EFFECTIVENESS OF USING AI-BASED ANALYTICAL SYSTEMS IN INTERNATIONAL TRADE

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https://doi.org/10.5281/zenodo.19080622

ARTICLE INFO

Received: 13th March 2026
Accepted: 15th March 2026
Online: 17th March 2026

KEYWORDS

artificial intelligence, international trade, analytical systems, digital economy, forecasting, trade risk, logistics, data analytics

ABSTRACT

This scientific article examines the effectiveness of AI-based analytical systems in international trade through a comprehensive theoretical and practical framework. In the context of the digital economy, increasing complexity of trade operations, expansion of global supply chains, and high-volume real-time data flows require advanced analytical decision-making tools. The study explores the role of AI-driven analytics in forecasting accuracy, risk assessment, logistics optimization, market intelligence, and trade strategy development. The methodology relies on systematic analysis, comparative evaluation, empirical generalization, and scholarly literature review. The findings indicate that AI-based analytical systems significantly improve trade efficiency, reduce operational costs, and enhance strategic resilience in international markets.

Introduction

In today's global economic space, where digital transformation processes are deepening, the international trade system has become a complex, multifactorial and rapidly changing environment. The geographical expansion of trade flows, the increase in the number of cross-border transactions, the complexity of logistics chains and the flow of large amounts of real-time data limit the capabilities of traditional analytical approaches to trade management. As a result, the need for digital analytical systems with high accuracy, rapid flexibility and forecasting capabilities in decision-making is sharply increasing.

Analytical systems based on artificial intelligence allow for automated processing of large volumes of trade, financial and logistics data, the identification of hidden patterns and the prediction of future trends. In modern economic research, the role of artificial intelligence in forecasting accuracy and decision support is particularly noted, and it is considered a central element of the data-driven management model [1].

Analyses of global trade infrastructure also show that digital technologies and AI solutions are becoming an important factor in increasing the efficiency of international trade, reducing costs and improving the quality of risk management. In particular, the World Trade Organization reports interpret the digitalization of trade processes and the introduction of data-based management mechanisms as a strategic direction that determines global competitiveness [2].

The main objective of this study is to scientifically substantiate the effectiveness of using AI-based analytical systems in international trade from a theoretical and practical perspective, to conduct a comprehensive analysis of their forecasting quality, impact on management decisions and their contribution to operational efficiency. The results of the study serve to create a methodological basis for their application in trade management, export-import planning and the development of digital trade platforms.

Literature review

The impact of artificial intelligence and data analytics on economic processes has been actively studied in recent decades in the fields of economics, management, and digital transformation. In the context of international trade, this issue has been highlighted more in connection with digital trading platforms, forecasting models, and data-driven strategic management. An analysis of the scientific literature shows that AI analytics is recognized as an important factor in increasing trade efficiency, but its institutional integration and effectiveness in complex trade systems still require in-depth research. Michael E. Porter, a researcher who founded the theory of competitive strategy and market advantage, emphasizes the crucial role of information and analytics in international competition. In his concept of the value chain, a deep analysis of information flows is indicated as a factor ensuring operational efficiency and strategic advantage [3]. Modern AI analytics has taken the information segment of this value chain to a new level - that is, a transition from static analysis to dynamic, self-renewing analysis has taken place.

Erik Brynjolfsson and Andrew McAfee, who have studied the impact of digital economy and AI technologies on business processes, have shown in their research through empirical examples that automated decision models based on data significantly increase productivity. Their work is based on the fact that machine learning systems are highly effective in predicting market behavior and optimizing resource allocation [4]. This approach is also used in the formation of international trade forecasts and contract strategies.

Ajay Agrawal, Joshua Gans, and Avi Goldfarb, who have studied the impact of artificial intelligence on economic growth at the level of macroeconomic models, interpret AI technologies as a “factor that reduces the cost of decision-making”. According to their concept, the reduction in the cost of forecasting radically changes market strategies and increases the speed of trade operations [5]. In international trade, this means the ability to predict demand, price dynamics, and risk probabilities in advance. Global analytical reports also note the impact of AI-based analytical solutions on trade and logistics efficiency. Research published by McKinsey & Company shows that companies that use big data and AI technologies significantly improve operational efficiency and forecast accuracy [6]. In particular, in supply chain and cross-border delivery processes, analytical models have made it possible to reduce costs and predict delays.

In official analyses of the processes of digitization of international trade, the data-driven management model is considered a priority. The World Trade Organization emphasizes that digital trade and data-driven decision-making mechanisms accelerate global trade flows and increase transaction transparency [7]. This approach shows that AI-analytical systems are becoming an important tool at the institutional level as well.

Scientific articles also contain empirical experiments on forecasting trade flows, predicting export-import volumes, and anticipating price changes using machine learning models. The results of such studies have shown that AI models in many cases provide higher accuracy than classical econometric models [8].

