

USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ASSESSING PROJECT EFFICIENCY BASED ON ESG CRITERIA

Master's Student

Erkinova Durdona Ilyosbek qizi

*Group LB-01, Project Management Program, Faculty of Finance and Financial
Technologies*

Banking and Finance Academy of the Republic of Uzbekistan

Abstract: In order to evaluate the efficacy of investment projects based on ESG (Environmental, Social, and Governance) criteria, this article explores the theoretical and practical aspects of utilizing artificial intelligence technologies. The study demonstrates artificial intelligence's capacity to handle massive volumes of data, evaluate ESG indicators, recognize hazards, and project the project's long-term viability. Additionally, it looks at how to improve the quality of investment decisions by combining traditional financial assessment techniques like NPV and IRR indicators with ESG factors. The study's findings demonstrate that the application of AI technologies enables a thorough evaluation of the outcomes of corporate, social, and environmental governance as well as the financial viability of projects. The article's findings help to advance contemporary digital methods for evaluating and overseeing investment projects.

Keywords: NPV, IRR, risk assessment, corporate governance, digital technologies, ESG standards, artificial intelligence.

Introduction

In recent years, there has been a growing need to consider environmental, social, and governance (ESG) factors alongside financial indicators in the evaluation of investment projects on a global scale. Climate change, the depletion of natural resources, and increasing demands for corporate governance and social responsibility are shaping new approaches to investment decision-making. As a result, ESG standards are becoming a crucial tool for assessing the long-term sustainability and investment attractiveness of projects (Xamidovich and Khamidovich, 2025).

Uzbekistan is also implementing large-scale reforms aimed at integrating the principles of sustainable development into all sectors of the economy. In particular, the Decree of the President of the Republic of Uzbekistan dated February 7, 2025, "On the State Program for the Implementation of the 'Uzbekistan-2030' Strategy in the Year of Environmental Protection and Green Economy," identifies the financing of green projects, ensuring environmental sustainability, and the large-scale promotion of the green economy as priority principles. In addition, in 2026, the Cabinet of Ministers adopted a resolution on the introduction of ESG principles, the preparation of sustainability reports based on international standards, and the improvement of processes for assessing and determining ESG indicators in

entrepreneurial activities. Furthermore, state-owned enterprises will begin publishing ESG and corporate social responsibility reports. Under such circumstances, the use of artificial intelligence technologies is of great importance for data processing, risk forecasting, and optimizing decision-making processes in the analysis of ESG indicators. Artificial intelligence enables the automated assessment of project sustainability, the identification of investment risks, and the analysis of ESG-related environmental, social, and governance data. Consequently, the process of evaluating the efficiency of investment projects becomes more accurate, efficient, and reliable. In addition to developing scientific recommendations for improving the quality of investment decisions through the integration of ESG indicators with traditional financial evaluation methods, the purpose of this article is to examine the theoretical foundations and practical application of artificial intelligence technologies in assessing project efficiency based on ESG criteria (Rizakulov, 2025).

As the processes of digital transformation accelerate, artificial intelligence technologies are increasingly being used across various sectors of the economy, including investment project evaluation and management systems. Artificial intelligence algorithms can significantly improve the efficiency of ESG indicator assessment by processing large volumes of data, identifying complex relationships, and forecasting future trends. While traditional evaluation methods often examine environmental and social factors qualitatively, artificial intelligence technologies enable the quantitative assessment and real-time monitoring of these factors.

In global practice, the number of investment decisions based on ESG criteria is increasing year by year. Achieving sustainable development goals, mitigating the negative effects of climate change, and improving corporate governance have become important directions of investment policy. According to research, the use of Big Data and artificial intelligence technologies enhances the effectiveness of ESG investments, expands opportunities for risk identification, and contributes to more efficient capital allocation.

In the Republic of Uzbekistan, the development of the digital economy and artificial intelligence technologies is one of the priority areas of state policy. The “Uzbekistan–2030” Strategy outlines tasks such as the widespread implementation of green economy principles, ensuring environmental sustainability, expanding the use of renewable energy sources, and financing a portion of investment projects based on “green components.” To effectively implement these tasks, it is necessary to integrate ESG criteria with modern digital technologies.

From this perspective, the scientific and practical analysis of ESG indicators based on artificial intelligence, as well as their integration with financial indicators used in project efficiency evaluation—net present value (NPV), internal rate of return (IRR), and profitability index (PI)—is an important issue. Such a comprehensive approach makes it possible to evaluate not only the economic efficiency of investment projects but also their environmental, social, and governance sustainability.

The scientific novelty of this research lies in its systematic examination of the

feasibility of using artificial intelligence technologies to assess project efficiency based on ESG criteria and in proposing an integrated model that combines ESG indicators with traditional investment evaluation methods. The results of the study will contribute to improving the quality of decision-making in the selection and financing of investment projects, reducing risks, and achieving long-term development goals.

