UDC 005.8:005.334

DOI https://doi.org/10.32782/1995-0519.2026.1.1.10

DERIVATIVE RISKS IN PROJECT MANAGEMENT: HOW EXTERNAL CHANGES TRANSFORM INTO INTERNAL THREATS AND OPPORTUNITIES

Vadym Ziuziun
Candidate of Technical Sciences, Associate Professor, Associate Professor at the Department of Management Technologies
Taras Shevchenko National University of Kyiv, 60 Volodymyrska str., Kyiv, Ukraine, 01033,
vadym.ziuziun@knu.ua
ORCID: 0000-0001-6566-8798

The purpose of this article is to adapt the concept of derivative risks to project management methodology, to elucidate the mechanism by which external changes transform into internal project threats and opportunities, and to substantiate a model of chain reactions aimed at enhancing project resilience. The relevance of this study stems from the fact that the contemporary project environment has evolved into an open structure subjected to constant pressure from macroeconomic, regulatory, and technological factors. Traditional risk management often overlooks the cascading nature of threats, focusing solely on direct impacts on the «project triangle».

The scientific novelty of the work lies in the introduction and justification of the concept of «project derivative risk», defined as a functional dependence on changes in the external environment. For the first time, project dynamics are proposed to be viewed as a system of chain reactions to external impulses. The dual-vector model has been further developed, enabling managers to identify not only destructive consequences but also «windows of opportunity» (derivative opportunities) that arise during periods of turbulence.

The research methodology is based on a systems approach and the mathematical formalization of cascading processes. The author proposes a formula for calculating the magnitude of derivative risk that accounts for the intensity of the external trigger, the linkage transmission coefficient, and the level of internal system vulnerability. For the practical implementation of the model, a parameter evaluation scale (ranging from low to high levels of determination) has been developed, enabling a transition from qualitative description to quantitative analysis of the «domino effect».

Research results. The article develops and presents a «transformation matrix» that systematizes typical external impulses (changes in regulatory frameworks, market volatility, logistical disruptions) and their internal consequences. It is demonstrated that effective management requires the implementation of a proactive algorithm consisting of four stages: horizon scanning, cascade analysis, response differentiation, and root-cause correction. Particular attention is given to industry specifics: risks in the IT sector are shown to concentrate around the technological context, while in social projects they cluster around stakeholder management.

Practical significance. The proposed toolkit enables project managers to anticipate cascading disruptions at the initiation stage and to develop response plans focused on addressing root causes rather than merely their consequences. This approach ensures the project's strategic stability and adaptability within an aggressive external environment.

Key words: derivative risks, risk management, project management, IT projects, strategic management and resilience, external trigger, cascading changes, chain processes, change and opportunity management, adaptability.

Introduction. The contemporary paradigm of project management is being shaped under conditions of unprecedented turbulence driven by global geopolitical transformations, financial market volatility, and exponential technological progress. The project environment has ceased to be a closed system with predictable parameters; instead, it has become an open structure subjected to constant pressure from macroeconomic and regulatory factors.

The traditional approach to project risk management, codified in international standards (such as the PMBOK Guide), is largely oriented toward identifying direct threats – events that have an immediate impact on the «project triangle» (time, cost, scope). However, in real-world conditions, most critical risks are not direct but cascading in nature. They arise as a result of the transformation of external impulses into internal destructive or stimulating processes.

The key problem lies in the absence of a systematic methodological framework for identifying and analyzing derivative risks. At present, project management exhibits a gap between external environmental monitoring and internal change management. When an external change occurs (for example, a shift in the interest rate, the introduction of new environmental standards, or logistical disruptions), it acts as a trigger that activates a chain reaction. This reaction generates new, previously unidentified events – derivative risks – which are often masked as operational problems, although they in fact have deep strategic roots.

