

DOI: 10.55643/fcaptp.4.57.2024.4467

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Received: 20/06/2024

Accepted: 12/08/2024

Published: 31/08/2024

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METHODOLOGICAL APPROACH TO THE ASSESSMENT OF INTERNATIONAL LOGISTICS MANAGEMENT IN RECREATIONAL ENTERPRISES: THE IMPACT OF RISKS ON FINANCIAL SECURITY

ABSTRACT

In the article, we present a methodological approach to evaluating international logistics management in the context of ensuring financial security through the development of an appropriate model for assessing indicators and risks that influence it. The research focuses on enterprises in the recreational sector. Structural-logical analysis methods were applied for modelling and graphical methods for their visualization. The fundamental method was the technique of evaluation using fuzzy sets. In this context, the MATLAB system served as the basis for more effective modelling. The article demonstrates that the evaluation of international management begins with the analysis of key performance indicators and risks. As a result of the research, a methodological approach to evaluating the effectiveness of international logistics management in the recreational sphere was formed. The main goal of such management is efficient planning and execution of logistics operations, which ensure continuity and high quality of recreational services at an international level, cost optimization, and increased customer satisfaction. However, to achieve this, it is necessary to properly assess risks and key indicators in the context of ensuring an adequate level of financial security. The proposed approach to evaluation focuses on identifying logistics risks, providing a comprehensive understanding of the problems and opportunities in the context of enhancing financial security. Looking ahead, it is necessary to more closely consider the possibility of practical application for specifically selected enterprises in the recreational sphere and to evaluate not only risks but also threats to financial security.

Keywords: financial security, innovation, methodological approach, international management, logistics, recreational sphere, logistic risks

JEL Classification: L83, F30, C50

INTRODUCTION

It should be noted that the level of development of the Ukrainian economy requires the formation of new approaches to increasing the efficiency of managing the logistics operations of enterprises, maintaining their competitiveness, financial security, and operational effectiveness taking into account the set goals. In today's globalized world, where supply chains span several countries, enterprise logistics management cannot be imagined without an international component. It should be noted that today, the benchmarks in safety have significantly changed, and when it comes to ensuring financial security, the task is not only to prevent the negative impact of various threats but also to evaluate and change one's own management system. It should be mentioned that the so-called "Service Revolution," which occurred in the last third of the previous century, and the rapid development of international tourism have brought increased attention to recreational activities and their detailed theoretical-methodological development. In most studies, the functional-territorial structure and the management of business operations in the recreational sector occupy an important place. Thus, the recreational complex ties the concentration of recreational enterprises directly to the natural, socio-

economic, historical-geographical, financial, logistical, and ecological conditions and resources of the territory. Enterprises in the recreational sphere significantly depend on logistics, including the transportation of goods and products from one country to another.

In modern conditions, it is impossible to imagine the operation of any recreational enterprise without a well-established communication network. In turn, a comprehensive approach to the logistical cycle of the recreational product requires the development of an effective information logistics subsystem. Due to the lack of a well-established logistical information system in the regions of Ukraine, the promotion of regional recreational products primarily occurs in a disintegrated communicative environment. It should be understood that in recent years, international management has become increasingly developed and popular. As a result, competition in this economic sector is intensifying, necessitating the management of tourist flows on an international level as well as at the levels of individual states and recreational enterprises. This requires the application of new approaches and methods in recreational sectors, which are provided by the logistics system.

A systematic understanding of recreation as a type of activity suggests that recreational activity is a collective concept that includes several related directions: leisure, health improvement, restoration of physical and moral (spiritual) forces of the personality. The main criteria for classifying enterprises as recreational activities are the creation, sale, and provision of recreational services with the presence of basic means in the form of recreational resources that have a targeted use. Based on this, recreational activity includes tourism, sanatorium-resort, therapeutic and health improvement, sports and health improvement, and cultural-educational and entertainment activities. The so-called financial essence of recreational activity lies in creating a socially useful product (recreational service) and ensuring economic results (profits from sales, job creation), which distinguishes it as a special, socially and ecologically oriented type of economic activity. At the same time, all this can and will bring the corresponding financial profit, but logistics also plays a significant role. Among the financial functions are identified: production (creation of a new product and promotion of value accumulation); ensuring population employment growth (the recreational sector is highly personalized); creating income; smoothing or levelling (recreational enterprises promote economic development in industrially weak regions or countries); balancing the payment and currency balance (expenses of those who have left are offset by expenses of those who have entered); and performing continuous logistical operations. For this purpose, it is important for recreational enterprises to attract financial and investment resources, prepare innovative staff, enhance the level of service, and expand advertising and virtual sales of services. Without this, achieving global standards in recreational services, ensuring demand for services, and expanding their market are quite problematic. These circumstances, related to the action of internal and external factors, will determine the strategic orientations for the development of recreational activities. It is also necessary to consider the objective risks and challenges, taking into account which will allow any programs and projects with proper financing to be competitive.

