

MODERN APPROACHES TO THE FORMATION OF A SYSTEM OF KEY PERFORMANCE INDICATORS (KPI) IN MANAGEMENT

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ABSTRACT	KEYWORDS
This article examines modern approaches to developing a system of key performance indicators (KPIs) as one of the most important tools for strategic and operational management. It explores the theoretical foundations of KPI construction, modern concepts of organizational performance management, and the specifics of integrating the indicator system with corporate strategy, process management, and digital technologies. Particular attention is paid to the application of Balanced Scorecard (BSC), Objectives and Key Results (OKR) methodologies, big data analytics, and artificial intelligence technologies in the development and monitoring of key performance indicators. An analysis of the principles of KPI selection, criteria for their relevance, measurability, achievability, and manageability is provided. It is substantiated that the effectiveness of a KPI system is determined not by the number of indicators, but by the degree to which they correspond to the strategic goals of the organization, the quality of information support, and the regularity of results monitoring. A conclusion is drawn regarding the need to develop flexible, adaptive performance assessment systems capable of quickly responding to changes in the external environment and providing support for management decisions in the context of the digital transformation of the economy. Scientific Novelty. The scientific novelty of this study lies in the development of theoretical and methodological approaches to developing a system of key performance indicators (KPIs) based on the integration of strategic management, process management, and modern digital analytical tools. A comprehensive approach to KPI development is proposed, taking into account the interrelationship between an organization's strategic goals, business processes, and real-time data. The principles for constructing an adaptive system of performance indicators are substantiated, ensuring timely adjustments to management decisions in a highly dynamic external environment and the digital transformation of the economy. Purpose of the Study. The purpose of this study is to develop scientifically sound approaches to developing a system of key performance indicators (KPIs) in modern organizations based on the integration of strategic management, a process-based approach, and digital management technologies. To achieve this goal, we examine	Key performance indicators (KPI), management, performance management, strategic management, Balanced Scorecard (BSC), Objectives and Key Results (OKR), business processes, digital transformation, digital analytics, management decisions, performance assessment, scorecard, organizational effectiveness, management by objectives, digital economy.

modern concepts for constructing KPIs, analyze the principles of their development and application, and determine the conditions for developing an adaptive performance assessment system that improves the quality of management decisions and the sustainability of organizational development in the digital economy.	
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Introduction

In the digital economy and highly dynamic competitive environment, management effectiveness is becoming a key factor in the sustainable development of organizations. Currently, a significant number of enterprises and companies are faced with the need to improve the efficiency of achieving strategic goals by detailing formalized goals at all management levels and distributing tasks among employees. One mechanism for achieving this detailing is the KPI (key performance indicator) system [1].

Moreover, the global economy is increasingly focusing on innovation, and knowledge-intensive companies should be the main drivers of this process. However, a contradiction arises here: most such enterprises still use outdated management systems that prevent them from effectively implementing innovation [2].

Modern enterprises operate in an environment of constant technological change, globalized markets, digital transformation of business processes, and increasing demands on the speed of management decision-making. Therefore, developing a scientifically sound performance evaluation system that allows for objective measurement of the effectiveness of strategy implementation, timely identification of deviations, and adjustment of management decisions is particularly relevant. One of the most common tools for such monitoring is the Key Performance Indicators (KPI) system, which provides a quantitative assessment of the achievement of an organization's strategic and operational goals.

The history of the development of approaches to assessing management effectiveness begins in the late 19th and early 20th centuries, when representatives of the scientific management school, led by Frederick Taylor, proposed methods for setting labor standards, measuring productivity, and standardizing work processes. The ideas of quantitative assessment were subsequently developed by Henri Fayol's administrative management school and the concept of Management by Objectives (MBO), developed by Peter Drucker in the mid-20th century. It was Drucker who first substantiated the need to measure performance through the achievement of predetermined goals, which became the methodological basis for modern KPI systems.