Insufficient attention to the derivative nature of risks leads to a «domino effect», in which the project manager responds to consequences (internal threats) without understanding their functional connection to the original source (the external influence). This not only increases the probability of project failure but also nullifies the «windows of opportunity» that emerge alongside external changes. Consequently, there is an urgent need to develop models that would formalize the transition from an external impact to a specific derivative risk, thereby ensuring the project's strategic stability and adaptability in a dynamic environment.

Despite the existence of international standards (such as PMBOK), the mechanism of risk «cascading» remains insufficiently studied in project management. There is no clear methodology that would allow practitioners to forecast how a change in a specific external parameter (for example, the tax regime or technological stack) will transform into concrete derivative risks at the level of individual project work packages. The problem of identifying not only negative consequences but also «derivative opportunities», which are often overlooked due to a focus on loss minimization, also remains unresolved.

The purpose of the research. The purpose of this article is to adapt the concept of derivative risks to project management methodology, to elucidate the mechanism by which external changes transform into internal project threats and opportunities, and to substantiate a chain-reaction model for enhancing project resilience.

Analysis of recent research and publications. Fundamental aspects of strategic risk management in complex systems have been studied by many scholars. A significant contribution to the formation of theoretical foundations was made in [1], where the concept of a «derivative risk of impact development» was conceptualized. The author demonstrates that risk should be considered as a function of changes in the external environment – that is, as a derivative quantity of external factors. The proposed mathematical model describes the mechanisms by which business processes adapt to external triggers. At the same time, the specificity of project activity – namely its uniqueness and its constraints in time and resources – requires further clarification regarding the applicability of this concept specifically to project management.

Further development of the systems approach to risk is reflected in works [2–3], devoted to modeling environmental risks in project activities. These studies substantiate the need to integrate strategic analysis into a unified risk management system and examine the morphological characteristics and systemic interconnections that determine a project's resilience to external influences.

The issue of project complexity and the propagation of risks within projects is addressed in study [4], which proposes a two-level model: a descriptive factor model at the upper level and a graph-based model at the lower level. This approach makes it possible to identify critical dependencies among project elements and to forecast project behavior. Additionally, a method for clustering actors is proposed, forming groups of interrelated participants outside the formal hierarchy, thereby bringing the organizational structure closer to a network model and improving coordination in complex projects.

A substantial body of research focuses on risk analysis in specific industries. In particular, study [5] shows that large-scale infrastructure projects, due to their duration and complexity, are especially sensitive to external influences. The use of specialized planning systems such as Primavera P6, combined with construction management protocols, makes it possible not only to systematize threat identification but also to plan for unforeseen circumstances.

IT projects exhibit their own distinctive risk profiles. Study [6] presents a bibliometric analysis of contemporary scientific publications and dissertations, identifying twelve thematic clusters of risks associated with digital technologies, cybersecurity, analytics, outsourcing, and change management. Similar findings are reported in [7], which concludes that most IT project risks are concentrated in six key domains: organizational culture, schedule and cost, project environment, team, user or client, and technological context.

In international projects, the multidimensional nature of risks plays a crucial role. Study [8] proposes an integrated three-level management model encompassing political, economic, legal, cultural, and operational factors. Such integration of strategic, operational, and cultural levels enhances the effectiveness of international project implementation and reduces unforeseen costs.

A separate line of research concerns risk management practice. Study [9] emphasizes that the project manager effectively performs the functions of a risk manager, being responsible for the timely identification of and response to threats. Meanwhile, study [10] shows that a significant portion of risk management in practice is carried out through informal or implicit methods that are not always reflected in formal procedures but may prove more effective.

With the development of digital technologies, the role of intelligent risk analysis tools is increasing. Study [11] notes that the application of machine learning and predictive analytics enables the processing of large volumes of data and the identification of complex patterns, thereby supporting proactive forecasting and decision-making. However, the adoption of such technologies is constrained by human factors and stakeholder resistance.

