



THE DIGITAL FUTURE OF INTERNATIONAL TRADE: ARTIFICIAL INTELLIGENCE APPLICATIONS AND THEIR IMPACT

1. Fatma İzgi¹

ORCID No 0000-0002-5313-2360

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ABSTRACT

Artificial intelligence (AI) has become progressively strategic in the economy and international trade. Recognised as one of the most groundbreaking innovations of the technological age, AI is bringing about fundamental changes in global trade operations in terms of efficiency, speed, and accuracy. In this context, AI applications are used across various areas, including supply chain management, production optimisation, operational process improvement, digitalisation of customs procedures, logistics planning and optimisation, market analysis and demand forecasting, and risk management. In addition, big data analytics and machine learning techniques make it possible to identify target markets, optimise pricing strategies, and enhance trade security. This study explores the transformation of artificial intelligence technologies in international trade processes. The research uses case studies at both the national and global levels. The study highlights the contributions of AI to international trade performance, efficiency, and competitive advantage.

Keywords: Artificial Intelligence, International Trade, Case Study

ULUSLARARASI TİCARETİN DİJİTAL GELECEĞİ: YAPAY ZEKÂ UYGULAMALARI VE ETKİLERİ

ÖZET

Yapay zekâ (YZ), gerek ekonomi alanında gerekse uluslararası ticarete giderek artan bir şekilde stratejik önem kazanmıştır. Teknoloji çağının en çığır açan yeniliklerinden biri olarak kabul edilen YZ, uluslararası ticaret operasyonlarında verimlilik, hız ve doğruluk açısından köklü değişimlere yol açmaktadır. Bu bağlamda, YZ uygulamaları tedarik zinciri yönetiminden üretim optimizasyonuna, operasyonel süreçlerin iyileştirilmesinden gümrük işlemlerinin dijitalleşmesine, lojistik planlama ve optimizasyonundan pazar analizi ile talep tahminine ve risk yönetimine kadar geniş bir yelpazede kullanılmaktadır. Ayrıca, büyük veri analitiği ve makine öğrenmesi teknikleri sayesinde hedef pazarların belirlenmesi, fiyat stratejilerinin optimize edilmesi ve ticaret güvenliğinin artırılması mümkün hâle gelmektedir. Bu çalışmanın amacı, yapay zekâ teknolojilerinin dış ticaret süreçlerinde yarattığı dönüşümü incelemektir. Araştırmada, gerek ulusal gerekse uluslararası düzeyde vaka çalışmaları kullanılmıştır. Çalışma, YZ'nin dış ticaret performansı, verimlilik ve rekabet avantajına sağladığı katkıları ortaya koymaktadır.

Anahtar Kelimeler: Yapay Zekâ, Uluslararası Ticaret, Vaka Analizi

¹ Fatma İzgi, Araştırma Görevlisi, Bayburt Üniversitesi, fatmaizgi@bayburt.edu.tr



1. INTRODUCTION

With globalization, international trade has become increasingly complex and data-intensive. This change has made using digital and innovative technologies essential for businesses to gain a competitive advantage. Artificial intelligence (AI) reshapes business, the economy, and society by transforming experiences and relationships between stakeholders and citizens (Lu et al., 2018, p. 368). Artificial intelligence has enabled the automation of cognitive tasks to make predictions using complex algorithms and data. This already has wide applications in international trade, such as productivity improvements, efficiency gains throughout supply chains, and reductions in trade costs (Ferencz et al., 2022, p. 27). Artificial intelligence is a strategic transformation tool in international trade processes with its analytical power and automation capabilities. Artificial intelligence-based prediction models and analytical tools, when used in risk management and strategic planning processes in trade, can help businesses develop more robust and sustainable trade policies (Igbinenikaro & Adewusi, 2024, p. 3). Artificial intelligence will have an impact on international trade. It will lead to significant changes in the management of export and import transactions. Artificial intelligence-based automation simplifies the transaction mechanism and reduces administrative tasks by transforming supply chain management, financing, and document management processes specific to an international trade transaction (Belu, 2024, p. 2).

This study aims to systematically examine the transformation brought about by artificial intelligence (AI) technologies in international trade processes, to reveal the effects of AI applications in critical areas such as supply chain management, production processes, operational activities, customs procedures, logistics optimisation, market analysis and risk management, and to comprehensively evaluate the contributions of AI to international trade performance, efficiency and competitiveness in light of national and international case studies. The study aims to reveal the concrete effects of AI in both public and private sector applications by using current case analyses in conjunction with a literature review. AI international trade applications are examined through case analyses in different sectors and countries in this context.

