ИКОНОМИЧЕСКИ УНИВЕРСИТЕТ ВАРНА

Вх. № Р220-1029 \ 08.08.2024

REVIEW

of dissertation for awarding the educational and scientific degree "Doctor"
under an announced procedure by the University of Economics – Varna in the professional
field 3.8 "Economics", PhD program "Optimal Management of Economic Systems"

1. General information
- Reviewer: **Prof. Dr. Rosen Nikolaev**
- Regarding: participation in a scientific jury appointed by order **of the Rector of the University of Economics - Varna No RD-06-78 / 05.06.2024** and a decision of the scientific jury, taken at the first meeting on 11.06.2024.
- Author of the dissertation: **Julieta Deyanova Mihaylova**
- Title of the dissertation: **"Optimization of material flows of fast turnover goods in a small wholesale and retail company (the example of Malvis trade LTD)"**

2. Data about the doctoral candidate
Julieta Mihaylova has acquired a Bachelor's degree in Computer Systems and Technologies at the Technical University of Varna. At the same university, she also acquired a master's degree in Industrial Management.

The specialties she studies explain her solid knowledge, both in optimization methods and algorithms, and in economics. All this predetermines her interest and her successful training in the educational and scientific degree "Doctor" in the doctoral program "Optimal Management of Economic Systems" at the Department of Statistics and Applied Mathematics. Julieta Mihaylova is enrolled in a full-time PhD program with a three-year term of study from 01.09.2020 and a supervisor Assoc. Prof. Dr. Tanka Milkova.

During her doctoral studies, she strictly followed the implementation of her individual plan. She has successfully passed the PhD exams in "Economics of Enterprise" with a grade of very good 5, "Mathematical Modelling" with an excellent grade of 6, "English Language" with an excellent grade of 5.75 and "Operations Research" with an excellent grade of 6.

The dissertation and the abstract on it of PhD student Julieta Mihaylova were discussed at the Department of Statistics and Applied Mathematics, and after considering the critical remarks made by the members of the department, on 21.05.2024 it was decided to make a proposal to the Faculty Council of the Faculty of Informatics to open a procedure for defending the dissertation.
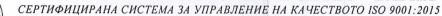
Julieta Mihaylova also has extensive experience in practice, as within her work experience she has held positions in various companies such as accountant, office assistant, commodity specialist, etc.

Education and work experience explain the presence of both theoretical and practical knowledge on the topic of the doctoral student's dissertation.

3. General presentation of the dissertation
The dissertation has a total volume of 236 pages. The main part consists of a title page, table of contents, an introduction (4 pages), three chapters (169 pages), a conclusion (3 pages) and references. Appendices of 50 pages have also been added.

The text includes 32 figures and 9 tables, 29 of which are the author's own development. The literature used includes 102 titles, 30 of which are in Cyrillic and 72 in Latin. About 20% of these sources have been published in the last 5 years.

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СЕРТИФИЦИРАНА СИСТЕМА ЗА УПРАВЛЕНИЕ НА КАЧЕСТВОТО ISO 9001:2015

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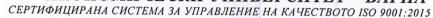
4. Assessment of the structure and content of the dissertation, opinion on the correctness of the abstract of the dissertation and the lexical and stylistic characteristics of the text
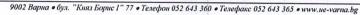
The dissertation is devoted to topical and significant issues for theory and practice. In the introduction of the study, the author substantiates this fact with arguments and defines the object, subject, purpose and tasks of the study. All of them are correctly formulated in order to prove the research thesis in the dissertation, namely that the optimization of supply planning and the determination of the optimal route can be carried out with the help of appropriate economic and mathematical models. The main research methods and some limitations are indicated. It should be noted and highly appreciated that all analyses and approbations of models in the dissertation are made with real data provided by Malvis Trade Ltd.