International standards also play an important role in formalizing risk management. Study [12] demonstrates that effective management requires the integration of qualitative and quantitative methods in accordance with the recommendations of standards such as PMBOK [13] and ISO 31000:2018 [14]. The use of Big Data technologies and specialized information systems for risk assessment is also recognized as promising. A comparative analysis of standards presented in [15] indicates that ISO 31000 is the most universal and adaptable, whereas certain standards, such as NIST SP 800-53, are oriented toward specific domains, including cybersecurity.

Finally, a synthesis of best practices in risk management across different stages of the project life cycle is presented in [16], which reviews contemporary methods of risk identification, qualitative and quantitative assessment, and the influence of emerging technologies in this field.

Despite the substantial volume of research devoted to the identification, assessment, and management of risks in project activities, analysis of the scientific literature indicates insufficient attention to the mechanisms by which derivative risks arise as a result of the transformation of external influences into internal project processes. Most studies focus on risk classification, evaluation methods, standardized management procedures, or industry-specific characteristics, whereas issues such as the cascading propagation of risks, their functional relationship with primary external triggers, and the possibility of formalized forecasting of such chain reactions remain underexplored. In particular, there is a lack of comprehensive models capable of describing the transition from macro-environmental changes to specific internal threats or opportunities at the level of individual project elements. This necessitates further development of the theoretical and methodological foundations for the study of derivative risks in project management and substantiates the relevance of the chosen research direction.

Presentation of the main research material. The contemporary paradigm of project management requires a fundamental rethinking of the role of the external environment, which has evolved from a predictable backdrop into a dynamic source of cascading change. Traditional approaches embedded in PMBOK standards are primarily oriented toward identifying direct threats to the «project triangle» (time, cost, scope). However, real-world practice indicates that most critical risks are not direct but cascading in nature, arising as a result of the transformation of external impulses into internal destructive or stimulating processes.

Conceptualization and cascading mechanism. The contemporary paradigm of project management calls for a radical reassessment of the role of the external environment, which has shifted from a predictable background to a dynamic source of cascading change. Traditional approaches codified in PMBOK standards remain largely focused on identifying immediate threats to the «project triangle» (time, cost, scope). Yet practical experience demonstrates that the majority of critical risks are not direct but cascading, emerging from the transformation of external impulses into internal disruptive or enabling processes.

A central element of this study is the introduction of the concept of «project derivative risk». Unlike primary risks, a derivative risk is defined as a function of changes in the external environment – that is, as a derivative quantity of external factors. The emergence of such risks is described through a chain-reaction model, in which an external change (trigger) activates a sequence of internal disruptions. When an external event occurs – for example, a change in the interest rate or a logistics collapse – it acts as an impulse that converts external instability into internal threats to resources, schedules, and quality.

To move from qualitative description to quantitative analysis, derivative risk should be treated as a functional relationship. If the external trigger is defined as an impulse I_{ext}, then the state of an internal project element E_{int} after the impact can be described through a transformation coefficient:

$$R_{der} = \sum_{i=1}^{n} \left(I_{ext} \cdot K_{trans} \cdot V_{sens} \right), \qquad (1)$$

where R_{der} is the magnitude of the derivative risk; I_{ext} is the intensity of the external trigger (for example, a percentage change in the exchange rate or interest rate); K_{trans} is the transmission coefficient, which determines the degree of linkage between the external environment and a specific work package; and V_{sens} is the indicator of the internal vulnerability (sensitivity) of the project system to change.

For practical application of formula (1), the following parameter evaluation scale is proposed:

1. Transmission coefficient (K_{trans}), which determines the degree of linkage between the external environment and a project work package:

• 0,1–0,3 (low) → indirect influence, presence of buffers (e.g., stable inventories during logistical disruptions);

• 0,4–0,7 (medium) → direct dependence, requiring plan adjustments within a single sprint/phase;

• 0,8–1,0 (high) → strict determinacy (e.g., a legal change that renders the current technology non-compliant).

