ISSN 2786-5002 (online)
ISSN 2786-4995 (print)

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
імені В. Н. КАРАЗІНА

ФІНАНСОВО-КРЕДИТНІ СИСТЕМИ: ПЕРСПЕКТИВИ РОЗВИТКУ

ЗБІРНИК НАУКОВИХ ПРАЦЬ

Випуск 3(22)2026

Заснований 2021р.

Харків – 2026

УДК 336.7:338.24

Збірник наукових праць «Фінансово-кредитні системи: перспективи розвитку» публікує наукові статті, які містять оригінальні результати розв'язання питанн економіки, обліку, фінансів та банківської справи, управління та інформаційних технологій зазначених напрямків. Журнал виходить 4 рази на рік (березень, червень, вересень, грудень).

ISSN 2786-5002 (online) **ISSN 2786-4995 (print)**

Головний редактор:
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Ткаченко Наталія, Київський національний університет імені Тараса Шевченка, Україна
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майдан Свободи 4, м. Харків, 61022, Україна. **www.karazin.ua**

Сайт збірника: **https://periodicals.karazin.ua/fcs** Електронна адреса: **fcs.journal@karazin.ua**
Ідентифікатор медіа у Реєстрі суб'єктів у сфері медіа: R30-04477 (Рішення № 1538 від 09.05.2024 року Національної ради України з питань телебачення і радіомовлення. Протокол № 15)

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ISSN 2786-5002 (online)
ISSN 2786-4995 (print)

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

V. N. KARAZIN KHARKIV NATIONAL UNIVERSITY

FINANCIAL AND CREDIT SYSTEMS: PROSPECTS FOR DEVELOPMENT

COLLECTION OF SCIENTIFIC WORKS

Issue 3(22)2026

Founded in 2021

Kharkiv – 2026

UDC 336.7:338.24

Collection of scientific works "Financial and credit systems: prospects for development" publishes scientific articles that contain original results of solving problems of economics, accounting, finance and banking, management and information technology in these areas. The magazine is published 4 times a year (March, June, September, December).

ISSN 2786-5002 (online) **ISSN 2786-4995 (print)**

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Approved for publication by the decision of the Academic Council
of V.N. Karazin Kharkiv National University (protocol № 17 dated 05.10.2026)

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Founder:
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Collection website: **https://periodicals.karazin.ua/fcs** E-mail: **fcs.journal@karazin**
Media identifier in the Register of the field of Media Entities: R30-04477 (Decision № 1538 dated May 9, 2024 of the National Council of Television and Radio Broadcasting of Ukraine, Protocol № 15)

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https://doi.org/10.26565/2786-4995-2026-3-15
UDC 005.8:004

Misiura Ievgeniia
PhD in Technics, Associate Professor,
Department of Economic and Mathematical Modelling
Simon Kuznets Kharkiv National University of Economics
9-A, Nauky Av., Kharkiv, 61165, Ukraine
e-mail: ievgeniia.misiura@hneu.net
ORCID ID: 0000-0002-5208-0853
Novikova Tetyana
PhD in Economics, Associate Professor,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., Kharkiv, 61022, Ukraine
e-mail: tvnovikova75@gmail.com
ORCID ID: 0000-0002-0428-4181
Khrystoforova Olena
PhD in Economics, Associate Professor,
Head of the Material and Technical Support Department, Procurement Division, Kyiv Branch of "Gas Distribution Networks of Ukraine" LLC
e-mail: lena.guseva7677@gmail.com
ORCID ID: 0000-0003-4868-2488
Malafieiev Timur
PhD in Public Administration, Associate Professor,
Education and Research Institute "Karazin Banking Institute"
of V. N. Karazin Kharkiv National University,
4, Svobody Sq., 61022, Kharkiv, Ukraine
e-mail: malafeyev14@gmail.com
ORCID ID: 0000-0002-3839-7096

Digital transformation of project management: current challenges and future prospects

Abstract. The digital transformation of project management is shaping a new project management model based on the integration of digital technologies, data, artificial intelligence, and digital ecosystems into a unified management environment. These processes are particularly significant for Ukrainian enterprises amid the full-scale war, post-war recovery, and integration into the European digital environment. The study substantiates a strategic model for the development of digital project management that combines technological, organisational, and human-centred dimensions of its transformation. The proposed approach is aimed at enhancing adaptability, digital resilience, transparency, and project implementation efficiency under conditions of high uncertainty.

Problem statement. In the context of the digital economy and high levels of instability, traditional approaches to project management do not fully provide the flexibility, responsiveness in decision-making, and effective coordination required for project activities. The digital transformation of project management often remains fragmented and is limited to the implementation of individual digital tools without their systematic integration into planning, risk management, communication, and managerial decision-making processes.

Unresolved issues. Comprehensive approaches to the digital transformation of project management that integrate technological, organisational, and managerial components remain insufficiently developed. Further research is required into the integration of artificial intelligence and data-driven management into project activities, the enhancement of digital maturity and project resilience, and the adaptation of project management systems of Ukrainian enterprises to the requirements of post-war recovery and the European digital environment.

Purpose of the article. The study aims to substantiate promising directions for the digital transformation of project management, taking into account contemporary technological challenges, war-induced transformations, and Ukraine's European integration.

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Main material. Based on a systematisation of current trends in the digital transformation of project management, the study identifies key changes in project management methodology and substantiates the transition from the fragmented use of digital tools to an integrated digital management architecture. The transformational impact of artificial intelligence, data-driven management, cloud ecosystems, Digital Twins, Blockchain, Predictive Analytics, and Business Intelligence on planning, decision-making, risk management, and project resilience is examined. A strategic model for the development of digital project management is proposed, integrating AI adoption, the formation of digital project ecosystems, the development of digital resilience, human-centred management, integration into the EU digital space, and digital support for Ukraine's post-war reconstruction projects.

Conclusions. The proposed strategic model for the digital transformation of project management enables the comprehensive integration of digital technologies, artificial intelligence, data-driven management, digital ecosystems, and digital resilience mechanisms into a unified project management system. This integration can enhance the adaptability, transparency, and effectiveness of project activities undertaken by Ukrainian enterprises amid war-related challenges and European integration, while providing a foundation for the further development of methodological approaches to assessing the digital maturity and effectiveness of project management systems.

Keywords: *digital transformation, project management, digital technologies, artificial intelligence, digital maturity, digital resilience, project management systems, digital ecosystems, data-driven management, European integration.*

Formulas: -; figures: 2; tables: 3; references: 25.

JEL Classification: M15, O33, M21, O22.

For citation: Misiura Ievgeniia, Novikova Tetyana, Khrystoforova Olena, Malafieiev Timur. Digital transformation of project management: current challenges and future prospects. Financial and Credit Systems: Prospects for Development. №3(22) 2026. P. 230-250. https://doi.org/10.26565/2786-4995-2026-3-15

Introduction. The rapid development of digital technologies and the growing adoption of artificial intelligence, cloud platforms, big data, and intelligent analytics are fundamentally reshaping approaches to project management, making digitalisation one of the key drivers of its transformation. Whereas digital tools previously served primarily as supporting instruments for automating individual processes, they now underpin a new model of project management based on continuous data analysis, risk forecasting, rapid managerial decision-making, and the integration of all project stakeholders into a unified digital environment. Under these conditions, digital transformation extends beyond technological modernisation and becomes a strategic prerequisite for enhancing enterprise competitiveness, organisational resilience, and adaptability [1].

