

T. Kulinich,
PhD in Economics, Associate Professor of the Department
of Management of Organizations, Lviv Polytechnic National University
ORCID ID: <https://orcid.org/0000-0003-0110-7080>
V. Malena,
graduate student of the Department of Management of Organizations,
Lviv Polytechnic National University
ORCID ID: <https://orcid.org/0009-0001-3384-0538>

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METHODS AND MODELS OF ENTERPRISE RISK MANAGEMENT

Т. В. Кулініч,
к. е. н., доцент кафедри менеджменту організацій, Національний університет "Львівська політехніка"
В. В. Малена,
аспірант кафедри менеджменту організацій, Національний університет "Львівська політехніка"

МЕТОДИ ТА МОДЕЛІ УПРАВЛІННЯ РИЗИКАМИ ПІДПРИЄМСТВА

Classical risk management is considered a systematic process of identifying, analyzing, assessing, controlling, and monitoring risks with the aim of ensuring the achievement of strategic goals and minimizing the impact of negative events. Despite the established clarity of content, the defined scope faces significant challenges in the selection of management methods and models directly linked to factors such as potential incompatibility of methods with strategy, insufficient resources, lack of stakeholder participation, and the inability to forecast. According to the above, the purpose of the article is to analyze existing methods and models for enterprise risk management. The research results demonstrate that the wide range of risks arising in the enterprise's activities requires the utilization of a significant number of risk management methods and models. Collectively, these methods and models should contribute to maximizing gains, achieving optimal result volatility, as well as attaining optimal probability and combining gains and risk magnitude optimally. It is noted that the pursuit of proper implementation of rules for utilizing enterprise risk management methods requires their proper identification. In particular, several groups of risk management methods have been highlighted, which can be effectively used in enterprises for their identification, analysis, and assessment. In particular, these include groups of methods such as integrated, quantitative, and methods for the general identification of internal strengths and weaknesses of the organization, its external opportunities, and threats. The outlined methods create a comprehensive methodological approach that allows enterprises to situationally form an understanding of the environment in which they operate. It is emphasized that the aspiration to implement rules for operating enterprise risk management models requires orientation towards several groups of risk management models. These models can be effectively utilized for their comprehensive identification, analysis, assessment, and control. These include statistical models for enterprise risk management, probability analysis models for enterprise risks, specialized models for enterprise risk analysis, stress testing models for assessing the impact of risks on enterprise activities, and systemic models for enterprise risk management. The comprehensive utilization of the mentioned models can assist enterprises in gaining a more complete and multifaceted perspective on risks. This can be particularly beneficial in the development of risk management strategies.

Управління ризиками розглядається як систематичний процес ідентифікації, аналізу, оцінки, контролю та моніторингу ризиків, орієнтованих на досягнення стратегічних цілей та мінімізацію впливу негативних подій. Незважаючи на усталений зміст, окреслена площа має значні проблеми з добору методів та моделей управління, що напряму пов'язане з такими факторами, як можлива несумісність методів із стратегією, недостатні ресурси, недостатня участь зацікавлених сторін та неспроможність прогнозування. Відповідно до вищенаведеного, метою статті є аналіз наявних методів та моделей управління ризиками підприємства. За результатами дослідження доведено, що широке коло ризиків, що виникають у діяльності підприємства, вимагає використання значної кількості методів та моделей управління ризиками. Ці методи та моделі у сукупності сприяють максимізації вигаду при оптимальній волатильності результату, а також досягненню оптимальної ймовірності результату та оптимальності поєднання вигаду і вели-

чини ризику. Констатовано, що прагнення до належної реалізації правил оперування методами управління ризиками підприємства потребує їх належної ідентифікації. Ми виділили декілька груп методів управління ризиками, які можуть ефективно використовуватися на підприємствах. Зокрема, до таких груп методів належать інтегровані, кількісні та загальної ідентифікації внутрішніх сильних і слабких сторін підприємства, її зовнішніх можливостей та загроз. Окреслені методи створюють комплексний методичний підхід, що дозволяє підприємствам ситуативно формувати розуміння середовища функціонування. Звернено увагу, що важливе орієнтування на декілька груп моделей управління ризиками на підприємствах для їх комплексної ідентифікації, аналізу, оцінки та керування. Зокрема це статистичні моделі управління ризиками, моделі ймовірного аналізу ризиків підприємства, спеціалізовані моделі аналізу ризиків підприємства, моделі стрес-тестування впливу ризиків на діяльність підприємства, системні моделі управління ризиками підприємства. Комплексне використання наведених моделей може допомогти підприємствам отримати різнобічний погляд на ризики, що може бути особливо корисним при розробці стратегій управління ризиками.

