Artificial Intelligence in International Trade:
A Bibliometric Analysis

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Abstract

Artificial intelligence (AI) has emerged as a key force reshaping the international business landscape. Artificial intelligence, known as one of the disruptive technologies of the moment, will produce important changes in the mechanism of unfolding specific to foreign trade operations. The research is based on a quantitative research method, bibliometric analysis. By querying the existing database on the Scopus platform, scientific papers (research articles, books, papers presented at conferences) containing the keywords in the title, abstract or keywords of the documents were identified. The bibliometric analysis carried out can be a guide for future research directions and for identifying strategic directions for the implementation of AI in international trade. The results obtained can also guide market participants, especially international trade companies, on how artificial intelligence could be used in the process of conducting export-import business. At the same time, the results can help academic researchers explore issues related to the application of artificial intelligence in international trade in future studies.

1. Introduction

The development of emerging technologies, including artificial intelligence (AI), has a direct impact on international trade, facilitating the cross-border movement of goods and services. They can drive innovation, productivity, and efficiency while also enabling secure supply chains to be established, ensuring product traceability, and improving customer experiences.

The impact of AI in the field of international trade will be profound and will produce important changes in the management of export-import transactions. AI-based automation transforms the specific processes for supply chain management, financing, and document management specific to a foreign trade transaction, facilitating the transactional mechanism and reducing administrative tasks.

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In recent times, global trade has been experiencing a transformation influenced by three primary factors: (a) The initial factor is the broadening of the regionalization process, stemming from geopolitical risks present globally. Various geopolitical issues, such as growing trade tensions between the United States and China, could further divide the global economy into West-East and North-South trade blocs, fostering the rise of multipolar and regional trade centers in Asia and North America. (b) The second factor, the restructuring of supply chains, results from the regionalization process of recent years, compounded by other events (the COVID-19 pandemic, the conflict in Ukraine, attacks on cargo ships in the Red Sea). The coronavirus pandemic has nearly halted the longstanding trend of globalization, as worldwide lockdowns and transportation delays have exposed vulnerabilities in global supply chains, the absence of alternative suppliers, and the breakdown of just-in-time delivery systems. (c) Lastly, the third factor, the proliferation of trade digitalization and the widespread integration of AI, has brought significant changes to the business models of companies engaged in international trade.

The paper investigates the impact of artificial intelligence on the management of export-import and is structured into four parts. The initial section of the literature review explores key emerging technologies, with a special focus on artificial intelligence, with the aim of pinpointing key trends and challenges in global trade and how AI can improve the management of export-import processes business. The second part describes the research methodology, using bibliometric analysis to map the progression of research in this domain, identify the main influences, and examine the links between various subjects and ideas related to AI and international trade. The third part, dedicated to discussion, evaluates the results and their significance in comparison to existing research and theories. Lastly, the conclusion section presents the main findings, highlights its contributions to international commerce and artificial intelligence, and notes the limitations of the present study.

2. Literature review

2.1 *Emerging and disruptive technologies*: artificial intelligence, blockchain, big data, the Internet of Things, 3D printing

Emerging technologies have a major impact on business models and provide companies with important opportunities to diversify their ways of operating in international markets. From artificial intelligence to blockchain, from the Internet of Things to Big Data, these technologies are constantly evolving and continue to change business models. As a rule, emerging technologies arise unexpectedly and can cause shocks in the market, disrupt the activity of companies, as they change

the entire structure of the industry or market, and create new categories of products or services to quickly replace existing ones.

Artificial intelligence. In recent years, artificial intelligence has been among the fastest growing technologies, and AI tools have evolved from rule-based systems (replicating human intelligence) to complex models capable of deep learning, adaptation, problem solving, understanding, and generating human language, image processing and analysis, analyzing historical data to predict future outcomes, and informed decision making.

| Artificial intelligence: definitions	The first definition of the term AI was proposed by british mathematician and computer scientist Turing: a computer is considered intelligent if a human interacting with that computer cannot distinguish whether it is communicating with a machine or a human (Turing, A., 1950)
	AI can be defined as "intelligent entities that mimic cognitive functions"; they define AI as the ability to mimic human intelligence and perform tasks using automation or robots (Russell and Norvig , 2010).
	AI is the ability of a system to correctly interpret external data, learn from this data, and use this knowledge to achieve specific goals and tasks through flexible adaptation (Kaplan and Haenlein, 2019).
	AI is "a machine-based system that can, for a given set of human-defined goals, make predictions, recommendations, or make decisions that influence real or virtual environments. AI systems are designed to operate with different levels of autonomy" (OECD, 2019).

There are several types of artificial intelligence, as follows:

a. Narrow AI: Helps to perform a dedicated task with intelligence. Such "narrow" artificial intelligence uses large samples of data to generalize pattern recognition in images, text, or language.

b. General artificial intelligence: It can perform any intellectual task efficiently, as a human being. AGI refers to (hypothetically) advanced artificial intelligence systems that can overcome specific tasks in well-defined contexts to enable autonomous learning, decision-making, and action-taking functions in a range of tasks that are much closer to human cognitive functions.

c. *Artificial super-intelligence*: allows computers to understand human language and respond in a natural way.

d. *Generative Artificial Intelligence* (Gen-AI): the launch of the ChatCPT program allowed the consolidation of AI with a new branch, generative intelligence, aimed at generating content (text, images, audio, music, etc.). According to a study, organizations that act now to reinvent their work and way of working using 'Human by Design' technologies will redefine what it means to be an industry leader." (Daugherty, P. et al., 2024)