These processes have become particularly relevant in Ukraine amid the full-scale war, which has significantly altered traditional approaches to project implementation. War-related risks, the destruction of production and logistics infrastructure, enterprise relocation, the geographical dispersion of project teams, workforce shortages, growing cyber threats, and the need for rapid responses to crises have necessitated a reconsideration of the principles underlying the organisation of project activities. Under such conditions, digital technologies have become not only a means of process optimisation but also an important factor in ensuring project continuity, effective interaction among project stakeholders, transparency of management procedures, and greater enterprise resilience to external disruptions.

At the same time, Ukraine's European integration trajectory creates new opportunities for modernising project management systems in line with contemporary European Union digital standards. The integration of Ukrainian enterprises into the EU digital space requires the harmonisation of management practices, the development of digital competencies, the adoption of advanced information platforms, and the use of artificial intelligence, data analytics, digital ecosystems, and cyber-resilience tools. Ukraine's participation in European digital development and post-war reconstruction programmes further highlights the need to develop new approaches to project management capable of ensuring the effective use of international investment, transparency in project implementation, and compliance with European requirements [2].

Despite the considerable body of research devoted to the digitalisation of project management, the current operating environment of Ukrainian enterprises calls for a reconsideration of digital transformation as a comprehensive factor contributing to organisational resilience, adaptability, and integration into the European digital environment. This necessitates further research into the contemporary challenges associated with the digital transformation of project management and the identification of promising directions for its development, taking into account the realities of war, global technological trends, and Ukraine's ongoing European integration.

Literature review. The digital transformation of project management has gained increasing prominence in academic discourse in recent years, driven by the transition from the use of standalone information systems for automating individual project operations towards the comprehensive digitalisation of planning, coordination, risk management, monitoring, and managerial decision-making processes. The systematic review conducted by M. Chen, T. S. Martins, L. Zhang, and H. Dong [1] demonstrates the emergence of digital transformation in project management as a distinct field of research and outlines prospects for its further development. At the same time, X. Wu, G. Klein, and J. J. Jiang [25], examining digital transformation in the context of IT programme management, emphasise that digitalisation is reshaping not only the technological toolkit but also the underlying logic of organising and managing portfolios of interconnected projects. This provides a basis for viewing the digital transformation of project management as a comprehensive managerial change encompassing technological, process-related, and organisational dimensions.

An important strand of contemporary research focuses on the transformation of the methodological foundations of project management. A. Polianska [7] systematises the methodological principles and international standards of project management, while J. Reiff and D. Schlegel [8] examine the growing adoption of hybrid project management, which combines elements of traditional and agile approaches. The findings of these studies indicate a gradual shift away from a rigid distinction between predictive and adaptive methodologies towards their combination depending on project characteristics, the level of uncertainty, and the managerial context. The practical application of contemporary project management tools, particularly in infrastructure projects, is examined by V. O. Zadoia, T. Yu. Charkina, N. S. Chernova, and T. V. Polishko [6]. Thus, the digital environment creates favourable conditions for the further hybridisation of management methodologies and their integration with digital technologies.

A distinct body of research addresses the application of intelligent technologies and data in project activities. Yu. A. Matvieieva, Yu. A. Opanasiuk, and D. M. Kurhanskyi [19] investigate an AI-oriented approach to project management, reflecting the growing role of artificial intelligence in supporting managerial decision-making. D. B. Zadniprovskyi and V. I. Sitnikov [16] examine data analysis methods in the context of project management, emphasising the use of information as a foundation for managerial analysis. The study by M. Golestanizadeh, H. Sarvari, A. Parishani, N. Akindele, and D. J. Edwards [21] further develops this research stream by analysing the impact of Business Intelligence on project performance. Taken together, these approaches provide a scholarly foundation for the development of data-driven and AI-supported project management, in which digital technologies are used not only to automate operations but also to support forecasting and analytics and to enhance the evidence base and quality of managerial decision-making.

The expansion of the technological foundations of project management is also associated with the increasing adoption of Digital Twins, cloud technologies, and Blockchain. I. B. Shevchuk and B. Ya. Deputat [20] examine the conceptual and applied aspects of using Digital Twins in project management, highlighting their potential for modelling alternative scenarios, monitoring the status of project assets, and supporting decision-making throughout the project life cycle. P. Skakun and L. Mysnyk [22] explore the potential of cloud technologies for knowledge management in IT projects, while M. Cheng, H.-Y. Chong, and Y. Xu [23] investigate the application of Blockchain and smart contracts in the context of enhancing project performance. These technologies create the

prerequisites for an integrated digital environment in which data, communications, management procedures, and control mechanisms operate in an interconnected manner.

In this context, the concept of digital project management ecosystems warrants particular attention. I. Ya. Kuzmuk [9] considers digital ecosystems as one of the development directions of contemporary project management, reflecting the broader transition from standalone software solutions to integrated management platforms. This approach involves integrating project management systems, ERP, CRM, Business Intelligence, cloud services, digital document management, and analytical tools within a shared information environment. Increasingly, it is the level of integration among digital tools, rather than merely their adoption, that determines an enterprise's ability to ensure timely information exchange, coordinate distributed teams, and adapt project decisions to changing external conditions.

Alongside the opportunities offered by digital technologies, researchers devote considerable attention to the risks associated with digitalisation and the resilience of project activities. S. A. Suprunenko [13] examines information security issues in project management, highlighting the need to incorporate cyber risks into the overall project risk management framework. S. M. Onyshchenko [15] considers the digital resilience of enterprises through the lens of an adaptive management mechanism. A related perspective is presented by L. Wu, Z. Zhang, J. Huang, I.-H. Su, and S. Tian [12], who investigate the relationship between digital technologies and supply chain resilience. These studies indicate a broadening of the traditional understanding of project performance: alongside meeting deadlines, staying within budget, and achieving quality requirements, increasing importance is attached to implementation continuity, the security of information resources, and the ability to adapt rapidly to external disruptions.

A specific strand of research has emerged around the digital transformation of Ukrainian enterprises amid the full-scale war. M. I. Peshko and O. H. Melnyk [2] analyse the specific features of IT project management under the conditions of war and digital transformation, while D. Dubinin [4] identifies the barriers to and opportunities for the digital transformation of Ukrainian construction and project-based enterprises. Human capital challenges arising from the war, migration, and the widespread adoption of remote work are examined by T. Skliaruk and V. Turko [10]. The logistics dimension of digital transformation is addressed by O. M. Sarakhman [11], who focuses on the transition from traditional logistics models to digital supply chain management systems. In the Ukrainian context, these dimensions are closely interconnected, as war-related, human capital, logistics, infrastructure, and cyber risks simultaneously affect project implementation and intensify the need for adaptive digital management mechanisms.

The prospects for the development of project management in Ukraine are also closely linked to European integration and future reconstruction. O. A. Shulha [5] examines the management of regional development project portfolios in the context of post-war reconstruction, while the regulatory and institutional opportunities for Ukraine's digital integration are being shaped, in particular, by its participation in the Digital Europe Programme [17] and the funding mechanisms of the Ukraine Facility [18]. The need to strengthen institutional capacity for the implementation of large-scale infrastructure recovery projects is also highlighted in OECD materials [24]. These developments increase the importance of digital system interoperability, transparency of management procedures, digital monitoring, cybersecurity, and the capacity of Ukrainian organisations to operate within international project and digital ecosystems.

Thus, the analysis of the literature demonstrates that current research provides substantial insights into individual dimensions of the digital transformation of project management, including the development of hybrid methodologies [7, 8], the application of artificial intelligence and data analytics [16, 19, 21], the formation of digital ecosystems [9, 22], the use of Digital Twins and Blockchain [20, 23], information security and digital resilience [12, 13, 15], as well as the specific features of project management under wartime conditions and during Ukraine's post-war recovery [2, 4, 5]. However, these research streams are predominantly examined in isolation. A

comprehensive approach that integrates the technological, organisational, security, human-centred, and institutional dimensions of digital transformation into a unified project management architecture, while simultaneously accounting for the specific challenges posed by war-related risks, post-war recovery, and the integration of Ukrainian enterprises into the European Union's digital space, remains insufficiently developed. This research gap provides the rationale for further substantiating a strategic model for the development of digital project management in Ukrainian enterprises.

