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Mapping the AI Revolution in Global Trade: A Systematic Bibliometric Synthesis of Cross-Border E-Commerce Evolution

Mustafa YİĞİTOĞLU [1] Sabri ÖZ[2]

ABSTRACT

AI is the key force behind the direction in which CBEC evolves. While there is no shortage of algorithmic implementation, the conceptual development behind this connection has proven to be varied. This paper presents a comprehensive bibliometric review of innovations spanning a period of twenty-six years (2000-2025) at the nexus of artificial intelligence and international business. Based on PRISMA principles, the initial set of 181 Scopus papers was narrowed down to form a high-quality collection of 93 papers. Latent intellectual structures were discovered through advanced data visualization based on VOSviewer. As a result, a dense geographical distribution emerges, where China acts as the epicenter of research on AI-based CBEC. Three central topics have emerged, including strategic management, technological infrastructure, and consumer behavior, all supported by big data. Analysis indicates the evolution from simple automation to accuracy-focused predictive governance via the development of AI.

Keywords: Cross-Border E-Commerce (CBEC), Artificial Intelligence (AI), Bibliometric Analysis, Data Science and Analytics, Management Information Systems

JEL Classification Codes: L81, M31

Küresel Ticarette Yapay Zekâ Devriminin İzlenmesi: Sınır Ötesi E-Ticaretin Gelişimine İlişkin Sistematik Bir Bibliyometrik Sentez

ÖZ

Yapay zekâ, CBEC'nin gelişim yönünü belirleyen temel itici güçtür. Algoritmik uygulamalar konusunda bir eksiklik bulunmamakla birlikte, bu bağlantının ardındaki kavramsal gelişimin oldukça çeşitlilik gösterdiği ortaya çıkmıştır. Bu makale, yapay zekâ ve uluslararası işletme alanlarının kesişim noktasında, yirmi altı yıllık bir dönemi (2000-2025) kapsayan yeniliklere ilişkin kapsamlı bir bibliyometrik inceleme sunmaktadır. PRISMA ilkelerine dayalı olarak, başlangıçta 181 adet olan Scopus makalesi, 93 adetlik yüksek kaliteli bir koleksiyon oluşturmak üzere daraltılmıştır. VOSviewer tabanlı gelişmiş veri görselleştirme yoluyla gizli entelektüel yapılar keşfedilmiştir. Sonuç olarak, Çin'in yapay zekâ tabanlı CBEC araştırmalarının merkez üssü olduğu yoğun bir coğrafi dağılım ortaya çıkmaktadır. Büyük verilerle desteklenen üç ana konu ortaya çıkmıştır: stratejik yönetim, teknolojik altyapı ve tüketici davranışı. Analizler, yapay zekânın gelişimi ile basit otomasyondan doğruluk odaklı öngörücü yönetişime doğru bir dönüşüm yaşandığını göstermektedir.

Anahtar Kelimeler: Sınır Ötesi E-Ticaret (CBEC), Yapay Zekâ (AI), Bibliyometrik Analiz, Veri Bilimi ve Analitiği, Yönetim Bilişim Sistemleri

JEL Sınıflandırma Kodları: L81, M31

[1] PhD., Kayseri University, mustafa-yigitoglu@hotmail.com

[2] Assoc. Prof., BeTa Science Association, Istanbul School of Technology, soz.iticu@gmail.com

GENİŞLETİLMİŞ ÖZET

Amaç ve Kapsam:

Uluslararası ticaret, son yirmi yılda geleneksel ve fiziksel sınırların ötesine geçerek veriye dayalı dijital bir ekosisteme doğru belirgin bir değişim göstermiştir. Bu bağlamda, Sınır Ötesi E-Ticaret (SÖET), işletmelerin coğrafi engelleri aşmasına ve küresel pazarlara entegre olmasına olanak tanıyan önemli bir ticari faaliyet haline gelmiştir. Bu dönüşümün merkezinde ise Yapay Zekâ (YZ) ve SÖET arasındaki artan etkileşim yer almaktadır. Dijital platformlar aracılığıyla küresel ticaret engelleri aşıldıkça, yapay zekâ ve büyük veri analitiği sadece destekleyici araçlar olmaktan çıkmış; küresel pazarda verimliliği, kişiselleştirmeyi ve karar alma süreçlerini yönlendiren temel unsurlar haline gelmiştir. Lojistik süreçlerindeki tahminleyici analizlerden, tüketici davranışlarını anlamaya yönelik akıllı öneri sistemlerine kadar çok çeşitli yapay zekâ uygulamaları hızla yaygınlaşmaktadır.