Literature Review

The integration of ESG criteria and artificial intelligence (AI) technologies is a growing field of scientific research. The main objectives of this area of study are to improve the accuracy of ESG indicator assessment, forecast investment risks, and ensure sustainable development. In the study “Environmental, Social, and Governance (ESG) and Artificial Intelligence in Finance: State of the Art and Research Pathways” (Lim, 2024), the current state of ESG and AI integration in the financial sector is examined. According to the author, artificial intelligence serves as an important tool for developing ESG ratings, assessing investment risks, and automatically analyzing corporate reports. The findings of the study demonstrate the significance of AI technologies in improving the quality of ESG data and optimizing decision-making processes.

One of the most relevant studies in this field is “Integrating ESG and AI: A Comprehensive Evaluation System for Responsible Artificial Intelligence” by Lee et al. (2025). It focuses on the challenges of integrating AI technologies with ESG principles. The authors emphasize the need to assess not only the economic efficiency of artificial intelligence systems but also their impact on corporate governance, the environment, and society.

Accordingly, a new evaluation model based on the integration of AI and ESG was developed. In this study, 28 companies from different sectors were analyzed as case studies to examine how artificial intelligence technologies comply with ESG principles. The evaluation process included indicators such as energy consumption, carbon emissions, data security, algorithmic transparency, social equity, employee rights protection, and corporate governance.

This approach can be applied in the selection and assessment of investment projects, enabling a comprehensive evaluation of project efficiency from economic, environmental, and social perspectives. As a result, this study represents one of the key scientific sources establishing both the theoretical and practical foundations for the application of AI technologies in assessing project performance based on ESG standards.

Aljohani (2025) published a study titled “A Decision-Making Framework for Evaluating AI-Supported ESG Strategies in the Context of Sustainable Production Systems”, which focuses on the potential application of artificial intelligence technologies for assessing ESG strategies in sustainable manufacturing systems. According to the author, one of the main challenges facing modern production enterprises is ensuring economic efficiency while complying with social responsibility requirements, environmental protection regulations, and corporate governance standards.

This study is scientifically significant as it proposes a new model for evaluating ESG

strategies that helps ensure resource efficiency in sustainable production systems, reduce environmental risks, and enhance business competitiveness. The findings indicate that integrating artificial intelligence technologies with ESG standards enables more accurate and reliable results in evaluating the performance of investment projects.

In this sense, the study serves as a valuable theoretical and practical source for the application of AI technologies in assessing project efficiency based on ESG standards.

Elhady and Shohieb (2025) published a study titled “AI-Driven Sustainable Finance: Computational Tools, ESG Indicators, and Global Implementation”, which provides a comprehensive analysis of the role and significance of artificial intelligence technologies in sustainable finance systems. The authors argue that, due to the increasing volume of ESG-based investments in modern financial markets, the use of advanced digital technologies is essential for effectively managing and evaluating these processes.

The study thoroughly examines the capabilities of artificial intelligence in the collection, processing, analysis, and forecasting of ESG data. According to the authors, traditional financial analysis methods often fail to fully capture ESG-related risks. The results of the study show that financial institutions using artificial intelligence achieve higher efficiency in selecting and monitoring ESG investments.

The scientific and practical significance of this research lies in its theoretical and empirical justification of the advantages of artificial intelligence technologies in evaluating investment projects based on ESG criteria.

The potential application of Explainable Artificial Intelligence (XAI) technologies in assessing ESG criteria was examined in the study “An AI-Enhanced ESG Framework for Sustainability: A Multidimensional Analysis Through Explainable AI Approach.” The authors emphasize that one of the main limitations of traditional artificial intelligence models is their “black box” nature, which makes it difficult for users to understand how the algorithm arrives at a particular conclusion.

The findings of the study indicate that ESG indicators assessed through explainable AI are more accurate and reliable compared to traditional statistical methods. ESG technologies have proven to be a useful tool in risk identification, screening promising projects, and making investment decisions aligned with sustainable development goals, particularly in complex and multidimensional investment projects.

The authors further argue that this approach enhances the transparency of the investment process and ensures that ESG assessment systems comply with international standards (Ahmad and Ahmed, 2026).

Methodology

This study’s methodology is based on scientific methods for assessing project efficiency using ESG (Environmental, Social, and Governance) criteria and exploring the possibilities of integrating AI technologies into this process. Based on the combination of theoretical and practical approaches, a comprehensive system for evaluating the social, environmental, and economic efficiency of investment projects was developed. The initial

