*Review Article*

Using Artificial Intelligence for Resource Forecasting in Strategic Project Management

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ABSTRACT

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| **Aims:** The aim of this study is to analyze the role of artificial intelligence in improving project management processes, identify key implementation challenges, and develop recommendations for optimizing the use of intelligent technologies in resource forecasting.**Study design:** Analytical research based on secondary data and modeling.**Place and Duration of Study:** The research was conducted through analytical evaluation of global scientific publications and applied modeling between January 2024 and February 2025.**Methodology:** The study applied the analysis of scientific literature to identify current trends in the use of artificial intelligence, a structural-logical method for generalizing forecasting processes, and modeling to evaluate AI capabilities in project management. Methods of analysis and synthesis were used to develop practical recommendations.**Results:** The study revealed that artificial intelligence improves the accuracy of project resource forecasting, reduces the risk of exceeding budgets, and enhances project adaptability. Key implementation challenges were identified, including poor data quality, high financial costs, and lack of staff competencies. The study proposes a step-by-step approach to AI integration, including pilot project deployment, reliable data preparation, and staff training.**Conclusion:** Artificial intelligence significantly contributes to the improvement of strategic project management. Its integration facilitates more accurate forecasting, effective resource distribution, and timely adaptation to external changes. Gradual implementation and further research on forecasting algorithms, industry-specific models, and AI-related standards are recommended to enhance project sustainability and security. |

*Keywords: Artificial Intelligence, Resource Forecasting, Strategic Project Management, Risk Management, Resource Optimization, Project Adaptation, Technology Implementation*

1. INTRODUCTION

Using artificial intelligence to forecast resources in strategic project management is one of the key challenges of modern science and practice. The growing complexity of projects and the need for efficient resource management under time and budget constraints require new approaches that go beyond traditional methods. Artificial intelligence, in particular its ability to analyze large amounts of data, predict trends, and model complex systems, opens up significant opportunities to improve the accuracy and speed of management decision-making. However, the challenges of implementing such innovations are multifaceted and include both technical and organizational aspects. Integration of innovative technologies, in particular information systems, requires a comprehensive approach, including economic, organizational, and legal aspects, which ensures the sustainability and adaptability of systems in the face of increasing threats and uncertainty (Chyzhmar, Dniprov, Korotiuk, Shapoval, & Sydorenko, 2020). From a scientific point of view, this issue concerns the development and improvement of forecasting algorithms adapted to the specifics of management tasks in various industries. Practical tasks include integrating these algorithms into existing project management systems, increasing their efficiency, and ensuring adaptation to changing environmental conditions. It is also important to analyze the impact of artificial intelligence on the organizational structure of enterprises, staff training, and possible risks associated with the use of new technologies.

Thus, research in this area is aimed at solving important scientific and practical problems, including ensuring optimal resource allocation, minimizing the risks of cost overruns and project deadlines, and improving the overall effectiveness of strategic management. The results of such research have the potential to significantly influence the development of management approaches, ensuring the competitiveness of enterprises in the modern economy.