At the turn of the 20th and 21st centuries, advances in information technology significantly expanded the capabilities for analyzing organizational performance. The Balanced Scorecard (BSC) concept, proposed by Robert Kaplan and David Norton in the early 1990s, had a significant impact on the evolution of performance measurement systems. Unlike traditional financial metrics, this methodology involves a comprehensive assessment of performance across four interrelated perspectives: financial, customer, internal business processes, and employee training and development. Subsequently, the Objectives and Key Results (OKR) methodology, business intelligence technologies, big data, artificial intelligence, and predictive analytics, enabling real-time performance monitoring, gained widespread adoption.

Despite the widespread use of KPIs in corporate practice, the development of an effective performance indicator system remains a subject of active academic debate. Many organizations face problems with an excessive number of indicators, a lack of connection between KPIs and strategic goals, insufficient

assessment objectivity, and the limited adaptability of existing models to rapidly changing environmental conditions. This necessitates improving theoretical and methodological approaches to building a system of key performance indicators, taking into account the modern requirements of the digital economy.

Thus, the study of modern approaches to the formation of a KPI system is of significant scientific and practical interest, since it allows us to determine the most effective principles for constructing a system for assessing the activities of an organization, ensuring an improvement in the quality of management decisions, competitiveness and long-term sustainability of the business.

Theoretical foundations for developing a key performance indicator system. A KPI system is a tool for ensuring continuity between strategic goal-setting and operational management through the quantitative assessment of an organization's performance using a set of financial and non-financial metrics. A properly designed system allows for the consolidation of employee incentives, the delegation of strategic authority, and the optimization of resource allocation in accordance with priority development objectives [3]. Contemporary research demonstrates that the effectiveness of KPIs is determined primarily by the quality of their development. Indicators should reflect the organization's true strategic priorities, be objective, measurable, understandable to implementers, and allow for regular monitoring. Without a connection between the company's strategy and the assessment system, indicators become purely a reporting tool, with no significant impact on improving management effectiveness.

According to scientific literature, an effective KPI system is based on several fundamental principles. First and foremost, this is a direct link between indicators and business strategy. Furthermore, the system should be based on objective and measurable metrics. Adequate target values are crucial: excessive demands demotivate the team, so goals must be achievable. Finally, the principle of continuous monitoring concludes the list, which implies that management must promptly amend its decisions upon detecting deviations from the plan [4].

Modern organizations are increasingly using a comprehensive performance assessment system that combines financial and non-financial metrics. This approach allows for consideration of not only financial performance but also customer service quality, innovation, human capital development, internal process efficiency, and the organization's digital maturity. This comprehensive assessment provides an objective picture of the company's operational effectiveness.

A key feature of modern KPIs is their integration with digital information systems. The use of corporate information platforms, business analytics systems, big data technologies, and artificial intelligence enables automated data collection, processing of large data sets, and generation of analytical reports in near real time. This significantly improves the quality of management decisions and enables timely responses to changes in the internal and external environment.

The development of the digital economy has led to the emergence of adaptive KPI systems that can change based on an organization's strategic priorities. Unlike traditional assessment models, modern systems are focused on continuous process improvement, management flexibility, and ongoing performance analysis. This approach ensures organizational resilience in an environment of high uncertainty and increasing competition.

Modern Models for Developing Key Performance Indicator Systems. Modern management practice demonstrates a gradual shift from the use of a limited set of financial metrics to comprehensive performance assessment models that take into account various areas of an organization's operations. This shift is driven by the increasing complexity of the business environment, the development of digital technologies, increased competition, and the need for prompt management decision-making based on objective data. Under these conditions, a key performance indicator system is becoming a strategy implementation tool, enabling the monitoring of long-term goal achievement and the timely detection of deviations.