Ancak, bu hızlı teknolojik entegrasyona rağmen, konuyla ilgili akademik çalışmaların literatürde oldukça dağınık bir yapıda olduğu görülmektedir. Ödeme güvenliği, lojistik optimizasyonu ve tüketici güveni gibi belirli alanlarda çok sayıda bağımsız çalışma bulunmasına rağmen, yapay zekânın SÖET alanındaki entelektüel gelişimini bütüncül bir şekilde ele alan çalışmalar kısıtlıdır. Bu nedenle, bu çalışmanın temel amacı, 2000 ile 2025 yılları arasında yapay zekânın küresel ticaretteki gelişimini ortaya koyan kapsamlı ve sistematik bir bibliyometrik sentez sunmaktır. Araştırmanın kapsamı, akademik kalitesi yüksek olan Scopus veritabanından elde edilen makalelerle sınırlandırılmıştır. Araştırma çıktılarının coğrafi dağılımını incelemek, temel tematik kümeleri belirlemek ve gelişen terminolojilerin yapısal etkisini izlemek suretiyle, algoritmik yeniliklerin küresel ticareti nasıl etkilediğini ve basit otomasyondan veriye dayalı yönetim modeline nasıl geçildiğini göstermeyi hedeflemektedir.

Yöntem:

Yapay zekânın SÖET alanındaki mevcut durumunu haritalandırmak amacıyla, 2000-2025 yıllarını kapsayan yenilik sürecini incelemek için sistematik bir bibliyometrik tarama metodolojisi uygulanmıştır. Araştırma tasarımı, Sistematik Derlemeler ve Meta-Analizler için Tercih Edilen Bildirim Öğeleri (PRISMA) çerçevesinden ilham alan çok aşamalı bir veri eleme sürecine dayanmaktadır. Veri kaynağı olarak, yüksek metaveri kalitesi, disiplinler arası e-ticaret literatürünü geniş bir şekilde kapsaması ve gelişmiş bibliyometrik haritalama yazılımlarıyla tam uyumlu olması nedeniyle Scopus veritabanı seçilmiştir.

Veri toplama aşaması, "SÖET" ve "YZ" (İngilizce karşılıklarıyla) gibi temel anahtar kelimelerin stratejik bir kombinasyonunu içeren mantıksal arama stratejisi ile başlatılmıştır. Bu kapsamlı sorgu sonucunda ilk aşamada 181 akademik çalışmadan oluşan ham bir veri seti elde edilmiştir. Makale sayısından ziyade nitelikli ve yüksek etkili araştırmalara odaklanabilmek için titiz bir filtreleme süreci yürütülmüştür. İlk olarak, veri tekrarlarını önlemek amacıyla aynı kayıtlar ve örtüşen başlıklar sistemden çıkarılmış, böylece veri seti 123 özgün çalışmaya indirilmiştir. Daha sonra, doğrulanabilir metaveriye sahip olmayan kayıtları çıkarmak için teknik bir inceleme yapılmış; Dijital Nesne Tanımlayıcısı (DOI) olmayan 16 makale ve yazar kimliği eksik olan 7 kayıt veri setinden çıkarılmıştır. Kalan 100 makale, içerik ve tema açısından nitel bir değerlendirmeye tabi tutulmuştur. Bu inceleme sırasında, YZ ve SÖET'in temel bağlantısından yapısal olarak uzak olduğu veya konuya sadece yüzeysel olarak değindiği belirlenen 7 çalışma kapsam dışı bırakılmıştır. Bu detaylı eleme süreci, 93 yüksek etkili araştırma makalesinden oluşan nihai ve güvenilir bir veri setinin oluşturulmasıyla sonuçlanmıştır. Son aşamada, bu makaleler VOSviewer adlı bibliyometrik haritalama yazılımı kullanılarak işlenmiş; ortak yazar analizleri, anahtar kelime ortak bulunma (co-occurrence) analizleri ve atıf ağ haritalamaları yapılarak alanın gizli entelektüel yapıları görünür hale getirilmiştir.

Bulgular:

Seçilen 93 belgenin sistematik bibliyometrik analizi, yapay zekânın SÖET sektöründeki gelişiminin coğrafi dağılım, tematik kümelenme ve terminoloji eğilimleri olmak üzere üç ana boyutta toplandığını göstermektedir.

Coğrafi olarak yapılan analiz, Çin'in yapay zekâ destekli SÖET çalışmalarında küresel anlamda en belirgin ülke olduğunu ortaya koymaktadır. 78 belge ve 255 atıf ile Çin, dijital ticarete yönelik akademik araştırmalarda yüksek bir oran sergilemektedir. Çin'in ağ haritasındaki "Toplam Bağlantı Gücü"nün (Total Link Strength) 10 olması, bu araştırmaların izole olmadığını; aksine kıtalararası araştırma ağlarıyla iş birliği içinde yürütüldüğünü göstermektedir. Öne çıkan diğer ülkeler arasında Amerika Birleşik Devletleri, Birleşik Krallık, Güney Kore, Portekiz ve Malezya yer almakta olup, bu durum uluslararası ticarette yapay zekâ araştırmalarının giderek daha küresel bir nitelik kazandığına işaret etmektedir.