Purpose, objectives and research methods. The purpose of the article is to examine current trends in the digital transformation of project management, identify key challenges, and substantiate prospects for its development in the context of economic digitalisation, war-induced transformations, and Ukraine's European integration.

To achieve this purpose, the following research objectives were defined: to examine current trends in the digital transformation of project management in the context of global digitalisation; to analyse the impact of the full-scale war on changes in project management approaches in Ukraine; to determine the role of contemporary digital technologies, particularly artificial intelligence, cloud services, data analytics, and digital platforms, in transforming project activities; to investigate the specific features of the integration of Ukrainian enterprises into the European Union's digital space and its impact on the development of project management; and to substantiate strategic directions for the development of digital project management in Ukraine in the context of post-war recovery and European integration.

The scientific novelty of the study lies in the comprehensive substantiation of a contemporary concept of the digital transformation of project management as a strategic foundation for ensuring the organisational resilience of enterprises amid war-related risks and European integration. The study further develops the understanding of digital project management as an integrated management system that combines artificial intelligence technologies, data analytics, digital ecosystems, cloud services, and cyber-resilience tools to enhance project implementation efficiency. Strategic directions for the development of digital project management in Ukrainian enterprises are proposed, with a focus on strengthening digital resilience, integration into the European Union's digital space, and ensuring the effective implementation of post-war recovery projects.

The methodological framework of the study comprises a combination of general scientific and specialised research methods. Systemic and logical analysis, scientific generalisation, and comparison were employed to synthesise contemporary scholarly approaches to the digital transformation of project management. Structural and functional analysis was applied to examine the impact of digital technologies on the transformation of project management processes. The comparative method was used to compare Ukrainian and European experience in the digitalisation of project activities. Strategic analysis and synthesis were employed to substantiate promising directions for the development of digital project management in the context of war-related challenges, European integration, and Ukraine's post-war recovery.

Research results. Digital transformation is increasingly understood as extending far beyond the adoption of new information technologies or the automation of individual business processes. In project management, it entails a qualitative shift in the very logic of management, whereby digital technologies become the foundation for managerial decision-making, coordination among project stakeholders, risk forecasting, and adaptation to changes in the external environment. Under conditions of high economic turbulence, traditional management models are increasingly giving way to digital systems that enable continuous data exchange, process transparency, and rapid responses to unforeseen challenges [3].

Recent years have demonstrated that the digital transformation of project management is no longer merely a competitive advantage for individual companies but is gradually becoming a prerequisite for their effective operation. This trend has been particularly evident in Ukraine since

the onset of the full-scale invasion, when enterprises were compelled to adapt their management systems within an extremely short period to operate under conditions of persistent uncertainty, physical threats, disruptions to production chains, and the geographical dispersion of personnel. Under these circumstances, digital technologies have become not merely tools for supporting business activities but, in effect, a new infrastructure for project management [2].

Accordingly, the understanding and application of established project management methodologies are also undergoing transformation. For a considerable period, the international PMBOK and PRINCE2 frameworks and Agile approaches were viewed as distinct approaches to organising project activities, differing in their degree of formalisation, process flexibility, and mechanisms for controlling project execution. However, the contemporary digital environment is gradually blurring the boundaries between these approaches. Management practice is increasingly based not on selecting a single methodology but on integrating different approaches according to project-specific characteristics, the level of uncertainty, and the availability of digital tools [6].

In particular, the contemporary PMBOK framework reflects a shift from a predominantly process-oriented logic towards principles, performance domains, and value delivery, allowing predictive, adaptive, and hybrid approaches to be applied depending on project characteristics. PRINCE2 likewise provides for tailoring the methodology to a specific project environment and allows it to be combined with agile approaches. At the same time, the development of Agile and digital technologies expands the opportunities for creating hybrid project management models in which methodologies and digital tools are selected according to project complexity, the level of uncertainty, and stakeholder needs [7, 8].

Contemporary transformation processes indicate that the development of project management is occurring not through the gradual improvement of individual management tools but through changes in the conceptual foundations of how project activities are organised. Under the influence of digitalisation, war-related challenges, and European integration, the principles of planning, coordination, risk management, and managerial decision-making are being transformed. A summary of the key dimensions of this transformation is presented in Table 1.

Table 1. Evolution of Project Management in the Context of Digital Transformation

Dimension of Transformation	Traditional Project Management	Digital Project Management
Management concept	Management of an individual project according to a predefined plan	Adaptive management of the project's digital ecosystem under conditions of uncertainty
Methodological framework	Predominance of individual approaches (PMBOK, PRINCE2, or Agile)	Integration of agile methodologies with digital technologies and data analytics
Decision-making	Predominantly expert-based assessment	Data-driven and AI-supported managerial decision-making
Team organisation	Co-located project teams	Distributed digital teams; remote and hybrid collaboration
Risk management	Response after a problem occurs	Risk forecasting, predictive analytics, and digital monitoring
Key risks	Time, budget, and resources	War-related and logistics risks, cyber risks, human capital shortages, and data-related risks
Project success criteria	Compliance with time, budget, and quality requirements	Additional criteria: digital resilience, implementation continuity, and speed of adaptation
Information support	Periodic reporting	Real-time data, digital management dashboards, and Big Data
External integration	Local information systems	Enterprise digital ecosystems; integration with ERP and CRM systems and the EU digital space
Strategic objective	Effective implementation of an individual project	Building the enterprise's digital organisational resilience and competitiveness

Source: compiled by the authors based on [3, 6, 9].

The data presented in Table 1 demonstrate that the contemporary digital transformation of project management is characterised by a shift from a process-oriented management model towards an integrated digital architecture in which data, digital technologies, and the adaptability of managerial decision-making play a central role. At the same time, the full-scale war has significantly expanded the range of factors determining project success, bringing issues of digital resilience, cybersecurity, and business process continuity to the forefront [2]. Under these conditions, the integration of Ukrainian enterprises into the European Union's digital space is becoming an important driver of technological modernisation and creates additional opportunities for the adoption of digital technologies, the development of digital competencies, and participation in joint digital projects.

Digitalisation does not replace existing project management methodologies but rather creates a new level of integration among them. The emphasis is shifting away from adherence to individual procedures towards the speed of project adaptation to change, the capacity to process large volumes of information, forecast risks, and maintain implementation continuity even under conditions of high instability [6].

In Ukraine, the transformation of project management is taking place under the influence of factors that are uncommon in most other countries. The full-scale war has radically altered the project implementation environment, transforming crisis management from an exceptional response into a permanent component of managerial activity. A significant number of enterprises have been compelled to relocate their production facilities, change suppliers, revise logistics routes, transition to remote or hybrid working arrangements, and adapt their management structures to new security requirements [2].

One of the most distinctive features of contemporary project management has been the emergence of distributed teams. While remote collaboration was often regarded as an alternative working arrangement before the COVID-19 pandemic, it has now become common practice for many Ukrainian enterprises. Members of the same project team may work simultaneously across different regions of Ukraine and abroad, requiring a qualitatively new level of digital coordination. Project management increasingly relies on integrated digital workspaces, cloud-based environments, corporate collaboration platforms, and tools for real-time task synchronisation. Under these conditions, the key resource is no longer the physical presence of the project team but the speed of information exchange, data accessibility, and transparency of project execution processes [10].

