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MANAGERIAL DECISION-MAKING IN THE CONTEXT OF DIGITAL TRANSFORMATION

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Babenko M. V., Pyvavar I. V., Morozova N. L., Lytvynenko A. V. Managerial Decision-Making in the Context of Digital Transformation

In many organizations, managerial decisions are based on fragmented and unsystematic information and limited analytical capabilities of managers This reduces the soundness of decisions, increases the likelihood of errors, and complicates the achievement of strategic goals, especially in an unstable external environment. Digital transformation, in turn, leads to rapid growth in the volume and variety of data from internal and external sources, opening up opportunities for evidence-based decision-making, forecasting, and scenario modeling. At the same time, it complicates the collection, processing, and interpretation of data. Information overload, the lack of unified data standards, and insufficient digital competencies among managers can negate the advantages of digitalization and create additional barriers. Under such conditions, there is a growing need for a systemic approach to the application of digital technologies in managerial decision-making processes, which involves the integration of analytical platforms, automated systems, and intelligent data analysis tools into a single managerial space. The aim of this article is to analyze the specifics of managerial decision-making in the process of digital transformation and to clarify the importance of modern digital technologies for improving the effectiveness of managerial activities. To achieve this aim, the article analyzes the essence and content of the managerial decision-making process; characterizes the impact of digital transformation on managerial processes; identifies the main digital tools and technologies used in managerial decision-making; and summarizes the advantages and risks of using digital solutions in the management system. Particular emphasis is placed on identifying key areas for improving the managerial decision-making process in the context of digitalization, which involves the integration of modern digital technologies into management activities, the use of analytical platforms and decision support systems, and the introduction of intelligent data analysis and predictive analytics tools. The need to develop the digital competencies of management staff, unify data processing standards, automate information flows, and ensure a unified information space to improve the soundness, efficiency, and strategic focus of managerial decisions is identified.

Keywords: *managerial decision-making, digital transformation, digital economy, digitalization, analytical substantiation of decisions, management models, digital competencies, digital economy.*

Fig.: *1.* ***Tabl.:*** *5.* ***Bibl.:*** *19.*

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Бабенко М. В., Пивавар І. В., Морозова Н. Л., Литвиненко А. В. Прийняття управлінських рішень в умовах цифрової трансформації

У багатьох організаціях прийняття управлінських рішень базується на використанні розрізненої та несистематизованої інформації й обмежених аналітичних можливостях менеджерів. Це знижує обґрунтованість рішень, підвищує ймовірність помилок і ускладнює досягнення стратегічних цілей, особливо в умовах нестабільності зовнішнього середовища. Цифрова трансформація, своєю чергою, зумовлює стрімке зростання обсягів і різноманітності даних із внутрішніх і зовнішніх джерел, відкриваючи можливості для прийняття рішень на основі доказової аналітики, прогнозування та моделювання сценаріїв. Водночас це ускладнює їх збирання, обробку й інтерпретацію. Інформаційне перевантаження, відсутність уніфікованих стандартів даних і недостатній рівень цифрових компетентностей управлінців можуть нівелювати переваги цифровізації та створювати додаткові бар'єри. За таких умов зростає потреба у системному підході до застосування цифрових технологій у процесах

прийняття управлінських рішень, що передбачає інтеграцію аналітичних платформ, автоматизованих систем та інструментів інтелектуального аналізу даних у єдиний управлінський простір. Метою статті є аналіз специфіки прийняття управлінських рішень у процесі цифрової трансформації та з'ясування значення сучасних цифрових технологій для підвищення результативності управлінської діяльності. Для досягнення поставленої мети у статті проаналізовано сутність і зміст процесу прийняття управлінських рішень; охарактеризовано вплив цифрової трансформації на управлінські процеси; визначено основні цифрові інструменти та технології, що застосовуються у прийнятті управлінських рішень; узагальнено переваги та ризики використання цифрових рішень у системі управління. Окремий акцент зроблено на окресленні ключових напрямів удосконалення процесу прийняття управлінських рішень в умовах цифровізації, що передбачають інтеграцію сучасних цифрових технологій в управлінську діяльність, використання аналітичних платформ і систем підтримки прийняття рішень, упровадження інструментів інтелектуального аналізу даних і прогнозної аналітики. Визначено необхідність формування цифрових компетентностей управлінського персоналу, уніфікації стандартів роботи з даними, автоматизації інформаційних потоків та забезпечення єдиного інформаційного простору для підвищення обґрунтованості, оперативності та стратегічної спрямованості управлінських рішень.