2. Internal vulnerability indicator (V_{sens}), which characterizes the project system's ability to absorb critical events (the «shock» state):

• below 0,5 (resilient system) → presence of time and financial buffers, as well as a cross-functional team;

• above 0,5 (critical sensitivity) → operating in a «just-in-time» mode, absence of financial reserves, narrow resource specialization.

This formalization allows the «domino effect» to be assessed not as a random occurrence, but as a systematic process of deviation propagation through the project's critical dependencies.

Analytical decomposition of risk transformation. A key theoretical feature of the proposed approach is the dual-vector model, which enables simultaneous assessment of both destructive and stimulating effects of external factors. External turbulence is often masked as operational problems, although it frequently has deep strategic roots. Neglecting this derivative nature leads to the «domino effect», where the project manager reacts only to consequences without understanding their functional connection to the original source.

To gain a deeper understanding of these transformation mechanisms and to identify entry points through which external threats penetrate the internal project structure, a specialized transformation matrix was developed. In the table below (Table 1), typical external impulses and their corresponding derivative project risks are systematized, allowing the manager to clearly trace the logic of internal changes depending on the nature of the root cause.

Industry-specific features and management tools. The study confirms that the cascading mechanism manifests differently depending on the project's industry. In large-scale infrastructure projects, due to their extended duration, derivative risks require the use of specialized information systems, such as Primavera P6, to model scenarios for unforeseen circumstances. In the IT sector, risks are primarily concentrated around the technological context, cybersecurity, and organizational culture, necessitating the use of intelligent analytical tools, including machine learning and Big Data.

The choice of a specific management method directly depends on the project's complexity and the required level of detail for cascading relationships. To compare the effectiveness of different approaches in the context of identifying derivative threats, an analysis was conducted, the results of which are presented in Table 2. This table highlights the advantages and limitations of each method, supporting a reasoned selection of tools depending on the project's objectives for adaptation to external turbulence.

Consider the following example illustrating the mechanisms of transformation, highlighting the specificity of derivative risks in socially significant projects:

1. Trigger source → political instability and shifts in donor priorities.

2. Entry point → stakeholder management [17].

3. Derivative risk → loss of reputation and suspension of funding, arising from a failure to timely adapt to societal demands.

Proactive response and strategic resilience. Effective management of derivative risks requires the development of proactive response plans focused on addressing root causes (external influences) rather than merely their internal consequences. This approach not only minimizes the likelihood of project failure but also enables the effective exploitation of «windows of opportunity» that arise from market turbulence.

Applying the proposed chain-reaction model provides project managers with tools to forecast the «domino effect» at the initiation stage, ensuring the project's adaptability and strategic stability in an open and aggressive environment.

Table 1

Transformation matrix of external impulses into derivative project risks

External trigger (Root cause)	**Derivative risk (Internal consequence)**	**Monitoring indicator (KPI)**	**Strategy according to the dual-vector model**
Change in regulatory framework (e.g., environmental standards)	Need for redesign, increased certification costs	Number of updates in the standards registry	Opportunity (early entry into eco-markets and gaining competitive advantage)
Financial market volatility (interest rate)	Liquidity deficit, change in cost of capital	Deviation of LIBOR/UIRD rate from planned >5%	Threat (budget revision, currency risk hedging)
Global logistics disruptions	Cascading delays, team idle time	Supply schedule deviations (Lead Time)	Opportunity (shift to local suppliers, inventory optimization)
Technological progress	Premature obsolescence of solutions before phase completion	Citation index of new technologies (Hype Cycle)	Opportunity (implementation of innovations through Agile requirement changes)

ISSN 1995-0519 (print), ISSN 2072-8263 (online)

Achieving strategic resilience requires the implementation of an algorithm based on the dual-vector model. Instead of the traditional approach of simply mitigating threats, the project manager should act according to the following scenario (Fig. 1).