The importance of this study lies in its contribution to academic literature and its provision of guidance to policymakers and businesses by highlighting the contributions of artificial intelligence technologies to efficiency, risk management, and competitive advantage in international trade processes, based on national and global case studies.

The study consists of four sections. Following the introduction, the concepts of artificial intelligence and international trade are discussed. In the second section, studies on the applications of artificial intelligence in global trade processes are presented within the scope of a literature review. In the third section, artificial intelligence applications in the international trade process are examined in detail, and case studies at national and international levels are shared. In the conclusion section, the general findings of the research are summarised, and policy and implementation recommendations, as well as suggestions for future studies, are presented.



2. ARTIFICIAL INTELLIGENCE AND INTERNATIONAL TRADE

Artificial intelligence technologies include a range of methods that enable computers to solve complex problems and mimic human-like decision-making processes. Deep learning solutions stand out for their ability to identify complex patterns in large data sets. Natural language processing systems use computer-based techniques to process and interpret human language. Machine learning is robust in learning from experience and improving itself (Panch et al., 2018, p. 2). The concept of artificial intelligence was first introduced in 1956 by John McCarthy. British the mathematician and computer scientist Turing was the first to define artificial intelligence: He explains that a computer is considered intelligent if, when interacting with a human, it is impossible to distinguish whether the human is communicating with a machine or another human (Turing, 1950). The OECD defines an artificial intelligence system as a machine-based system that, from inputs for explicit or implicit objectives, produces outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments (OECD, 2019). Figure 1 demonstrates the historical development process of artificial intelligence.

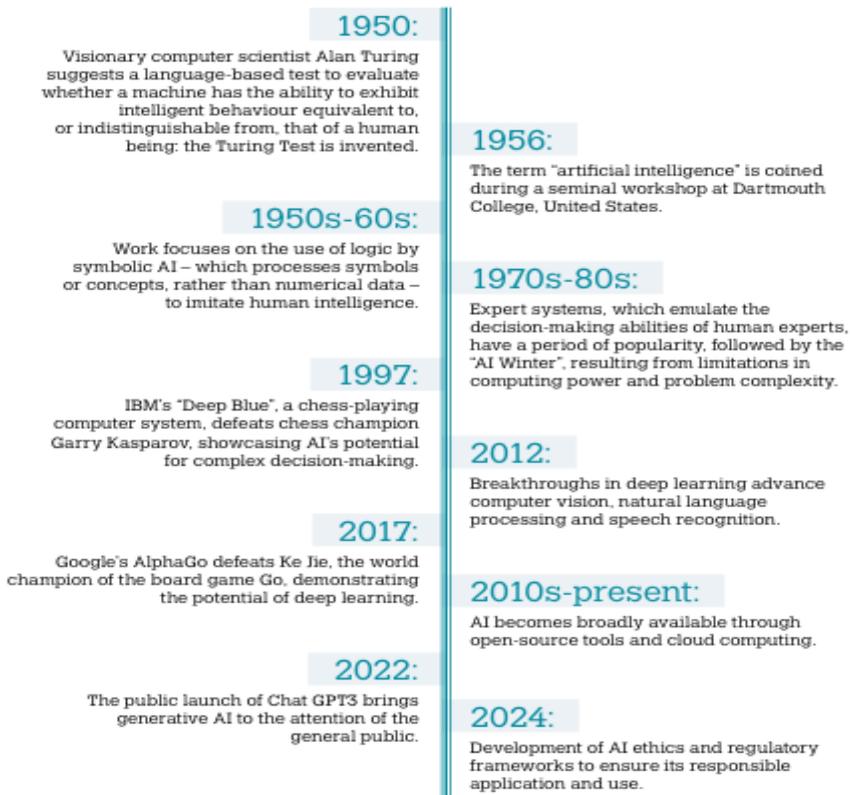


Figure 1: A Brief History of AI

Source: WTO, 2024:14

International trade consists of export and import transactions. Exports are goods and services outside national borders (Keegan, 2012). The removal of goods from the Turkish customs territory or free zones per the applicable export regulations and



customs regulations, or other removals and transactions accepted as exports by the Ministry (İhracat Yönetmeliği, 2025). There are basic stages in the export process, which are as follows: obtaining export status, finding a market and customers, discussing details with the customer, reaching an agreement with the customer, receiving notification of the letter of credit, preparing goods for export, preparing the relevant documents, customs clearance, delivery of goods to the means of transport, completion of final procedures, and settlement of foreign exchange commitments (Cantez: 2023: 11).