The elements of artificial intelligence are machine learning and deep learning (see figure below). Machine learning (ML) is a subset of AI, but with a slightly different scope, allowing machines to learn in an automated manner through models and inferences, rather than explicit instructions from a human (OECD, 2019). Deep learning (DL) is a more advanced form of ML based on neural networks that approximate complex relationships by learning to classify input examples into output examples based on large amounts of training data. DL usually applies to unstructured data, such as images or voice. (OECD, 2021)

Figure 1. Components of Artificial Intelligence
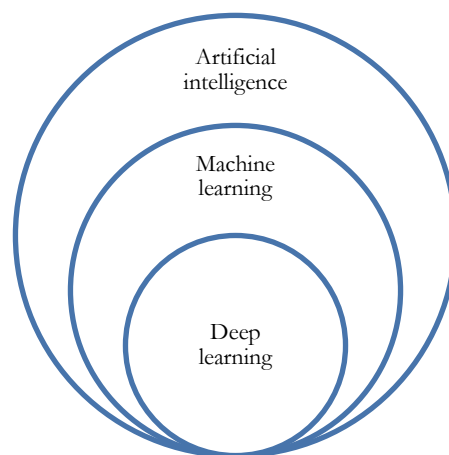
Meltzer (2018) argues that it is essential to look at the fundamental components of restricted artificial intelligence in order to understand its importance and potential for international trade. Specifically, restricted artificial intelligence is based on machine learning, which is capable of making increasingly accurate predictions about the future, combining massive volumes of data with powerful algorithms (S. Russell et al. 2015).

Blockchain technology is a global ledger that runs on computers and is available by volunteers around the world. At the heart of the blockchain concept is a network of computing nodes; each customer logged into the network receives a copy of the updated and validated data (Tapscott, D., Tapscott, A., 2016).

The Internet of Things (IoT) enables the interconnection, via the Internet, of smart devices that share specific information and data with each other and with other remote digital platforms for real-time decision-making by users or by other smart devices through machine communication.

Big data. Big data can be considered complementary to IoT, as it generates large volumes of varied data. The management and conversion of these data into useful information for strategic planning and decision making takes place. Big data has four basic characteristics (the 4 Vs): volume: the amount of information stored (gigabytes, terabytes, petabytes, exabytes); speed: The speed at which data streams are created and captured. variety refers to the diversity of data, their way of representation; veracity, i.e., the precision and accuracy of the data.

3D printing creates objects by superimposing (printing) successive layers of material based on a 3D model or drawing. 3D printing in an industrial setting involves printing polymer parts locally, which could bring about significant changes in some value chains. For example, in automotive manufacturing, it could change the operating model by shortening the value chain, making it easier to make finished products directly in or near factories, saving time and transportation costs, and also providing greater flexibility in production in response to changes in demand or customer tastes.

In the context of the development of emerging technologies, questions arise about the impact of these technologies on global trade. (a) The first question concerns the technologies that will have the greatest impact on global trade. The answer to this question was found in a report on the future of trade published in 2024 (DMCC Future of Trade Survey, 2024). According to this document, the technologies with the greatest impact on global trade are artificial intelligence, big data, and blockchain (see Figure 2).

Figure 2. Technology will have the greatest impact on global trade over the next two years.
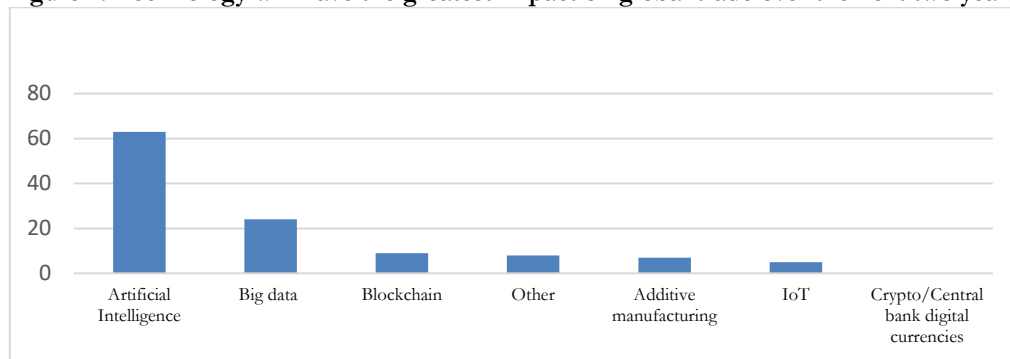
Source: DMCC Future of Trade survey, 2024

(b) A second question relates to "What is the biggest impact that technology will have on global trade?". According to the study, the most common responses were an improvement in supply chain visibility and traceability (27%), increased automation of operations (25%), and an increase in digitally delivered services (20%) (DMCC Future of Trade survey, 2024). It is clear that emerging technologies will reshape international trade, particularly in terms of supply chain restructuring and the growth of trade in services.