Logistics risks have also had a significant impact on project implementation. The destruction of transport infrastructure, disruptions to certain transportation routes, changes in supply routes, and the need to diversify supply chains have increased the importance of digital platforms for monitoring logistics processes. Data on resource flows, project timelines, financial indicators, and the progress of individual project stages are increasingly updated in real time, enabling deviations to be identified promptly and managerial decisions to be adjusted accordingly [11, 12].

At the same time, digitalisation increases enterprises' vulnerability to cyber threats. In recent years, the number of cyberattacks targeting Ukrainian public institutions, critical infrastructure, and businesses has increased substantially, highlighting the need to integrate cybersecurity directly into project management systems. Whereas information security was previously regarded primarily as the responsibility of IT departments, cyber risks are now becoming one of the fundamental parameters of project planning, alongside budget, schedule, and resource requirements. Consequently, a new approach to risk assessment is emerging, encompassing not only financial and organisational factors but also potential digital threats, the continuity of information systems, and the security of corporate data [13].

Another consequence of the war has been a shortage of human capital. Mobilisation, forced population displacement, workforce losses, and intensified competition for highly qualified professionals constrain enterprises' ability to build and maintain stable project teams. This has

accelerated the adoption of digital tools for automating routine operations, decision-support systems, and generative artificial intelligence for preparing documentation, analysing risks, developing project schedules, and monitoring task completion. At the same time, the role of the project manager is not diminishing but rather evolving: project managers increasingly act as coordinators of digital collaboration, integrators of information flows, and architects of managerial decision-making [14].

Under these conditions, digital resilience is becoming one of the key criteria for the effectiveness of contemporary projects. Unlike the traditional understanding of resilience as a project's ability to remain within its established budget and schedule, digital resilience refers to the capacity of a management system to maintain its functionality during crises, cyberattacks, the loss of individual information resources, communication disruptions, or changes in the external environment. In essence, it involves creating a digital environment capable of ensuring project continuity in the face of external disruptions. Therefore, alongside cost, time, and quality indicators, increasing importance is attached to data security, the speed of information system recovery, the flexibility of digital infrastructure, and the capacity to rapidly scale project activities [15].

The role of information is also undergoing a fundamental transformation in the digital economy. Whereas data were previously used primarily for reporting purposes or monitoring project execution, they are now becoming a strategic enterprise asset. Contemporary digital platforms enable financial, production, logistics, human resources, and market data to be integrated into a unified system, allowing managerial decisions to be based on up-to-date indicators rather than expert assumptions. This development underpins the concept of data-driven project management, in which data analysis provides the foundation for risk forecasting, resource optimisation, project prioritisation, and performance assessment [16]. For Ukrainian enterprises, this is particularly important in a highly dynamic external environment, where the speed at which reliable information is obtained directly affects a project's ability to achieve its objectives.

The integration of Ukrainian enterprises into the digital ecosystems of the European Union is becoming increasingly important. European practices are progressively oriented towards the development of interconnected digital environments in which project management is carried out not in isolation but within a shared information infrastructure. The adoption of common digital standards, the development of cross-border data exchange, and the implementation of contemporary requirements for cybersecurity, digital identification, and electronic document management create favourable conditions for the more active participation of Ukrainian enterprises in international investment, innovation, and recovery projects [17]. This is particularly important in the context of Ukraine's post-war reconstruction, which will require the large-scale mobilisation of international financial resources, grant programmes, and partnership initiatives [18]. Under these conditions, interoperability with European digital ecosystems is becoming an important prerequisite for transparent project management, effective control over the use of resources, and strengthening the trust of international partners.

The contemporary development of project management is characterised by a transition from the use of individual digital solutions towards the creation of an integrated digital project management environment. Rather than performing isolated functions, emerging technologies transform specific components of the management system, thereby enhancing its adaptability, transparency, and efficiency. Table 2 summarises the major global digital trends and the opportunities for their practical application by Ukrainian enterprises.

As the data presented in Table 2 indicate, contemporary digital technologies are gradually transforming all key project management functions, from planning and resource allocation to risk forecasting and performance monitoring. The defining trend, however, is not the adoption of individual digital tools but their integration into unified digital ecosystems that combine data analytics, artificial intelligence, cloud services, and digital platforms.

Table 2. Emerging Digital Technologies in Project Management and Their Transformational Impact on Project Activities

Digital Trend	Project Management Function Transformed	Practical Implications for Ukrainian Enterprises
Generative AI and AI-first Project Management	Planning, risk analysis, documentation preparation, and decision support	Reduced time required for project documentation, rapid response to change, and optimised resource utilisation
Data-driven Project Management	Managerial decision-making based on data	Risk forecasting, real-time KPI monitoring, and more evidence-based managerial decision-making
Cloud-based Digital Ecosystems	Communication, collaboration, and business process integration	Coordination of distributed teams, support for relocated enterprises, and integration of ERP, CRM, BI, and document management systems
Digital Twins	Planning and modelling of project implementation	Analysis of alternative scenarios, optimisation of infrastructure and logistics projects, and support for post-war reconstruction
Blockchain	Contract execution monitoring and financial flow management	Greater transparency in the use of international assistance, digital auditing, and increased trust among investors and donors
Predictive Analytics	Risk management and performance forecasting	Early identification of critical deviations, loss minimisation, and enhanced project resilience
Business Intelligence (BI)	Project performance monitoring	Interactive analytical dashboards, milestone monitoring, and assessment of resource utilisation efficiency

Source: compiled by the authors based on [16, 19, 20, 21, 22].

The past few years have witnessed a significant shift in the role of digital technologies in project management. While the initial stage of digitalisation focused primarily on automating project scheduling, document management, and task monitoring, the current stage is characterised by a transition towards Intelligent Project Management. Its distinguishing feature is that digital tools are no longer merely supporting instruments for project managers but increasingly perform the role of analytical partners capable of forecasting risks, evaluating alternative project development scenarios, and supporting managerial decision-making [14].

This transformation has become particularly relevant for Ukrainian enterprises since 2022. Under conditions of war-related uncertainty, traditional planning rapidly became less effective due to constant changes in the security environment, logistics routes, workforce availability, and sources of financing. Under these circumstances, competitive advantage has increasingly depended not on rigid control procedures but on the ability to rapidly reassess and adapt projects on the basis of up-to-date data [2].

Consequently, data-related technologies have assumed a central role in contemporary project management. Large volumes of information, Predictive Analytics, and digital monitoring dashboards are transforming project management from a reactive into a proactive process. Project managers are able not only to identify existing problems but also to assess the likelihood of their occurrence, model potential consequences, and adjust project decisions in a timely manner [16].

At the same time, the role of artificial intelligence is changing substantially. Whereas only a few years ago its application was largely limited to the automation of individual routine operations, AI is now increasingly being integrated into project management processes. It is used to generate project documentation, analyse risks, assess team workloads, optimise resource utilisation, develop project scenarios, and support managerial decision-making. In effect, AI is gradually becoming an intelligent component of the digital management system [2].

Another important trend is the development of integrated digital platforms. In contemporary project management practice, standalone software solutions are gradually giving way to digital ecosystems that integrate planning, communication, document management, financial control, and ERP and CRM solutions within a unified information environment. For Ukrainian enterprises, such integration is particularly important, as it enables effective collaboration among geographically

distributed teams and ensures project implementation continuity regardless of where project activities are carried out [22].

In parallel, the use of Digital Twins is emerging as a new direction in the development of project management. Unlike traditional modelling approaches, a digital twin enables continuous support throughout the entire project life cycle, allowing the consequences of managerial decisions to be assessed promptly and potential risks to be anticipated. This technology offers particularly significant potential for infrastructure projects, transport logistics, the energy sector, and Ukraine's post-war reconstruction programmes, where the cost of managerial errors can be exceptionally high [20].