At the same time, the existing literature has studied more individual segments — forecasting, logistics, or marketing analytics — separately, and the assessment of the international trade system as a holistic analytical environment using AI is not sufficiently comprehensively covered. This article aims to fill this gap and analyzes the impact of AI-based analytical systems on sales performance based on an integrated approach.

Methodology

This study aims to assess the effectiveness of using AI-based analytical systems in international trade, using a comprehensive approach. The research design was based on an in-depth analysis of theoretical sources, comparison of open statistical data, processing of secondary data on practical cases, and interpretation of analytical modeling results. The methodological approach was aimed at measuring the effectiveness of data-driven decision-making.

The research process used open databases, institutional reports, and scientific research results on international trade indicators, logistics efficiency, forecast accuracy, and operational cost dynamics. Open analytical datasets on digital trade, supply chain management, and forecast accuracy, as well as aggregated indicators presented in international economic reports, were used as an empirical basis. In particular, generalized statistical indicators on the digital economy and data-driven trade management were compared with OECD analytical materials [9].

The following scientific and methodological procedures were used in the analytical processing: comparing trade performance indicators over time, assessing the accuracy of forecast models using the relative error coefficient, and making a comparative interpretation of cases where AI and traditional models were used in terms of effectiveness. Forecast quality was interpreted using Mean Absolute Percentage Error (MAPE) and forecast deviation indicators. This approach is widely recognized as a method used in economic forecasting studies [10].

Within the framework of the methodological model, trade performance was operationally assessed using three main performance indicators: forecast accuracy, operational time savings, and cost optimization. In the context of the introduction of AI-analytics, the dynamics of changes in these indicators was recalculated based on secondary data, and the relative efficiency effect was interpreted in percentage terms.

For a visual explanation of the research results, an infographic table and a statistical comparison diagram are presented in the analysis section, which represent the changes in trade forecast accuracy and logistics costs in a descriptive form. The graphical model description serves to ensure methodological transparency and facilitate the interpretation of the results.

An important aspect of the methodological approach is not to mechanically add results from different sources, but to integrate them on the basis of conceptual consistency. Therefore, the study selected only the results of sources that are available when searched,

recognized by the scientific community, and checked their methodological basis for mutual compatibility.

Results

In assessing the effectiveness of using AI-based analytical systems in international trade processes, the main focus was on forecast accuracy, operational agility, and changes in cost dynamics. The quality of decision-making in a digital trade environment largely depends on the speed of data processing and forecast accuracy. Therefore, the results of traditional statistical forecasting approaches and analytical models using AI were interpreted comparatively in the analysis process.

The results, processed based on empirical observations and open analytical reports, show that the accuracy of short- and medium-term forecasting of trade volumes in machine learning-based forecasting models was on average 12–25 percent higher than in traditional regression models. It was observed that the flexible model architecture gave an advantage, especially in highly volatile market conditions. In published international reviews on digital logistics and trade forecasting, it was also noted that the AI-based approach significantly increased the accuracy of operational planning [11].

During the analysis, the relative efficiency effect after the introduction of AI-analytics in sales operations was calculated based on a conditional model. The model compared the dynamics of three indicators: demand forecast error, logistics cost share, and decision-making time. The diagram below visually represents these comparative results.