Figure 3. What is the greatest impact that technology will have on global trade?
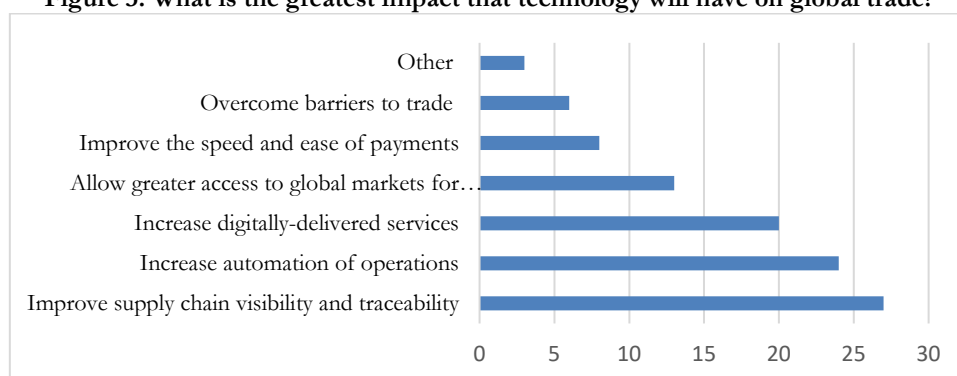
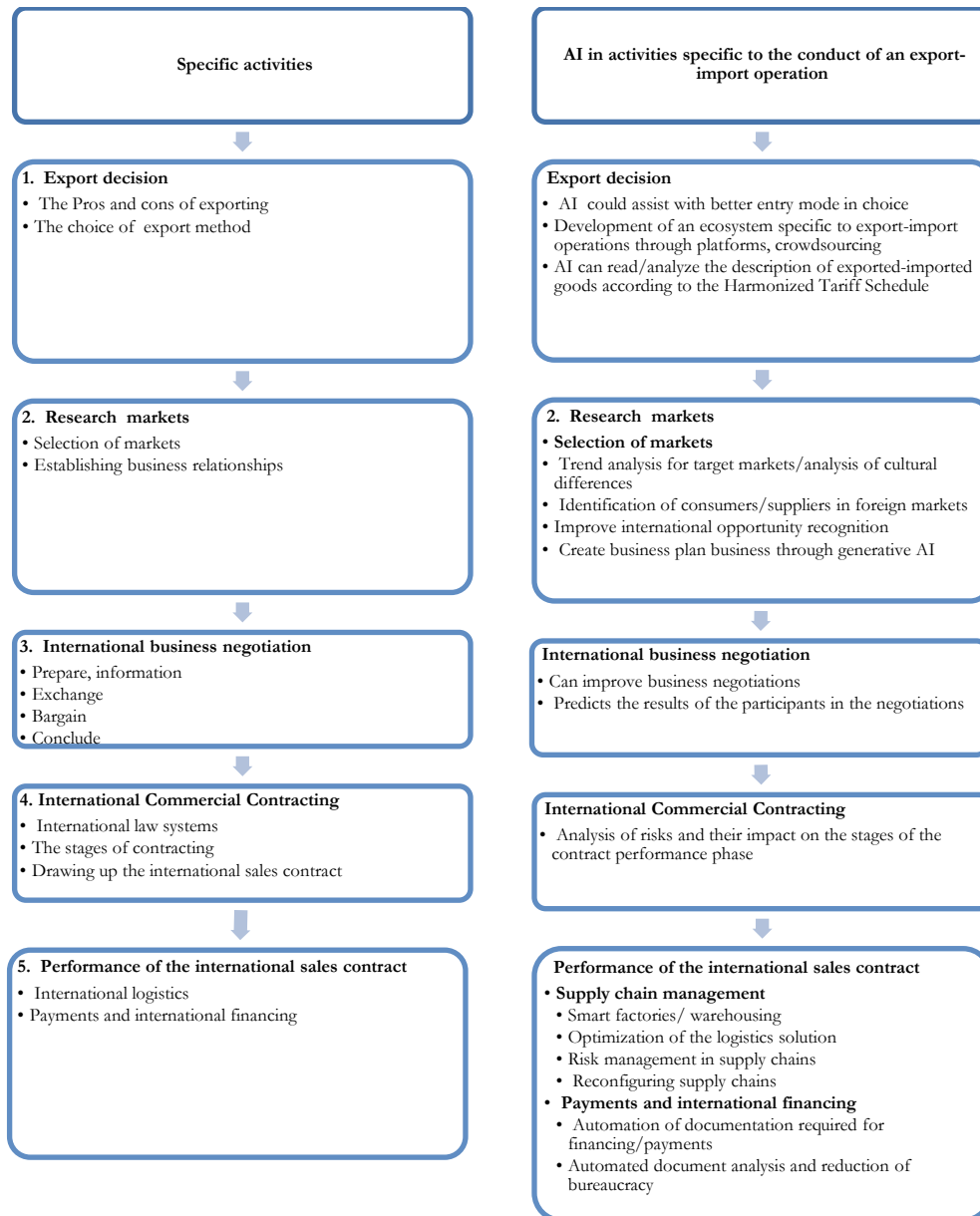*Source*: DMCC Future of Trade survey 2024

2.2 The use of artificial intelligence in the specific activities of a foreign trade transaction

Foreign trade transactions are, in general, high value transactions, which are carried out between producing, trading, and service companies; they represent business-to-business (B2B) operations. As such, they have a number of particularities, such as the legal framework, the number of participants, and the transactional mechanism. An export-import operation involves: the contracting parties; the product (object of the transaction); payment (the value of the service). At the same time, a number of other companies participate in the operation that ensure the transport (the cart), the insurance of the goods (the insurer), and the payment of the price (the bank). An important role in the conduct of the transaction is played by the public authorities of the partner countries: ministries or departments with responsibilities in the field of foreign trade activity, customs authority, Chambers of Commerce, etc.

Carrying out an export operation involves going through several stages, from the export decision to the research of foreign markets, negotiation, contracting, and execution of the international sales contract. Artificial intelligence can be applied to the stages/activities specific to the mechanism of conducting a foreign trade

transaction. Thus, from the first stage, the choice of the way to enter foreign markets, artificial intelligence (see the figure below).