Ключові слова: *прийняття управлінських рішень, цифрова трансформація, цифрова економіка, цифровізація, аналітичне обґрунтування рішень, управлінські моделі, цифрові компетентності, цифрова економіка.*

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In today's environment of globalization, intensified competition, and growing market uncertainty, digital transformation has become one of the key factors driving organizational development and enhancing competitiveness. The active adoption of digital technologies is significantly reshaping approaches to management and decision-making processes at all levels of the organizational hierarchy.

The digitalization of management activities provides access to large volumes of up-to-date information in real time, increases the transparency of business processes, supports more accurate forecasting, and reduces the influence of subjective factors in decision-making. At the same time, traditional methods of analysis, planning, and control are increasingly proving insufficiently effective in the context of dynamic changes in the external environment, the growing complexity of management tasks, and the need for rapid responses to market challenges [1].

Under such conditions, there is a need to reconsider traditional management models, adapt decision-making tools to the digital environment, and develop new competencies among management personnel. The use of digital solutions enables a shift from intuitive and reactive management to proactive, analytically grounded, and strategically oriented decision-making, which constitutes a necessary prerequisite for the sustainable development of organizations in the digital economy [2].

The aim of the article is to examine the peculiarities of managerial decision-making in the context of digital transformation and to determine the role of modern digital technologies in enhancing the efficiency of managerial activities.

The issue of managerial decision-making has traditionally been a central focus of economic and management science, since it is through managerial decisions that organizations achieve their strategic goals, adapt to changes in the external environment, and enhance their competitiveness. In academic research, management decisions are viewed as a complex multifactorial process that combines information analysis, evaluation of alternatives, risk assessment, and the selection of an optimal course of action [4; 6].

A significant number of studies are devoted to the theoretical and methodological foundations of management decision-making. In particular, the works of I. Ishchenko, N. Kononets, O. Zhdanova-Nedilko, and

O. Bolshaya substantiate the role of managerial skills, professional competencies, and managers' analytical thinking in the process of developing effective management decisions [5]. Similar approaches are reflected in the studies of L. Pariy and A. Kubrak, who emphasize the need for a systematic analysis of internal and external factors influencing the selection of management alternatives [6].

At the same time, current business operating conditions are characterized by growing uncertainty, a dynamic market environment, and increasingly complex management tasks, which necessitate the transformation of traditional approaches to decision-making. In this context, the digital transformation of management, which reshapes the tools, logic, and speed of managerial decision-making, becomes particularly important.

The impact of digitalization and digital transformation on management processes is widely discussed in contemporary academic research. For example, the works of O. Petrykiva and T. Petrykiva demonstrate that digital technologies create a new quality of management decisions, enabling the transition from intuitive management to analytically grounded, data-driven decision-making [1]. Similar conclusions are presented in the studies of I. S. Denchyk, where digitalization is considered a key factor in innovative development and managerial innovation in the modern economy [3].

A separate stream of research focuses on analyzing the role of digital technologies in business transformation in the context of crises and military challenges. In the works of N. Yevtushenko and D. Stetsenko, the digital transformation of business in Ukraine is considered as a tool for enhancing the stability, adaptability, and effectiveness of management decisions under wartime conditions [8]. Similar approaches are presented in the studies of I. Shaforenko and O. Marukhlenko with co-authors, which emphasize the growing role of digital technologies in supporting emergency and strategic management decision-making in unstable environments [9; 18].

Contemporary academic publications devote considerable attention to the use of analytical platforms, business intelligence systems, big data, and artificial intelligence in management. In particular, the studies by G. Doroshenko and I. Ternova, as well as O. Zhuravel and M. Mikhlyaev, consider artificial intelligence as a tool for supporting strategic management, enabling greater forecasting accuracy, risk reduction, and optimization of the managerial decision-making process [10; 15]. At the same time, the authors emphasize the need to combine automated solutions with human managerial oversight.