Another important development is the application of Blockchain technology. While Blockchain was previously associated primarily with cryptocurrencies, it is increasingly being used as a tool for enhancing transparency in project implementation. The immutability of digital records, the automated execution of smart contracts, and the traceability of financial transactions provide additional safeguards for international donors, investors, and partners, which is particularly important for Ukraine's post-war recovery programmes [23].

A characteristic trend in contemporary project management is the gradual integration of digital technologies into unified digital project management ecosystems. Within such systems, artificial intelligence provides data analysis and decision support; Predictive Analytics is used for risk forecasting; Digital Twins enable scenario modelling and project monitoring; Blockchain enhances transparency and trust in data; and cloud platforms provide a shared digital environment for collaboration among all project stakeholders [14, 16, 20, 22, 23].

Such an integrated model increasingly corresponds to the contemporary needs of Ukrainian enterprises in the context of digital transformation and European integration.

Figure 1 illustrates the interaction of these technologies within an integrated digital project management architecture.

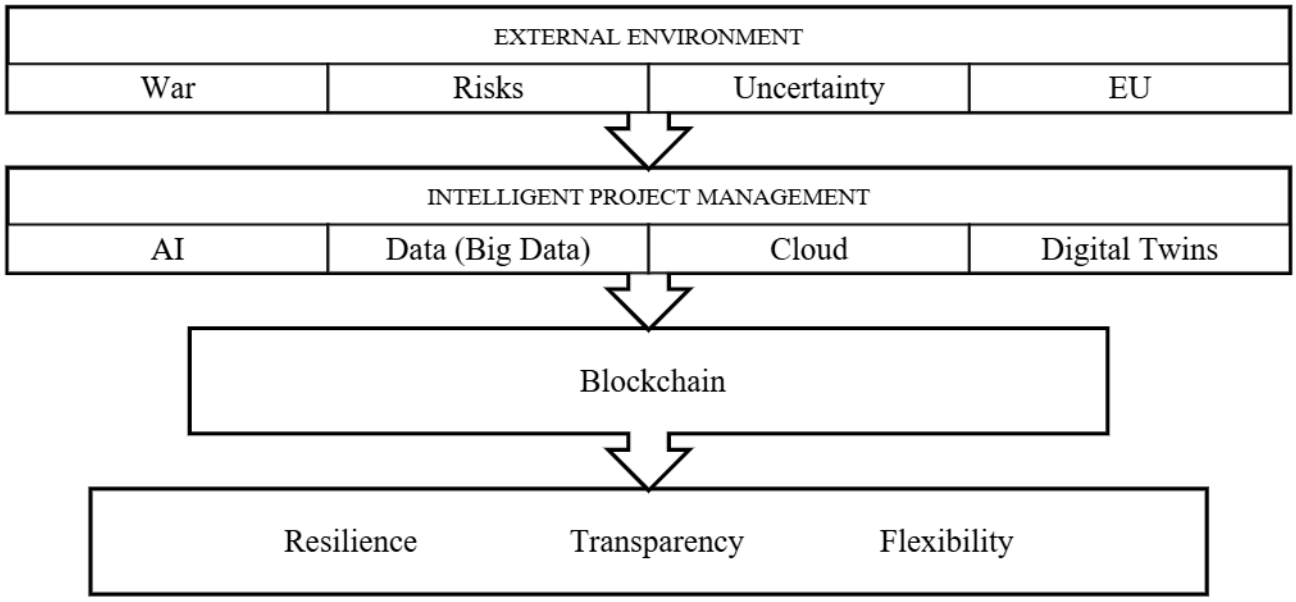


Figure 1. Interaction of Modern Digital Technologies in Project Management
Source: developed by the authors based on [14, 16, 20, 22, 23].

The analysis of current trends in project management indicates that its further evolution will be determined not so much by the emergence of new digital technologies as by changes in the principles underlying project design, implementation, and evaluation. Global practice is gradually shifting from the digitalisation of individual business processes towards the development of integrated management systems in which a project is viewed as a dynamic ecosystem capable of adapting to continuous changes in the external environment. Under these conditions, competitive

advantages are no longer built around individual software products or digital services but around an enterprise's ability to rapidly integrate technological innovations, management approaches, and organisational competencies into a unified value creation system.

For Ukraine, this transformation has its own specific characteristics. The digital modernisation of project management is taking place simultaneously with efforts to ensure economic resilience, restore productive capacity, implement large-scale infrastructure projects, and gradually adapt to European standards of digital governance. This means that strategic development priorities should focus not only on improving operational efficiency but also on strengthening the institutional capacity of enterprises to operate under conditions of high uncertainty, international cooperation, and increasingly stringent requirements for management transparency [24].

Moreover, Ukraine's integration into the European economic and digital space is changing the criteria used to assess the effectiveness of project activities. Alongside traditional indicators of cost, time, and quality, increasing importance is attached to the digital maturity of management processes, information system interoperability, secure data exchange, the capacity for inter-organisational collaboration, and compliance with European regulatory requirements. Consequently, digital project management is gradually becoming one of the key mechanisms for integrating Ukrainian enterprises into international production, innovation, and investment ecosystems [25].

In this context, the strategic directions for the development of digital project management should be viewed not as a set of separate technological solutions but as an interconnected system of long-term managerial transformations encompassing the technological, organisational, institutional, and human dimensions of development. Contemporary approaches to the digital transformation of project activities involve strengthening the human-centred orientation of management and integrating digital technologies with organisational change. For Ukraine, particular importance is attached to the use of digital tools in reconstruction processes, ensuring transparency, and achieving compliance with European standards [2, 14, 25].

Based on the synthesis of these trends, a conceptual model for the strategic transformation of digital project management is proposed, addressing contemporary challenges of economic instability, the needs of Ukraine's post-war recovery, and its integration into the European digital space (Fig. 2).