The first chapter is entirely theoretical in nature and in it the dissertation demonstrates his in-depth theoretical knowledge related to the management of the movement of material flows. A deductive approach to research is applied and the essence and features of the supply chain as an element of logistics are first presented. Once the three main flows (material, informational and financial) that are included in the scope of the supply chain are described, attention is turned to the material flow. After presenting the essence of the material flow, the author proceeds to study the features and significance of the material flow in the context of the commercial enterprise. Emphasis is placed both on the movement of the material flow and on the static state of this flow, namely the stocks in the commercial enterprise. Theoretically different options for managing the material flow in motion and of stocks are presented. After justifying that the management of the inventories and the transport activities of the commercial companies are essential for the optimal implementation of their activities, he draws attention to the specific features of the activities of Malvis Trade Ltd. The organization of work in the company is described on a trial basis and an in-depth SWOT analysis is offered. The need for optimal planning of the supply of goods and material values and transport activities in the implementation of the activities of Malvis Trade Ltd. is justified.

The second chapter of the dissertation is dedicated to the first main activity in the company, namely the supply of commodity and material values in case of random search. Initially, a literature review of the existing methods of planning deliveries in case of random search was made. On this basis, an author's methodology for modelling the supply of goods in case of random consumer demand is proposed, which is adapted to the specific requirements of Malvis Trade Ltd. This methodology is based on forecasting using a one-parameter Holt model (exponential smoothing), a two-parameter Holt model and ARIMA models. The proposed methodology has been tested with real data for a 7-year period and the relevant analyses have been made, which are applicable to small wholesale and retail companies. It is argued how this leads to a reduction in the cost of storing excess quantities of stocks, as well as losses from unfulfilled customer orders.

The third chapter of the dissertation is dedicated to the second main activity in the company, namely determining optimal routes for transporting the goods to the customers of Malvis Trade Ltd. A review of the specialized literature on the topic is made again, with an emphasis on the methods of linear optimization. On this basis, an author's methodology for planning optimal transportation routes has been proposed, which will ensure minimal costs for the implementation of all transportations. An approbation of the proposed methodology has been developed using real data about the company. For the actual determination of optimal transportation routes, a road network has been created on a digital geographical map Google

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My Maps, and the R language has been used to create and solve the optimization problem, which offers a free software environment for calculations.

In the conclusion, the author has summarized the main results achieved in the dissertation and some limitations of the study.

I believe that the dissertation is presented in the form of a monographic manuscript and contains significant scientific and applied results achieved on the basis of a study of a real practical problem, which can be considered an original contribution to science. The presentation is logical and consistent. The writing style is learned and readable at the same time. The literature sources used are correctly cited and the study clearly shows the author's opinion on the topic. The author has acquired in-depth theoretical and practical knowledge regarding the optimization of deliveries and transportation routes in a small wholesale and retail company.

The abstract on the dissertation is 37 pages. and has been developed according to the established requirements. It presents correctly in an abbreviated form the content of the dissertation. The main contributions of the author are summarized and other publications on the topic of the dissertation are indicated.

5. Identification and evaluation of scientific and scientific-applied contributions in the dissertation

In the dissertation of Julieta Mihaylova, significant contribution points are found, which I can divide into two groups – contributions of a theoretical nature and contributions of a practical and applied nature.

In general, I can summarize the contributions of a theoretical nature to the following:
- The theory related to the essence of the supply chain, material flows and their management is enriched, as specific features of the management of supplies (stocks) of fast turnover goods and routing of shipments to customers in small wholesale and retail companies are derived.
- Some of the appropriate economic, mathematical and statistical models and methods for optimal management of material flows in the supply chain, applicable to small wholesale and retail companies, are presented in theoretical terms.
- On the basis of the existing models and methods, author's models and methodologies have been developed to help optimize the planning of the supply of goods and materials and in the preparation of the routes used for distribution in small wholesale and retail companies.

The contribution points of a practical and applied nature can be summarized as follows:
- Appropriate methods and algorithms are proposed for finding optimal solutions to the proposed economic and mathematical models, which are based on freely available software tools and can be used by any small wholesale and retail company.
- The models and methods proposed by the author have been tested on the basis of real data on the activities of Malvis Trade Ltd. and analyses have been carried out that show what positive economic results their application can lead to. This shows that the models and methods are valid for any company with a similar nature of activity.