It should be noted that differences in various types of recreation leave an imprint on the forms of managing logistical processes. In this regard, international management of logistical operations causes a lot of difficulties, as it mostly involves individual servicing, which requires constant evaluation. In recreational areas, there is a constant need for new and new goods to satisfy the specific needs of clients. At the same time, it is well known that one of the means of attracting recreants is innovation. For their development, it is necessary to conduct "brainstorming," business games, and other educational and creatively stimulating activities. It is advisable to make changes in the service technology at least once every six months, which must necessarily be reflected in the advertising. But along with this, to retain a client, it is necessary to offer special services and goods, the delivery and transportation of which is always an extremely complex management process. Recreational logistics is formed at the junction of traditional and service logistics. Principles of traditional logistics, based on the integration paradigm, are applied in the formation of the recreational product, and service - in managing the flows of recreants. Recreant flows can have both short-term and long-term nature. The latter include flows of tourists and vacationers at sanatoriums. The complexity of managing tourist flows is determined by their activity as a possibility of counteracting the general trend. The health status of individuals undergoing sanatorium-resort treatment determines their potential dissatisfaction with staff attitude and quality of service, which creates difficulties in managing the corresponding flows of recreants. The complexity of the recreational product, which includes catering and accommodation services, as well as cultural entertainment (including excursion), sports and health improvement, and medical services, determines the diversity of parameters of recreational flows when receiving different types of services. The use of accompanying services by recreants has several differences compared to "autonomous consumers," determined by the main purpose of their travel.

This requires knowledge of international trade regulations, transport laws, customs procedures and other aspects related to cross-border transport. Recreational businesses often use goods and services from around the world. At the same time, throughout history, the world has witnessed natural disasters that have affected security, businesses and society with varying degrees of destruction. COVID-19/SARS-CoV-2 in 2020 was a major systemic shock and a reminder of the sensitivity of business economic systems. The pandemic has had a significant impact on economic development, in particular

on the functioning and efficiency of enterprise logistics. Further, the implementation of martial law in 2022 changed the very paradigm of ensuring financial security.

In our opinion, logistics as an area of specific scientific knowledge has emerged relatively recently and is developing intensively. Its impact on ensuring financial security is significant, especially considering how many indicators, such as return on assets and inventories, depend on logistics activities. We would like to note that the need to study the problems posed is dictated by the lack in the scientific literature of a complete reflection of a sufficiently developed logistics management methodology to ensure an adequate level of financial security. It should also be understood that logistics is a significant cost item for recreational enterprises. Effective logistics management can help reduce these costs and help improve financial security.

LITERATURE REVIEW

Scientific and practical literature today is very actively analyzing the issues of management and ensuring financial security. For example, Marych et al. (2020) note that without a management system, an acceptable level of financial security is not possible. It is worth agreeing with this and adding that in the context of logistics, this concerns international management more.

Drobyazko et al. (2020) examine the integration of risk management in the financial stability frameworks of service enterprises. In this context, it is necessary not only to evaluate indicators that directly affect the management and provision of financial security but also to properly assess comprehensive risks. The adoption and implementation of effective management decisions should be based on information obtained after assessing all possible risks (Aryati et al., 2023).

As noted by Kliuchenko, et al. (2021), any activity, including recreational ones, takes place within a specific territory. Therefore, it is important to identify the elements of the territorial structure of the recreational complex. A recreational site is a populated area where recreational enterprises that perform elementary recreational functions are located. Due to such geographical features, logistic operations are complicated in general and new risks arise. Regarding the risks and their impact on the financial security of the enterprise, the scientist also noted that ignoring these risks leads to a decrease in safety indicators. Risks and threats within the financial security management system must be constantly assessed. Logistics has always played a significant role in ensuring the financial security of recreational enterprises.