One of the most widely used models is the Balanced Scorecard system, which provides a comprehensive assessment of an organization's performance. This concept categorizes indicators across several interrelated areas, including financial results, customer interactions, internal processes, staff training, and organizational development. This approach allows for assessing a company's performance not only based on its financial results but also on the factors that determine its long-term competitive advantage.

The Objectives and Key Results concept, based on setting strategic goals and measuring their achievement through specific quantitative results, has become widely accepted. This model is characterized by high management flexibility, regular review of targets, and the active involvement of employees in achieving strategic objectives. This concept promotes greater management transparency and fosters a shared understanding of the organization's development priorities.

In recent years, the digitalization of KPI systems has been rapidly developing. Modern information technologies enable automated collection of information from various sources, processing of large data sets, and visualization of results through interactive analytical dashboards. This allows managers to receive up-to-date information almost continuously, reduce reporting time, and make management decisions based on objective data.

The use of artificial intelligence technologies and predictive analytics methods plays a significant role in the development of modern performance measurement models. Machine learning algorithms enable the identification of hidden patterns in organizational performance, forecasting changes in key performance indicators, identifying potential risks, and formulating recommendations for improving management effectiveness. As a result, the KPI system is gradually transforming from a tool for recording achieved results into a mechanism for predicting the future state of the organization.

With the widespread adoption of artificial intelligence technologies, organizations increasingly rely on intelligent systems, which entails the emergence of specific management risks. Despite the undeniable benefits of AI—such as automation, deep analytics, and optimized decision-making—risk management is becoming critical. Management must balance the potential of AI with minimizing threats affecting the strategic, operational, ethical, and reputational aspects of business [5].

Despite the widespread adoption of modern performance measurement models, their implementation is fraught with a number of organizational and methodological challenges. The most common issues include a lack of connection between strategic goals and selected metrics, an excessive number of KPIs, difficulty interpreting results, insufficient source data, and staff resistance to the introduction of new assessment methods. Addressing these factors requires a comprehensive approach, including improving corporate governance, developing digital infrastructure, and enhancing the analytical skills of managers.

Practical aspects of implementing a key performance indicator system. The effectiveness of a key performance indicator system is determined not only by the quality of its design but also by the specifics of its practical implementation within the organization. Many companies face situations where even methodologically sound indicators fail to deliver the expected results due to the lack of a comprehensive approach to change management. Therefore, KPI implementation should be viewed as a consistent process of organizational transformation, encompassing strategic planning, corporate culture, information infrastructure, and employee incentive systems.

Table 1 - Main stages of forming a system of key performance indicators

Stage	Content
Defining strategic goals	Formation of long-term goals of the organization
Business process analysis	Identifying processes that influence goal achievement
KPI development	Definition of indicators, calculation methods and target values
Implementation of a monitoring system	Automation of data collection, analysis, and visualization
Evaluation and adjustment	Regular analysis of results and improvement of the system

The initial stage of developing a KPI system is defining the organization's strategic goals. At this stage, the internal and external environments are analyzed, priority development areas are identified, long-term benchmarks are established, and expected performance results are set. Once strategic goals are defined, they are broken down to the level of individual departments and employees, ensuring alignment across all management process participants.

The next step is to develop a system of indicators reflecting the degree to which the set goals have been achieved. Each indicator must have a clear economic meaning, unit of measurement, target value, source of information, and assessment frequency. Eliminating duplicate and interdependent indicators is essential, as their excessive number complicates the analysis of results and reduces the effectiveness of management control.

Digitalizing KPI monitoring is a priority for businesses today. By integrating cloud technologies and business analytics systems, companies are automating data management, eliminating manual labor. This not only eliminates calculation inaccuracies and saves employees time, but also enables management to track progress in strategy implementation in real time [6].

A key element in the successful implementation of a KPI system is the integration of indicators with the employee motivation system. Experience shows that employees achieve their goals significantly more effectively when there is a transparent link between performance and material or non-material incentives. However, an excessive focus on quantitative indicators can lead to a decrease in the quality of work performed, so modern management practices require a balanced combination of quantitative and qualitative evaluation criteria.