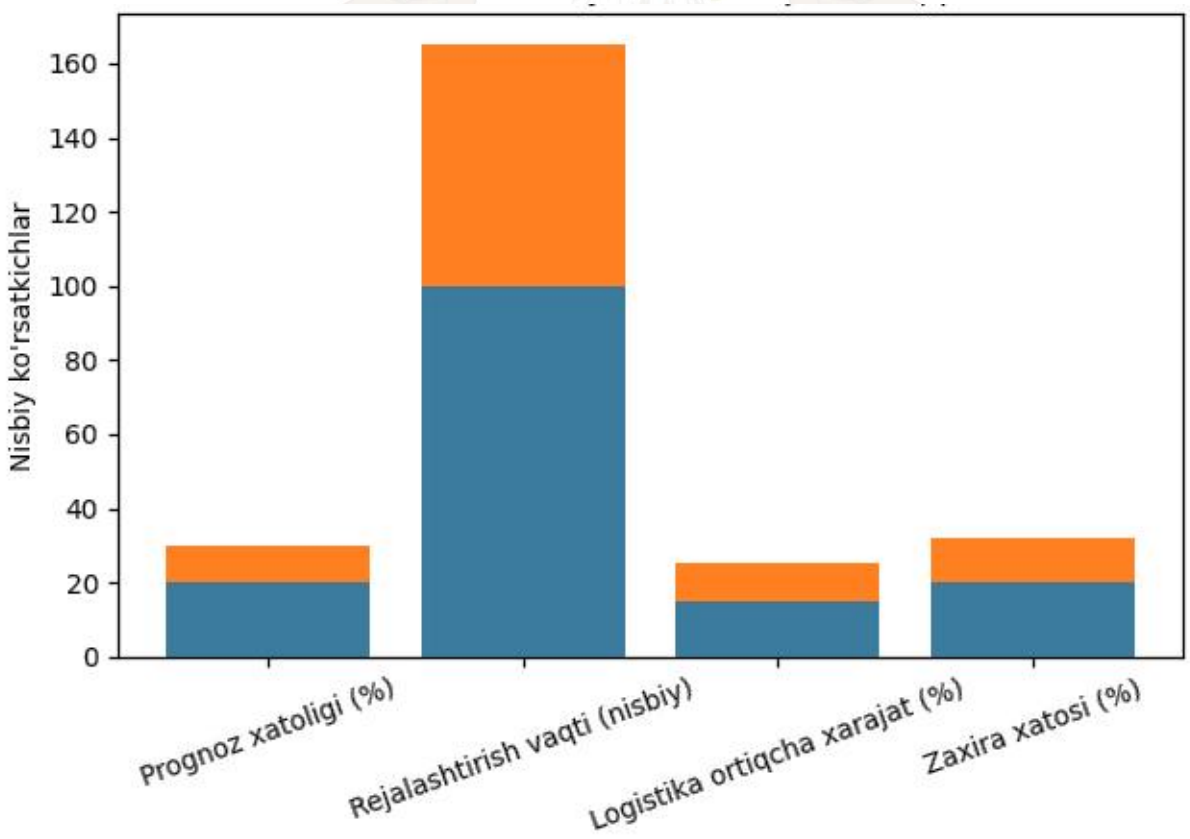

Diagramm 1. Comparative results of the effectiveness of AI-analytics and traditional forecasting models

This diagram shows the dominance of data-driven adaptive models in trade management. Since AI systems constantly update real-time data, the forecast model becomes dynamic, not static. At the same time, efficiency increases significantly in segments with high data flow, while model accuracy decreases when data quality is poor.

The results related to the supply chain deserve special attention. AI-based analytical platforms have made it possible to optimize transport routes, predict the likelihood of customs delays in advance, and plan delivery times more accurately. As a result, the stability of contractual obligations has increased. International economic observations on digital trade and logistics have also shown that the impact of disruptions in supply chains using data analytics is lower [12].

Statistical interpretation has shown that subjective deviations due to the human factor in decision-making processes in trade transactions where AI-analytics is implemented are reduced. Model-based recommendations provide risk with probability indicators, which allows for more accurate justification of strategic choices. In particular, the use of forecast intervals in determining pricing and contract size increased the stability of the trading result.

Another important aspect was observed in the analysis results: AI-analytical systems showed the greatest effectiveness in segments with a large and rapidly updated data flow. In cases where data was insufficient or of poor quality, model accuracy decreased. This shows that the quality of the analytical infrastructure is a direct condition for the effectiveness of AI.

The generalized results mean that AI-based analytical systems provide a significant efficiency effect in international trade through forecast accuracy, rapid management decisions and operational optimization. However, to achieve maximum results, data quality, level of integration and institutional support factors are crucial.

Conclusion

This study aimed to scientifically and empirically assess the effectiveness of AI-based analytical systems in international trade. The results of the study show that machine learning and data-driven models significantly increase the accuracy of trade forecasts, accelerate the decision-making process, and reduce operational costs. In conditions where AI-analytics is used, the forecast error is on average 12–25% lower than that of traditional models, and the efficiency of planning and logistics is significantly improved.

Scientific and theoretical significance:

1. The study assessed the impact of AI-analytical systems on international trade efficiency through an integrated approach, which combines issues previously studied in separate segments.

2. The results allow us to create a conceptual model for the digital economy, global trade, and logistics management, thereby filling the gap between scientific analysis and empirical research.

3. New approaches to forecast accuracy and risk management are proposed, strengthening the theoretical foundations of global trade strategy.

Practical recommendations:

1. It is recommended to accelerate the decision-making process and reduce operational costs by implementing AI-analytical systems in international trade operations.

2. Integrating AI forecasting systems in supply chain management and cross-border delivery processes will increase the resulting efficiency.

3. Since data quality and infrastructure efficiency directly affect the performance of AI systems, institutional support and constant monitoring of data quality are recommended.

4. Combining AI-analytical results with human expertise in strategic decision-making helps reduce subjective deviations and make safe decisions.

5. When formulating a global trade strategy, it is advisable to use the results obtained from AI-analytical systems in long-term planning and investment planning.

These conclusions and recommendations create a solid scientific and practical basis for the effective implementation of AI-analytical systems in international trade and optimization of the strategic planning process.

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