Figure 4. Stages of Exporting

Specific activities	AI in activities specific to the conduct of an export-import operation
1. Export decision • The Pros and cons of exporting • The choice of export method	**Export decision** • AI could assist with better entry mode in choice • Development of an ecosystem specific to export-import operations through platforms, crowdsourcing • AI can read/analyze the description of exported-imported goods according to the Harmonized Tariff Schedule
2. Research markets • Selection of markets • Establishing business relationships	**2. Research markets** • **Selection of markets** • Trend analysis for target markets/analysis of cultural differences • Identification of consumers/suppliers in foreign markets • Improve international opportunity recognition • Create business plan business through generative AI
3. International business negotiation • Prepare, information • Exchange • Bargain • Conclude	**International business negotiation** • Can improve business negotiations • Predicts the results of the participants in the negotiations
4. International Commercial Contracting • International law systems • The stages of contracting • Drawing up the international sales contract	**International Commercial Contracting** • Analysis of risks and their impact on the stages of the contract performance phase

5. Performance of the international sales contract
• International logistics
• Payments and international financing
	Performance of the international sales contract
	• **Supply chain management**
	  • Smart factories/ warehousing
	  • Optimization of the logistics solution
	  • Risk management in supply chains
	  • Reconfiguring supply chains
	• **Payments and international financing**
	  • Automation of documentation required for financing/payments
	  • Automated document analysis and reduction of bureaucracy

The first stage in the process of initiating and carrying out a foreign trade operation, the export decision involves balancing the pros and cons of initiating the commercial operation. Once the export decision is made, the manufacturing company opts for the export method (direct export, indirect export, export through intermediaries).

The research of foreign markets, having as its main tool the market study, aims to choose the export market(s) (taking into account the accessibility of the market: physical, commercial, cultural accessibility) and to establish business relationships in order to initiate negotiations.

AI will improve market analysis and competitive intelligence, including in global trade. Its ability to quickly process and analyze large amounts of data from multiple sources, as well as the ability to generate new data on trends in consumer preferences and market demands, will allow companies to make better decisions and react more quickly to changes in the global business environment.

Selection of foreign markets. AI can play a role in the choice of international markets. This allows multinational companies easier access to international markets and can increase recognition of existing opportunities in international markets (Dillon et al., 2020). Through AI-powered data analysis and visualization tools, multinational companies can benefit from analyzing market trends, gaining insights and recommendations on the current and future state of an external market (Meltzer, 2018).

AI could also help develop a business plan needed to carry out a foreign trade transaction, as it can help compare cultural and physical distances between countries. Generative AI tools, such as ChatGPT, Bing, and Bard, allow rapid realization of a business plan (Hughes, 2023). These tools could also provide valuable information on the specific business environment of a market: the political, economic, legal, and regulatory environment of the market, industry, and competitor information.

Machine learning-based applications can identify cultural subgroups and help identify suppliers and other actors directly or indirectly involved in the conduct of a foreign trade transaction (Messner, 2022).

International business negotiation allows the parties to reach an agreement, by going through the specific stages of this decision-making and intercultural communication process, namely: preparation of negotiations (establishment of the negotiation strategy, composition of the team of negotiators, etc.), the first meetings, phases of argumentation and objections, concessions and compromise) and closing the deal (Popa, 2006).

Business negotiation, according to the authors (Fisher & Ury 1991; Lewicki et al. 1991), is considered to be a win-win negotiation, which has a number of characteristics, namely: the exchange of information is open between the parties: each party presents its own objectives and listens to the objectives of the opposing party, and through the exchange of information, the negotiators try to reach an agreement; both parties are guided, during negotiations, by the desire to reach a solution that meets the interests of both parties; the negotiators know that, in addition to common points, they also have possible points of disagreement (possible conflicts), and their efforts are aimed at reaching a mutually beneficial agreement.

An important stage of the negotiation process is the preparation and planning of negotiations; This is of major importance for the success of the negotiations and, in general, of the business. In fact, this is the stage that distinguishes ab initio the negotiations carried out professionally from the improvised ones (Popa, 2006). In the negotiation preparation stage, AI helps to: research the market, set clear objectives, brainstorm alternatives, but also to better understand the object of the negotiation. AI applications help in negotiation preparation by: (i) identifying and assessing possible contractual risks: (ii) optimizing the process of setting prices, negotiation points, through suggestions made by AI.

In the negotiation phase, the use of AI allows one to maintain a productive dialogue, allow you to overcome relational blockages by identifying creative solutions, and can help manage emotions and provide quick responses.

Negotiation is a decision-making process, and AI helps to: comparative analysis of the options that the negotiator has; analysis of the risks and impact that certain commercial conditions may have, making simulations and predictions for the various possible scenarios in the negotiation. Therefore, the application of AI in negotiation results in: an easier evaluation of decisions, and the emotional involvement of the negotiator can have less negative impact on the final outcome of the negotiation.

In the post-negotiation phase, AI allows: the analysis of the results obtained from the negotiation process and the elaboration of strategies for future negotiations.

It is obvious that artificial intelligence will revolutionize business negotiations. In collaboration with autonomous negotiation technologies, hundreds of thousands of possible agreements (including all possible presumptions about each party) can be evaluated based on combinations of previous answers, external information, as well as knowledge gained from previous negotiations) with a view to reaching an agreement that benefits both parties. It is practically impossible for human beings

to understand such a level of data without taking into account the time it takes to process it (M. Rand, 2022).

The main result of international commercial contracting is the drafting of the international sales contract, the legal basis of the export-import operation. At this stage, business partners must take into account the differences between legal systems in the contracting process.