Tematik olarak bakıldığında, VOSviewer anahtar kelime eş-oluşum haritası alanın entelektüel yapısını üç farklı temele ayırmaktadır: (1) Tedarik zincirleri, pazar yerleri ve envanter yönetimine odaklanan Stratejik Yönetim ve Lojistik; (2) Algoritmalar, sistem mimarisi ve bulut bilişimi merkeze alan Teknolojik Altyapı; (3) Kişiselleştirilmiş öneriler, alışveriş rehberleri ve tüketici davranışlarını inceleyen Tüketici Dinamikleri. Analiz, "Büyük Veri" (Big Data) kavramının lojistik ve pazarlama kümelerini birbirine bağlayan temel bir köprü görevi gördüğünü açıkça göstermektedir. Bu durum, büyük veri altyapısının yapay zekânın hem tedarik zincirlerini optimize etmesine hem

de tüketici etkileşimlerini aynı anda kişiselleştirmesine olanak tanıyan vazgeçilmez bir unsur olduğunu doğrulamaktadır.

Bunun yanı sıra, makale özetlerindeki kelime eğilimleri incelendiğinde, mevcut araştırmaların uygulamaya dönük doğası dikkat çekmektedir. "Geliştirme" (development) terimi en sık kullanılan tanımlayıcı (69 tekrar) olarak öne çıkmaktadır. Daha da önemlisi, "doğruluk" (accuracy) terimi son derece yüksek bir ilgililik puanı (1.87) almış ve çoğunlukla "algoritma" kelimesiyle birlikte (61 tekrar) kullanılmıştır. Bu bulgu, SÖET alanındaki gümrük uyumluluğu ve talep tahmini gibi yüksek riskli kararların hataya yer vermemesi nedeniyle, alanın yüksek doğruluk ve hassasiyet gerektiren bir yapıya doğru kaydığını kanıtlamaktadır. Zaman çizelgesine bakıldığında, 2022 ile 2025 yılları arasında yayın sayısında büyük bir ivme yaşandığı görülmektedir.

Sonuç ve Tartışma:

Bu sistematik bibliyometrik analiz, Yapay Zekânın 26 yıllık Sınır Ötesi E-Ticaret serüvenini haritalandırarak, algoritmik yeniliklerin dijital ekonomiyi nasıl şekillendirdiğine dair açıklayıcı bir çerçeve sunmaktadır. Elde edilen bulgular, yapay zekânın basit bir destekleyici araçtan çıkarak uluslararası ticaretin verimliliğini ve kişiselleştirilmesini doğrudan etkileyen temel bir teknoloji haline geldiğini göstermektedir. Araştırmaların coğrafi olarak belirli bölgelerde yoğunlaşması, ulusal dijital ticaret politikalarının ve teknolojik altyapı yatırımlarının akademik çıktılar üzerindeki etkisini vurgulamaktadır. Ayrıca tematik haritalama sonuçları, karmaşık lojistik ağlarında ve uluslararası pazarlama kanallarında yapay zekâdan verimli bir şekilde yararlanabilmek için güçlü büyük veri mimarilerine sahip olmanın bir zorunluluk olduğunu teyit etmektedir.

Bu araştırmanın sonuçları hem sektör profesyonelleri hem de akademisyenler için belirgin çıkarımlar sunmaktadır. İş dünyası ve uygulayıcılar açısından bakıldığında, "doğruluk" odaklı tahmin modellerine geçiş, küresel pazarda rekabetçi kalabilmek için karmaşık sınır ötesi lojistik süreçlerini hatasız yönetebilen, şeffaf ve entegre yapay zekâ sistemlerine yatırım yapılmasını gerektirmektedir. Sınır ötesi ticarette karşılaşılan iade yönetimi ve gümrük maliyetleri gibi operasyonel sorunlar, algoritmik hassasiyet ihtiyacını artırmaktadır.

Akademik topluluk için ise bu çalışma, mevcut literatürün yapısal boyutlarını ortaya koyarken gelecekte odaklanılması gereken boşlukları da işaret etmektedir. 2022-2025 dönemindeki eğilimlere dayanarak, gelecekteki araştırmaların özellikle iki alana yönelmesi faydalı olacaktır. İlk olarak, Üretken Yapay Zekâ (Generative AI) modellerinin tüketici güveni üzerindeki etkisi ve farklı kültürlere yönelik pazarlama süreçlerindeki rolü incelenmelidir. İkinci olarak, sınır ötesi ödeme sistemlerinin güvenliğini artırmak, akıllı sözleşmeleri otomatikleştirmek ve finansal riskleri azaltmak amacıyla Blokzincir (Blockchain) teknolojisi ile yapay zekânın entegrasyonu daha derinlemesine araştırılmalıdır. Sonuç olarak, yapay zekânın daha pürüzsüz ve sınırların daha aza indiği bir ticari deneyim yaratmadaki rolü artmaya devam edecek ve bu konu gelecekteki küresel ekonomi araştırmalarının önemli odak noktalarından biri olmayı sürdürecektir.