Issues related to digital risks, information security, and data protection also occupy an important place in academic research. The works of O. Plesyuk and O. Shishkina analyze the risks associated with management digitalization, including cyber threats, data quality problems, and dependence on digital platforms [17; 19]. Additionally, the protection of personal and commercially sensitive data is addressed in the studies of M. Palchik, K. Shkriblyak, and Y. Berezdecky, which emphasize the strategic importance of information security for the stability of management processes [14].

At the same time, the scientific literature increasingly emphasizes the problem of insufficient digital competencies among management personnel. Research by A. Grinko and P. Hrynko demonstrates that the development of a competency model for personnel is a necessary condition for the effective use of digital tools in the managerial decision-making process [2]. Similar conclusions are presented in the works of E. Yeromin, which focus on adaptive decision-making and the role of managerial competencies in the digital environment [7].

Despite a significant number of studies devoted to individual aspects of management digitalization, the issue of the comprehensive impact of digital transformation on the management decision-making process, taking into account the advantages, risks, and practical experience of Ukrainian enterprises, remains insufficiently systematized. This determines the relevance of further research aimed at generalizing modern approaches and developing a holistic understanding of the role of digital technologies in improving the effectiveness of management activities.

The process of managerial decision-making is a central component of managerial activity and a key mechanism for implementing management functions, since it is through managerial decisions that the strategic and tactical goals of an organization are achieved. This process involves the systematic analysis of available information, evaluation of alternative courses of action, and selection of the optimal option that enables the most effective use of available resources and the achievement of established goals [3].

Decision-making involves taking into account internal factors (organizational structure, resource availability, staff competencies) and external factors (market conditions, regulatory environment, competitive landscape, and socio-economic and technological conditions) [4].

In addition, modern managers must consider the risks and uncertainties that accompany any management decision, as well as the potential consequences for the long-term development of the organization.

The effectiveness of an organization's functioning, its adaptability to change, competitiveness, and capacity for sustainable development directly depend on the quality and timeliness of decisions made. The modern approach to management decision-making involves the integration of digital tools, analytical models, and decision-support technologies, enabling more accurate forecasting, cost optimization, and faster decision-making. Thus, a management decision is not only a tool for the current regulation of activities but also a strategic resource for ensuring organizational development and sustaining competitive advantages [5].

Figure 1 presents a model illustrating the key stages of management decision-making using modern digital technologies. It reflects the sequence of actions from problem identification to the monitoring of results, taking into account analytical and forecasting tools [6].

In the classical sense, the managerial decision-making process encompasses the following main stages: identification and formulation of a managerial problem; collection, processing, and analysis of relevant information; development of alternative solutions; assessment of possible consequences and risks; selection of the most appropriate solution; its implementation; and subsequent monitoring of results. These stages form a logically sequential and cyclical process that can be adjusted depending on changes in the internal and external environment of the organization.

At the same time, under current conditions of digital transformation, the traditional understanding of the management decision-making process is undergoing significant changes. The growth in data volumes, the proliferation of digital platforms, and the use of analytical systems, artificial intelligence, and machine learning technologies are driving a shift from intuitive and experience-based management toward the concept of data-driven decision-making. Management decisions are increasingly based on predictive analytics, scenario modeling, automated recommendations, and real-time performance monitoring.