Key words: risk; insufficient resources; planning initiatives and investments; influencing factors.

Ключові слова: ризик; недостатні ресурси; планування ініціатив та інвестицій; фактори впливу.

TARGET SETTING

Classical risk management is considered a systematic process of identifying, analyzing, assessing, controlling, and monitoring risks to ensure the achievement of strategic goals and minimize the impact of adverse events. Despite the established clarity of its content, the delineated plane faces significant challenges in the selection of management methods and models directly linked to factors such as possible method-strategy mismatch, inadequate resources (as methods may require substantial financial, human, or technical resources), insufficient stakeholder involvement, and the inability to forecast (if some risks are difficult to predict considering their unpredictable consequences). To avoid these problems, it's crucial to conduct a comprehensive analysis of the organization's needs, considering its specific characteristics and the interaction of all stakeholders. It will enable the application of the most appropriate methods and models. Considering the outlined needs, effective risk management requires not only a systematic approach, flexibility, and continuous improvement of existing methods and models but also purposeful efforts and the development of strategies for enhancing actions and stages focused on the identification, analysis, assessment, control, and monitoring of risks. It is essential to ensure the achievement of strategic goals and minimize the impact of adverse events.

ANALYSIS OF RESEARCH AND PUBLICATIONS

The problems of risk and uncertainty in the activities of enterprises engaged in economic activities have been studied by such scholars as Semchuk Zh. V., Protsyat O. S., Skrynkovskyi R. M., Sysiuk S. V., Vitlinsky V. V., Velykovanenko H. I., and others. At the same time, the works of the mentioned scholars have considered general risks of entrepreneurial activities and approaches to risk classification. However, insufficient attention has been given to the methods and models that shape an effective risk management process in enterprise activities.

THE WORDING OF THE PURPOSES OF ARTICLE (PROBLEM)

The purpose of the article is to analyze the existing methods and models of enterprise risk management.

THE PAPER MAIN BODY WITH FULL REASONING OF ACADEMIC RESULTS

Methods and models of risk management constitute a flexible set of tools, approaches, and frameworks that are refined and utilized for the systematic management of risks in organizations. These methods and models assist in the identification, analysis, assessment, and control of risks, aiming to maximize opportunities and minimize the impact of adverse events across various areas of enterprise activities. The foundational elements of these approaches are systematically organized in Table 1. In addition to those defined in the table, a fairly broad range of risks can arise in the social aspects of the organization's activities, relationships with employees and society, information security, management of interactions with suppliers and partners, analysis of market trends and potential consumer demands, and project management.

Such a broad spectrum of risks arising in the enterprise's activities requires the utilization of a significant number of risk management methods and models. Collectively, these methods and models should contribute to maximizing gains, achieving optimal result volatility, as well as attaining optimal probability and combining gains and risk magnitude optimally (see Figure 1).

The proper implementation of rules for operating methods in enterprise risk management requires their proper identification. In particular, an analysis of the scientific literature [1; 3; 5] allows for the identification of several block groups of risk management methods that organizations can effectively use for their identification, analysis, and assessment:

1. Integrated management methods, namely those that can be used as constructs of a unified approach to managing thematic risks through integration with practices of systematic and integrated management of all types of organization risks

(including quality management methods, environmental management methods, safety and occupational health management methods, energy efficiency assurance methods, resilience management methods).

