing combined transportation technologies, and the implementation of an integrated approach in optimizing the structure of supply chains created by logistics systems are used in scientific research to determine the relevance of the problem. According to the study, logistics is undergoing dynamic development in the modern setting, which is being pushed by the escalating globalization of production, markets, and competition. This development is finding increasingly extensive expression both geographically and industry-specific, driven by the growing globalization of production, markets, and competition.

The adoption of an integrated strategy and the use of corresponding tools in controlling material flows from their point of origin through all phases of movement (procurement, production, distribution) to the end user are at the center of this trend. To ensure better coordination among individual supply chain participants, increase the effectiveness of logistical solutions, and rationalize resource use, achieving a higher level of integration in managing logistical activities and functions at both intra-firm and inter-firm levels is one of the crucial tasks.

### **3. Understanding the state of the problem**

In the first chapter, “Analysis of Transportation Logistics Systems”, a classification of transportation as an activity is conducted based on purpose and organization within the context of the unified transportation system. Detailed analysis is provided on the infrastructure facilities, specifically the terminals for performing combined transportation in the Republic of Bulgaria.

An analysis has been conducted on the transported goods using intermodal transport units in the Republic of Bulgaria for the period of 2017-2021, based on data from the National Statistical Institute (NSI). Additionally, an analysis has been performed on the transported goods using different modes of transport for the same period.

An analysis has been conducted on the main objective and conditions for the interaction between different modes of transport in the logistic transportation system. This analysis aims to rationalize the utilization of characteristics and resources of the respective modes of transport in performing combined transportation. A comparative characterization of the primary modes of transport has been made to determine the factors influencing the choice of an appropriate mode of transportation.

**The object of the research** is the concept of building, developing, and implementing combined transportation technologies in supply chain logistics.

In the second chapter, "Application of a Systems Approach in the Organization and Management of Combined Transportation," a definition of combined transport is provided, and the main technologies in this type of transport are examined. A classification of combined transportation is made based on the modes of transport used, the types of cargo units, and the origin and destination of goods. The overall goals and objectives of combined transport are formulated.

Logistic operations in combined transportation that improve the efficiency of the logistic system are discussed. A standardized approach is applied to categorize terminals for combined transport, aligning them with the overall European network. The prerequisites for their successful positioning in terms of integration and functioning within the logistic network are justified.

Trans-European and Trans-Asian transport corridors are examined as factors for the development of combined transport within the context of a systems approach.

The economic efficiency of using combined transportation technologies is explored through key systemic indicators for assessing a combined transport system.

Measures to mitigate the impact of transportation on the environment are outlined.

In **the third chapter**, "Application of an Integrated Approach in Optimizing the Structure of Logistics Supply Chains", the theoretical development of efficient numerical methods and models for solving classes of extreme optimization problems related to decision-making in the transportation domain is discussed. The theoretical essence and purpose of graph theory are explored as a model for describing logistic systems within the context of an integrated approach in logistics.

An algorithm of a comprehensive methodology is presented, aiming to justify the structure of the integrated approach and define the subjects of the optimization procedure to achieve optimal management of logistic systems.

The integrated approach is applied in optimizing the structure of logistics supply chains by selecting routes and flows in networks using graphs and computer tools. This approach is used to determine the shortest paths in an international transportation network based on distance and travel time criteria. By employing this method, the aim is to achieve efficient and optimized management of logistics systems.

#### **4. Abstract**

This abstract reflects the content of the dissertation and the main results and contributions of the author, according to the requirements of Shumen University "Episkop Konstantin Preslavski".

#### **5. Main contribution**

Based on the analysis and research conducted, the author claims the following scientific and practical contributions:

1. An analysis and comprehensive presentation of the scientific and practical framework for the state of the intermodal transport network in the Republic of Bulgaria as a segment of the functioning of the transport logistics system for intermodal transport.

2. A systematic approach to managing the intermodal transport system, as well as models and methodologies for designing and managing a logistics transport system to improve the economic efficiency of this mode of transport.

3. The application of an integral approach to optimizing the structure of logistics supply chains in the transport logistics system through mathematical modeling and optimization. The integral paradigm is applicable only when considering the value chain as the main complex (integral) characteristic of the material flow.

4. A real application of graph theory and linear programming in optimizing the elements and structure of logistics supply chains.

Based on the results of the theoretical research conducted in accordance with the objectives of the dissertation, the author suggests that the dissertation study can contribute to solving the following problems:

1. Development and updating of the national strategy for positioning transport corridors and networks for intermodal transport activities through the application of specialized algorithms for solving optimization procedures.

2. Development and updating of the national strategy for positioning a network of logistic intermodal terminals that meet the requirements of modern freight transport services to ensure better coordination between different modes of transport, establishing reliable and fast rail connections between terminals.

3. Implementation of an active policy for intergovernmental cooperation on important logistic projects related to intermodal transport to develop the Europe-Caucasus-Asia corridor, i.e., prospects for interconnectivity between Eurasian and European transport corridors.

#### **Personal contribution of the author and publication activity**

The materials developed during the doctoral research were presented and discussed at Scientific Forums in 2020 and 2021, dedicated to the current issues of security, logistics, and public systems, organized by NMU "Vasil Levski," as well as in the proceedings of scientific papers of Shumen University "Episkop Konstantin Preslavski" in 2020.

Some of the results from the theoretical research conducted in the dissertation have been published in international scientific journals.

The aforementioned demonstrates that the doctoral candidate's research on the topic has been validated by scientific forums in national and international formats, where the academic community has become acquainted with the content of the scientific research and the achieved results by Eng. Mariyan Rahnev.

#### **6. Critical notes and recommendation for the dissertation and the abstract.**

6.1. The dissertation pays great attention to providing detailed explanations of commonly known facts, which reduces the scientific density of the research;

6.2. In chapter three, when determining the optimal routes for an international transport network under the travel time criterion, in the graphical representation of the transport network for finding an optimal path from the start to the end point, the longest among all paths is not presented as a critical one

6.3. In Chapter Three, significant attention is devoted to the application of graph theory as a primary tool for solving problems related to route selection and flow optimization in networks, without providing a verification of the algorithm used in the methodology for optimal design of logistic chains, channels, and networks for completeness and consistency.

6.4. The requirements for formatting literary sources should be followed.

6.5. The volume of the Abstract should be reduced to 40 pages.

#### **7. Conclusion**

I believe that the presented dissertation work, which meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and its implementing regulations, and I recommend that the academic jury vote for the award of the educational and scientific degree of "Doctor" to Mr. Marian Iliyev Rahnev in the field of higher education: 5. "Technical Sciences", Professional field: 5.13. "General Engineering", Doctoral program: "Engineering Logistics".

07.06.2023

Reviewer: .....  
Assoc. Prof. Stamen Antonov/