Import transactions are the exact opposite of export transactions. It involves the actual importation of goods or economic value within the framework of the applicable customs legislation and related regulations and the transfer of the import value to the exporting country within the framework of foreign exchange legislation, excluding duty-free imports. The import process consists of the following basic stages: obtaining importer status, preliminary research related to import, finding an exporter, discussing details, reaching an agreement, opening a letter of credit on our part, receiving and accepting documents, customs clearance, and closing foreign exchange commitments (Cantez: 2017: 20).

Artificial intelligence accelerates decision-making processes and increases their accuracy in many areas of international trade, from market analysis to logistics optimisation. This enables businesses to develop more effective strategies in a global competitive environment and sustainably increase their trade volumes. A study conducted by Meltzer (2018) states that despite the impact on international trade and the reduction of barriers to trade through specific applications in areas such as data analytics and translation services, difficulties persist due to the lack of global access to data. Brynjolfsson et al. (2019) conducted a study on the effects of machine translation on international trade. They found that introducing a new machine translation system significantly improved international trade on the relevant platform and increased exports by 10.9%.

3. LITERATURE REVIEW

Studies in the literature mainly focus on the advantages, disadvantages, application areas, and future of artificial intelligence in international trade. This study, however, is noteworthy in that it examines the transformation brought about by artificial intelligence (AI) technologies in global trade processes, reveals the effects of AI applications in different areas, and evaluates the contributions of AI to international trade performance in light of national and international case studies.

Meltzer (2018) revealed that artificial intelligence (AI) will likely have a groundbreaking impact on international trade. The study highlights challenges in AI development, such as improving access to global data for training AI systems, which international trade rules could address. In addition to some significant AI opportunities for trade, it has identified areas where trade rules could help support AI development.

Achar (2019). It has investigated the developing significance of artificial intelligence for international trade and the role that international trade can play in advancing the adoption of artificial intelligence. Study demonstrates that developments in artificial intelligence are vital in tradable areas such as ICT goods and services.



Liu and Lin (2020) systematically map the current challenges facing the World Trade Organization in light of the emergence of artificial intelligence. The governance approaches of different jurisdictions in the context of robot lawyers, computer-generated works, autonomous driving systems and automated decision-making processes have been examined comparatively, and the economic, social, cultural, and political foundations of these approaches have been analyzed.

Chander (2021). This study examines artificial intelligence law from the viewpoint of international trade law. In addition, the study reveals how WTO agreements enable governments to enforce on locally responsible artificial intelligence while promoting artificial intelligence-supported international trade.

Ferencz et al. (2022). It searches the links between AI technologies and international trade and highlights essential trade policy issues for policymakers who want to leverage the full potential of AI technologies. The article demonstrates how AI can enhance international trade through three case studies. First, the application of AI in machine translation has been proven to reduce language barriers in trade, particularly for e-retailers, and to encourage exports. Second, AI can enhance efficiency, particularly in the logistics sector. The article demonstrates how artificial intelligence can improve international trade through three case studies. The first is the application of artificial intelligence in machine translation, the second is logistics and warehousing, and the third is financial services.

Jayathilaka (2022) examines the impact of a nation's artificial intelligence capacity on international trade. The study uses the WDI (Government Artificial Intelligence Readiness Index), which covers 150 countries from 2018 to 2021, and tests panel data analysis. The results emphasise that a nation's artificial intelligence capacity has a significant positive influence on trade.

International Trade Council (2023). International Trade Council (2023). This study analyzed the impact of artificial intelligence on international trade in two ways: its potential advantages and disadvantages. The study also highlighted the benefits of artificial intelligence in global trade: improving the decision-making process through data analysis, increasing efficiency in supply chain management, and reducing labor costs—increased productivity and competitiveness. The disadvantages of artificial intelligence in international trade include dependence on technology, potential unfair competition, job losses due to automation, concerns about data privacy and security, and monopolization.

Ozturk (2024) explores the transformative potential of artificial intelligence in international trade. It also highlights a comprehensive analysis of the applications of artificial intelligence in optimising trade operations, improving trade finance, and expanding market access. Case studies of Alibaba, DHL, and Maersk are examined.