6. Publications and participation in scientific forums

PhD student Julieta Mihaylova presents three independent publications, two reports and one article, both of which are related to participation in a scientific forum, namely the International Scientific and Practical Conference "Fundamental Training in Higher Education", organized by the Department of Statistics and Applied Mathematics. All three publications are in journals included in the National Reference List of Contemporary Bulgarian Scientific

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Journals with Scientific Peer Review and are therefore evaluated with 10 points each. Thus, the minimum national requirements for awarding the educational and scientific degree of "Doctor" are met.

The article entitled "An Approach to Modelling the Probable Consumers Demand of Food Products Using Pearson Distribution System and Johnson Distribution System" was published in English in the journal "Izvestia" of the University of Economics – Varna. It is related to modelling inventory management in case of random search. The author proposes an approach for constructing a function of distribution of probabilities of demand, which is tested with real data for weekly sales of more than 400 types of food products for a period of five years in a small distribution company. For primary analysis of consumption data, the ARIMA model was used, and random variables were modelled using the Pearson Distribution System and the Johnson Distribution System. It is demonstrated how optimal inventory management strategies can be determined.

The report, titled "Applying Box and Jenkins Theory to Estimating Wholesale Sales Dynamics in a Small Distribution Firm," is also related to inventory management. In it, the author uses this theory to propose a method for studying consumer demand for groceries distributed by a small distribution company, as a dynamic series. The goal is to determine demand as accurately as possible, which will lead to the development of an inventory management strategy that minimizes the risks of shortages or surpluses.

The report titled "Using a Linear Optimization Model for Route Delivery Planning" is related to optimal planning of the transportation of goods to the company's customers. A model has been proposed that is suitable for optimizing transport costs for the delivery of goods from one source (warehouse) to several receivers (retail outlets). The model is based on the problem of mixed integer linear programming, with the criterion of optimality being minimizing the kilometres travelled. The model solution is a plan for the use of transport vehicles along routes, sites and number of routes.

The publications are related to the topic of the dissertation without completely overlapping it and also represent in-depth applied research and contain contributing points.
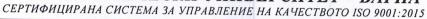
7. Established or unestablished plagiarism in the dissertation and abstract

A plagiarism check was made in the dissertation with the help of Strike Plagiarism and the found about 3% of non-original text give me reason to assert that the dissertation and the abstract on it are the personal work of the author.

8. Critical notes and recommendations

As a member of the Department of Statistics and Applied Mathematics, I have made critical remarks, recommendations to the dissertation of Julieta Mihaylova during its consideration at the department. They were removed in a timely manner and in view of this in the review I will not make comments on the dissertation.

I have a note regarding one of the documents submitted by the PhD student on the procedure. In the Reference-Declaration for the fulfilment of the minimum national requirements for awarding the educational and scientific degree of "Doctor", the three publications are reported in the column "Articles and reports published in scientific journals, refereed and indexed in world-famous databases with scientific information (Scopus/Web of Science)" and are evaluated with 30 points each. In fact, they should be reported in the column "Articles and reports published in non-refereed journals with scientific peer review or published in edited collective volumes" and should be evaluated with 10 points each. I consider this to be a technical error, since in reality the publications are sufficient to meet the minimum national

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requirements for awarding the educational and scientific degree of "Doctor" in the professional field 3.8 "Economics".

9. Questions for the doctoral candidate

I would like to pose the following questions to the doctoral candidate:

1. The dissertation discusses in detail the issue of optimization of deliveries from the distributor's warehouse to wholesalers. What is the opinion of the PhD student about the possibilities for optimizing deliveries from manufacturers to the distributor's warehouse?

2. What difficulties would arise in the implementation of the methods presented in the dissertation for optimizing deliveries to and from the distributor in the studied or related companies?

10. Conclusion

The set of documents provided to me contains everything provided for in the Regulations for the Development of the Academic Staff at the University of Economics – Varna. As a result of my acquaintance with all the details of the procedure for acquiring the educational and scientific degree of "Doctor", as well as the entire process of training in the doctoral program of Julieta Mihaylova, I can confirm that all requirements have been correctly complied with.

The presented dissertation is a complete research in which there are significant scientific and applied contributions. I believe that the PhD student has successfully fulfilled the educational goal of the doctoral program and has mastered the ability to carry out independent applied research.