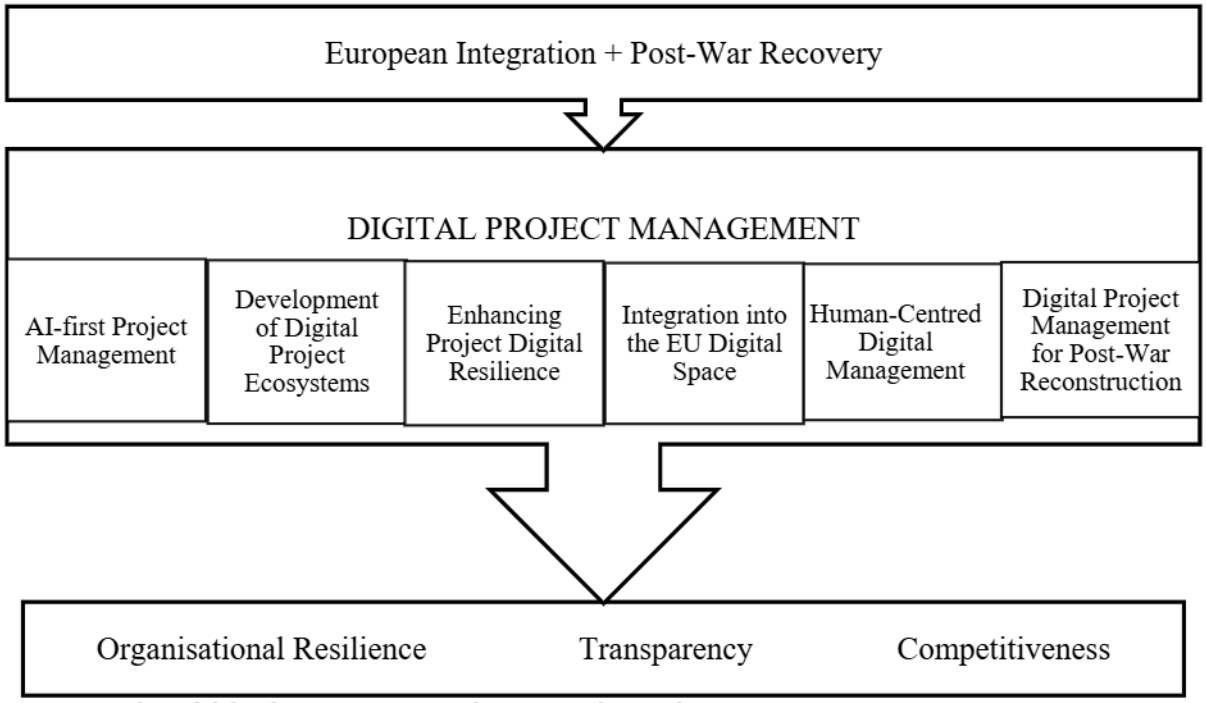


Figure 2. Conceptual Model for the Strategic Transformation of Digital Project Management
Source: developed by the authors.

Unlike earlier stages of digitalisation, when enterprises primarily automated individual management functions, the contemporary model involves the development of a digital architecture for project activities in which data, technologies, people, and management processes operate as an integrated system. In this context, several strategic directions for further development can be identified.

The first direction is the transition towards an AI-first Project Management model. While artificial intelligence is currently used primarily as a tool for automating individual operations, in the near future it is expected to become a fully integrated participant in the management process. Its functions extend beyond report preparation and document generation to include risk forecasting, modelling alternative project development scenarios, analysing resource constraints, assessing the probability of achieving target indicators, and supporting strategic decision-making. In effect, this represents a transition from a Project Manager with AI towards AI-assisted Project Management, in which managerial decisions are shaped through the synergy of professional expertise and algorithmic analytics.

The second strategic direction is the development of digital project ecosystems. Recent practice demonstrates that the use of standalone software solutions no longer provides the level of flexibility and project controllability required in a rapidly changing environment. Instead, competitive advantages are increasingly generated through integrated digital environments that combine project management systems, ERP, CRM, financial management, Business Intelligence, electronic document management, and artificial intelligence tools. This approach changes the underlying logic of project management: rather than relying on a single information system as the core of a project, management is organised around a unified digital environment that enables continuous data exchange among all project stakeholders.

The third direction is the development of Digital Project Resilience. Under wartime conditions, project success is increasingly determined not only by adherence to schedules and budgets but also by the ability to maintain project implementation despite external threats and disruptions. Digital resilience should therefore be regarded as a distinct criterion for assessing project performance. It is underpinned by integrated cybersecurity systems, data backup and recovery mechanisms, business continuity arrangements, digital crisis management, and the rapid restoration of information infrastructure following emergencies.

The fourth direction concerns the integration of Ukrainian project management into the European Union’s digital market. This involves not merely access to European funding programmes but also gradual adaptation to the EU’s evolving regulatory and technological ecosystem. In the future, the effectiveness of Ukrainian projects will increasingly depend on compliance with the principles and requirements governing data management, artificial intelligence, cybersecurity, and digital governance embedded in the Digital Europe Programme, Horizon Europe, European Digital Innovation Hubs, Data Governance Act, AI Act, and NIS2 Directive. In this context, European integration implies not simply the adoption of individual European digital practices but the integration of Ukrainian enterprises into a common digital environment for the implementation of international projects.

The fifth direction is the development of a human-centred model of digital project management. The growing adoption of artificial intelligence raises important questions regarding the redistribution of functions between humans and digital technologies. Accordingly, enterprise competitiveness will increasingly depend not on the degree of automation itself but on the ability to foster digital leadership, develop the digital competencies of project teams, manage organisational change, and build a digital organisational culture. Thus, digital transformation is reshaping the role of the project manager: from a coordinator of task execution, the project manager is gradually evolving into an integrator of data, digital services, and human capabilities.

A distinct strategic direction of particular importance to Ukraine is the development of a digital project management model for post-war reconstruction. The scale of future infrastructure

programmes, international technical assistance, and investment will require a fundamentally new level of transparency, coordination, and accountability. Under these conditions, digital project management can provide the foundation for an integrated system for monitoring reconstruction projects, overseeing the use of international funds, tracking the achievement of target indicators, and facilitating interaction among government authorities, businesses, local communities, and international partners. In our view, this direction will largely shape the development of project management in Ukraine over the next decade.

In light of the above, the strategic development of digital project management should be regarded as a multi-level transformation combining technological, organisational, institutional, and human dimensions of change. Such an approach enables a transition from the digitalisation of individual functions towards an integrated project management system capable of strengthening enterprise resilience, ensuring the effective use of international resources, and enhancing the competitiveness of the Ukrainian economy within the European digital space.

Given the transformation of contemporary project management and the new requirements for project implementation amid war-related challenges and European integration, it is appropriate to systematise the strategic directions for its further development. The synthesis of the research findings [2, 14, 25] has enabled the authors to formulate their own perspective on the key vectors of the digital transformation of project management in Ukrainian enterprises, as presented in Table 3.

Table 3. Architecture of the Strategic Transformation of Digital Project Management in Ukrainian Enterprises in the Context of European Integration

Strategic Direction	Nature of the Transformation	Expected Strategic Effect
AI-first Project Management	Integration of AI into project planning, forecasting, and managerial decision support	Improved quality of managerial decisions, reduced risks, and shorter response times
Development of Digital Project Ecosystems	Integration of project management systems, ERP, CRM, BI, finance, document management, and AI	A unified information environment, transparency, and synchronisation of business processes
Development of Project Digital Resilience	Cybersecurity, data backup, business continuity, and digital crisis management	Greater project resilience to war-related, technological, and cyber threats
Integration into the EU Digital Space	Adaptation to European digital programmes, standards, and regulatory requirements	Broader participation in international projects and increased investment attractiveness
Human-Centred Digital Management	Development of digital leadership, competencies, change management, and digital culture	Greater team adaptability and enhanced effectiveness of digital transformation
Digital Project Management for Post-War Reconstruction	Digital monitoring, financial control, and coordination of infrastructure projects	Greater transparency of reconstruction programmes and increased trust among international partners

Source: compiled by the authors.

The strategic directions presented in Table 3 indicate that the current stage of digital project management development is characterised by a transition from fragmented digitalisation towards a comprehensive transformation of the project management system. The key determinant of success is no longer the number of digital tools implemented but the degree to which they are integrated into a unified management architecture capable of ensuring continuous information exchange, rapid decision-making, risk forecasting, and coordination among all project stakeholders. Within such a model, artificial intelligence, data analytics, digital ecosystems, cybersecurity tools, and human capital development are regarded not as autonomous components but as complementary elements of an integrated digital management system.

Within the proposed approach, the strategic significance of the digital transformation of project management extends beyond individual enterprises. Its development creates the conditions for strengthening the institutional capacity of the economy, building trust in project implementation mechanisms, and expanding Ukraine’s opportunities to participate in international investment and

recovery programmes. In this context, digital technologies contribute not only to greater operational efficiency but also to the standardisation of management processes, increased transparency, and enhanced traceability throughout the key stages of project implementation.

The proposed system of strategic directions has been developed with due consideration of the European Union's current digital development priorities related to integrated data management, artificial intelligence, cyber resilience, and digital governance. At the same time, it reflects the specific operating conditions of Ukrainian enterprises amid war-related risks and post-war recovery, where the speed of adaptation, effective use of international financial assistance, transparency of project implementation, and the capacity to integrate into European digital ecosystems are of particular importance. The comprehensive integration of these components provides the foundation for a transition towards a new generation of project management that combines digital technologies, contemporary management practices, and European standards for project implementation.