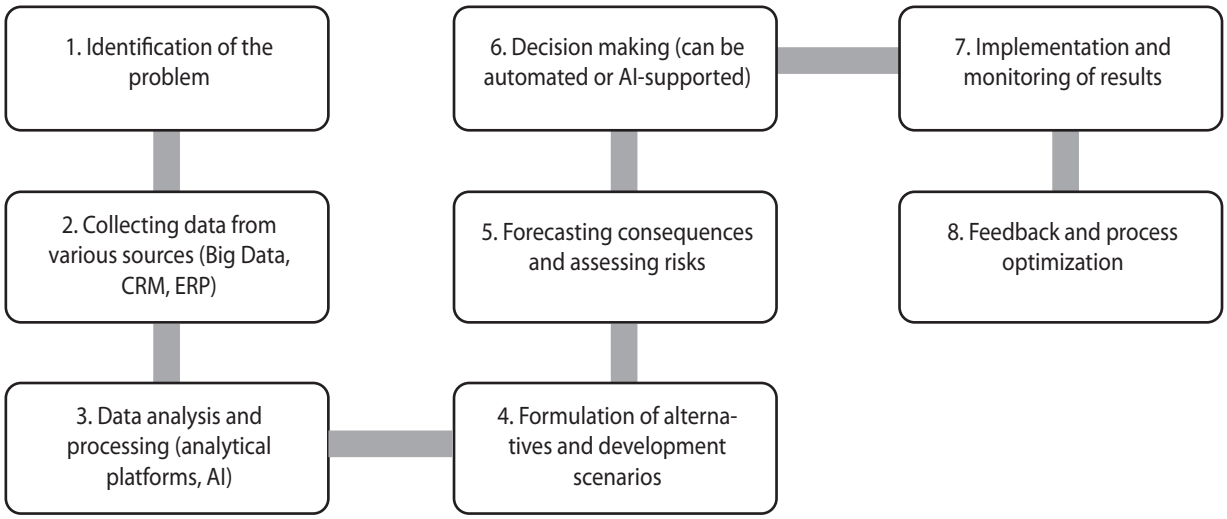

Fig. 1. Model of the management decision-making process in a digital environment

The process of managerial decision-making becomes particularly important in an unstable, turbulent, and uncertain external environment (VUCA environment), characterized by high levels of risk, rapid changes in market conditions, and increasing complexity of managerial tasks. Under such conditions, the effectiveness of management decisions is determined not only by the completeness of information but also by the speed of its processing, the ability to respond adaptively, the flexibility of management models, and the level of digital competencies among management personnel [8].

A comparative analysis of traditional and digital approaches, presented in Table 1, shows that the digital approach provides a significantly higher level of validity, speed, and flexibility in management decision-making [9; 10; 11]. The use of analytical platforms, artificial intelligence, and big data contributes to more effective forecasting, reduces risks, and enables organizations to adapt quickly to changes in the external environment.

The modern managerial decision-making process should be viewed as a complex, dynamic, and multi-level system that combines human intelligence, digital technologies, and organizational management mechanisms.

Its effectiveness largely depends on the quality of information support, the level of digital maturity of the organization, the professional training of managers,

Table 1

Differences between traditional and digital approaches to management decision-making

Criterion	Traditional approach	Digital approach
Sources of information	Limited data, internal reports	Big data, analytics, external sources
Speed of decision-making	Slow, due to manual collection and analysis	Fast, thanks to automated processing
Analytical capabilities	Limited, depends on competence	Enhanced by AI, ML, and predictive models
Formulation of alternatives	Mostly intuitive or expert-based	Based on scenario modeling and simulations
Assessment of consequences	Partially, empirically	Computer modeling and forecasting
Monitoring and feedback	Manual	Real-time, automated dashboards and analytics
Flexibility and adaptability	Limited	High ability to quickly adjust strategy

and the organization's ability to integrate innovative management tools into its activities.

Digital transformation is significantly reshaping traditional approaches to management, affecting all key management functions: planning, organization, motivation, and control. Modern digital technologies (big data, artificial intelligence (AI), machine learning (ML), cloud services, and automated information systems) enable organizations to collect, analyze, and integrate information from various sources in real time, thereby ensuring more informed and faster management decisions [12].

Thanks to digital platforms, management processes become more transparent and dynamic, as each stage of activity can be monitored and adjusted based on data. This enables organizations not only to respond quickly to changes in market conditions but also to anticipate potential risks and plan resources more effectively.

At the same time, digitalization contributes to the transformation of organizational structures – from traditional hierarchical management models to flexible, networked structures in which the role of analytics, collective decision-making, and digital coordination of teams is increasing. Practices such as predictive analytics, automated scenario modeling, and the integration of CRM and ERP systems are becoming particularly important, as they enhance the efficiency of management activities and reduce decision-making time.

Digital technologies contribute to the strategic flexibility of organizations by enabling them to rapidly adapt business processes to changes in the external environment, integrate innovations, and optimize costs. For example, the use of AI-based analytics for demand forecasting and supply chain management can significantly improve planning efficiency and reduce losses.

The relationship between digital technologies, management structure, and decision-making efficiency in the context of digital transformation is presented in Table 2 [9; 10; 11; 12].