stage of the research consisted of a literature review on artificial intelligence technologies, project performance evaluation methods, and ESG criteria. In this regard, recent scientific publications from global databases such as Scopus, Web of Science, Springer, ScienceDirect, and MDPI were reviewed. Through this literature analysis, existing ESG assessment methods, their advantages and disadvantages, as well as the role of artificial intelligence technologies in this process, were identified. For the practical part of project performance evaluation, traditional financial indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index (PI), and payback period were used. These indicators allow for the assessment of the economic efficiency of a project. However, in the current investment landscape, evaluation based solely on financial indicators is not sufficient; therefore, ESG factors were also incorporated into the system. For ESG evaluation, the following environmental factors were selected: energy efficiency, carbon emissions, renewable energy usage, and resource efficiency. Social criteria included corporate social responsibility, gender equality, working conditions, employee safety, and the impact on local community interests. Governance standards were assessed using indicators such as risk management systems, information disclosure, stakeholder relations, and governance transparency. In the AI application section, the capabilities of machine learning, big data analytics, and natural language processing were considered. These technologies enable the prediction of future project outcomes, identification of hidden relationships, and rapid processing of large volumes of ESG-related data. In particular, investment risk forecasting and the relationship between ESG indicators and project performance were identified using machine learning algorithms. During the study, a comparative analysis method was applied to compare traditional evaluation results with AI-based ESG assessments. The findings show that integrating artificial intelligence technologies with ESG criteria improves the quality of investment decisions, reduces risks, and enables more accurate assessment of project efficiency. Using systematic analysis, scientific abstraction, induction, and deduction methods, the study also developed a conceptual evaluation model based on the integration of ESG and artificial intelligence. This model enables a comprehensive assessment of the social, environmental, and economic impacts of investment projects and supports decision-making aligned with sustainable development principles.

Results And Discussion

The results of the study show that the effectiveness of investment projects cannot be adequately assessed using only traditional financial indicators. In particular, indicators such as NPV, IRR, and PI allow for the evaluation of a project's financial performance; however, they overlook its impact on the environment, society, and corporate governance. The inclusion of ESG criteria in the evaluation system increases the number of approaches used to assess a project's long-term viability and investment attractiveness. According to the analysis, projects with higher ESG performance tend to have relatively lower investment risks. It was found that projects aimed at reducing carbon emissions, improving energy efficiency, and ensuring the efficient use of resources generate significant long-term economic benefits. At

the same time, social and governance factors such as ensuring employee safety, improving working conditions, and maintaining corporate governance transparency increase investor confidence and enhance financing opportunities. The analysis also shows that the introduction of artificial intelligence technologies significantly improves the efficiency of the ESG assessment process. By analyzing large datasets, machine learning algorithms made it possible to identify variables affecting ESG indicators and predict future outcomes. The AI-based evaluation system accelerated data processing, reduced human error, and improved the accuracy of decision-making compared to traditional methods. According to the study, project performance and ESG indicators are positively correlated, and it was found that projects with higher levels of environmental and social responsibility have a higher probability of investment returns. This demonstrates that ESG factors, beyond their environmental and social importance, also have a direct impact on financial outcomes. The results further indicate that AI-based risk forecasting and ESG rating generation are useful tools for investment decision-making. In particular, ESG-related data can now be automatically collected and analyzed from open databases and corporate reports through natural language processing technologies, resulting in more reliable assessments of the social and environmental impact of projects. Based on the results, an integrated model for evaluating project efficiency was proposed, which uses artificial intelligence algorithms, ESG criteria, and financial indicators (NPV, IRR, and PI). This approach enables the simultaneous assessment of corporate governance, social benefits, environmental safety, and economic efficiency of investment projects. Overall, the findings highlight the importance of using AI technologies in assessing project efficiency based on ESG standards to improve investment selection, reduce risks, and achieve sustainable development goals, and in the future this approach can be widely applied in investment project selection and financing practices.

Conclusion

This study examined both the theoretical and practical aspects of using artificial intelligence technologies to assess project efficiency based on ESG criteria. The results of the analysis showed that evaluating projects solely on the basis of financial indicators is not sufficient to accurately reflect their real performance in the modern investment environment. The ESG approach, which takes into account environmental, social, and governance factors, is becoming a crucial tool for assessing the long-term sustainability of investment projects.

According to the scientific literature and the practical approaches reviewed during the study, projects with higher ESG performance are characterized by relatively lower investment risks, higher investor confidence, and stronger financial stability. In particular, it was found that social sustainability, environmental responsibility, and good corporate governance have a direct impact on the long-term success of investment projects.

The findings of the study also confirmed the usefulness of artificial intelligence tools in evaluating ESG factors. Technologies such as machine learning, big data analytics, and natural language processing enable the rapid processing of large volumes of ESG-related data, risk assessment, and prediction of project outcomes. This leads to a reduction in human error

and an improvement in the accuracy and reliability of decision-making.

Based on the research, an integrated model for evaluating project efficiency was proposed. This model combines traditional financial indicators such as NPV, IRR, and PI with artificial intelligence algorithms and ESG criteria. The proposed approach enables a comprehensive assessment of project economic efficiency, environmental safety, social benefits, and governance quality.

The results of the study make it possible to develop the following recommendations: making ESG indicators an essential component of the investment project evaluation process; creating ESG reporting systems for both public and private sector investment projects based on international standards; expanding the use of artificial intelligence technologies in project monitoring and risk management systems; developing digital evaluation platforms that integrate ESG and financial indicators; and implementing AI-based ESG rating and forecasting systems.

In conclusion, a new stage in investment project evaluation is being formed through the integration of artificial intelligence technologies and ESG criteria. This strategy not only contributes to achieving sustainable development goals, efficient use of resources, and improving the quality of investment decisions but also helps ensure long-term economic growth. Therefore, it is crucial in the future to continue improving and widely implementing evaluation systems based on ESG and artificial intelligence technologies.

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