Discussion. The findings of this study are consistent with the broader trend towards the transformation of project management from the use of standalone digital tools to the development of an integrated digital project management environment. The results are consistent with the conclusions of Chen et al. [1], whose systematic review identifies digital transformation as a promising direction in the development of contemporary project management, as well as with the study by Wu et al. [25], which associates digital transformation with changes in IT programme management. At the same time, the present study extends these approaches by shifting the focus from individual digital technologies and processes towards their interaction within a unified project management architecture.

The transition identified in this study from the predominance of individual methodologies towards hybrid project management models is also consistent with the contemporary academic discourse. In particular, the findings of Reiff and Schlegel [8] demonstrate the growing adoption of hybrid project management, while Polianska [7] emphasises the development of methodological foundations and international project management standards. The findings of the present study complement these perspectives by demonstrating that digitalisation facilitates not only the combination of predictive and adaptive approaches but also a new level of their integration with data analytics, digital platforms, and intelligent decision-support systems.

Of particular significance is the identified role of artificial intelligence and data-driven management in transforming project decision-making mechanisms. This finding is consistent with the results of Matvieieva, Opanasiuk, and Kurhanskyi [19] regarding the development of an AI-oriented approach to project management, the research of Zadniprovskyi and Sitnikov [16] on the application of data analysis methods, and the findings of Golestanizadeh et al. [21] concerning the role of Business Intelligence in project performance. However, the present study extends these perspectives by considering AI, Business Intelligence, and Predictive Analytics not as standalone tools but as interconnected components of a data-driven management system that enables continuous monitoring, risk forecasting, and the timely adjustment of managerial decisions.

The findings regarding the development of digital project ecosystems extend Kuzmuk's [9] perspective on the importance of digital ecosystems for contemporary project management and are complemented by the conclusions of Skakun and Mysnyk [22] concerning the use of cloud technologies in knowledge management. At the same time, the approach proposed in this study adopts a broader interpretation of a digital project ecosystem as an integrated environment in which project management systems interact with ERP, CRM, Business Intelligence, cloud services, digital document management, and AI. This fundamentally distinguishes systemic digital transformation from the fragmented automation of individual management functions.

Particular attention should be given to the inclusion of digital resilience among the strategic characteristics of contemporary project management. This finding is consistent with Onyshchenko [15], who considers digital resilience as a component of adaptive enterprise management, as well as with the findings of Wu et al. [12] regarding the impact of digital technologies on supply chain

resilience. In the Ukrainian context, this concept acquires particular significance, as project implementation is simultaneously affected by war-related, logistics, human capital, energy, and cybersecurity risks. This supports the need to extend the traditional criteria of project success, which primarily focus on time, budget, and quality, by incorporating implementation continuity, speed of adaptation, and the capacity of digital infrastructure to sustain project activities in the face of external disruptions. This transition is also reflected in the comparative analysis of traditional and digital project management presented in this study.

The specific nature of the findings is largely shaped by the Ukrainian context. The studies by Peshko and Melnyk [2], Dubinin [4], and Skliaruk and Turko [10] demonstrate that the war has substantially altered the organisational, human capital, and technological conditions of project implementation. The findings of the present study are consistent with these conclusions but further suggest that war-related challenges should be viewed not merely as additional risk factors but also as a catalyst for the transition towards a new project management architecture. Distributed teams, disruptions to logistics chains, human capital shortages, and increasing cyber risks heighten the importance of cloud platforms, automation, real-time analytics, AI, and digital mechanisms for ensuring the continuity of project activities. These transformations are examined in detail in the main body of the study.

An important finding of the study is the linkage between the digital transformation of project management and the processes of Ukraine's European integration and post-war recovery. Ukraine's participation in the Digital Europe Programme [17], the implementation of the Ukraine Facility [18], and future large-scale infrastructure reconstruction projects are increasing the requirements for transparency, digital monitoring, information system interoperability, and efficient resource utilisation. In this context, Digital Twins, Blockchain, Business Intelligence, and integrated digital platforms can be regarded not only as tools for improving the operational efficiency of individual enterprises but also as a technological foundation for the transparent management of complex recovery programmes and projects. In particular, the potential of Digital Twins is examined by Shevchuk and Deputat [20], while the application of Blockchain and smart contracts is addressed by Cheng et al. [23].

The scientific contribution of the findings lies primarily in systematising these technological and managerial changes within a strategic model for the development of digital project management. Unlike approaches in which AI, data analytics, Digital Twins, cloud technologies, Blockchain, or digital resilience are predominantly examined as separate dimensions of digitalisation, the proposed model integrates six interconnected strategic directions: AI-first Project Management, the development of digital project ecosystems, the enhancement of project digital resilience, integration into the European Union's digital space, human-centred digital management, and digital support for post-war recovery programmes. This approach is consistent with the scientific novelty formulated in the study and shifts the focus from the digitalisation of individual functions towards the transformation of the overall project management architecture.

The practical significance of the proposed approach lies in its potential application by Ukrainian enterprises as a conceptual framework for identifying priorities in the digital transformation of their project management systems. The implementation of the proposed strategic directions should take into account an enterprise's level of digital maturity, the availability of financial and technological resources, employees' digital competencies, the characteristics of the projects being implemented, and the level of external risks. Therefore, the proposed model does not imply the simultaneous adoption of all digital technologies but should instead be adapted to the specific organisational context of each enterprise.

At the same time, the study has several limitations. The proposed strategic model is primarily conceptual in nature and was developed through the systematisation of existing scholarly approaches, comparative analysis, and structural-functional analysis, without quantitative empirical testing of the relationships between individual dimensions of digital transformation and project

performance indicators. Furthermore, the specific operating conditions of Ukrainian enterprises during the full-scale war limit the extent to which the findings can be directly generalised to other economic and institutional contexts. Further empirical investigation is also required to assess the impact of enterprises' digital maturity on the effectiveness of the proposed model and to identify potential differences across enterprises of different sizes and sectors.

A promising direction for future research is the development of a methodological framework for assessing the digital maturity of project management systems and the quantitative evaluation of the effects of individual components of the proposed strategic model on project performance, adaptability, and digital resilience. Further research should also examine practical models for integrating AI, Predictive Analytics, Business Intelligence, and Digital Twins into unified project decision-support systems. In the Ukrainian context, particular attention should be given to identifying mechanisms for using digital project ecosystems to monitor post-war recovery programmes and ensure transparency in the use of international financial resources.

Conclusions. The study has established that the digital transformation of project management extends beyond the implementation of individual information technologies and the automation of management processes and involves a transition towards an integrated digital project management architecture. This architecture is based on the interconnected use of digital technologies, data, artificial intelligence, and digital ecosystems in planning, coordination, monitoring, risk management, and managerial decision-making. Under these conditions, alongside traditional project performance parameters, increasing importance is attached to adaptability, responsiveness in decision-making, digital resilience, implementation continuity, and the capacity to respond to changes in the external environment.

The findings demonstrate that the specific nature of the digital transformation of project management in Ukrainian enterprises is shaped by the simultaneous influence of war-related challenges and European integration processes. The full-scale war has intensified the need for digital mechanisms to ensure the continuity of project activities, coordinate distributed teams, and manage logistics, human capital, information, and cyber risks. At the same time, Ukraine's integration into the European digital space is increasing requirements for project transparency, data management, cyber resilience, digital system interoperability, and efficient resource utilisation, all of which are particularly important in the context of implementing post-war recovery programmes.