As rightly noted by Lee (2011), and Zhyvko, et.al. (2024) the financial-economic function of developing recreational enterprises primarily involves managing logistics and the workforce. Recreation increases work capacity and extends the working time fund, which contributes to increased productivity. Recreation also raises international interest in the region. All of this requires logistics. The financial-economic function also includes the expansion of labour application and the accelerated development of logistic infrastructure in areas of intensive recreational use of nature.

The opinion of Hryhorieva, et al. (2022) and Birol et al. (2009) is valid in that recreation has become a phenomenon that has entered into the daily lives of hundreds of millions of people. Recreation as a business includes tourism, which in turn consists of all the free movements of people away from their permanent residence and work; the production and service sectors created to meet the needs arising from these movements. Recreational enterprises are particularly significant in people's lives and modern societies. They have transformed into a meaningful form of using individuals' free time and a primary means of interpersonal, as well as political, economic, and cultural contacts, which have become necessary due to the internationalization of all sectors of nations' lives.

The potential for the development of the recreational sector is indeed significant. It is primarily associated with the cultural heritage left by previous generations, as well as the natural environment – the presence of seacoasts, areas with healing properties, and picturesque landscapes. Information on the logistics of the recreational sector plays a very important role in the international management system. Its purpose is to provide information to enhance the level of its own financial security. This task requires constant evaluation of the logistical system in the recreational sector (Nunes, (2013) and Faccioli, et al. (2014)).

Meanwhile, the issue of logistics remains relevant, as logistics management directly impacts the provision of financial security. For example, Cao et al. (2019) consider how optimizing logistics management can strengthen the security of the enterprise as a whole. Bensassi et al. (2015) explore the relationship between logistics infrastructure and trade, presenting evidence from Spanish regional exports. Their findings suggest that enhanced logistics infrastructure significantly boosts trade by improving supply chain efficiency and reducing transportation costs. In this context, the issue of security management plays a crucial role, as most indicators in logistics activities are of a financial and economic nature (Shtangret et

al., 2020). Bosak et al. (2023) aptly define how logistical potential influences the acceptance and implementation of management decisions in the context of ensuring the financial security of an enterprise. Zhyvko et al. (2021) emphasize the critical role of human capital management in the postmodern society, highlighting its importance for the economic safety of enterprises. We can highlight the most significant gaps in the literature today: the lack of an effective methodological approach to assessing international management systems, especially concerning recreational industry enterprises, a business that is not always extremely popular among scholars and practitioners who mainly consider enterprises within the scope of financial security, specifically industrial or tourist enterprises; gaps in the assessment of logistics risks when making and implementing management decisions, especially in the context of ensuring the financial security of the enterprise.

AIMS AND OBJECTIVES

In the article, we present a methodological approach to evaluating international logistics management in the context of ensuring financial security through the development of an appropriate model for assessing indicators and risks that influence it. The task is to evaluate the international logistics management of recreational enterprises through relevant indicators and risks.

METHODS

This simulation was carried out using MATLAB. The effectiveness of MATLAB is primarily due to its focus on matrix calculations with software emulation of parallel calculations and simplified loop task facilities. The latest versions of the system support 64-bit processors and multi-core processors, providing high computational speed and speed of mathematical simulation modelling. MATLAB successfully implements tools for working with multidimensional arrays, large and sparse matrices, and many data types. The system has gone through many years of development from a highly specialized matrix software module. The MATLAB system includes special fuzzy modelling tools that allow to perform the entire range of studies on the development and application of fuzzy models. At the stage of constructing a model for assessing the effectiveness of international logistics management of recreational enterprises, the structure of the MATLAB system (number of inputs and outputs) and the output algorithm are specified. The MATLAB graphical interface is presented as an example in Figure 1.

