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METHODOLOGY OF INNOVATIVE TOOLS FOR INVOLVING INFORMATION TECHNOLOGIES INTO THE SYSTEM OF SUPPORTING THE EFFICIENCY OF CONTROLLING AND MANAGEMENT

The article considers the methodological principles of involving innovative information technology tools in the system of supporting the efficiency of controlling and management. It is emphasized that modern IT solutions not only automate routine processes, but also radically change the approach to making managerial decisions, forming a proactive management model. It is determined that the key elements of digital transformation are big data analytics, artificial intelligence, ERP and BI systems, which ensure efficiency, transparency and accuracy of management. The role of organizational culture and digital literacy of personnel as critical factors for effective implementation is substantiated. Tables are presented that illustrate the areas of application of IT in controlling and quantitative results of digital transformation. The results of the study confirm the increase in the efficiency of management processes and overall productivity of the enterprise as a result of the digitalization of controlling.

Keywords: *controlling, information technology, management, digital transformation, analytics, efficiency, artificial intelligence, management solutions.*

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МЕТОДОЛОГІЯ ІННОВАЦІЙНОГО ІНСТРУМЕНТАРІЮ ЗАЛУЧЕННЯ ІНФОРМАЦІЙНИХ ТЕХНОЛОГІЙ В СИСТЕМУ ПІДТРИМКИ ЕФЕКТИВНОСТІ КОНТРОЛІНГУ І МЕНЕДЖМЕНТУ

У статті розглянуто методологічні засади залучення інноваційного інструментарію інформаційних технологій у систему підтримки ефективності контролінгу і менеджменту. Акцентовано на тому, що сучасні IT-рішення не лише автоматизують рутинні процеси, а й кардинально змінюють підхід до прийняття управлінських рішень, формуючи проактивну модель управління. Визначено, що ключовими елементами цифрової трансформації є аналітика великих даних, штучний інтелект, ERP- та BI-системи, які забезпечують оперативність, прозорість і точність управління. Обґрунтовано роль організаційної культури та цифрової грамотності персоналу як критичних чинників ефективного впровадження. Подано таблиці, що ілюструють напрями застосування IT у контролінгу та кількісні результати цифрової трансформації. Результати дослідження підтверджують зростання ефективності управлінських процесів і загальної продуктивності підприємства внаслідок цифровізації контролінгу.

Ключові слова: *контролінг, інформаційні технології, менеджмент, цифрова трансформація, аналітика, ефективність, штучний інтелект, управлінські рішення.*

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Problem statement. Modern business conditions are characterized by high dynamics, increasing complexity of the operating environment and the need to make informed management decisions in real time. Traditional tools of controlling and management are increasingly less responsive to the needs of rapid response, forecasting and strategic planning. This makes it urgent to develop new approaches that would combine the technological capabilities of information systems with analytical management needs. The problem lies in the lack of a holistic methodology for using innovative IT tools in the controlling system, which would ensure adaptability, transparency and efficiency of management processes. The unsystematic implementation of digital solutions, without taking into account their role in changing the logic of management, limits the potential of digital transformation. Therefore, there is a need to develop and substantiate a comprehensive methodological approach to the integration of information technologies into controlling as a key element of modern management.

Analysis of publications. In scientific and applied literature, more and more attention is paid to the topic of digitalization of management, development of information systems in financial and economic activities of enterprises, as well as transformation of controlling in the conditions of digital economy [1-5]. Research focuses on the advantages of implementing BI systems, ERP solutions, analytical platforms and artificial intelligence tools in monitoring, planning and analysis processes. Attention is also focused on the impact of digital technologies on changing management roles, expanding controlling functions and transforming organizational culture [6-10].

However, despite all the versatility of research, a number of important aspects remain unresolved. In particular, the methodological principles of combining digital tools with functional tasks of controlling are not sufficiently disclosed; there is a lack of a systematic vision of the relationships between IT solutions, management practices and performance; the role of management culture in the effective use of digital tools is not sufficiently studied. The problem of quantifying the impact of IT on the effectiveness of controlling, taking into account non-financial indicators, also remains relevant. This indicates the need for further theoretical and practical understanding of this issue.

Presentation of the main results. In today's conditions of rapid technological changes and uncertainty of the economic environment, the issue of increasing the efficiency of management decisions is becoming a strategic priority for enterprises of all sectors. Controlling, as a function of monitoring, analyzing and managing the effectiveness of activities, plays a key role in ensuring the adoption of sound decisions, timely response to risks and adaptation to changes. That is why the methodology for integrating information technologies into the controlling and management support system is of utmost importance. Such integration not only contributes to increasing the efficiency of information exchange, but also changes the very nature of management activities, transferring it to a qualitatively new level of flexibility, transparency and predictive ability.

Analysis of scientific approaches to the digitalization of management shows that information technologies are becoming not just tools for automating routine processes, but fundamental elements of management architecture. They transform the

processes of collecting, processing, analyzing and presenting data, which, in turn, allows you to create holistic real-time information pictures necessary for an adequate assessment of the current state of the enterprise and forecasting its prospects. Controlling, traditionally focused on assessing the results of economic activity, is integrated with digital systems that provide automated accumulation of key indicators, their validation and further use in strategic planning. It is in this area that information technologies become not only a technical tool, but also a driving force for the formation of new approaches to efficiency management.