The application of artificial intelligence in international commercial contracting has the potential to improve the way firms manage the contracting process: first, it can change the tools that firms use to contract; secondly, it can influence the content of contracts; third, it can improve the processes through which firms develop and perform the contract. These new emerging technologies have the potential to significantly reduce the manpower required to manage both the contracts themselves and the entire commercial contracting process. (Beverly, R., 2018)

Why is it necessary to improve the commercial contracting process? According to one study, inefficient contracting has been estimated to cause firms to lose between 5% and 40% of the value of a particular transaction, depending on the circumstances. Emerging technologies such as artificial intelligence (AI) are now helping companies overcome many of the challenges of the contracting process.

Combining artificial intelligence with smart contracts, based on blockchain technology, can lead to the development of contracts that are adaptable to existing market conditions during the execution of the contract. AI can analyze large amounts of data to optimize contract terms, anticipate potential problems, and improve decision-making processes. For example, AI algorithms can identify patterns and trends in market data, allowing smart contracts to adjust terms in real time to reflect new market conditions. This dynamic capability can improve contract responsiveness and flexibility in global trade.

By integrating AI, companies can create more efficient and proactive contract management systems that not only automate but also intelligently adapt to the complexity of international trade.

The performance of the international sales contract, a stage that involves the fulfillment of contractual obligations, is transposed into the performance of activities that fall within the scope of international logistics (preparation of goods for delivery-packing, marking, conditioning, organization of transport (pre-transport, international transport, post-transport), insurance of goods in international traffic (conclusion of the insurance policy), customs clearance
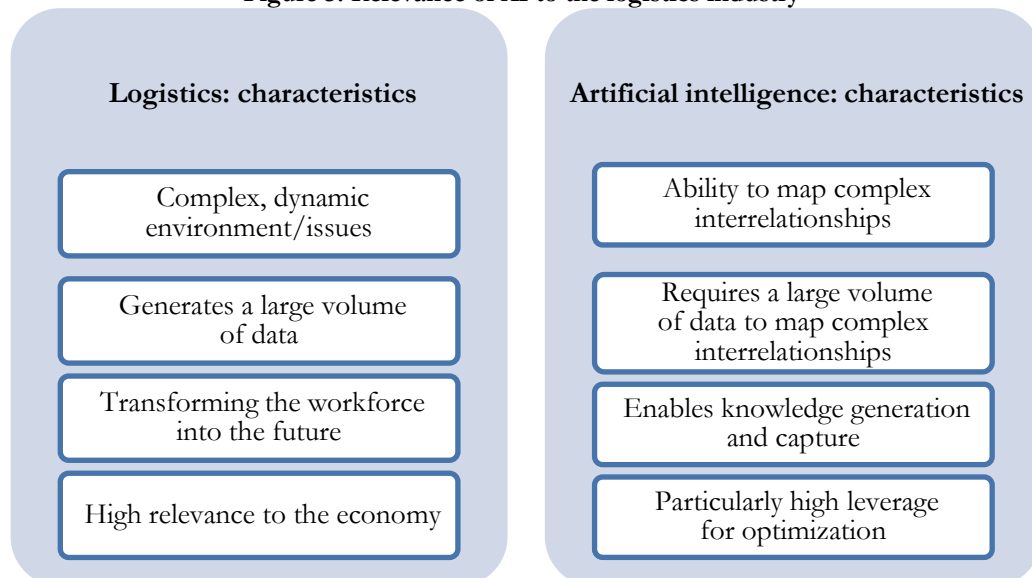
formalities, or in the financial sphere (carrying out the formalities necessary for the realization/collection of the value of the goods).).

Using Artificial Intelligence in the Supply Chain. AI will optimize supply chains, streamlining their management and reducing trade costs. The implementation of artificial intelligence in the process of carrying out an export-import transaction allows: the automation of repetitive tasks, the use of algorithms and data to formulate the business strategy, the facilitation of intelligent production. This will allow for more accurate forecasting of consumer demand, more efficient inventory management, and improved supply chain management. AI will increase the resilience of the supply chain and reduce the risk of disruptions.

Real-time AI-generated data and insights will enable more extensive monitoring of the supply chain. This will support better risk management strategies, mitigating supply chain disruptions, and increasing its resilience (Murrenhoff et al. 2024).

The logistics industry is suitable for the use of AI due to its specific characteristics (see Figure 5). The environment in which logistics systems operate is characterized by a fluctuating consumer market, many different actors, and opposing objectives that need to be reconciled. Therefore, it is a highly dynamic and complex environment, leading to complex optimization problems that must be solved in order to achieve efficient and sustainable logistics processes. AI has the ability to capture complex relationships in logistics environments and, to achieve this, a large volume of data is needed.

Figure 5. Relevance of AI to the logistics industry

Logistics: characteristics	Artificial intelligence: characteristics
Complex, dynamic environment/issues	Ability to map complex interrelationships
Generates a large volume of data	Requires a large volume of data to map complex interrelationships
Transforming the workforce into the future	Enables knowledge generation and capture
High relevance to the economy	Particularly high leverage for optimization

Source: Murrenhoff, A., and al. 2024, p. 6

The emergence of generative artificial intelligence has the potential to radically transform logistics activities and supply chain management (Glenn Richey Jr. R. et al., 2023).