The opinion expressed in the review gives me grounds to express my positive assessment of the dissertation and as a member of the Scientific Jury to vote FOR the acquisition by Julieta Deyanova Mihaylova of the educational and scientific degree of "Doctor" in the professional field 3.8 "Economics", doctoral program "Optimal Management of Economic Systems".

08.08.2024   Reviewer:

/Prof. Dr. Rosen Nikolaev/

REVIEW

of dissertation thesis

for the award of the educational and scientific degree "PhD"

in professional field 3.8. Economics,

scientific specialty "Optimal Management of Economic Systems"

1. General information

Reviewer: Professor Svetlana Raycheva Dimitrakieva, PhD, Technical University - Varna

Basis for writing the review: Order No. RD 06-78 of 05.06.2024 of the Rector of the University of Economics - Varna for appointment of Scientific Jury and decision of the Scientific Jury of 11.06.2024 г. for designation of reviewers

Author of the dissertation thesis: Julieta Deyanova Mihaylova

Title of the dissertation thesis: "Optimization of material flows of fast turnover goods in a small wholesale and retail company (the example of Malvis Trade LTD)"

Supervisor of the dissertation thesis: Associate professor Tanka Vasileva Milkova, PhD.

2. Data about the dissertant

Julieta Mihaylova graduated from the Professional High School of Economics "Dr. Ivan Bogorov" in 2005. In 2009 she obtained a Bachelor's degree in Computer Systems and Technologies, and in 2011 - a Master's degree in Industrial Management. In the period 01.09.2020-01.09.2023 she was a full-time PhD student in the doctoral program "Optimal Management of Economic Systems", professional field 3.8. Economics at the Department of Statistics and Applied Mathematics, University of Economics - Varna. The dissertant has fulfilled all the obligations under her individual plan and by Order No. RD 17-563 of 12.10.2023 she was exmatriculated with the right of thesis defence. By Protocol No. 7/21.05.2024 of a meeting of the Departmental Council of the Department of Statistics and Applied Mathematics was decided to open the procedure for the defence of the dissertation thesis.

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3. General presentation of the dissertation
3.1. Volume and structure

The dissertation is developed according the requirements of Art. 27, para. 2 of the Regulations for the Implementation of the Act on the Development of the Academic Staff of the Republic of Bulgaria. It is written in a classical form and contains a preface, three chapters, a conclusion, a list of references and appendices. The volume of the dissertation amounts to 236 pages, including 50 pages of appendices. The main text includes 9 tables and 32 figures. For the purposes of the research, doctoral student Julieta Mihaylova used 102 literature sources, of which 30 in Cyrillic and 72 in English. There are no grounds for doubts about their fair use.

3.2. Relevance of the topic

The relevance of the dissertation topic is unquestionable and is determined by the need of companies to adapt to the dynamic changes in the environment, to allocate optimally the available resources and to satisfy to the maximum extent the needs of their customers. The implementation of such a complex task requires the application of various economic-mathematical methods, which is of interest both from the perspective of scientific theory and business practice.

3.3. Object, subject, purpose and objectives

The object and subject of the dissertation are correctly identified, which contributes to the successful argumentation of the formulated thesis. On this basis, the purpose of the dissertation is also formulated, namely "to develop and test models for optimization of the planning process based on the analysis of the current state and development of the supply and transport activities of Malvis Trade Ltd". In order to fulfil this purpose, three main tasks are set in the paper. They are solved by using different research methods. SWOT-analysis is used to present the strengths and weaknesses of the company, and potential opportunities and threats are analyzed through it. Optimization in supply planning is done by using uncertain demand modelling methods. Elements of graph theory and linear optimization methods are used to optimize the company's transportation activities. Data analysis is performed using the R programming language and the built-in MS Excel functions.

4. Assessment of the dissertation content

The dissertation is a comprehensive study in which the doctoral candidate shows in-depth theoretical knowledge and skills to systematize, analyze and summarize theoretical and empirical data.

The preface clearly outlines the conceptual framework and relevance of the thesis.