Uyan (2023). This study reveals the effect of artificial intelligence applications on the international trade processes of businesses in Turkey and their contribution to Turkey's global trade in general. As a result of this study, it is predicted that artificial intelligence technology will enable the production and export of high-value-added products in our country and increase the international competitiveness of our exporters. Therefore, R&D investments in AI are anticipated to provide significant returns for Turkish international trade in the short and medium term.



Tüfenk (2023). This study has revealed the advantages and disadvantages of using artificial intelligence technology in international trade. The use of artificial intelligence technology in foreign trade identified in this study shows that artificial intelligence has advantages such as increased efficiency, improved accuracy, and cost savings. However, there are also disadvantages such as data privacy concerns, cybersecurity risks, and technology dependency.

Aggarwal & Karwasra (2025). This study exceptionally examines the comparative strengths and weaknesses of insights generated by artificial intelligence and those generated by humans to evaluate the relationship between digitalization and international trade. The results emphasize that artificial intelligence is trending due to machines' comparative superiority in speed and ease of access.

Jakubik et al. (2025) examined the association between adopting artificial intelligence technology and bilateral trade flows. The study's conclusions reveal that AI significantly positively correlates with trade.

Tao et al. (2025) investigate the specific applications of AI in international trade and logistics and role in driving the digital transformation of global supply chains. Additionally, the study highlights the challenges and limitations of artificial intelligence in international trade and logistics, its applications, future impact, and case studies of successful application.

4. ARTIFICIAL INTELLIGENCE APPLICATIONS IN INTERNATIONAL TRADE PROCESSES

With globalisation, international trade processes have become increasingly complex and data-intensive, and the need for technological solutions has grown for businesses to gain a competitive advantage (WTO, 2024). Artificial intelligence (AI) is being integrated into various international trade applications, from supply chain management to customs procedures, market analysis to risk management (OECD, 2025). AI-supported systems provide high accuracy and speed in identifying target markets, demand forecasting, price optimisation, and logistics planning through big data analytics (UNCTAD, 2024).

The advantages of artificial intelligence in international trade are considerable (International Trade Council, 2023:6). Firstly, artificial intelligence can provide significant efficiencies in the management and processing of trade flows, customs compliance, and logistics data. This enables businesses to reduce costs, increase accuracy, and speed up processes. Secondly, artificial intelligence can help companies to identify potential risks in advance and take appropriate measures by improving risk management in international trade. For example, AI-powered analysis systems predict demand for goods and services, enabling businesses to optimise stock levels and prevent situations such as overstocking or stock shortages. Thirdly, artificial intelligence provides businesses with valuable insights into international markets, enabling them to understand consumer preferences and market trends better. This allows companies to develop more effective marketing strategies, tailor their products and services to specific market needs, and increase their competitiveness in the global market (International Trade Council, 2023:6).

However, despite the potential benefits of artificial intelligence in international trade, some concerns and challenges must be considered. Chief among these concerns is its



impact on employment. As businesses turn to automation to reduce costs, advanced technologies may lead to job losses and income inequality in specific sectors. Another significant issue is the lack of transparency and accountability in decision-making processes. The complex structure of artificial intelligence models can make it difficult to understand how specific outcomes are reached fully. This can create problems in trade policies and regulations where fair and effective decision-making is crucial. Furthermore, there is a risk that existing biases and discrimination in artificial intelligence algorithms will persist, which could deepen social and economic inequalities. Therefore, while the benefits of artificial intelligence in international trade are clear, potential issues must be carefully addressed to ensure that these benefits are shared fairly and equitably (International Trade Council, 2023:9).

In the literature and current applications, it is seen that artificial intelligence can be used in key areas such as supply chain, logistics management, risk management and security, financial forecasting and analysis, product and service development, marketing and customer service, and finally in the field of IT, such as customs and border controls (Yavuz & Çetinkaya, 2024, pp. 26-27). In addition, it is also used in applications such as pricing strategy, e-commerce, demand forecasting, production optimisation, and market research. AI systems are used in the financial sector to enable and improve money management. Artificial intelligence (AI) in supply chains can revolutionise the planning, production, management, and optimisation of supply chain activities. AI can improve supply chain decision-making processes and operational efficiency by processing large amounts of data, predicting trends, and performing complex tasks in real time (IBM, 2025). Logistics: Artificial intelligence systems can help optimise warehouse utilisation by forecasting demand, managing inventory, improving efficiency across the supply chain, and tracking the movement of packages (Ferencz et al., 20225).