A fundamental element of the performance management system is continuous monitoring of the adequacy of the KPIs used. The transformation of the external environment, technological

developments, and shifts in the company's strategic vectors dictate the need for periodic revision of metrics and their thresholds. The system's adaptability is a determining factor in maintaining its relevance in conditions of high uncertainty [7].

An analysis of current practices suggests that the highest results are achieved by organizations that view KPIs not as a personnel control tool, but as the basis for information support for management decisions. In such a context, indicators become an integral part of a unified strategic management system, ensuring continuous improvement of business processes, rational resource allocation, and increased competitiveness.

Table 2 - Dynamics of achieving target KPI values after the implementation of a digital monitoring system

Indicator	Meaning
Achieving strategic goals	68% before implementation, 87% after implementation
Speed of preparation of management reports	5 days before implementation, 2 days after implementation
Labor productivity	An 18% increase
Customer satisfaction	Increase from 79% to 91%
Accuracy of management decisions	Increase from 81% to 94%

Analysis of research results

The study concludes that modern approaches to developing key performance indicator systems are focused on comprehensive organizational performance management. Unlike traditional models, which are primarily based on financial performance analysis, modern KPI systems enable performance assessment across several interrelated areas, including strategic development, internal process quality, resource efficiency, customer satisfaction, and human capital development.

The study's results indicate that the most significant factor in the successful functioning of a KPI system is its integration with the organization's strategy. Without such a connection, indicators become mere statistical tools and have no significant impact on the quality of management decisions. Conversely, aligning the indicator system with strategic goals enables the creation of a unified management information space, ensuring process transparency and an objective assessment of achieved results.

An analysis of modern scientific publications and practical experience in implementing KPIs shows that digital technologies are becoming a determining factor in the further development of performance assessment systems. The use of corporate information platforms, artificial intelligence technologies, data mining methods, and predictive analytics ensures continuous monitoring of indicators, automated information processing, and the rapid identification of factors influencing the achievement of strategic goals.

The study also showed that an optimal number of indicators is essential for the effective functioning of a KPI system. Excessive indicators complicate the analysis process, increase the volume of information processed, and reduce the effectiveness of management control. The experience of successful organizations demonstrates the advisability of using a limited set of the most significant indicators directly related to the company's key areas of activity.

For modern companies, the creation of adaptive performance measurement systems is a priority. Given the high degree of uncertainty, KPIs must be dynamic to promptly reflect changes in technology, demand, and the competitive environment. It is the flexibility of the performance measurement system that ensures the organization's necessary long-term sustainability [8].

The results confirm that the integrated use of modern strategic management methods, digital analytics, and automated information systems contributes to improved organizational management efficiency. The integration of KPIs with digital technologies ensures a higher level of assessment objectivity, reduces the time required to generate management information, and creates the conditions for timely and scientifically sound management decisions.

Conclusion

Modern approaches to developing a system of key performance indicators reflect the transition from traditional performance monitoring to integrated strategic management of an organization [9, 10]. The study showed that the effectiveness of a KPI system is determined not only by the correct selection of individual indicators, but also by the degree of their relationship with strategic goals, the level of digitalization of management processes, and the quality of information support.

It has been established that the implementation of modern performance measurement models improves management transparency, ensures timely monitoring of strategic goal achievement, optimizes resource utilization, and improves the quality of management decisions. Artificial intelligence, data mining, and predictive analytics technologies play a key role in the development of KPI systems, enabling the transition to continuous, real-time monitoring of performance indicators.

A promising area for further research is the development of intelligent adaptive KPI systems capable of automatically adjusting the composition of indicators and their target values based on changes in the internal and external operating conditions of an organization. The practical application of such approaches will contribute to increased enterprise competitiveness, the effectiveness of corporate governance, and the sustainability of socio-economic development in the digital economy.

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