1. INTRODUCTION

The landscape of international commerce has seen a significant shift in the, first quarter of 21st century. transforming from the conventional physical exchange of goods to a more complex and data-driven digital landscape. Cross-Border E-commerce (CBEC) has been recognized as a key driver affecting the dynamics of global trade, transcending geographical constraints to achieve unprecedented levels of global market integration (Zhang et al., 2020). At the heart of this evolution is the symbiosis that occurs when Artificial Intelligence (AI) and cross-border e-commerce (CBEC) come together. Thus, it has been seen that with the increasing ability of digital platforms to transcend international trade barriers, AI and Big Data Analytics have become the key drivers of the international marketplace (Guo & Zhang, 2022).

Although the development and expansion of artificial intelligence technologies, such as predictive analytics in the supply chain and intelligent recommendation systems for consumer behavior, have been quite rapid, the academic path in this regard is largely fragmented (Bawack et al., 2022). While several research works have covered specific facets of the subject, such as secure payments, logistics optimization, and consumer trust, it is essential to have an overall understanding of the intellectual development of AI in the context of CBEC. Recent bibliometric analysis suggests that there is an exponential growth in the subject, which can be described as the "golden era" of AI adoption in e-commerce. However, the intricacy of the subject demands an integrated understanding of its intellectual development.

The geographic concentration in the research landscape was also evident in our perusal of the extant literature. The current global scientific output leader in this area is China, with the United States, India, the United Kingdom, and South Korea also making noteworthy contributions (He et al., 2022). This pattern of distribution, in particular, highlights a strategic shift in the global scene in which the technological infrastructure, as well as e-commerce policies, work in tandem to encourage innovation, all of which can be associated with the process of digital transformation and the growth of international trade. Moreover, the main thematic clusters that can be identified from the current corpus of research highlight that, although trade facilitation and logistics form the basic foundation, the main focus of the research is significantly anchored in Big Data technologies, recommendation systems, and resilience in supply chains (Liu et al., 2021).

This study aims to provide a holistic Mapping of the AI Revolution in Global Trade through the systematic synthesis of impactful studies retrieved from prominent academic databases. Using cutting-edge tools for the analysis of complex networks, such as VOSviewer (Chen, 2006), this study investigates significant aspects such as the evolution of primary keywords, international scholar collaboration networks, and the progression from elementary automation to highly evolved intelligent systems.

Ultimately, the systematic bibliometric synthesis aims at fulfilling an important purpose. To be precise, it not only captures the historical development of AI integration in CBEC but also reveals key knowledge gaps in terms of shifting focus from theory-based frameworks to application-centric frameworks.

2. RESEARCH METHODOLOGY AND DATA REFINEMENT

In order to define the intellectual landscape of AI in the context of the CBEC domain, a thorough and meticulous bibliometric screening has been undertaken, considering the time frame between the years 2000 and 2025. In order to make sure that an exceptionally reliable corpus is developed, the inclusion criteria have restricted the selection only to scholarly journals. Conference proceedings, book sections, editorials, and non-English studies have been excluded from the selection process. Therefore, while the resulting corpus may appear too small in terms of numbers when compared to a period of twenty-six years (with a total number of 93 selected papers), this level of filtering was vital for eliminating background noise (Marzi et al., 2025). Scopus was selected as the primary source of data because of the better quality of metadata and full compatibility with advanced tools of bibliometrics, ensuring a sound representation of interdisciplinary literature of electronic commerce (Pranckutė, 2021).

The first step involved the implementation of a precise Boolean search with strategically chosen keywords: "cross-border e-commerce," "CBEC," "artificial intelligence," and "AI." This comprehensive

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search process generated the initial corpus of materials containing 181 scholarly works. In order to guarantee the integrity and reliability of the data set, the process of distillation was implemented in several steps in accordance with the guidelines provided by the PRISMA protocol (Marzi et al., 2025):

De-duplication & Structural Integrity: First, the list was cleansed of redundant entries and overlapping titles, which reduced the list to 123 unique entries. Further, the list underwent a thorough technical audit, which removed 16 entries that did not contain a Digital Object Identifier (DOI) and another 7 entries that did not contain the Author ID.

Eligibility and Objective Refinement: The remaining 100 articles was subjected to a rigorous process of full-text inclusion assessment based on objective criteria for inclusion and exclusion to avoid any bias in the selection of sources. Seven articles were not included because they focused exclusively on domestic e-commerce and not cross-border e-commerce or had no more than superficial mention of AI without any implementation of an algorithm.