**2. LITERATURE REVIEW**

The use of artificial intelligence for resource forecasting in strategic project management has become a key area of modern scientific research aimed at improving the efficiency of management decisions and adapting to complex conditions. In particular, Chyzhmar, Dniprov, Korotiuk, Shapoval, and Sydorenko (2020) study the relationship between the development of information and computer technologies and challenges in the field of information security, emphasizing that artificial intelligence can minimize the risks of information interference and serve as a basis for strategic management of project resources. In the same aspect, Vasylenko and Vakaliuk (2024) explore the prospects of artificial intelligence, emphasizing its role in resource forecasting and preventing their shortage through the automation of analytical processes. Bachynskyi (2024) draws attention to specific practical aspects of using artificial intelligence, in particular to reduce decision-making time and optimize project management costs. Bushuieva, Ivko, and Tykhonovych (2024) proposed a syncretic management approach that combines adaptability and strategicity through the introduction of intelligent algorithms. The importance of artificial intelligence for processing large amounts of data and long-term resource planning is demonstrated in the study by Krasnokutska and Osetrova (2018). Savio and Ali (2023) emphasize its ability to reduce uncertainty in strategic planning, which is critical in a dynamic environment. A different approach is proposed by Parekh and Olivia (2024), who develop methodologies for automating management processes using artificial intelligence, which allows for more efficient resource allocation. Pal et al. (2023) confirm that artificial intelligence significantly improves the quality of strategic decision-making through forecasting that takes into account numerous variables. In turn, Kiani (2024) focuses on entrepreneurial projects, demonstrating how innovative AI approaches contribute to efficiency. Davahli (2020) systematizes research results, demonstrating the feasibility of integrating artificial intelligence to optimize resources in strategic management. Thompson (2024) examines the accuracy of risk forecasting using artificial intelligence, noting that it reduces the likelihood of errors. The impact of artificial intelligence on the management of complex projects is analyzed by Wijayasekera et al. (2022), emphasizing its importance for adaptability. Bai, Wang, Wang, Huang, and Shi (2020) demonstrate the effectiveness of neural networks in predicting conflicts between projects, which helps avoid resource conflicts. Mesa Fernández, González Moreno, Vergara-González, and Alonso Iglesias (2022) trace the growing interest in the topic of intelligent resource management. Ong and Uddin (2020) analyze the historical development of artificial intelligence in project management, outlining its further potential.
All of these studies show that the use of artificial intelligence in project management not only increases the accuracy and speed of resource forecasting, but also lays the foundation for adaptive and effective strategies in a changing environment.

Despite significant progress in the study of artificial intelligence for resource forecasting in strategic project management, several important aspects remain to be addressed. In particular, the specifics of adapting artificial intelligence to different industry needs and project scales, as well as the development of approaches that can ensure high adaptability to an unstable environment, require further research.

There is still limited understanding of how AI resource forecasting affects the long-term sustainability of projects. Methodological approaches need to be improved to take into account the specifics of data processing and management processes in complex environments. The issue of integrating artificial intelligence into project management systems, taking into account organizational, technical, and ethical barriers, has not been sufficiently studied. The proposed research aims to overcome these gaps by developing new algorithmic approaches adapted to conditions of uncertainty, as well as creating recommendations for integrating artificial intelligence into various types of projects. These aspects are critical to improving the efficiency of project management and expanding the practical application of innovative technologies.

**The purpose of the article** to study the possibilities of using artificial intelligence to forecast resources in strategic project management, determine its impact on optimizing resource planning and management decision-making, and identify key challenges and prospects for the implementation of these technologies.

**Objectives of the article:**

1. characterize the current state, main approaches, and algorithms for using artificial intelligence to forecast resources in project management;
2. to analyze the impact of artificial intelligence on the success of project implementation, in particular through optimization of risk and resource management, and to identify key issues that arise during the implementation of these technologies;
3. to develop recommendations for the effective integration of artificial intelligence into project management systems to increase their efficiency.

**3. MATERIALS AND METHODS**

The study is based on a combination of several methodological approaches that allow for a comprehensive assessment of the impact of artificial intelligence on resource forecasting in strategic project management. The main research methods are the analysis of scientific sources, the structural and logical method, modeling, as well as methods of analysis and synthesis.

The analysis of scientific sources was used to identify the main trends in the implementation of artificial intelligence in project management, to identify key challenges and prospects for the development of this technology. Modern scientific publications, reports, and empirical studies related to artificial intelligence in the field of resource forecasting were used.

The structural-logical method allows to systematize the processes of resource forecasting, identifying the main factors that affect the effectiveness of artificial intelligence. Based on this method, a model for integrating artificial intelligence technologies into strategic project resource management has been developed.

Modeling was used to assess the capabilities of artificial intelligence in solving resource forecasting problems. We simulated project resource forecasting using machine learning algorithms, which allowed us to determine the level of forecast accuracy and potential risks.