Conclusions. The study confirms that under conditions of contemporary economic turbulence, traditional static approaches to risk management are losing their effectiveness, as they focus on direct threats and often ignore the complex nature of cascading change. The introduction of the concept of «project derivative risk» makes it possible to shift the management focus from passive responses to internal problems toward proactive monitoring of external root causes that act as triggers of chain reactions. The proposed mathematical model – based on the intensity of the external impulse, the transmission coefficient, and the level of the system's internal vulnerability – enables a transition from intuitive assessment to scientifically grounded forecasting of the «domino effect» within the project structure.

Of particular scientific significance is the dual-vector model, which demonstrates that external instability is not solely a source of destruction but also creates specific «windows of opportunity» for innovative development and strategic adaptation. The developed transformation matrix and step-by-step algorithm for project manager actions establish a practical foundation for identifying entry points through which external threats penetrate the project's internal structure – an issue especially relevant for dynamic sectors such as IT and large-scale infrastructure. Thus, the proposed toolkit not only makes it possible to halt the spread of cascading disruptions at early stages but also to transform external challenges into competitive advantages, ensuring the viability and strategic resilience of the project system within an open and aggressive environment.

Table 2

Comparative analysis of approaches to risk identification and assessment

Analysis method	Advantages in the context of derivative risks	Limitations	Standardization source
Qualitative and quantitative analysis	Allows prioritization of threats in accordance with international standards	May not account for complex nonlinear «cascading» relationships	PMBOK, ISO 31000
Machine learning and big data	Detection of hidden patterns and proactive forecasting	Constrained by human factors and stakeholder resistance	Contemporary scientific research
Graph-based modeling	Visualization of critical dependencies and system behavior forecasting	High complexity in model construction for large projects	Systems approach