2. Quantitative methods for accurate assessment of the probability and impact of risks, allow for the determination of their specific numerical values. Among these are the Expected Monetary Value (EMV) method (which considers the probability of occurrence and its potential costs or benefits), the "Risk Triangle" method (estimating the probability of risk based on three data points: the least probable, the most probable, and the most possible value), the Monte Carlo method (risk modeling and probability determination of various scenarios by generating random numerical values), Bayesian analysis method (reassessing risk probabilities based on new information, combining initial forecasts and current data), the "Expected Number of Cases" method (forecasting the number of cases that may arise due to risks), the "Zonal Regression" method (analyzing the relationship between different variables and assessing the probability of risk occurrence), sensitivity analysis method (evaluating the impact of changing parameters on the final result and the probability of risk occurrence), and methods for forecasting the number of cases that may arise due to risks.

3. Methods for the general identification of internal strengths and weaknesses of the organization, its external opportunities, and threats, are used for developing risk management strategies and adapting to changes in their environment. These include PESTLE analysis, market segmentation, SWOT analysis, SNW analysis, and stakeholder analysis.

It should be noted that the outlined methods above form methodological blocks (or elements consisting of various algorithms, procedures, and tools) that interact, creating a comprehensive methodological approach to risk management. This approach allows for effective identification, analysis, assessment, and control of risks at all levels of the organization (see Figure 2).

The use of such a methodological approach to enterprise risk management allows organizations to:

1. Situationally form an understanding of their operational environment through active analysis, consideration of various factors, and the ability to forecast and manage risks.

2. Ensure high resilience to risks in changing conditions through systematic risk analysis, effective communication, and change management.

The desire for the proper implementation of rules for operating enterprise risk management models requires their proper identification.

Table 1. The main types of risks that correspond to all possible directions of enterprise activities

Field of activity	Potential risks
Strategic and operational planning, budgeting	Risk of incorrect identification of internal and external influencing factors, which may lead to formulating a strategy that overlooks key environmental aspects. Lack of broad participation and communication with key stakeholders can result in unsuccessful strategic decisions. Risk of insufficient or incorrect planning of initiatives and investments for organizational development.
Resource planning and asset management	Risk of determining the incorrect scope of resources, which may lead to insufficient support for the organization's activities. Risk of unpredictability or changes in demand for resources, which can result in disruptions in resource supply or excessive accumulation. Risk of complicated forecasting of resource needs due to external factors or market uncertainty.
Changes in organizational business processes related to technologies or management	Risk of personnel lacking sufficient expertise for the effective utilization of new technologies, leading to productivity losses. Risk of malfunctions, failures, or other technical issues that may result in operational disruptions and data loss. Risk of increased opportunities for cyber-attacks, data security breaches, or leakage of confidential information. Risk of exceeding the budget during the implementation of new technologies due to unexpected expenses.
Research and development	Risk that new technologies or products cannot be effectively developed or tested. Risk that research and development expenses may exceed initial estimates, leading to financial difficulties. Risk of encountering technical and organizational challenges that may result in project implementation delays.
Quality management of products and processes	Risk of defects in production, which can lead to unacceptable product quality and negatively impact the company's reputation. Risk of an insufficient quality control system, which may result in underestimating or failing to detect defects during production. Risk of production incompatibility with established standards and regulations, leading to issues with product legalization and potential fines.
Ecology and occupational safety	Risk of emissions of toxic substances that can negatively impact air quality and human health. Risk of injuries and accidents related to inadequate working conditions and insufficient compliance with safety standards.

Source: formed based on [1; 3; 5].

In particular, an analysis of the scientific literature [1; 3] allows for the identification of several groups of risk management models (based on the methods mentioned above) that can be effectively used in organizations for their comprehensive identification, analysis, assessment, and control, including:

1. Statistical models for enterprise risk management (based on mathematical methods and statistical data). According to their characteristics (see Figure 3), these models may include probability analysis, regression models, and other statistical methods for predicting possible risks.

2. Models for probability analysis of enterprise risks, which, according to their characteristics (Fig. 4), allow for the quantitative assessment of the probability

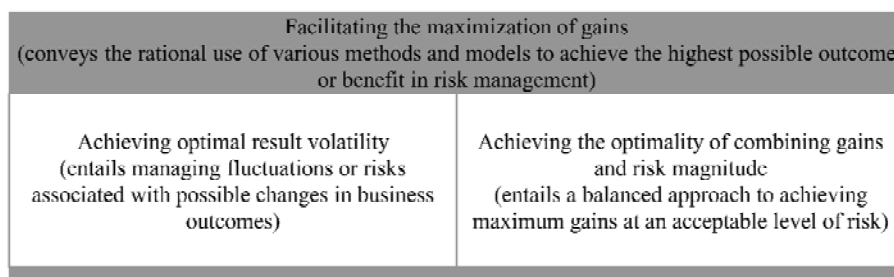


Figure 1. Operating rules for methods and models in enterprise risk management

Note
1 Optimal volatility refers to a balance between risk management and the opportunity to obtain benefits or returns.
Source: formed based on [1; 5].