Digital technologies facilitate the transition of organizations to flexible, networked structures, increase the transparency and speed of management processes, and improve the quality of decisions through analytics, forecasting, and automation. The use of comprehensive digital tools enables the integration of organizational structures, processes, and technologies into a unified system aimed at improving management efficiency.

In modern organizations, digital tools play a key role in supporting and optimizing management decision-making processes. Their use enables the processing of large volumes of both structured and unstructured information from internal and external sources in real time [12].

Business Intelligence systems provide data visualization, analytical reports, and dashboards that support tactical and strategic decision-making. Using BI tools, managers can quickly track key performance indicators (KPIs), analyze deviations from planned values, and adjust management actions in a timely manner. Such systems are widely used in financial management, marketing, logistics, and human resource management.

Big Data technologies and intelligent data analysis enable the processing of large volumes of information characterized by high velocity, variety of formats, and significant complexity. Combined with machine learning methods, they support demand forecasting, identification of hidden patterns, risk assessment, and scenario modeling. For example, in trade and logistics,

Table 2

Impact of digital transformation on management processes

Digital transformation component	Impact on management structure	Impact on management processes and decision-making efficiency	Examples of use
Big Data	Support for more flexible and transparent structures	Improves analysis and forecasting; decisions are made based on objective data	Analysis of customer behavior, demand forecasting
Artificial Intelligence (AI) and ML	Increased role of analytical departments, automation of routine decisions	Accelerates decision-making, improves the accuracy of risk assessment, and scenario modeling	Automatic generation of sales forecasts, risk management
Cloud services and integrated platforms (CRM, ERP)	Network structures, remote interaction between teams	Provides access to real-time data, process coordination, and effective control	Collaborative work on projects, centralized resource management
Business process automation (RPA)	Minimization of hierarchical control, greater autonomy for departments	Reduces the time required to perform routine operations, increases productivity, and accuracy	Automated reports, inventory management
Analytics and forecasting (Predictive Analytics)	Support for collective decision-making	Allows you to evaluate alternatives, predict consequences, and reduce risks	Simulations of market development scenarios, strategic planning

these technologies are used to optimize inventories and supply chains, while in the financial sector, they help manage credit risks and detect fraudulent transactions [11].

Artificial intelligence and machine learning are increasingly used to support or partially automate management decisions, especially at the operational level. AI algorithms are capable of analyzing large volumes of data, generating recommendations, predicting the outcomes of management actions, and reducing the influence of the human factor. Examples include automated pricing, sales forecasting, human resource management, and customer relationship management systems [9].

Cloud platforms play an important role in digital management by providing access to data and analytical tools regardless of user location. This facilitates the development of remote and hybrid work, increases the speed of communication, and supports collective managerial decision-making. The integration of ERP and CRM systems enables the creation of a unified information environment within the organization, covering financial, production, human resources, and marketing processes.

The introduction of digital tools enables the integration of technological solutions at all levels of management, from operational to strategic. For Ukrainian enterprises and the public sector, digital technologies are becoming an important factor in improving the effectiveness of management decisions, enhancing management transparency, and increasing adaptability to crisis conditions. The use of analytical platforms and cloud services is particularly relevant in the context of military challenges, limited resources, and the need for rapid responses to changes in the external environment [10].

In general, the use of digital tools in the management decision-making process contributes to improving the accuracy and validity of management actions, reducing the influence of subjective factors, accelerating management processes, and increasing organizational adaptability to changes in the external environment. This makes digital technologies an integral part of modern management systems and an important factor in ensuring organizational competitiveness [13].

The use of digital solutions in management systems creates significant opportunities for organizations to improve the effectiveness of their management activities. The main advantages of digitalization include increased efficiency and greater validity of management decisions, ensured through access to up-to-date real-time data, the use of analytical tools, and predictive models. This enables managers to respond quickly to changes in the external environment, minimize management delays, and improve the quality of strategic and tactical planning [12].

The interconnection between digital tools, management levels, and management effectiveness, along with examples of their application in Ukraine, is presented in Table 3.