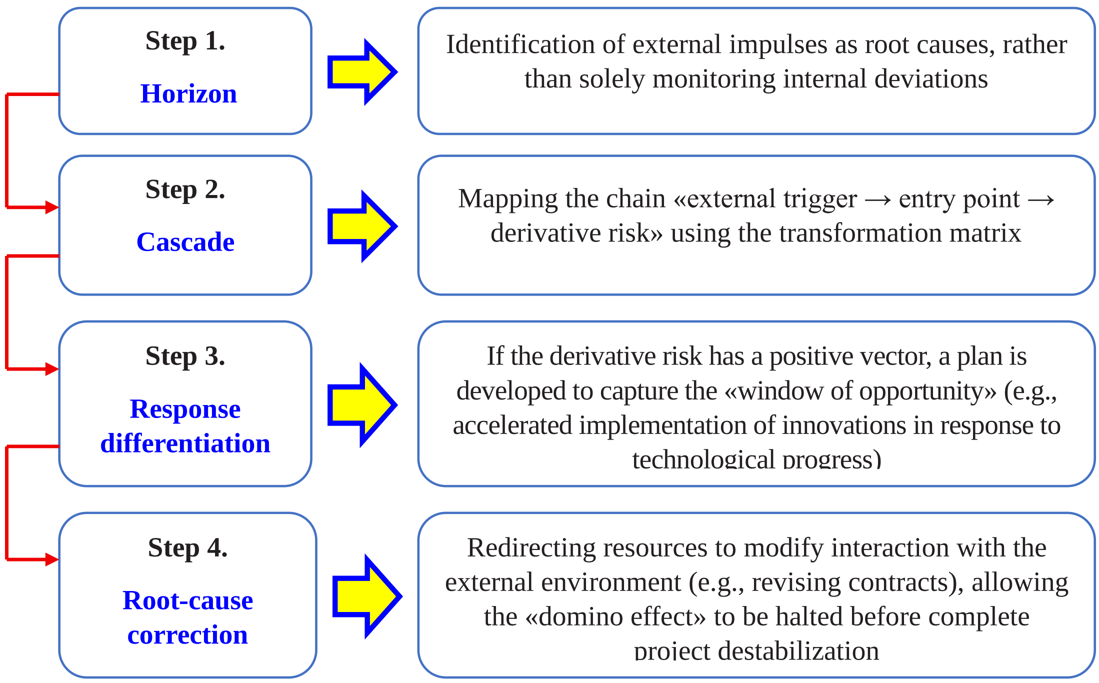

Fig. 1. Step-by-step action scenario for the project manager

REFERENCES

1. Ziuziun, V. (2024). Exploring the concept of derivative risks arising from external influences in the context of business operations and their strategic stability. Bulletin of the National Technical University «KhPI». *Series: Strategic management, portfolio, program and project management*, 2(9), 27-34. https://doi.org/10.20998/2413-3000.2024.9.4

2. Ziuziun, V. (2016). System model of environmental risk management in projects. *Bulletin of the National Transport University*, 2 (35), 84-92.

3. Ziuziun, V. (2017). Methods and models of environmental risk management in transport development projects. Authors' theses… Candidate of Technical Sciences. Kyiv: National Transport University.

4. Jaber, H. (2016). Modeling and analysis of propagation risks in complex projects : application to the development of new vehicles, URL: https://www.semanticscholar.org/paper/Modeling-and-analysis-of-propagation-risks-in-%3A-to-Jaber/d9ef7e0d8f070084c2944bc53b4ecd78256d75ff

5. Dayalan, D. (2026). Risk Assessment and Management in Large Scale Infrastructure Projects. *International Journal of Innovative Research in Engineering & Multidisciplinary Physical Sciences*, 2(9), 27-34. https://doi.org/10.20998/2413-3000.2024.9.4

6. Yasinetskyi, O., Fesenko, T. (2025). IT project risk management: an analytical review of research. *Bulletin of the National Technical University «KhPI». Series: Strategic management, portfolio, program and project managemen*t, 1(10), 47-57. Available at: https://doi.org/10.20998/2413-3000.2025.10.6

7. Bahaaudeen, A., Nazneen, A., Haque, R. (2025). Risk and sustainability in project management with special reference to the IT sector. *International Journal of Innovative Research and Scientific Studies*, 8(2), 4219–4231. https://doi.org/10.53894/ijirss.v8i2.6272

8. Maliukina, A. (2025). Risk management strategies in international business project management. *Sustainable Development of Economy*, 4(55). https://doi.org/10.32782/2308-1988/2025-55-90

9. Madauss, BJ. (2024). Project Risk Management. In: Project Management. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662-69057-4_19

10. Willumsen, P.L., Oehmen, J., & Selim, HMR. (2024). Project risk management in practice: the actuality of project risk management in organizations. *International Journal of Managing Projects in Business*, 17(4-5), 593–617. https://doi.org/10.1108/IJMPB-09-2023-0214

11. Mariam Saeed Abdulla Helal Al Kuwaiti. (2025). Sustainable Innovations and Project Risk Management. *International Journal for Multidisciplinary Research*, 7(5), P. 1-8. https://doi.org/10.36948/ijfmr.2025.v07i05.54364

12. Chykurkova1, A., Fedirets, O., Pokotylska, N., & Baranovska, O. (2025). Innovative approaches to risk identification and assessment in organizational project management. *Scientific notes of the University KROK*, 2(78), 225–237. https://doi.org/10.31732/2663-2209-2025-78-225-237

13. (2017). A Guide to the project management body of knowledge (PMBOK® Guide): Sixth Edition. Project Management Institute, 756 p.

14. ISO 31000:2018. (2018). Risk management – Guidelines. Switzerland, 16 p.

15. Maksymov, A. (2025). Analysis of risk management standards and their application in IT projects. *Management of Development of Complex Systems*, 61, P. 66–75, dx.doi.org\10.32347/2412-9933.2025.61.66-75.