Risk management and security are essential for international Trade. IT processes bring a range of risks, such as fraud, deception, and illegal activities. Artificial intelligence technologies help reduce these risks by improving risk assessment and fraud detection capabilities (Yavuz & Çetinkaya, 2024, p. 27). AI systems are used in the financial sector to enable and improve money management. For example, AI systems help banks consolidate their credit decisions by scoring borrowers' risks using machine learning and extensive data sources (Ferencz et al., 2022, p. 26). In international trade and cross-border e-commerce, customer service has always been a fundamental component of business operations. Traditional customer service models often face language barriers, time zone differences, and service efficiency challenges. However, AI-powered intelligent customer service systems are increasingly improving these issues, enhancing the customer experience and expanding markets. AI chatbots can provide 24/7 customer service, especially in global markets where businesses must respond to customer requests in different countries and regions. Thanks to natural language processing (NLP) technology, AI can understand and respond to customer needs in real time, increasing service efficiency and enhancing customer satisfaction (Tao et al., 2025, p. 37).

Artificial intelligence is used in customs and border controls to speed up and enhance import and export processes and prevent potential fraud. Biometric performance, such as facial recognition technology, data analysis, and big data analytics, makes customs and border controls more effective (Yavuz & Çetinkaya, 2024, p. 27). A competitive



pricing strategy is created by determining average selling prices in target markets. For example, an AI application can calculate the FOB price of a product. E-commerce is entirely based on current changes in consumer trends, traditions, designs, and styles; however, with the help of artificial intelligence, creative new ideas have emerged to determine consumer purchasing behavior and produce products according to consumer demands (Sharma, 2021, pp. 2-3). Deep learning algorithms and artificial neural networks can analyze past sales data to predict future demand accurately. Foreign market research, a fundamental market study tool, aims to select export markets and establish business relationships to initiate negotiations by assessing market accessibility (physical, commercial, and cultural accessibility). Artificial intelligence will improve market analysis and competitive intelligence, including global trade. In addition to quickly processing and analyzing large amounts of data from multiple sources, the ability to generate new data on consumer preferences and market demand trends will enable companies to make better decisions and respond more quickly to changes in the global business environment (Belu, 2024, p. 9)

Table 1 demonstrates national and international case studies on the application of artificial intelligence in global trade. Case study examples have been selected from current practices reported in the field of international trade over the last ten years and available in publicly accessible sources. Geographical diversity, differences in areas of application, and criteria relating to policy and business relevance were taken into account in the selection process. Artificial intelligence applications are being used effectively in various areas of international trade on a global and local scale. The Ministry of Trade of the Republic of Turkey (2025) provides strategic support to exporters with tools such as target market and sector analyses, the Easy Export Platform, and the Smart Export Robot. In logistics and supply chain management, Maersk (2025) optimizes cargo tracking and estimated arrival times using blockchain and artificial intelligence-based systems on the TradeLens platform developed in collaboration with IBM; Ekol Logistics (2022) uses artificial intelligence solutions for route optimization, fleet management, and fuel economy analysis, while DHL (2022) uses them for demand forecasting, inventory management, and route optimization. The European Union (2025) uses AI-based scanning systems in customs procedures, while Chinese customs utilizes artificial intelligence in the risk analysis-based classification of export and import documents. In production optimization, Arçelik (2023) uses AI-based systems in its production facilities, while Siemens (2024) is improving production processes with the Minsphere platform. In the e-commerce sector, Hepsiburada (2023) integrates AI into marketing and sales processes with the HepsiAd platform and the “quick comment” feature. Flexport (2025) is developing AI-based management systems in the global supply chain. Amazon Global Logistics is performing stock forecasting and price optimization with machine learning, and Alibaba is matching buyers and sellers and performing risk scoring with its “Intelligent Matching System.” In addition, US-based UPS is improving its logistics operations with the ORION route optimization system, while General Electric is increasing efficiency in production processes with the Predix Platform. In Turkey, the General Directorate of Customs and Protection (2022) offers AI-supported solutions for customs security and combating smuggling with its “Guard Program.” Dubai Customs has launched various projects utilizing artificial intelligence to facilitate trade and improve border control. For example, iDeclare



allows travellers to submit their customs declarations electronically and securely (WTO, 2025:).