Sourcing assessment and procurement The application of generative AI in supplier assessment and selection offers a revolutionary approach that goes beyond conventional methods that typically involve manual analysis and decision making. The ability of AI to quickly analyze large amounts of data from multiple potential suppliers, taking into account a diverse range of factors (such as profitability, product quality, reliability, operational efficiency, and sustainability), allows the generation of an optimal portfolio of suppliers. Enhanced by its text generation capability, AI can provide in-depth descriptions of the pros and cons of each provider. The usefulness of generative AI also extends to the field of risk management (e.g., political, economic, cultural, etc.), as it enables scenario-based risk assessment by generating potential patterns of disruption, including cases such as supplier insolvency, strikes, natural disasters, pandemics, etc.

Through a detailed and continuous analysis of potential disruptions, companies can develop resilient strategies to ensure business continuity. For example, in a supply chain disruption, AI can generate viable alternatives based on several factors related to traditional logistics service quality values (Mentzer et al., 2021).

Generative AI can formulate efficient distribution strategies and logistics solutions, taking into account constraints and objectives, such as reducing costs, maximizing the level of services, route interruptions, weather conditions, and environmental considerations.

The application of artificial intelligence in the customs clearance procedure of goods results in a reduction in the time it takes to obtain customs clearance (by up to 40%) and the costs related to the management of the supply chain, transport, and storage. At the same time, AI allows for an improved assessment of customs risks. Relying on machine learning algorithms, the customs worker can analyze the specific trade data of the goods subject to the customs clearance procedure, identify risk indicators, and irregularities.

AI algorithms also help with the classification of goods tariffs and their customs valuation, the basis for calculating customs duties. In the case of classification of goods, the AI assigns the correct tariff position from the Harmonized System to the goods, using the product description information, photographs, and their specifications (Freya, J. 2024).

At the same time, artificial intelligence can be a form of discouragement from the sale of counterfeit products. AI can be used to analyze large amounts of data

generated by blockchain networks, identifying patterns and anomalies that could indicate counterfeiting. For example, artificial intelligence could be used to detect unusual transactions or disruptions in the supply chain that could indicate entry into the market of counterfeit products.

The use of artificial intelligence in the logistics industry offers numerous benefits, including increased efficiency, accuracy, and sustainability. AI algorithms can optimize operations, reduce errors, and improve profitability. However, the deployment of AI in the logistics industry also presents significant challenges, such as high costs related to the implementation of the technology, concerns about data privacy and security, and challenges related to the regulation of artificial intelligence. In conclusion, organizations must consider these challenges before implementing AI-powered solutions in logistics activities.

International payments and financing refer to a series of activities specific to the financial field, activities aimed on the one hand at collecting the value of goods and, on the other hand, obtaining the financial resources necessary for the activities specific to an export-import operation.

The use of artificial intelligence in international payments and financing. Automated services will increase trust in payment/trade finance. AI can more easily identify fraud, counterfeiting, and illicit activities by querying financial records, transaction data, and shipping information, allowing businesses to identify suspicious patterns or anomalies. Artificial intelligence can be used to assess the financial risk associated with a foreign trade transaction.

AI-based solutions and blockchain technology are revolutionizing trade finance by automating documentation, verifying transactions, and reducing bureaucracy. At the same time, due to the digitization and automation process, international trade firms can speed up payment processing, minimize errors, and increase the transparency of financial transactions, thus streamlining export-import transactions.

The management of documents specific to a foreign trade transaction will be much easier thanks to AI. For example, automating electronic invoice and customer service through document processing and chatbots will reduce administrative processes in global commerce.

3. Research methodology

The article bases its research methodology on bibliometric analysis to map and highlight the importance of the field created by artificial intelligence used in international trade.

The methodological stages of the investigation are presented in Figure 6. In the first stage, we collect data from the Scopus database. We query the database, using several filters to identify the articles to be analyzed. Following the query, a number of 504 documents were identified that satisfy the query keywords: TITLE-ABS-KEY ("*international trade*" AND "*artificial intelligence*"). Subsequently, after successive refinements, the final number of documents analyzed was 363 documents. The search was conducted in September 2024 and produced 504 results, which were then subjected to various exclusion and inclusion criteria. The inclusion criteria consisted of the type of document, which included articles, review articles, or early access materials, and the requirement that articles be written in English.

Figure 6. Methodological flow
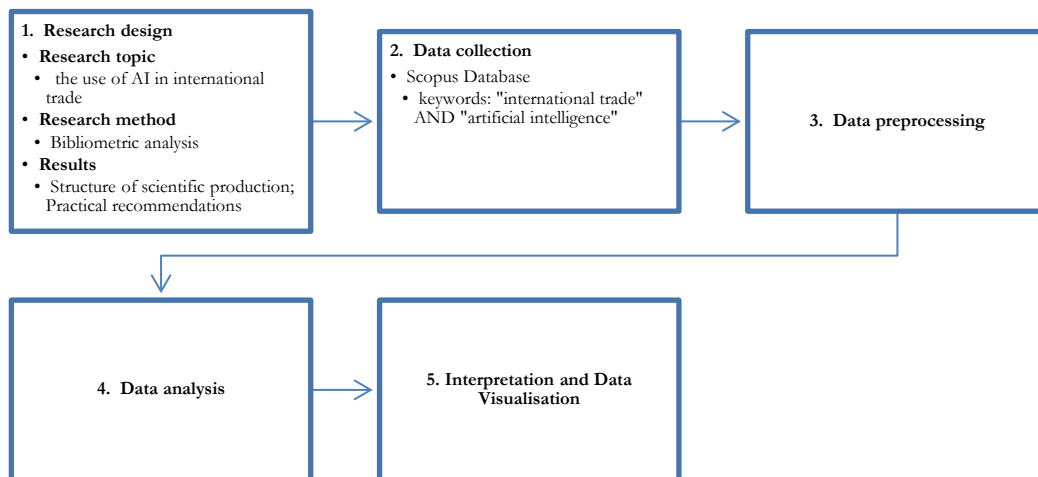
Data preprocessing, second step: Following data gathering, the search results were transferred to the Bibliometrix R package. This package facilitates extensive bibliometric analyses in relation to other significant software tools. In the third phase, data analysis was performed using Biblioshiny, the graphical user interface associated with the bibliometrix R package, to examine the data gathered from Scopus. In the final phase, data interpretation and visualization were performed: the results of the analysis were understood and presented through various tables, graphs, and charts produced by Biblioshiny. These visualizations enabled us to detect patterns and condense information in a straightforward manner.