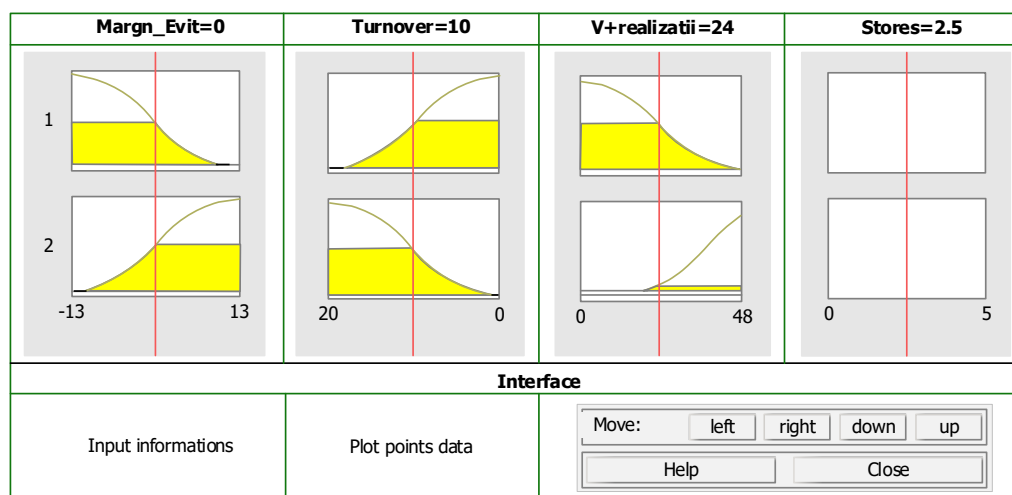


Figure 1. Graphical interface MATLAB.

Methodologies based on fuzzy sets make it possible to formalize quantities that have a qualitative basis, identify cause-and-effect relationships between regulated parameters, and formulate a fuzzy forecast under conditions of uncertainty in the forecast parameters. This is where the method of structural-logical analysis comes in handy. The method of structural-logical analysis is a scientific approach that is used to systematize, analyze and synthesize information by decomposing the object of study into its component elements and studying the logical connections between them. This method allows to gain a deeper understanding of the internal structure and logic of the functioning of various systems or processes. It is especially useful in complex studies where it is necessary to identify cause-and-effect relationships and key elements.

Since we use methods of economic and mathematical modelling, there must be an appropriate formulation of the problem. Consequently, we have a universal set (U), which should be key and cover all aspects of this task as such. In this case, there will also be a fuzzy subset F, and in this case, there is a membership function $\mu^F(U)$. In this case, F is achieved as follows (1):

$$F = \sum_{i=1}^n \mu F(U) / U_i \quad (1)$$

This is the membership function for the fuzzy set F. The membership function μ^F assigns a degree of belonging of each element in the universal set U to the fuzzy subset F. U_i : These are elements or subsets of the universal set U.

Moreover, the variables themselves can be both quantitative and qualitative. We denote the variables themselves as x_n . At the same time, according to the proposed methodology, the solution to the problem will involve the formation of a decision-making methodology through the fixed vector method for variables: $X^* = [x_1, x_2, x_3, \dots, x_n]$. So, to establish the dependence, we consider the variables as linguistic variables defined on universal sets. In this case, for evaluation, we will use qualitative terms: $A_i = [a_i^1, a_i^2, \dots, x_i^{k_i}]$. a_i is a linguistic term of variable x_i , $i=1, n$. It should be noted that the score corresponding to the smallest (largest) value of the input variable x_i is taken as a basis. The first stage of modelling will be the identification of the level of performance indicators for international management of logistics operations at recreational enterprises based on the selection of classifiers; this will already be presented in detail in the results of the article.

In the context of optimizing logistics operations management processes, a number of risks will also be assessed. In the context of ensuring the financial security of an enterprise, identifying risk factors and vulnerabilities is a priority task. Fuzzy systems will also be used here and will be based on expert analysis. The given linguistic variables are formed by the expert individually and are not required in wording or number. The number of variables and their formulation largely depend on the expert's competence and work experience.

RESULTS

To start, we will present a list of values G (these are subsets on a scale from 0 to 10) and subsets B, which will represent subsets depending on the level of indicators X_i (Table 1).

Table 1. G and B ranking.				
G1	G2	G3	G4	G5
Insignificant	Low	Average	High	Very high
0-1.5	1.5-3.5	3.5-6.5	6.5-8.5	8.5-10
B1	B2	B3	B4	B5
The indicator X_i shows a very high level	The indicator X_i shows a high level	The indicator X_i shows a medium level	The indicator X_i shows a low level	The indicator X_i shows a very low level

Thus, we will have 5 indicators, each with equal significance (1/5). Now, we will present the actual values of the indicators of the effectiveness of international logistics management in the context of ensuring the financial security of recreational enterprises (Figure 2).