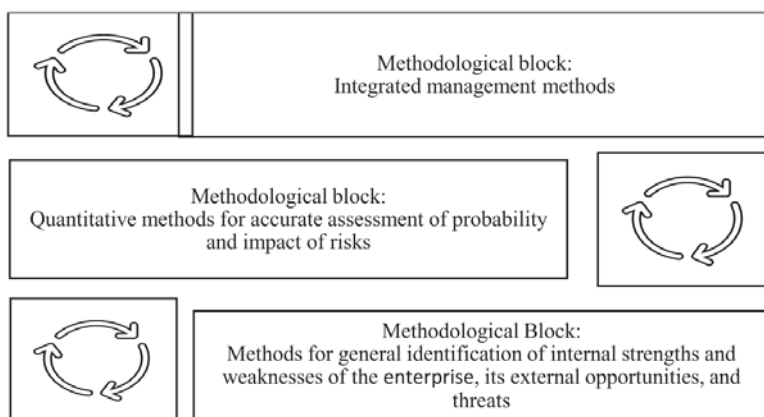


Figure 2. Methodological approach to enterprise risk management

Note:

* Methodological blocks define the main directions and strategies for risk management in the organization.

Source: formed based on [1; 3; 5]

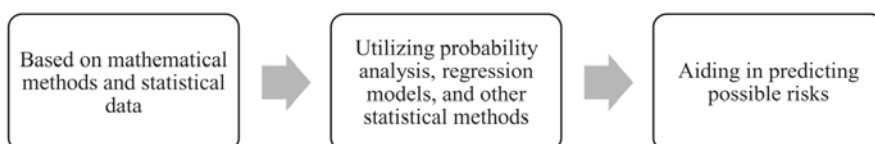


Figure 3. Features of statistical models for enterprise risk management

Source: formed based on [3].

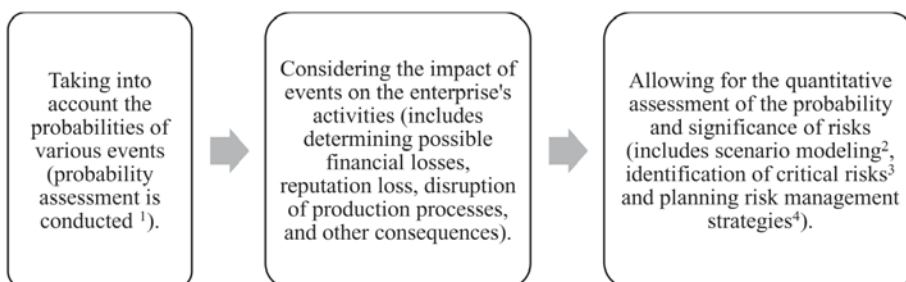


Figure 4. Features of enterprise risk probability analysis models

Note:

1 Probability analysis models allow determining the likelihood of specific risk events. Probability assessment may involve statistical analysis of past data, expert assessments, and other methods.

2 Probability analysis models can use scenario modeling to explore different situations and their impact on the enterprise. This helps develop risk management strategies and preparedness for various possible scenarios.

3 Models allow identifying and highlighting the most critical risks for the organization. This helps focus attention on aspects that may have the most significant impact on the business.

4 Evaluating the probability and impact of risk events allows for the development of effective risk management strategies, including the implementation of preventive measures and resource allocation.

Source: formed based on [1; 3; 5].