An important advantage of digital management solutions is the optimization of business processes and the reduction of operating costs. The automation of routine management functions and the use of ERP, CRM, and RPA systems help reduce transaction times, minimize errors, increase productivity, and ensure greater accuracy in data processing. Digital solutions enable managers to respond more quickly to changes in market conditions, track key performance indicators in real time, and make informed management decisions based on analytical data [10].

This is especially relevant for organizations operating under conditions of limited resources, market instability, and increased risks, as digital tools not only reduce costs but also optimize resource utilization and enhance organizational flexibility and adaptability. In addition, modern platforms enable the integration of various functional areas – finance, production, logistics, marketing, and sales – creating a unified information environment and facilitating more effective coordination of management decisions.

Digital solutions also ensure greater control and transparency in management, as they enable continuous monitoring of key performance indicators, analysis of deviations, and evaluation of performance outcomes. The use of analytical dashboards, performance management systems, and data-driven management tools contributes to greater accountability among management personnel and improves the quality of internal control.

At the same time, the digitalization of management is accompanied by a number of risks and limitations that may negate its positive effects in the absence of appropriate managerial support. One of the key risks is the growth of cyber threats and the vulnerability of information systems, which increase the likelihood of data loss, disruption of business continuity,

Table 3

Comparative characteristics of digital tools for management decision-making

Digital tool/ technology	Management level	Management effect	Examples of application in Ukraine
Business Intelligence (BI)	Tactical, strategic	Increased management transparency, KPI control, and operational analysis of deviations	Use of BI dashboards in banking – analysis of financial indicators; in retail chains – monitoring of sales and marketing campaign effectiveness
Big Data	Strategic	Forecasting market trends, improving the soundness of strategic decisions	Analysis of consumer behavior in retail, use of large data sets by telecom operators to forecast demand for services
Artificial Intelligence (AI) and Machine Learning (ML)	Operational, tactical	Automation of decisions, risk reduction, and increased forecast accuracy	Bank scoring systems, automated pricing in e-commerce, and risk analysis in the financial sector
ERP systems	Operational, tactical	Business process integration, resource optimization, and increased manageability	Use of ERP in industrial enterprises for production, finance, and logistics management
CRM systems	Operational, tactical	Improved customer interaction, personalized solutions	CRM in banks and service companies for managing customer requests and increasing loyalty
Cloud platforms	All levels	Flexible management, collective decision-making, and real-time data access	Use of cloud services in government agencies for interagency interaction and remote work
Analytical and forecasting systems	Strategic	Scenario modeling, risk assessment, strategic planning	Application of analytical systems in public administration for budget planning and evaluation of socio-economic programs
Digital platforms for public services	Tactical, strategic	Improving management efficiency, transparency, and trust	The Diia platform as a tool for making management decisions based on digital data

and reputational damage. This problem is particularly acute for organizations that rely on cloud services and integrated digital platforms [13].

Another significant challenge is the protection of personal and commercially sensitive data in compliance with information security and regulatory requirements. Insufficient attention to cybersecurity and data management issues may lead to legal risks and a loss of trust among customers and partners [14].

The risk of excessive dependence on digital systems and algorithms, whereby management decisions are made without proper human critical assessment, requires special attention. Poor data quality, bias, or errors in artificial intelligence algorithms may result in ineffective or strategically flawed management decisions. In this context, it is particularly important to combine automated tools with expert managerial analysis [15].

In addition, the lack of digital competencies among management personnel remains a significant limitation to the digital transformation of management. Insufficient skills in working with analytical systems, interpreting data, and using digital tools reduce the effectiveness of their implementation and may lead to resistance to change within the organization [2].

The main advantages and risks associated with the use of digital solutions in management systems are summarized in Table 4 [9; 16; 17].

Table 4

Advantages and risks of using digital solutions in the management system

Criterion	Advantages of digital solutions	Potential risks and limitations
Management efficiency	Real-time decision-making, rapid response to changes	Dependence on the stability of the IT infrastructure and system availability
Soundness of decisions	Data-driven approach, use of analytics and predictive models	Risk of errors due to poor data quality or incorrect algorithms
Effectiveness of business processes	Automation of routine operations, reduction of costs, and execution time	Excessive formalization of processes, reduced flexibility in non-standard situations
Control and transparency	Continuous KPI monitoring, analytical dashboards, and increased accountability	Risk of information overload and complexity of interpreting indicators
Risk management	Threat forecasting, scenario modeling, and early detection of deviations	Underestimation of "black swans" and non-standard crisis events
Information security	Centralized access and data management	Cyber threats, data leaks, privacy violations
Human factor	Reduced subjectivity and emotional influence	Lack of digital skills, staff resistance to change
Strategic flexibility	Rapid adaptation of strategies to changes in the environment	Risk of excessive dependence on digital platforms and suppliers