It should be noted that the analysis of the indicators presented in Figure 2 covers data for the last 5 years, taking into account such powerful crises as the COVID-19 pandemic and martial law in Ukraine. Thus, as we see, it is for the period of 2022 and 2023 that there is a significant decrease in indicators. Consequently, in the future, when modelling, we will see the lowest results for these years.

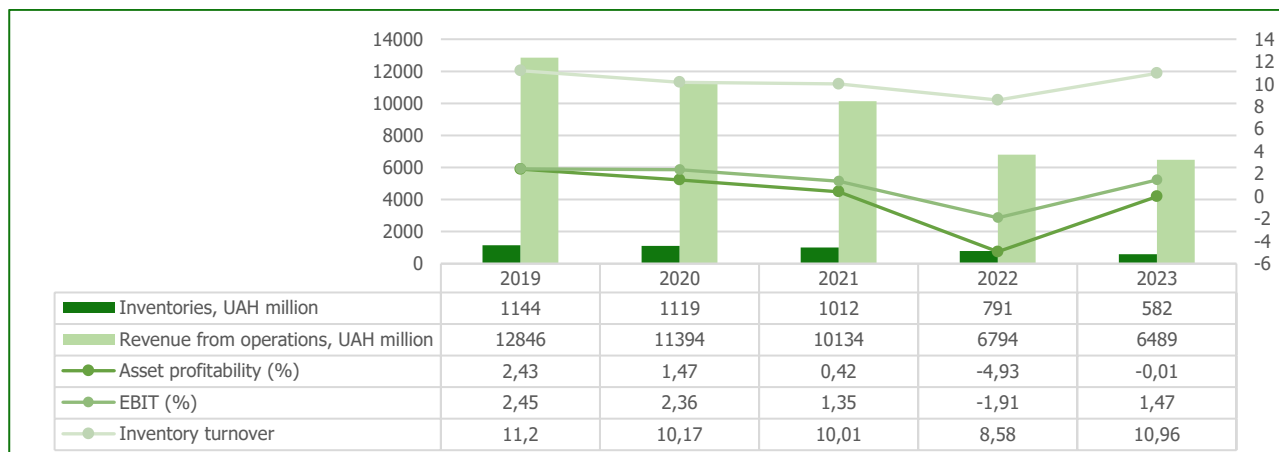


Figure 2. Actual values of the effectiveness indicators of international logistics management in the context of ensuring the financial security of recreational enterprises for the period 2019-2023. (Source: State Statistics Service of Ukraine (2023))

It should be noted that each indicator from Figure 2 is assigned a corresponding index x_n , and based on the collection of such indices, a matrix is constructed. Now, accordingly, asset profitability – x_1 , EBIT (Earnings Before Interest and Taxes - it is a measure of a firm's profitability that excludes interest and income tax expenses) – x_2 , inventory turnover – x_3 , revenue from operations – x_4 , inventories – x_5 . As a result of transforming the indicators in the MATLAB program, we obtained the following (2):

Years	x_1	x_2	x_3	x_4	x_5
2019	2,4	2,5	11	12,9	1,1
2020	1,5	2,4	10	11,4	1,2
2021	0,4	1,4	10	10,1	1
2022	-5	-1,9	8,6	6,8	0,8
2023	-0,01	1,5	11	6,5	0,6

(2)

According to the constructed matrix (2), linguistic identification suggests that international management of logistics operations is at an average level, as MATLAB yielded G3 according to Table 1. The results of the modelling can be visualized through fuzzy output surfaces (Figure 3).