16. Dong, X. (2024). Best Practices in Project Risk Management. *Transactions on Economics, Business and Management Research,* 11, 511-518. https://doi.org/10.62051/qkf9h233

17. Kubiavka, L., Zaremba, V., & Ziuziun, V. (2024). Application of Game Theory Methods to Optimize the Stakeholder Management Process. *2024 IEEE 4th International Conference on Smart Information Systems and Technologies (SIST)*, Astana, Kazakhstan, 647-651, https://doi.org/10.1109/SIST61555.2024.10629255

ПОХІДНІ РИЗИКИ В УПРАВЛІННІ ПРОЄКТАМИ: ЯК ЗОВНІШНІ ЗМІНИ ТРАНСФОРМУЮТЬСЯ У ВНУТРІШНІ ЗАГРОЗИ ТА МОЖЛИВОСТІ

Вадим Зюзюн

кандидат технічних наук, доцент, доцент кафедри технологій управління

Київський національний університет імені Тараса Шевченка, вул. Володимирська, 60, Київ, Україна, 01033, vadym.ziuziun@knu.ua

ORCID: 0000-0001-6566-8798

Метою статті є адаптація концепції похідних ризиків до методології управління проєктами, розкриття механізму трансформації зовнішніх змін у внутрішні проєктні загрози та можливості, а також обґрунтування моделі ланцюгових реакцій для підвищення стійкості проєктів. Актуальність дослідження зумовлена тим, що сучасне проєктне середовище перетворилося на відкриту структуру, яка перебуває під постійним тиском макроекономічних, нормативних та технологічних чинників. Традиційний ризик-менеджмент часто ігнорує каскадний характер загроз, концентруючись лише на прямих впливах на «проєктний трикутник».

Наукова новизна роботи полягає у впровадженні та обґрунтуванні поняття «проєктного похідного ризику», який розглядається як функціональна залежність від змін у зовнішньому середовищі. Вперше запропоновано розглядати динаміку проєкту як систему ланцюгових реакцій на зовнішні імпульси. Отримала подальший розвиток модель двовекторності, що дозволяє менеджеру ідентифікувати не лише деструктивні наслідки, а й «вікна можливостей» (похідні можливості), які виникають у періоди турбулентності.

Методологія дослідження базується на системному підході та математичній формалізації процесів каскадування. Автором запропоновано формулу розрахунку величини похідного ризику, яка враховує інтенсивність зовнішнього тригера, коефіцієнт передачі зв'язку та рівень внутрішньої вразливості системи. Для практичної реалізації моделі розроблено шкалу оцінювання параметрів (від низького до високого рівня детермінації), що дозволяє перейти від якісного опису до кількісного аналізу «ефекту доміно».

Результати дослідження. У статті розроблено та представлено «матрицю трансформації», яка систематизує типові зовнішні імпульси (зміна нормативної бази, волатильність ринків, логістичні збої) та їхні внутрішні наслідки. Доведено, що ефективне управління вимагає впровадження проактивного алгоритму, який складається з чотирьох етапів: сканування горизонту, аналізу каскадування, диференціації реакції та корекції першопричини. Особливу увагу приділено галузевій специфіці: визначено, що в ІТ-секторі ризики концентруються навколо технологічного контексту, а в соціальних проєктах – навколо управління зацікавленими сторонами.

Практичне значення. Запропонований інструментарій дозволяє проєктним менеджерам прогнозувати каскадні збої ще на етапі ініціації та розробляти плани реагування, орієнтовані на роботу з першопричинами, а не лише з їхніми наслідками. Це забезпечує стратегічну стабільність та адаптивність проєкту в агресивному зовнішньому середовищі.

Ключові слова: похідні ризики, управління ризиками, управління проєктами, ІТ-проєкти, стратегічне управління та стійкість, зовнішній тригер, каскадні зміни, ланцюгові процеси, управління змінами та можливостями, адаптивність.

BIBLIOGRAPHY

1. Ziuziun V. Exploring the concept of derivative risks arising from external influences in the context of business operations and their strategic stability. Bulletin of the National Technical University «KhPI». *Series: Strategic management, portfolio, program and project management*, 2024, 2(9), P. 27-34. https://doi.org/10.20998/2413-3000.2024.9.4

2. Ziuziun V. System model of environmental risk management in projects. *Bulletin of the National Transport University*, 2016, 2 (35), P. 84-92.