Based on the systematisation of contemporary technological and managerial trends, the study substantiates the transition from the fragmented digitalisation of individual functions towards a comprehensive transformation of the project management architecture. The scientific novelty of the findings lies in substantiating a strategic model for the development of digital project management in Ukrainian enterprises, which integrates six interconnected directions: AI-first Project Management, the development of digital project ecosystems, the enhancement of project digital resilience, integration into the European Union's digital space, human-centred digital management, and digital support for post-war recovery programmes. Unlike approaches focused primarily on the digitalisation of individual functions or the application of standalone technologies, the proposed model integrates the technological, organisational, security, human-centred, and institutional dimensions of digital transformation within a unified strategic project management architecture.

The practical significance of the findings lies in the potential application of the proposed model by Ukrainian enterprises to identify strategic priorities for the digital transformation of their project management systems, taking into account their level of digital maturity, the availability of technological and financial resources, the digital competencies of project teams, and the nature of external risks. Implementing the proposed directions can contribute to greater adaptability and transparency of project activities, improved managerial decision-making, enhanced digital resilience, and more efficient resource utilisation, particularly in the implementation of Ukraine's post-war recovery projects and programmes.

Future research should focus on developing a methodological framework for assessing the digital maturity of project management systems and empirically testing the effects of individual components of the proposed strategic model on project performance, adaptability, and digital resilience. Further research directions may include the development of AI-driven and data-driven project management models, the integration of Digital Twins, Business Intelligence, and Predictive Analytics into project decision-support systems, and the development of mechanisms for using integrated digital ecosystems to monitor Ukraine's post-war reconstruction programmes and ensure transparency in the use of international financial resources.

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Received: 20.02.2026 *Accepted: 05.09.2026*
Received after review: 25.07.2026 *Published: 05.10.2026*

Authors Contribution: *All authors have contributed equally to this work*
Conflict of Interest: *The authors declare no conflict of interest*

Declaration on the use of artificial intelligence

During the preparation of this article, the artificial intelligence tool Grammarly was used to check for grammatical and spelling errors. The concept, content, scientific novelty, and research results belong to the authors. The final version of the article was reviewed, revised, and edited by the authors.

Місюра Євгенія
Кандидат технічних наук, доцент
Кафедра економіко-математичного моделювання
Харківський національний економічний університет імені Семена Кузнеця
проспект Науки, 9-А, м. Харків, 61165, Україна
e-mail: ievgeniia.misiura@hneu.net
ORCID ID: 0000-0002-5208-0853
Новікова Тетяна
Кандидат економічних наук, доцент
Навчально-науковий інститут «Каразінський банківський інститут»
Харківський національний університет імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: tvnovikova75@gmail.com
ORCID ID: 0000-0002-0428-4181
Христофорова Олена
Кандидат економічних наук, доцент
Начальник відділу матеріально-технічного забезпечення управління закупівель
Київської філії ТОВ "Газорозподільні мережі України"
e-mail: lena.guseva7677@gmail.com
ORCID ID: 0000-0003-4868-2488
Малафєєв Тімур
Кандидат наук з державного управління, доцент
Навчально-науковий інститут «Каразінський банківський інститут»
Харківський національний університет імені В. Н. Каразіна
майдан Свободи, 4, м. Харків, 61022, Україна
e-mail: malafeyev14@gmail.com
ORCID ID: 0000-0002-3839-7096

Цифрова трансформація проєктного менеджменту: сучасні виклики та перспективи

Анотація. Цифрова трансформація проєктного менеджменту формує нову модель управління проєктами, засновану на інтеграції цифрових технологій, даних, штучного інтелекту та цифрових екосистем у єдиний управлінський простір. Особливого значення ці процеси набувають для українських підприємств в умовах повномасштабної війни, післявоєнного відновлення та інтеграції до європейського цифрового середовища. У дослідженні обґрунтовано стратегічну модель розвитку цифрового проєктного менеджменту, що поєднує технологічні, організаційні та людиноцентричні напрями його трансформації. Запропонований підхід спрямований на підвищення адаптивності, цифрової стійкості, прозорості та ефективності реалізації проєктів в умовах високої невизначеності.

Постановка проблеми. В умовах цифрової економіки та високої нестабільності традиційні підходи до управління проєктами не повною мірою забезпечують необхідну гнучкість, оперативність прийняття рішень та ефективну координацію проєктної діяльності. Цифрова трансформація проєктного менеджменту часто має фрагментарний характер і зводиться до впровадження окремих цифрових інструментів, без їх системної інтеграції з процесами планування, управління ризиками, комунікаціями та прийняттям управлінських рішень.

Нерозв'язані аспекти. Недостатньо обґрунтованими залишаються комплексні підходи до цифрової трансформації проєктного менеджменту, що поєднують технологічні, організаційні та управлінські складові. Подальшого дослідження потребують питання інтеграції штучного інтелекту та управління на основі даних у проєктну діяльність, підвищення цифрової зрілості й стійкості проєктів, а також адаптації систем проєктного менеджменту українських підприємств до умов післявоєнного відновлення та європейського цифрового середовища.

Мета статті. Обґрунтування перспективних напрямів цифрової трансформації проєктного менеджменту з урахуванням сучасних технологічних викликів, воєнних трансформацій та європейської інтеграції України.

Основний матеріал. На основі систематизації сучасних тенденцій цифрової трансформації проєктного менеджменту визначено ключові зміни у методології управління проєктами та обґрунтовано перехід від фрагментарного використання цифрових інструментів до інтегрованої цифрової архітектури управління. Досліджено трансформаційний вплив штучного інтелекту, data-driven управління, хмарних екосистем, цифрових двійників, Blockchain, прогнозної аналітики та Business Intelligence на планування, прийняття рішень, управління ризиками й забезпечення стійкості проєктів. Запропоновано стратегічну модель розвитку цифрового проєктного менеджменту, що поєднує впровадження AI, формування цифрових проєктних екосистем, розвиток цифрової стійкості, людиноцентричного управління, інтеграцію до цифрового простору ЄС та цифровий супровід проєктів післявоєнної відбудови України.

Висновки. Запропонована стратегічна модель цифрової трансформації проєктного менеджменту дає змогу комплексно інтегрувати цифрові технології, штучний інтелект, управління на основі даних, цифрові екосистеми та механізми цифрової стійкості в єдину систему управління проєктами, підвищуючи адаптивність, прозорість і результативність проєктної діяльності українських підприємств в умовах воєнних викликів та європейської інтеграції й створюючи підґрунтя для подальшого розроблення методичних підходів до оцінювання цифрової зрілості та ефективності систем проєктного менеджменту.

Ключові слова: *цифрова трансформація, проєктний менеджмент, цифрові технології, штучний інтелект, цифрова зрілість, цифрова стійкість, управління проєктами, цифрові екосистеми, управління на основі даних, європейська інтеграція.*

Формули: -, рис.: 2, табл.: 3, бібл.: 25.

JEL Classification: M15, O33, M21, O22.

Для цитування: Misiura Ievgeniia, Novikova Tetyana, Khrystoforova Olena, Malafieiev Timur. Digital transformation of project management: current challenges and future prospects. Фінансово-кредитні системи: перспективи розвитку. №3(22) 2026. С. 230-250. https://doi.org/10.26565/2786-4995-2026-3-15

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Стаття надійшла до редакції 20.02.2026 *Статтю рекомендовано до друку 05.09.2026*
Стаття надійшла після рецензування 25.07.2026 *Статтю опубліковано 05.10.2026*

Внесок авторів: *всі автори зробили рівний внесок у цю роботу*
Конфлікт інтересів: *автори повідомляють про відсутність конфлікту інтересів*

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