Final Analytical Corpus: This rigorous filtration process produced a definitive gold standard set consisting of 93 high-impact research articles.

Next, the 93 articles were subject to sophisticated computational mapping and visualization using VOSviewer. This software package enables sophisticated distance-based visualizations and precise graphical representations of complex bibliometric networks (Van Eck & Waltman, 2010). With the aid of software technology, VOSviewer, it is successful in clarifying the underlying intellectual structures and patterns of author keyword co-occurrence and dynamic evolutionary trends in this growing field.

Figure 1. Data Refinement Path: AI in Cross-Border E-Commerce

Source: (Created by the Authors)

As Figure 1 depicts, this study performs a bibliometric analysis of 93 studies compiled from the Scopus database between 2000 and 2025. Though there are also different possibilities and portals as database to make a bibliometric analysis such as web of science, according to Öz and Kaplan, in social science especially Scopus and Web of Science give parallel results in bibliometric analysis. (Öz & Kaplan, 2023).

3. ANALYSIS AND RESULTS

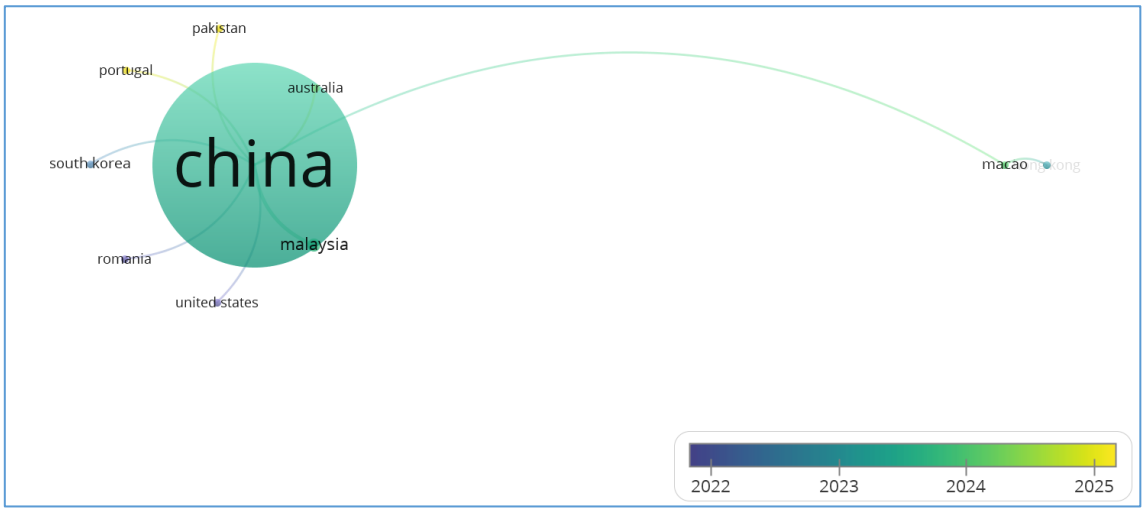
The bibliometric analysis of 93 selected documents indicates a multifaceted evolution of artificial intelligence in the CBEC sector. The following sections of this chapter will discuss the geographical distribution, thematic clustering, and structural influence of key terminologies in AI.

3.1. Geographical Distribution and Collaboration Networks

The spatial analysis of the research output clearly points to China as the leading contributor and central nod of AI-enabled CBEC research in the global arena, with 78 documents and 255 citations, reflecting an extensive institutional commitment to the digitization of international trade. Its Total Link Strength of 10 underscores that China is far from isolated, with an unmistakable regional leadership quality that enables seamless links with international partners (He et al., 2022).

Nodes in the network periphery, such as Portugal, Malaysia, South Korea, and Romania, have restricted document numbers as well as lower overall link strength. Instead of indicating that they form part of matured, highly influential groups, their peripheral location suggests that they are emerging international networks. These small but observable numbers illustrate the beginning of geographic expansion in the field outside its strong core nations, China and the USA.

Figure 2. Global Collaboration Network and Geographical Distribution of AI-enabled CBEC Research



Source: (VOS,2025)

Figure 2 shows the international collaboration map of AI-powered CBEC research where China acts as the major central node with an impressive publication output of 78 documents and 255 citations. From the pattern in the network, the Total Link Strength value of 10 from China highlights the trend of moving away from a primary regional context towards an overall international one. Some of the emerging clusters are those of Portugal, Malaysia, and South Korea. Furthermore, there is a cross-continent network connecting countries like the USA and Romania. Most importantly, the temporal overlay of colors from 2022-2025 shows that this field has undergone an evolution over time since the initial work carried out in 2022-2023 focused primarily on China while the yellow-colored nodes and links imply that the research scope has now moved beyond China to encompass Macao, Hong Kong, and Europe since 2024.