3. Ziuziun V. Methods and models of environmental risk management in transport development projects. Authors' theses… Candidate of Technical Sciences. Kyiv: National Transport University, 2017.

4. Jaber H. Modeling and analysis of propagation risks in complex projects : application to the development of new vehicles, 2016. URL: https://www.semanticscholar.org/paper/Modeling-and-analysis-of-propagation-risks-in-%3A-to-Jaber/d9ef7e0d8f070084c2944bc53b4ecd78256d75ff

5. Dayalan D. Risk Assessment and Management in Large Scale Infrastructure Projects. *International Journal of Innovative Research in Engineering & Multidisciplinary Physical Sciences*, 2026, 2(9), P. 27-34. https://doi.org/10.20998/2413-3000.2024.9.4

6. Yasinetskyi, O., Fesenko T. IT project risk management: an analytical review of research. *Bulletin of the National Technical University «KhPI». Series: Strategic management, portfolio, program and project managemen*t, 2025, 1(10), P. 47-57. Available at: https://doi.org/10.20998/2413-3000.2025.10.6

7. Bahaaudeen A., Nazneen A., Haque R. Risk and sustainability in project management with special reference to the IT sector. *International Journal of Innovative Research and Scientific Studies*, 2025, 8(2), P. 4219–4231. https://doi.org/10.53894/ijirss.v8i2.6272

8. Maliukina A. Risk management strategies in international business project management. *Sustainable Development of Economy*, 2025, 4(55). https://doi.org/10.32782/2308-1988/2025-55-90

9. Madauss, BJ. Project Risk Management. In: Project Management. Springer, Berlin, Heidelberg, 2024. https://doi.org/10.1007/978-3-662-69057-4_19

10. Willumsen P.L., Oehmen J., Selim HMR. Project risk management in practice: the actuality of project risk management in organizations. *International Journal of Managing Projects in Business*, 2024, 17(4-5), P. 593–617. https://doi.org/10.1108/IJMPB-09-2023-0214

11. Mariam Saeed Abdulla Helal Al Kuwaiti. Sustainable Innovations and Project Risk Management. *International Journal for Multidisciplinary Research*, 2025, 7(5), P. 1-8. https://doi.org/10.36948/ijfmr.2025.v07i05.54364

12. Chykurkova1 A., Fedirets O., Pokotylska N., Baranovska O. Innovative approaches to risk identification and assessment in organizational project management. *Scientific notes of the University KROK*, 2025, 2(78), 225–237. https://doi.org/10.31732/2663-2209-2025-78-225-237

13. A Guide to the project management body of knowledge (PMBOK® Guide): Sixth Edition. Project Management Institute, 2017. 756 p.

14. ISO 31000:2018. Risk management – Guidelines. Switzerland, 2018. 16 p.

15. Maksymov A. (Analysis of risk management standards and their application in IT projects. *Management of Development of Complex Systems*, 2025, 61, P. 66–75, dx.doi.org\10.32347/2412-9933.2025.61.66-75.

16. Dong X. Best Practices in Project Risk Management. *Transactions on Economics, Business and Management Research,* 2024, 11, P. 511-518. https://doi.org/10.62051/qkf9h233

17. Kubiavka L., Zaremba V., Ziuziun V. Application of Game Theory Methods to Optimize the Stakeholder Management Process. *2024 IEEE 4th International Conference on Smart Information Systems and Technologies (SIST)*, Astana, Kazakhstan, 2024, P. 647-651, https://doi.org/10.1109/SIST61555.2024.10629255

Дата першого надходження статті до видання: 16.02.2026
Дата прийняття статті до друку після рецензування: 16.03.2026
Дата публікації (оприлюднення) статті: 13.05.2026