Digital solutions significantly improve the quality and speed of management decisions; however, their effectiveness directly depends on data quality, the level of cybersecurity, and the digital competencies of staff. A balanced combination of technological tools and managerial experience is essential for minimizing risks and achieving sustainable results.

Digital solutions in management systems have a dual effect: on the one hand, they create conditions for increasing the efficiency, flexibility, and competitiveness of organizations; on the other hand, they require systematic risk management, the development of digital competencies, and the integration of technological and human factors in the management decision-making process.

One of the key areas is the development of a digital culture within organizations, which involves preparing staff to work with data, develop analytical thinking, maintain openness to innovation, and engage in continuous learning. Digital culture facilitates the transition from intuitive management to a data-driven approach, where decisions are based on objective analytical data.

An important area is the professional development of management personnel and the enhancement of digital competencies among managers at all levels. Modern managers must possess the skills to interpret analytical data, work with digital dashboards, and understand the capabilities and limitations of artificial intelligence algorithms. This is especially relevant in the context of increasingly complex management decisions and the need for rapid responses to crises [2].

Another important area is the implementation of integrated information systems (ERP, CRM, and BI platforms) that provide a unified information environment for the organization and ensure consistency in management decisions at the operational, tactical, and strategic levels. Integrating data from different subsystems helps prevent information fragmentation, improves analytical accuracy, and supports a comprehensive assessment of management alternatives.

A promising approach to improving management processes is the use of artificial intelligence and big data analytics as tools to support management decisions. AI algorithms can provide trend forecasting, scenario modeling, and risk assessment; however, their application must be combined with professional managerial judgment. This makes it possible to maintain a strategic perspective, take into account informal factors, and avoid excessive automation of management processes.

An important condition for improving the management decision-making process is the implementation of data and information security management systems that ensure the quality, reliability, and security of management information. In the context of growing cyber threats and increasing dependence on digital platforms, these aspects are of strategic importance for the stability of management processes.

In order to reduce the risks associated with the digitalization of the management decision-making process, it is advisable to implement the following measures:

1) Introduction of data governance policies. Today, approaches to formalizing data management are becoming increasingly widespread in order to ensure data quality, relevance, and integrity. In the financial sector, particularly in systemically important banks, centralized data warehouses, data ownership regulations, and standards for data validation and quality control have been introduced. In the public sector, similar principles are being implemented within digital platforms linked to the Diia ecosystem, where clear rules for verifying data accuracy are established, thereby reducing the risk of management decisions being made on the basis of incomplete or outdated information.
2) Combining automated solutions with human control (human-in-the-loop). Ukrainian companies actively use analytical and automated decision-support systems while leaving the final decision to managers. This approach reduces the risk of algorithmic errors and preserves the strategic responsibility of management personnel [18].
3) Development of digital competencies of personnel and change management. It is important to implement internal training programs focused on digital skills, business analytics, and working with information systems, which help reduce resistance to change and increase the effectiveness of using digital tools in decision-making [2].
4) Strengthening cybersecurity and protection of management information. In the context of growing cyber threats, Ukrainian organizations are paying particular attention to the security of digital management systems. In the banking sector, multi-level data protection systems, backup mechanisms, access control, and incident monitoring are being implemented. Reliable information protection reduces the risk of data loss, decision-making failures, and reputational damage [13].
5) Phased implementation of digital solutions and continuous monitoring of effectiveness. Digital tools should be implemented gradually, with testing, analysis of results, and further improvement of decision-making mechanisms. This approach allows management models to be adapted to new conditions, reduces the risk of organizational failures, and increases user confidence in digital solutions.

Minimizing the risks associated with the digitalization of management decisions is possible through the combination of technological innovations with human oversight, the development of digital competencies, and systematic data and security management. The application of these approaches not only improves management efficiency but also ensures organizational stability under crisis and unstable conditions [19].