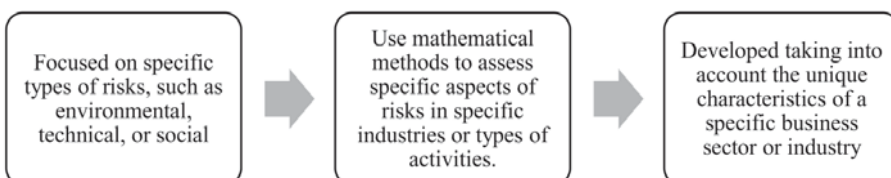


Figure 5. The features of specialized enterprise risk analysis models

Source: formed based on [4; 5].

of various events and their impact on the organization.

3. Specialized enterprise risk analysis models, according to their characteristics (see Figure 5), are based on mathematical methods and allow for assessments of specific types of risks that may be unique to certain industries or types of activities.

4. Stress-testing models of the impact of risks on business activities, in accordance with their inherent characteristics (see Figure 6), test the impact of rapid changes in factors on the financial condition of the organization. In particular, such models help determine how the organization responds to rapid and significant changes in various factors, such as economic indicators, interest rates, currency fluctuations, market and credit risks, etc.

5. System models of enterprise risk management, according to their characteristics (see Figure 7), consider risks as part of a larger system and the interaction between different components.

It's important to note that, according to the characteristics inherent in each type of model, their integrated use can help enterprises gain a more comprehensive and multifaceted view of risks. This can be particularly beneficial in the development of risk management strategies.

CONCLUSIONS FROM THIS STUDY AND PROSPECTS FOR FURTHER EXPLORATION IN THIS AREA

Within the research, it has been demonstrated that a broad spectrum of risks arising in the activities of an enterprise requires the application of a significant number of methods and models for risk management. In aggregate, these methods and models should contribute to maximizing gains, achieving optimal result volatility, as well as attaining optimal probability of outcomes and an optimal balance between gains and risks. The following conclusions have been drawn:

1. The pursuit of proper implementation of rules for operating with enterprise risk management methods requires their proper identification. In particular, we have identified several groups of risk

management methods that organizations can successfully use for their identification, analysis, and assessment, including: integrated management methods; quantitative methods for accurate assessment of probability and impact of risks; methods for general identification of internal strengths and weaknesses of the organization, its external opportunities, and threats. The outlined methods create a comprehensive methodological approach that allows enterprises to: situationally form an understanding of their operating environment through active analysis, consideration of various factors, and the ability to forecast and manage risks; ensure high resilience to risks in changing conditions through systematic risk analysis, effective communication, and change management.

2. The pursuit of proper implementation of rules for operating enterprise risk management models requires a focus on several groups of risk management models that can be effectively used for their comprehensive identification, analysis, assessment, and control within enterprises. Among these models are statistical models (based on mathematical methods and statistical data), probabilistic analysis of enterprise risks, specialized models, stress testing the impact of risks on enterprise activities, and systemic models. The comprehensive use of models can assist enterprises in gaining a more complete and diverse perspective on risks, which can be particularly beneficial in the development of risk management strategies

Given the aforementioned considerations, prospects for further research include expanding the arsenal of risk management methods to account for contemporary technological, economic, and socio-cultural changes, as well as the development of models that integrate various groups of methods for a more effective consideration of the complex risk environment in enterprise activities.

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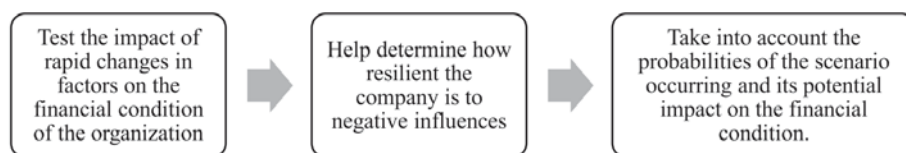


Figure 6. Features of stress testing models impact on the enterprise's activities

Source: formed based on [5; 6—7].

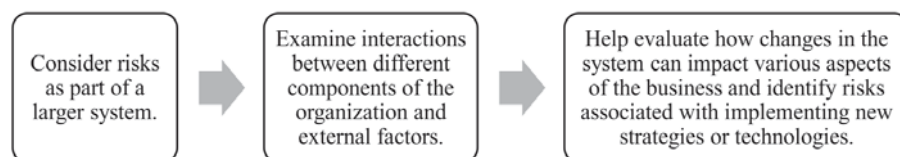


Figure 7. Characteristics of enterprise risk management system models

Source: formed based on [4; 5].

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