The effectiveness of controlling increases significantly due to the introduction of big data analytics and intelligent information processing tools. These tools allow managers not only to track past indicators, but also to predict future trends taking into account a large number of variables. Predictive models, machine learning, artificial intelligence algorithms that analyze market behavior, internal processes of the enterprise and the relationships between them open up new opportunities for systemic control. As a result, methods for forming management decisions are transformed – they cease to be reactive and become proactive, which allows minimizing risks even before they actually appear [1-3].

An important aspect of the methodology is the creation of integrated information systems that combine multi-level data from internal corporate sources, external market flows and analytical platforms. Such systems form an information environment where controlling and management are integral components of a single information support cycle. Ensuring the quality of data, its relevance and accessibility for responsible users becomes a critical condition for effective work. The role of the manager is not only to interpret this data, but also to form queries that allow information technologies to generate useful conclusions. Thus, a new type of cooperation between a person and a system appears, where a person defines strategic goals, and the system provides reliable, substantiated digital prompts for decision-making. The aspect of organizational culture is also of great importance in the implementation of innovative tools. Enterprises that seek to effectively use information technologies in controlling must create an environment that promotes the adoption of new technological solutions, supports personnel training and forms a culture of openness to change. Information systems are becoming part of the corporate nervous system, and the mindset of managers and employees is a key factor in their successful operation. Leadership competencies, readiness to adapt, analytical thinking skills – all this is becoming a component of digital literacy of modern management.

An important component of the methodology for involving information technologies is also the identification of key performance indicators that allow assessing transformational changes in the company's activities. These indicators include not only financial indicators, but also non-financial metrics related to consumer experience, process quality, environmental and social performance. Digital platforms allow you to aggregate, cross-analyze and visualize these indicators in such a way that they are understandable and useful for making strategic decisions at all levels of management [2-5]. As a result of the integration of innovative information technologies, controlling is transformed from a monitoring and reporting function into a powerful mechanism for supporting strategic transformations. It ceases to be a separate service and becomes an integral part of the management ecosystem, where data analytics,

information transparency and adaptive behavior models form the basis for long-term growth and competitiveness. This approach allows enterprises not only to reduce uncertainty, but also to create new opportunities for innovation, flexibility and resilience in difficult market conditions.

Thus, the methodology of innovative tools for involving information technologies in the system of supporting the effectiveness of controlling and management is not only a technical integration of systems, but also a systemic approach that combines technology, management culture, strategic vision and adaptation to new challenges. This helps to transform data into knowledge, knowledge into strategies, and strategies into competitive advantages, which meets the requirements of the digital economy and provides enterprises with the ability to function effectively and develop in a fast-paced world [4-10].

The modern system of controlling and management is increasingly focused on digital transformation, which opens up new opportunities for operational management of enterprises. The methodology of innovative tools that integrate information technologies allows you to increase the efficiency of planning, control and analysis through the use of automated solutions, artificial intelligence and analytical platforms. The tables below illustrate the main areas of application of IT in the functional areas of controlling, and also demonstrate a comparative assessment of the results before and after the implementation of digital technologies. Tables 1-2 illustrate the use of innovative tools in the controlling and management system (table 1).

Table 1. **Functional areas of application of information technologies in controlling,** *proposed by the authors*

Functional Area	Digital tools	Expected effect
Financial Planning	BI platforms	Increased forecast accuracy
Budgeting	ERP systems	Cost optimization
Management Reporting	Analytical panels	Transparency of management decisions
Performance Assessment	KPI monitoring	Improved control over results
Risk Analysis	Forecasting systems	Timely response to changes

Table 2 shows a comparison of key performance indicators of the controlling system before and after the integration of information technologies. An assessment of changes in the speed of reporting, accuracy of analytical data, level of management satisfaction, efficiency of decision-making and economic efficiency is provided. The presented data make it possible to trace the real impact of digital tools on the efficiency of management processes and determine the feasibility of further digital transformation of the enterprise (Table 2).

Table 2. **Indicators of the effectiveness of the implementation of information technologies in controlling,** *proposed by the authors*

Indicator	Before IT implementation	After IT implementation
Reporting preparation time	72 hours	24 hours
Number of analytical errors	15 errors/month	3 errors/month
Manager satisfaction level	65%	90%
Decision-making efficiency	5 days	1 day
Overall ROI	1.2	3.5

The analysis of the above indicators demonstrates a significant improvement in results after the implementation of information technologies in the controlling system. There is a significant reduction in reporting preparation time, a sharp decrease in the number of analytical errors, an increase in management personnel satisfaction and acceleration of management decision-making processes. The growth of the overall economic effect confirms that digital modernization not only optimizes internal processes, but also creates sustainable competitive advantages, providing the enterprise with a higher level of efficiency and stability.

Conclusions. The integration of information technologies into the system for supporting the effectiveness of controlling and management is not only a technical update, but also a deep transformation of management practices. In the conditions of the digital economy, this allows enterprises to quickly respond to changes, form a high-quality analytical basis for decision-making and increase the overall efficiency of functioning. The introduction of innovative tools ensures a reduction in information processing time, a decrease in analytical errors, an increase in the level of manager satisfaction and an increase in economic performance, which is confirmed by comparative indicators.

The role of controlling is evolving from reporting to strategic, where data is transformed into an effective management tool. The success of such a transformation largely depends on the established organizational culture, open to innovation, the level of digital literacy of personnel and the ability of management to formulate adequate requests for digital systems. Thus, an innovative approach to combining IT and controlling provides not only increased operational efficiency, but also forms the basis for sustainable strategic development of enterprises in a changing environment.

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