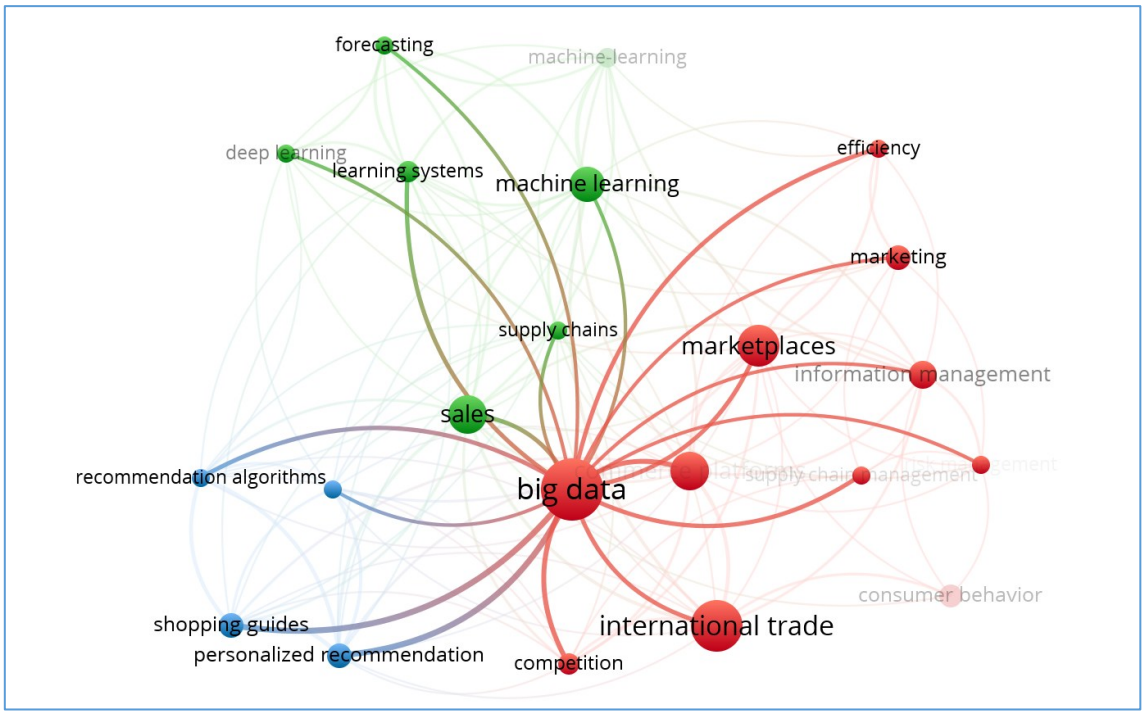
3.2. Keyword Co-occurrence and Thematic Clustering

A closer look at these research themes, as indicated by the keyword map generated by VOSviewer, indicates that there are three distinct thematic clusters. After eliminating generic terms such as "e-commerce" and "AI," the intellectual structure of the subject crystallizes into the following clusters:

- Strategic Management & Logistics: with emphasis on "supply chains," "marketplaces," and "inventory management."
- Technological Infrastructure: with emphasis on "algorithms," "cloud computing," and "system architecture."
- Consumer & Marketing Dynamics: with emphasis on "personalized recommendation," "consumer behavior," and "shopping guides.

Big Data occupies a central position as a key bridge between the marketing cluster (red) and the logistics cluster (green), allowing for the transfer of predictive information throughout the entire ecosystem (Wu & Lin, 2018). This positioning of Big Data highlights that this technology, in fact, does not simply cover a sub-topic but, rather, represents the fundamental basis for the optimization of supply chains through AI and, at the same time, for the personalization of consumer interactions.

Figure 3. Keyword Co-occurrence Network and Thematic Clusters in AI-enabled CBEC Research



Source: (VOS,2025)