Table 1: Case Study on Artificial Intelligence Applications in International Trade

Example	Areas	Artificial Intelligence Applications
Ministry of Trade of the Republic of Turkey (2025)	Target Market and Sector Analysis,	Easy Export Platform, Smart Export Robot
Maersk (2025)	Logistics, Supply Chain Management	In collaboration with IBM, TradeLens uses blockchain and AI for cargo tracking and ETA estimation.
European Union (2025). Arçelik (2023)	Customs Procedures	AI-based customs screening systems
Hepsiburada (2023)	Production Optimisation	AI-based systems in production facilities
Ekol Logistic (2022)	Marketing and sales	HepsiAd platform, quick comment
DHL (2022)	Logistics, Supply Chain Management	Route optimisation, Fleet management with AI, and fuel economy analysis
Siemens (2024)	Production process optimisation	Demand forecasting, inventory management, and route optimisation
Flexport (2025)	Production process optimisation	Minsphere Platform
General Electric (2025).	Logistics, Supply Chain Management	AI-based supply chain
China (2025)	Production process optimisation	Predix Platform
UPS (2016)	Customs Procedures	Customs Platform, Classifying export and import documents in customs procedures for risk analysis, Smart Customs, Smart Borders, and Smart Connectivity
Amazon Global Logistics (Luo, 2025)	Logistics, Supply Chain Management	ORION rota optimizasyon sistemi
Alibaba (2020)	Supply chain management-demand forecasting and pricing strategies	Stock forecasting and price optimisation with machine learning
General Direct Rate of Customs and Protection (2022)	Market and trading platform optimisation	Buyer-seller matching and risk scoring with the 'Intelligent Matching System'
Dubai Customs WTO (2025)	Customs, Security, and Anti-Smuggling	The Guard Programme
	Customs Procedures	Robotic Process Automation Smart Refund System, iDeclare

Source: Compiled by the author.



CONCLUSION

This study examines the transformation brought about by artificial intelligence (AI) technologies in international trade processes through both national and global examples. The findings reveal that AI applications are widely used in various areas such as supply chain management, production optimisation, operational efficiency, customs procedures, logistics optimisation, market analysis, and risk management.

In Turkish examples, the Ministry of Trade's Easy Export Platform and Smart Export Robot effectively utilize AI in target market and sector analysis, while the General Directorate of Customs and Border Guard's Guard Programme is leveraging AI in anti-smuggling and risk analysis processes. This demonstrates that public institutions embrace technological transformation to enhance international trade security and efficiency.

In international examples, the Maersk-IBM TradeLens collaboration uses blockchain and AI to track cargo and predict arrival times, ensuring global logistics transparency. Companies such as DHL, Ekol Logistics, and UPS systematically use AI in route optimisation, demand forecasting, and inventory management to reduce costs and increase service speed. Amazon and Alibaba are gaining a competitive advantage in global e-commerce through machine learning-based inventory forecasting, price optimisation, and buyer-seller matching systems.

AI technologies significantly improve international trade performance by contributing to data analytics, automation, forecasting, optimisation, and risk analysis. Findings show that AI provides operational efficiency and cost advantages and contributes to developing a sustainable international trade ecosystem by enhancing trade security.

To promote the widespread use of artificial intelligence in international trade, it is necessary to strengthen data sharing infrastructures and establish standards at the national level. Incentive mechanisms that support digital integration between customs, logistics, and supply chain actors should be implemented. Legal regulations and control mechanisms should be developed to ensure that artificial intelligence projects are carried out securely, transparently, and ethically. Training and capacity development programmes for artificial intelligence-based international trade solutions should be widespread to increase companies' competitiveness.

Methodologically, the study examined current reports and literature on artificial intelligence applications in international trade; assessments were made within the framework of qualitative content analysis and comparative case analysis. However, as the research was based on secondary data, it was not possible to access the technical details of the applications within the organisations. Furthermore, the selected cases are representative in nature and do not cover all global applications. However, despite these limitations, the case studies provide a valuable framework for understanding current trends in artificial intelligence applications in international trade and their policy implications.

In the context of future studies, it is recommended that more comprehensive impact analyses be conducted based on quantitative indicators such as the cost advantage created by AI in international trade, shorter delivery times, and reduced error rates. Comparative studies between countries at different levels of development can be conducted to develop more targeted recommendations for policymakers. Quantitative



and mixed-method studies on artificial intelligence applications in international trade can be performed.

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