The methods of analysis and synthesis are used to develop recommendations for the effective implementation of artificial intelligence in project management systems. The main organizational, technical, and economic aspects of using this technology are taken into account.

The study was conducted based on data from real projects where artificial intelligence was used to forecast resources. To evaluate the effectiveness of the models, a comparative analysis of forecasting results with traditional approaches based on expert opinions and historical data was conducted.

**4. RESULTS AND DISCUSSION**

The use of artificial intelligence in project management has become a new stage in the development of methodologies and tools used to achieve the strategic goals of enterprises. Traditional approaches based on manual data analysis and the use of standardized management models are increasingly being supplemented or replaced by automated solutions based on artificial intelligence algorithms. This includes resource forecasting, schedule optimization, risk management, and big data analysis. The use of such technologies allows not only to increase management efficiency but also to adapt to rapid changes in the external environment (Table 1).

**Table 1. Main approaches to using artificial intelligence in project management: advantages and limitations**

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| **Approaches to using artificial intelligence in project management** | **Advantages** | **Limitations** |
| Automate resource planning and allocation  | Reducing the time for preparing project documentation, optimizing costs | High dependence on the quality of initial data |
| Using predictive models for risk analysis  | Improving forecasting accuracy, reducing the likelihood of unforeseen expenses | The need for a large amount of historical data to train models |
| Intelligent analysis of big data  | Identification of trends and anomalies that may affect project implementation | Difficulty of integrating artificial intelligence with existing control systems |
| Decision support systems  | Improving the validity of management decisions | High cost of development and implementation |
| Automation of project monitoring and control  | Prompt detection of deviations, improved communication between project participants | The need to adapt systems to the specifics of a particular industry |

*Source: compiled by the author based on the works of Bachynskyi (2024), Savio and Ali (2023), Pal et al. (2023), Wijayasekera et al. (2022), and Mesa Fernández, González Moreno, Vergara-González, and Alonso Iglesias (2022).*

In practice, the introduction of artificial intelligence into management processes has already yielded noticeable results. For example, automated cost forecasting systems have reduced the duration of the preparatory stage of construction projects, while risk analysis models have become a key tool for managing large infrastructure projects. At the same time, modern artificial intelligence tools in project management continue to improve, which expands their functionality. If earlier the main focus was on automating routine processes, now artificial intelligence is increasingly being integrated into strategic aspects of management, including the formation of long-term plans, modeling alternative scenarios, and assessing their impact on achieving goals. The changes caused by the introduction of artificial intelligence have affected not only technical aspects but also the organizational culture of enterprises. Project teams rely more on data than intuition, making the management process more transparent and evidence-based. However, the introduction of such technologies also brings new challenges, including the need to train staff, ensure cybersecurity, and create the appropriate infrastructure to handle large amounts of data. The use of artificial intelligence algorithms and methods for resource forecasting has significantly impacted the effectiveness of strategic project management. These tools allow you to analyze large amounts of data, identify hidden patterns, and create accurate forecasts. They are used to determine the needs for material, financial, and human resources, which is especially important in a dynamic environment. The main approaches are machine learning, neural networks, genetic algorithms, and hybrid models that allow simulating different project development scenarios. Their implementation helps to optimize costs, minimize risks, and increase project efficiency (Table 2).

**Table 2. Artificial Intelligence Methods and Algorithms for Resource Forecasting: Main Applications and Practical Examples**

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| **Method/Algorithm**  | **Main application** | **Examples of practical use** |
| Linear regression  | Cost forecasting, resource calculation for simple projects | Cost analysis in small business projects with fixed parameters |
| Neural networks  | Optimization of resource allocation, anticipation of complex processes | Inventory management in retail, energy consumption forecasting |
| Genetic algorithms  | Developing optimal resource utilization plans | Optimizing supply chains in transportation companies |
| Machine learning  | Analyzing and forecasting market behavior, allocating resources based on trends | Demand forecasting in production systems, adaptation to seasonal changes |
| Hybrid models  | Combining methods to create multivariate models | Risk management in large infrastructure projects |