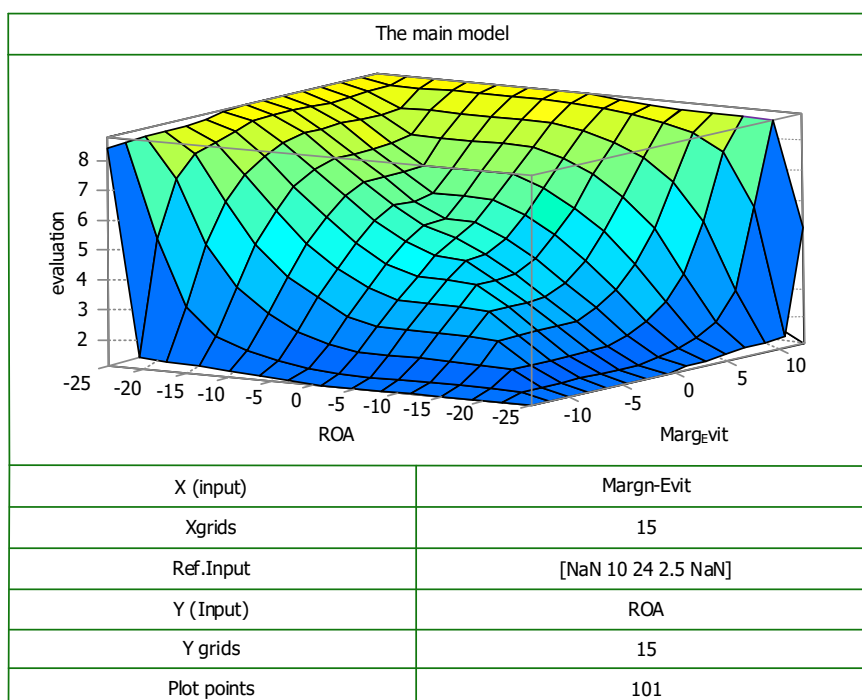


Figure 3. Visualization of the model according to the given variables.

The presented approach demonstrates that according to the proposed model based on fuzzy logic, it is possible to seek new optimal management decisions in the context of ensuring the financial security of an enterprise in the recreational sector. Each specific situation is unique, with its own features and characteristics, but they have certain parameters or indicators that can reveal their effectiveness or, conversely, decline. By evaluating and using the modelling method, it is possible to better visualize problems in key indicators and carry out appropriate strategic planning and the development of a comprehensive system of logistics control in the context of ensuring financial security. In the context of enhancing management aspects, the yellow colour in this model, appearing towards the peak of the surface, signifies areas of higher evaluation or output based on the input variables along the x and y axes. This visualization can aid in understanding how to make informed decisions. Conversely, the blue colour tends to represent lower values, indicating areas that might require more attention or different strategies to improve management outcomes.

But besides all the above, it is important to assess the logistical risks themselves. Thanks to the features of the software presented above, the evaluation will take place under similar program parameters. Three groups of risks: risks associated with the material flow (Risks associated with unforeseen delays or interruptions in the delivery of materials; Changes in the political environment of countries that can affect material supply; Natural disasters can cause significant disruptions in transportation and supply); risks associated with the financial flow (changes in exchange rates can affect the cost and profitability of international transactions; the risk that a counterparty will not fulfil its financial obligations; the threat that inflation could reduce the value of financial flows); risks associated with information flow (risk of losing critical logistical data due to transmission errors or system failures; attacks on IT infrastructure that can lead to theft or alteration of critical information; discrepancies in data among partners can cause delays and financial losses). A total of 3 risks from each group. Regarding risks, to form a rule base for assessing logistics risks when making management decisions, we also have corresponding input and output variables. We will consider the following as inputs: the efficiency of the logistics management system; financial security; the complexity of the international management system. The fuzzy variables will be defined in terms: low, medium, and high. Of course, we give them corresponding designations: R1 - the risk is considered insignificant in the context of financial security (from 0 to 1.5); R2 - the risk is considered low in the context of financial security (from 1.5 to 3.5); R3 - the risk is considered medium in the context of financial security (from 3.5 to 6); R4 - the risk is considered high in the context of financial security (from 6 to 8); R5 - the risk is considered very high in the context of financial security (from 9 to 10).

Subsequently, we will evaluate the system's performance considering the input parameters set by experts. We will obtain the corresponding membership function and visualization of the fuzzy output model for these risks (Figure 4).

In the visualization of the fuzzy inference surface of the logistic risk model shown in the image, the colours on the surface represent different levels of logistic risk based on the input variables of complexity and effect. The yellow colour, often appearing towards the peaks or higher areas of the surface, signifies areas of higher logistic risk. It indicates a higher output from the model. Also, we have blue colour as a main. This colour represents lower output values from the model, implying that the logistic risks are minimal under these specific conditions of complexity and effect.