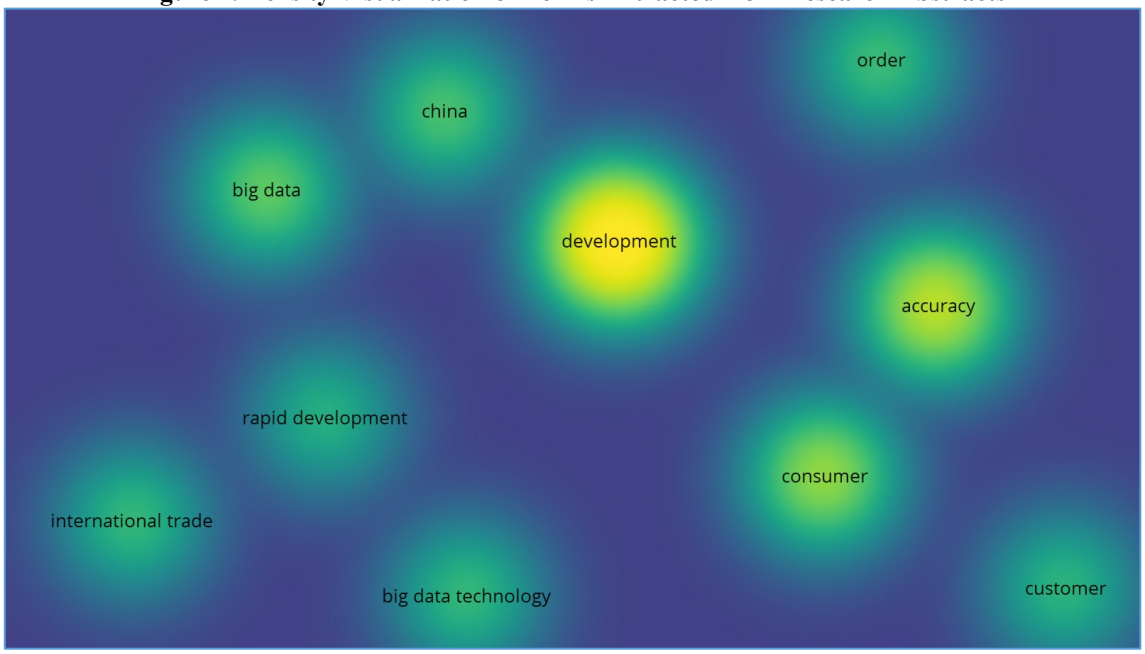
Based on the information in Figure 3, the keyword co-occurrence graph reveals the structure of the knowledge domain by dividing the latter into three clearly defined thematic groups, reflecting the complex nature of technological influence on modern business practices. The first cluster, denoted by red colors, is concerned with Consumer and Marketing Dynamics and includes such keywords as “international trade,” “marketplaces,” and “consumer behavior.” The green-colored cluster reflects the issues relating to Strategic Management and Logistics, and includes such concepts as “machine learning,” “supply chains,” and “forecasting.” Finally, the blue cluster concerns Technological Infrastructure and includes “recommendation algorithms” and “personalized recommendation.” Most significantly, “Big Data” is located centrally within the graph and serves as an essential connecting factor between all of these three clusters.

3.3. Abstract Content and Terminology Trends

Analysis of words found in the abstracts offers an understanding of the action-oriented nature of the research orientation in contemporary society. A key finding is that the word “development” is found 69 times, suggesting that the dominant focus of research is creating and executing models, rather than theory-based criticism.

Further, it is evident from the data that accuracy is an extremely relevant word (Relevance: 1.87), which is often used in conjunction with algorithm 61 times. This is due to the need to ensure accuracy in cross-border trade decisions such as customs, duties, and returns (Chen et al., 2024). The field is moving toward a "precision-first" paradigm.

Figure 4. Density Visualization of Terms Extracted from Research Abstracts



Source: (VOS,2025)

As demonstrated in Figure 4, the density map highlights the key aspects underlying the contemporary scientific study. The use of the word "development" is the first indication of the strong orientation of the field towards practical work in terms of the design and implementation of effective models rather than just theoretical discussion. Another term, "accuracy," has an importance rating of 1.87 and is often used alongside algorithm performance. Thus, this is a clear manifestation of the "quality first" approach driven by the specific demands of international trade, such as managing the customs and tariffs. Other key terms that emerge around this cluster include "big data," "international trade," and "consumer," thereby demonstrating that the trend in current research consists of applying innovations for ensuring consistency and efficiency in global business.

3.4. Keyword Evolutionary Trajectory (2022–2025)

Though the timeline extends over 26 years (2000-2025), the temporal distribution is quite right-skewed, indicating the clustering of publications since 2019. Instead of undermining the historical context, it perfectly captures the natural development of the technology in question. Consistent with previous bibliometric findings, there was a long period of latency and incubation when the volume of published papers was rather stable and low before 2018. Since then, due to the breakthroughs in deep learning and the growing emphasis on digitalization, there has been an explosion of interest in the area under discussion. Hence, the historical development discussed here is mostly concerned with the quick transition from theoretical latency to technological maturity, which occurred thanks to the development of ideas like AIGC (Artificial Intelligence Generated Content) and explainable AI after 2022.

4. DISCUSSION

Prior review studies have provided the necessary groundwork on the concept of AI in e-commerce, but they have been constrained to the mere description of the mapping of AI into a conceptual framework wherein AI is understood only in terms of practical utility and not as a transformative theoretical idea. The current work expands the theoretical knowledge base of the discipline by presenting an extensive analysis of the citations, bibliographic couplings, and theoretical core of CBEC research. Through the use of our findings in relation to the literature, this section highlights the basic paradigm shift that has occurred in AI-driven international trade.