*Source: compiled by the author based on the works of Parekh and Olivia (2024), Kiani (2024), Davahli (2020), Thompson (2024), and Bai, Wang, Wang, Huang, and Shi (2020).*

The introduction of these algorithms significantly changes the approach to resource management. For example, neural networks are used in manufacturing to predict the need for materials, which avoids cost overruns and reduces the time required to complete tasks. Genetic algorithms are effectively used in logistics to optimize transportation routes, which reduces fuel and maintenance costs. In retail, machine learning provides accurate forecasting of demand for goods, allowing for optimal management of warehouse stocks.

The current environment is conducive to the active implementation of artificial intelligence in project management, which allows for greater flexibility and adaptability. For example, in large construction projects, algorithms predict the need for materials depending on changes in weather conditions and the market. At the same time, the integration of such technologies requires high quality data and the adaptation of internal processes. These changes can significantly improve management efficiency and reduce risks, providing competitive advantages.

Artificial intelligence provides a new level of accuracy in resource forecasting, which is becoming an important factor in achieving project success. In modern project management, key success indicators, such as meeting deadlines, budget, and quality assurance, are largely dependent on proper resource planning and management. The use of artificial intelligence algorithms allows you to estimate resource requirements with greater accuracy, taking into account factors such as historical data, market changes, risks, and project specifics. This accuracy makes it possible to avoid cost overruns, shortages, and downtime, which has a positive impact on all aspects of project implementation (Table 3).

**Table 3. Impact of resource forecasting accuracy on key project success indicators**

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| **Key success indicators** | **The role of accurate resource forecasting** | **Impact on the project** |
| Meeting deadlines | Ensuring timely availability of all necessary resources | Avoiding delays in the implementation of project stages |
| Execution within the budget | Reducing redundant purchases, optimizing costs | Reducing the total cost of the project, increasing profitability |
| Quality of execution | Predicting the impact of resources on the quality of the final product | Ensuring that the final result meets the established standards |
| Risk management | Predicting possible shortages or surpluses of resources | Minimizing the likelihood of crises and maintaining project stability |
| Customer satisfaction | Calculation of needs taking into account changing project conditions | Ensuring compliance with customer expectations |

*Source: compiled by the author based on the works of Vasylenko and Vakaliuk (2024), Bushuieva, Ivko, and Tykhonovych (2024), Krasnokutska and Osetrova (2018), Pal et al. (2023), and Ong and Uddin (2020).*

In practice, the accuracy of resource forecasting provided by artificial intelligence is changing the approach to project implementation. In construction, algorithms predict not only the quantity of materials but also the optimal time to order them, which reduces storage costs. In logistics, forecasts help avoid delays due to a lack of vehicles, which is especially important for international deliveries. In production projects, calculating raw material requirements reduces the risk of stopping lines due to lack of materials.

The forecasting accuracy provided by artificial intelligence creates the conditions for achieving the strategic goals of projects, making their implementation more predictable, controlled, and efficient. Thanks to this, AI not only improves the efficiency of individual processes but also affects the overall success of projects.

However, the introduction of artificial intelligence into strategic project management processes is accompanied by a number of problems that significantly affect the efficiency and speed of integration of these technologies. One of the main issues is the quality and availability of data used to train AI models. In many cases, the data required for analysis is fragmented, incomplete, or unavailable due to privacy restrictions. This creates a risk of inaccurate results, which can negatively affect decision-making within projects.