The values of the input variables can be set either in the "input" field or by dragging the lines on the diagram. This depends on the financial security entity that will use this modelling method. In our opinion, the proposed approach will contribute to the automation of logistics administration functions: development/adaptation and implementation of information systems for ensuring financial security. At the same time, the approach systematizes fragmented methodologies and uses key indicators for a deeper analysis of logistics processes. This allows for predicting and forecasting problem areas, optimizing logistics chains, and improving the overall level of financial security.

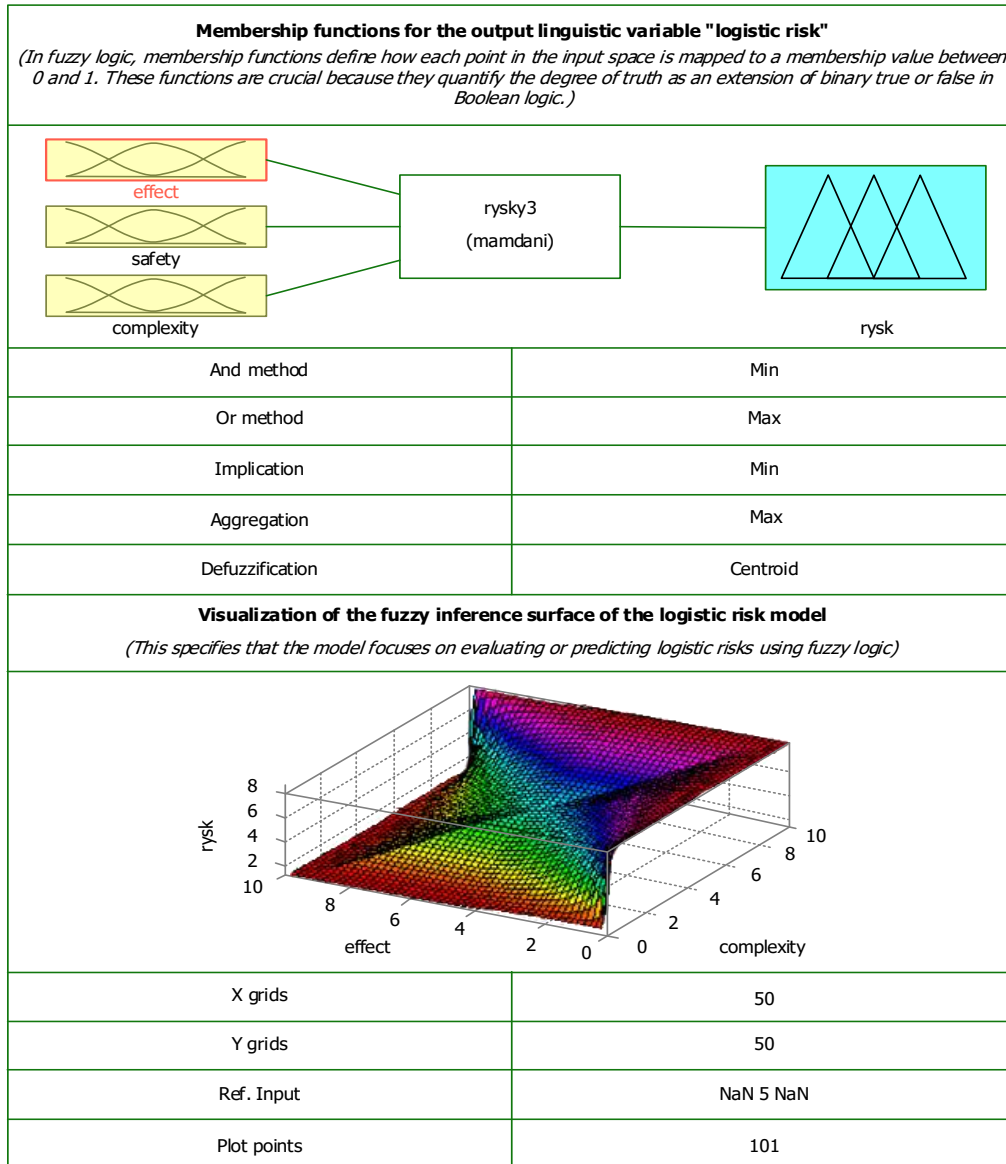


Figure 4. A model of logistic risk assessment.