3. Results and discussion.

The query of the Scopus database led to the identification of a number of 363 scientific documents in which the terms "international trade" AND "artificial

intelligence" were found at least in their title, abstract, or keywords. The 363 documents analyzed refer to conference papers (64.9%), articles (29.2%), book chapters (4.1%), and books (1.9%). For the temporal distribution of the selected works, the period analyzed is 2000-2024. From the analysis of the information, it can be seen that until 2007, the topic of the use of artificial intelligence in international trade was not at the center of concerns, with values ranging from 0 to 4 per year, and since 2008, there has been an increase in the number of articles dealing with this issue, showing awareness of the interest in using artificial intelligence in international trade (see Figure 7).

Figure 7. Temporal distribution of articles published in the period 2000-2024
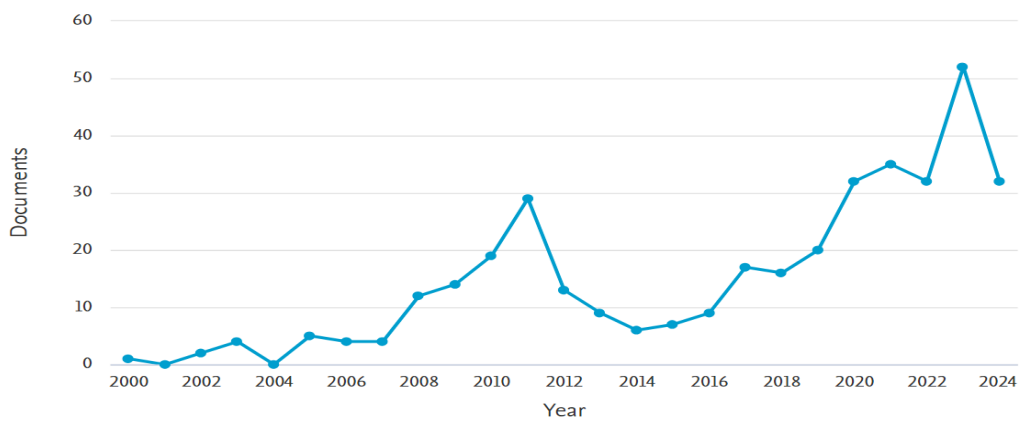
Source: by the author using Biblioshiny

The increase in the number of articles after 2007 can be explained by a number of factors, such as the adoption of the development of new technologies, especially artificial intelligence, the recognition of the growing role of artificial intelligence in international business, the focus on researching the impact of new technologies on the business environment. In the top three countries with the highest number of published articles, China is the leader, with 151 publications, followed by India with 95 publications, and in the third place is the United States, with 73 publications (Table 1).

Table 1. Top production by country

Country	Frequency
China	151
India	95
USA	73
Spain	23
Australia	22

Country	Frequency
Italy	22
Japan	17
Germany	16
Greece	15

Source: by the author using Biblioshiny

The top keywords are dominated by terms that were used in the search, but also by others that suggest a focus on the components of artificial intelligence and how they can be used in export-import transactions (Table 3).

Table 3. Most frequent words

Words	Occurrences
international trade	324
artificial intelligence;	256
Decision support systems	45
Competition	44
learning systems	39
Decision-making	36
global market	35
Electronic commerce	32
forecasting	26
investments	24
commerce	21
supply chains	20
Big data	19
machine-learning	19
international markets	18
learning algorithms	18
machine learning	17
management science	17
data mining	16
economics	16

Source: by the author using Biblioshiny

Figure 8 presents important information on the predominant topics and keywords in our research. Thus, we notice that the keyword "international trade" appears most frequently in the analyzed publications. The keyword 'artificial intelligence' suggests a focus on analyzing the impact of new technologies on international trade.

Figure 8. WordCloud by Keywords Plus

Source: by the author using Biblioshiny

Looking at the frequency of the author keywords in Figure 9, we see that some of the most widespread concepts are "artificial intelligence," "machine learning," and "international trade."

Figure 9. WordCloud by Author's Keywords

Source: by the author using Biblioshiny

This suggests that the research is focused on analyzing and understanding the importance of applying artificial intelligence in international trade.

Figure 10 illustrates the connection and importance of significant keywords in our study. The algorithm uses the Walktrap method, which generates three clusters. In the first cluster (red), it can be seen that the importance of modeling and selecting the appropriate information to manage export-import operations using modern

analysis and forecasting tools for international markets is highlighted. As for Cluster 2 (blue), it can be seen that it group keywords that emphasize the interest of researchers in the analysis of new technologies. Cluster 3 (green) indicates the interest in the analysis of modern forms of commerce, also highlighting the concern for supply chain management.