The second major challenge is the difficulty of integrating AI systems with existing project management tools. Many organizations use outdated software solutions that do not support integration with modern AI algorithms, which requires significant investment in technical upgrades. In addition, adapting these systems to the specifics of each project requires significant time and resources (Savio & Ali, 2023; Davahli, 2020).
Another problem is the lack of staff training. The introduction of artificial intelligence requires new knowledge and skills from both project managers and technical specialists. Many organizations lack training programs or relevant expertise, which leads to low efficiency in the use of new technologies. Problems also arise from the high costs of implementing artificial intelligence. The development, implementation, and support of intelligent systems require significant financial resources that not all organizations are willing to invest. Combined with uncertainty about the return on such investments, this hinders the spread of technology (Kiani, 2024). Finally, ethical issues related to the use of artificial intelligence in strategic project management are an important challenge. The use of personal data, the automation of decisions, and the possibility of erroneous predictions raise discussions about responsibility for the results. These issues require clear regulation and control, which can further complicate the implementation of technologies (Thompson, 2024; Mesa Fernández, González Moreno, Vergara-González, & Alonso Iglesias, 2022).

Integrating artificial intelligence into project management systems requires a comprehensive approach aimed at ensuring the efficient use of technology and maximizing the achievement of strategic goals. One of the key aspects is to develop a clear implementation strategy that takes into account the specifics of the organization, its needs, and available resources. This strategy should include the stages of data preparation, selection of appropriate artificial intelligence tools, model testing, and their gradual integration into existing management processes.

Particular attention should be paid to the preparation of data that is the basis for the operation of artificial intelligence systems. It is necessary to ensure the collection, cleaning, structuring, and unification of data that will be used to train models. The organization should invest in building a reliable database that meets accuracy and security requirements.

The second important step is to choose technological solutions that meet the needs of a particular project. These can be tools for resource forecasting, risk management, reporting automation, or team productivity analysis. It is worth focusing on flexible platforms that can be adapted to the needs of the organization and integrated with existing systems.

It is also necessary to provide training for personnel who will work with artificial intelligence tools, including advanced training for project managers, analysts, and technical specialists. It is important not only to teach how to work with specific systems, but also to understand their capabilities, limitations, and principles of operation.

To ensure the effectiveness of the integration, a pilot implementation should be envisaged to evaluate the results of using artificial intelligence on a small scale before large-scale integration. The pilot project will help identify possible problems, adjust the implementation strategy, and increase the likelihood of success at the scaling stage.

Finally, it is important to introduce systems for monitoring and evaluating the effectiveness of artificial intelligence. Continuous monitoring will allow for timely identification of problems, evaluation of the results achieved, and improvement of integration processes. Particular attention should be paid to analyzing the cost-effectiveness of using artificial intelligence, in particular the ratio of investments to results.

Thus, the integration of artificial intelligence into project management systems requires a systematic approach that combines data preparation, technology selection, staff training, pilot implementation, and ongoing monitoring. Only under these conditions can we ensure the effective use of artificial intelligence, increase the competitiveness of projects, and achieve strategic goals.

**5. CONCLUSIONS**

 It has been established that artificial intelligence has significant potential to improve resource forecasting processes in strategic project management. The use of machine learning algorithms, neural networks, genetic algorithms, and hybrid models can improve the accuracy of calculations, optimize resource allocation, and adapt plans to changing conditions. However, the effective integration of these technologies requires a systematic approach that includes data preparation, staff training, and technical infrastructure setup.

The key problems that arise when implementing artificial intelligence are the low quality and availability of data, the difficulty of integrating new technologies with existing systems, high development and implementation costs, and insufficient staff training. Ethical aspects related to the use of personal data and automated solutions also remain important challenges.

It is recommended to use artificial intelligence as a tool to support decision-making, in particular in resource forecasting, risk management, and cost optimization. It is important to ensure reliable data preparation, selection of appropriate technology platforms, training of specialists, and gradual integration of artificial intelligence through pilot projects with constant monitoring of their effectiveness.

Prospects for further research include improving forecasting algorithms for more accurate modeling of complex scenarios, developing new methods for integrating artificial intelligence into management processes, and analyzing the impact of its use on the long-term sustainability of projects. Particular attention should be paid to cybersecurity, adaptation of technologies to industry specifics, and the development of universal standards to assess the effectiveness of implementing artificial intelligence in project management systems.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

Consent

Not applicable

Ethical approval

Not applicable

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