DISCUSSION

When discussing the results we obtained, it is important to note that there are other contributions to solving this problem. However, covering all possible works would be an extremely cumbersome task. We will highlight and compare our results with some recent studies. Meanwhile, the results of Gusiev et al. (2023) show that there is a direct link between logistics management and security indicators. Their approach clearly demonstrates how the assessment of logistics management performance indicators can decrease or increase the level of sustainable security development. Kurcharcikova and Miciak (2017) examine human capital management within transport enterprises, emphasizing sustainability. Our research extends these themes by illustrating how efficient logistics management, through methodical risk and performance indicator assessments, contributes to sustainability in terms of financial security and service continuity.

It should also be noted that Cheng (2022) has very effectively demonstrated how risks should be assessed in the management system and highlighted the most influential factors on financial security. However, our research introduces new variables for evaluation, which are presented in matrix form (Xn), bringing new additional parameters for the development of this issue.

Principal characteristics and variations in our research findings: a methodological approach to the identification and assessment of logistical risks when making and implementing management decisions; construction of an appropriate model

for assessing the effectiveness of international logistics management; assessment of indicators that directly affect financial security.

Thus, we have a number of characteristic differences and elements of novelty in our research, which reflect the essence and significance of our article.

CONCLUSIONS

To summarize, it should be noted that a modern model for assessing the effectiveness of international logistics management was presented, which involves systematizing various methodological approaches taking into account the most significant indicators and risks in the context of logistics and financial security. Risks were assessed in the context of obtaining information for making effective management decisions. At the same time, the approach is implemented through MATLAB, which is accessible and easy to use in practice for financial security subjects.

In our opinion, international logistics management for recreational enterprises includes an integrated approach to coordinating and optimizing all processes associated with the movement of goods, services and information between countries to support recreational and entertainment activities. A number of risks and indicators characterize this process and opportunities for increasing financial security in general. A detailed theoretical justification, a literature review and the presented own results made it possible to prove that the assessment of the effectiveness of international logistics management should be based on a number of financial indicators and risk assessment, which are becoming increasingly important due to the high degree of uncertainty and hyperdynamic external environment.

In the future, it is necessary to more carefully consider the possibilities of practical application in actually operating enterprises and take into account such factors as the failure system and technologies based on artificial intelligence, which can directly influence the adoption and implementation of management decisions today.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

FUNDING

The Authors received no funding for this research.

CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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МЕТОДИЧНИЙ ПІДХІД ДО ОЦІНЮВАННЯ МІЖНАРОДНОГО ЛОГІСТИЧНОГО МЕНЕДЖМЕНТУ ПІДПРИЄМСТВ РЕКРЕАЦІЙНОЇ СФЕРИ: ВПЛИВ РИЗИКІВ НА ФІНАНСОВУ БЕЗПЕКУ

У статті представлено методологічний підхід до оцінювання міжнародного управління логістикою підприємств у контексті забезпечення їхньої фінансової безпеки через побудову відповідної моделі оцінки показників і ризиків, що на це впливають. Об'єктом дослідження є підприємства рекреаційної сфери. Застосовано методи структурно-логічного аналізу для проведення моделювання й графічний метод для їх візуалізації. Основоположим методом стала методика оцінювання за непарними множинами. При цьому система MATLAB слугувала базисом для більш результативного моделювання. Доведено, що оцінювання міжнародного управління починається з аналізу ключових показників діяльності й ризиків. У результаті проведеного дослідження було сформовано методологічний підхід до оцінювання ефективності міжнародного управління логістикою підприємств рекреаційної сфери. Головною ціллю такого управління є ефективне планування та виконання логістичних операцій, що забезпечують безперервність і високу якість рекреаційних послуг на міжнародному рівні, оптимізацію витрат і збільшення задоволення клієнтів. Але для цього необхідно правильно оцінювати ризики й ключові показники в контексті забезпечення належного рівня фінансової безпеки. Запропонований підхід до оцінювання орієнтується на ідентифікацію логістичних ризиків, що дає комплексне уявлення про проблеми й наявні можливості в контексті підвищення рівня фінансової безпеки.

У перспективі слід більш прицільно розглянути можливість практичного застосування для конкретно відібраних підприємств рекреаційної сфери й оцінювати не лише ризики, а й загрози фінансової безпеки.

Ключові слова: фінансова безпека, інновації, методологічний підхід, міжнародне управління, логістика, рекреаційна сфера, логістичні ризики

JEL Класифікація: L83, F30, C50