Table 5 presents ways to minimize the risks associated with the digitalization of management decisions, covering all management levels from operational to strategic. The greatest effect is achieved through the comprehensive implementation of digital solutions, when technological innovations are combined with the development of managerial competencies and systematic data quality control.

The examples above show that Ukrainian business organizations are gradually transitioning toward mature digital management models, in which a balance between automation and managerial control plays a key role. The systematic implementation of data management policies, the development of digital com-

Table 5

Ways to minimize the risks of digitizing management decisions: business practices of Ukrainian companies

Direction	Example of implementation in Ukrainian enterprises	Management level	Management effect
Implementation of data governance policies	Banking and financial companies (PrivatBank, Monobank) use centralized data repositories, rules for responsibility for information quality, and standards for its validation	Strategic, tactical	Increased reliability of analytics, reduced risk of erroneous strategic decisions, and consistent management
Combination of automated solutions with human control (human-in-the-loop)	Logistics companies (Nova Poshta) use algorithms for forecasting and route optimization, with the possibility of managerial adjustment	Operational, tactical	Reduction of algorithmic errors, increased flexibility, and adaptability of management decisions
Development of digital competencies among management personnel	Industrial companies and agricultural holdings train managers to work with ERP, BI, and analytical dashboards	Tactical, strategic	Improving the quality of management decisions, reducing the time spent on data analysis, and supporting digital change
Strengthening the cybersecurity of management systems	Banks, telecom, and IT companies implement multi-level protection, backup, and access control	Operational, strategic	Ensuring management continuity, reducing the risk of critical data loss
Phased implementation of digital management solutions	Manufacturing and service companies are gradually implementing ERP and CRM, starting with individual departments	Tactical, strategic	Reducing organizational risks and increasing the effectiveness of digital investments

petencies, and phased digitalization not only minimize risks but also enhance the strategic resilience of enterprises in a dynamic and unstable environment [17].

Improving the management decision-making process in the context of digitalization should be based on the integration of modern digital technologies, the development of managerial competencies, and the formation of a digital culture within the organization. Only a balanced combination of technological tools and strategic thinking on the part of managers can ensure the effectiveness, sustainability, and adaptability of management in the digital economy.

CONCLUSIONS

The study found that digital transformation significantly affects the management decision-making process, transforming its content, structure, tools, and temporal characteristics. Unlike traditional approaches based on intuitive assessments and limited information resources, modern digital management models rely on the use of large data sets, analytical platforms, automated information systems, and artificial intelligence technologies, ensuring the transition to data-driven management.

The research has shown that the use of digital tools (BI systems, Big Data, ERP, CRM, and AI solutions) contributes to improving the validity, efficiency, and adaptability of management decisions at the operational, tactical, and strategic levels. The digitalization of management processes reduces the time lag between problem identification and decision-making, lowers the level of managerial uncertainty, increases the transparency of planning and control processes, and ensures more efficient use of organizational resources.

At the same time, it has been established that the effectiveness of digital management decisions is not an automatic result of technology implementation. It largely depends on the level of digital maturity of the organization, the quality of data management, the availability of integrated information systems, and the readiness of management personnel for change. Of particular importance is the development of digital competencies among managers and the formation of a digital culture that ensures the conscious use of analytical tools and preserves the strategic role of human judgment in management.

The study also found that digitalization is accompanied by a number of risks related to cybersecurity, data quality, algorithmic errors, and excessive dependence on automated systems. The study substantiates the feasibility of applying data governance approaches, human-in-the-loop models, phased implementation of digital solutions, and continuous monitoring of their effectiveness as key tools for minimizing these

risks. The experience of Ukrainian enterprises shows that combining digital technologies with managerial experience makes it possible to achieve sustainable positive effects even under conditions of high external turbulence.

Future research should focus on developing applied models for management decision-making using artificial intelligence and big data analytics, particularly taking into account the specific characteristics of different business sectors. It is also important to quantitatively assess the effectiveness of digital management decisions in terms of productivity, financial performance, and organizational sustainability, as well as to examine the impact of digital maturity on the quality of strategic management. Further research in this area will contribute to the development of scientifically grounded recommendations aimed at improving the competitiveness of enterprises in the digital economy. ■

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