The first chapter "Theoretical and methodological foundations of the movement of material flows" reviews the nature and characteristics of supply chains and material flows as their element. A characterization of the activities of

commercial enterprises is made, as well as the importance of transport activities for their operation. The main factors influencing them are analysed.

In the second chapter "Supply modelling under uncertain demand" the basic methods for modeling the movement of goods under random consumer demand are discussed. Different optimization models are presented and analyzed and based on them an appropriate methodology for modeling supply under random consumer demand is developed and applied, taking into account the type of inventory and its shelf life. To verify the developed methodology, real data on the activities of the studied trading company for the period 2017-2023 are used. The results and the analyses of the conducted research are presented and based on them specific conclusions and recommendations are formulated

In the third chapter "Modelling and planning of transport routes" some of the existing methods that can be applied for modelling transport routes are presented. Special attention is given to the application of graph theory for representing a transportation network and generating possible routes. Based on the presented models, a methodology for modelling transport routes is developed and applied. The developed methodology is applied to optimise the transport routes for a specific date. The results and the analyses of the conducted research are presented and based on them specific conclusions and recommendations are formulated. The conclusion of the dissertation confirms the main thesis.

The presented Abstract of the dissertation contains 34 pages and reflects in a synthesized form the content of the main parts of the thesis.

The dissertation development style is scientific, the author handles the conceptual apparatus freely. The thesis has a logical structure and the requirements for a comprehensive development of the research problem are met.

5.   Identification and evaluation of the scientific and applied contributions in the dissertation

In the reference of contributions in the Abstract (p.33) the PhD student has listed five contributions that accurately reflect the achievements made.

The following are defined as theoretical contributions:

• Based on in-depth research and analysis, the nature of the supply chain, material flows and their management are complemented and clarified.

• The possibilities of economic-mathematical models and methods for the optimal management of material flows in the supply chain are presented.

The following are defined as practical contributions:

• Economic-mathematical models are developed to help in the optimization of the planning of the supply of goods and in the design of the used distribution routes.

• Appropriate methods and algorithms are proposed to find optimal solutions of the proposed economic-mathematical models.

- The applied aspects of the optimizations made are presented through an analysis of the activities of Malvis Trade Ltd.

I consider that the above contributions are an expression of the potential of PhD student Julieta Mihaylova to conduct independent scientific research and to correctly interpret the results obtained.

6. Publications and participation in scientific forums

Supporting her research and as an expression of publicity of her ideas, PhD student Julieta Mihaylova has pointed out three independent publications - one article and two reports. The minimum national requirements for the award of the PhD degree according to Art. 2b, para. 2 and para. 3 of the Act on the Development of the Academic Staff of the Republic of Bulgaria and the quantative requirements under Art. 35, para. 1, items 1-4 of the Regulations for Promotion of Academic Staff at the University of Economics - Varna are fulfilled.

7. Detected/not detected plagiarism in the dissertation and the abstract

I find no plagiarism in the dissertation and Abstract submitted by the PhD student.

8. Critical remarks and recommendations

I have no substantive comments on the presented dissertation. I recommend Julieta Mihaylova to continue working on current practical and applied problems of business using methods of economic-mathematical modeling.

9. Questions for the doctoral candidate

The thesis proposes a model for replenishment of stocks based on historical consumption data. How is replenishment done for new products that are not previously sold?

10. Conclusion

PhD student Julieta Deyanova Mihaylova has the necessary professional qualifications as well as proven competence. The dissertation submitted by her meets the requirements of the Act on the Development of the Academic Staff of the Republic of Bulgaria, the Regulations for the Implementation of the Act on the Development of the Academic Staff of the Republic of Bulgaria and Regulations for Promotion of Academic Staff at the University of Economics - Varna.

Taking the above into account, I provide a positive assessment of the presented work of Juliet Deyanova Mihaylova and recommend to the members of the respected Scientific Jury to award her the educational and scientific

degree "PhD" in higher education area 3. Social, economic and legal sciences, professional field 3.8 Economics, scientific specialty "Optimal Management of Economic Systems".

Reviewer:

Заличена информация съгласно ЗЗЛД и регламент (ЕС) 2016/ 679

/Professor Svetlana Dimitrakieva, PhD/

17.07.2024 г.
Varna