Figura 10. Keywords clusters
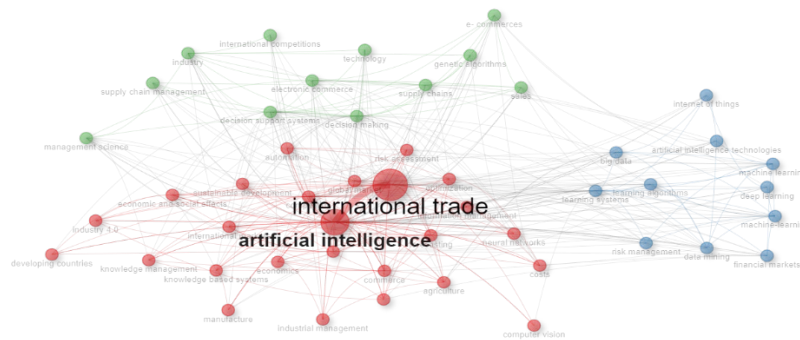
Source: by the author using Biblioshiny

Comparing the three periods (Figure 11), an evolution of the areas of interest can be observed. While in the first period the attention was focused on fundamental technological developments (AI, genetic algorithms, decision support systems), in the second period we see a combination of technology (AI and analytic hierarchy process, etc.) with international trade, and in the third period, artificial intelligence components and international trade predominate.

Figure 11. Thematic evolution during three periods of time
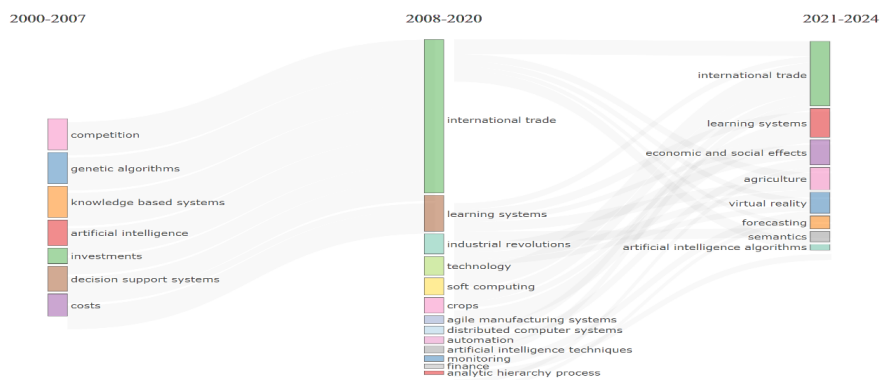
Source:

Clustering analysis by coupling is used to determine a correlation between different groups of phrases. Figure 12 identifies 7 clusters positioned according to density and centrality. The first cluster, the pink one, contains words terms such as: international trade, artificial intelligence, decision support systems. The results show that in the quadrant with "driving themes" there are 2 clusters with well-structured and important themes for the research field, respectively, "big data, economic and social effects, Internet of things. The last of these focuses on how technology and AI are integrated into international trade.

Figure 12. Clustering by coupling
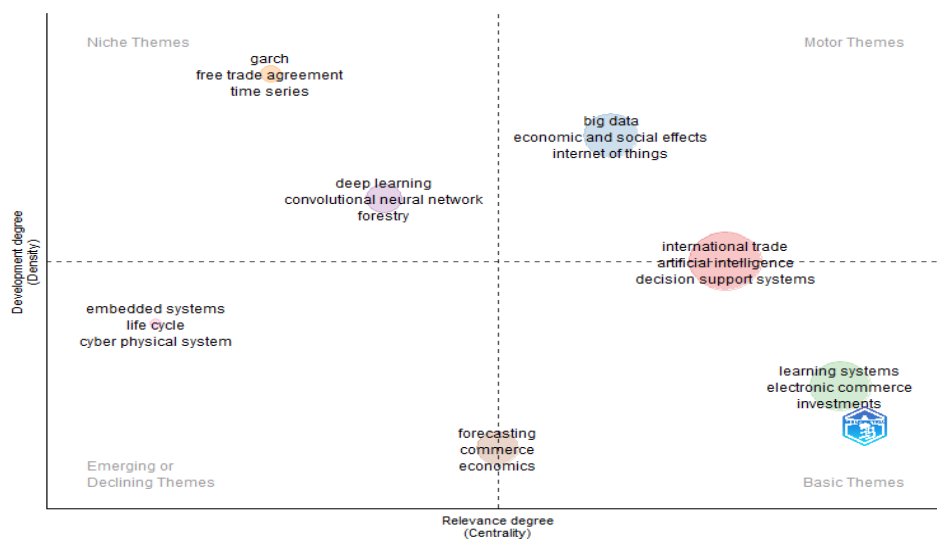
Source: by the author using Biblioshiny

The results of the analysis show that artificial intelligence is a tool of interest for international trade, the application of this technology revolutionizes the mechanism of development specific to export-import transactions. Sub-areas within the framework relevant to international trade have been highlighted, such as deep learning, robotics, e-commerce. The process of digitization of international trade is a concern for companies involved in carrying out export-import transactions.

Conclusions

Artificial intelligence has emerged as a pivotal force that is reshaping the international business landscape. In an era of digital revolution, AI technologies have become essential tools for increasing operational efficiency, decision-making and innovation worldwide. As AI continues to evolve, its potential to

revolutionize export-import operations is limitless. From autonomous supply chain management, to predictive pricing algorithms, the possibilities are endless.

However, the widespread adoption of AI in export-import transactions also raises concerns regarding data privacy, cybersecurity, and ethical implications. It is imperative that businesses and policymakers proactively address these challenges and ensure the responsible deployment of AI to realise its full potential in strengthening global trade

As for the limitations of the research carried out, they refer to the database used in the analysis, but taking into account the similarity of the most important databases that inventory scientific works globally, we consider that this limitation does not have an important effect on the results of the work.

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