4.1. Intellectual Structure and the Integration of Theoretical Compartments

The analysis of co-citation and bibliographic coupling shows a significant departure from the paradigms of early e-commerce studies. Traditionally, CBEC researchers considered supply chain management and consumer marketing as distinct theoretical domains (Giuffrida et al., 2017). However, keyword co-occurrences and clustering demonstrate that the separation between these topics has been overcome. "Big Data" becomes not just a technical term but a theoretical link and main channel connecting two groups of themes – "Strategic Management & Logistics" and "Consumer Dynamics." Such observations are fully aligned with the claims made by Wu and Lin (2018) and He et al. (2022) concerning the integration between logistics optimization and personalized marketing

through unstructured data analytics. Bibliographic coupling demonstrates yet another trend – a growing number of high citation papers devoted to the connection between the two domains, suggesting that the theory of current CBEC is based on mutual knowledge transfer, which means learning about consumer behavior to improve the efficiency of supply chains (Tang et al., 2023).

4.2. Transitioning to an "Accuracy-First" Predictive Paradigm

A comparative study of our results against existing literature shows that there is a paradigm shift indeed. Existing models for technology acceptance and adoption, including TAM (Technology Acceptance Model), were mainly focused on user adoption and basic automation processes (Liu et al., 2021). Our analysis of term density shows that in modern abstracts, accuracy and algorithm show a very high relevance, proving the necessity to move toward the "accuracy-first" approach to predictive governance. The high-risk nature of cross-border activities involving complicated customs calculations and reverse logistics is noted by Chen et al. (2024), who developed XAI frameworks for cross-border sales forecasting. This explains why the intellectual core of the industry is moving from determining if AI should be used to understanding how accurately and transparently DL (Deep Learning) and NN (Neural Networks) models can make such complicated and risky cross-border choices.

4.3. Geographical Centrality and Macro-Economic Drivers

The spatial organization and co-authorship analysis offered above clearly establish China as a central player in the global intellectual landscape of AI-enabled CBEC research. Despite the fact that previous systematic reviews e.g. (Liu et al., 2021) acknowledge China's superiority in terms of market operations, the network diagrams provided above confirm its superiority in the structural aspects of producing and distributing scientific knowledge. This academic supremacy may be theoretically explained by the macroeconomic policies supported by the government, such as the Belt and Road Initiative, which acts as a catalyst for the digitalization of digital trade (Kuang et al., 2022; Zhang et al., 2020). However, bibliographic coupling studies expand the geographic scope beyond the regional borders, identifying new clusters of cross-continental research. In other words, even though the models are often conceptualized in the context of Chinese CBEC, their algorithms and academic impact are fast becoming global thanks to collaboration networks involving countries such as the US, Europe, and growing Asian nations (He et al., 2022).

To conclude, the bibliometric study provides more than just a superficial mapping of the existing literature, showing how AI has shaped the knowledge core of global trade studies. AI is not considered an isolated technological phenomenon anymore but emerges as a "strategic sovereign" controlling the level of accuracy, interconnection, and cross-culture adaptability of cross-border e-commerce today (Bawack et al., 2022).

4.4. Limitations

Even with the strictness of the methodology used in the research, it should be noted that there are several limitations of the study. One of them is that the research was limited to the use of the Scopus database as the sole source of collecting data. While being known for its completeness in terms of containing scholarly publications, using just one database can limit the research in terms of the range of ideas explored (Pranckutė, 2021). The second limitation of our review is the filtration process applied in a multi-phase manner in an effort to ensure a high-quality impact corpus. As a result, conference papers, chapters, as well as sources in languages other than English, were omitted, hence limiting the quantitative amount of the resulting dataset. While this filtration ensured that 93 articles included in this review met higher analysis standards, some aspects and dynamics of emerging technology and CBEC practices, which are commonly discussed using different kinds of academic resources, may not be covered (Liu et al., 2021). The use of multiple databases, including grey literature, would be recommended for future studies.

5. CONCLUSION

The current systematic bibliometric analysis gives an elaborate and accurate picture of the emergence of AI in the CBEC environment over the last twenty-six years from 2000 to 2025. By critically analyzing an extensive body of literature consisting of 93 significant articles, this research sheds light on a clear path of progress showing how AI technology has significantly developed in the context of international e-commerce. From this study, it can be seen how algorithms have completely changed the framework of global business operations.

This comprehensive empirical study has found that there is considerable paradigmatic change in the utilization of AI. What was previously limited to carrying out simple and mundane automation processes, AI now comprises the core of the digital infrastructure of extremely complicated operational models. Modern-day AI-based technology continuously performs complex operations such as making predictions about the demands of consumers in real time and offering customized experiences for customers globally. Additionally, spatial and geographical analyses have demonstrated China's strong competitiveness in the tech sector. This supremacy highlights the success of the country's digital trade policies as well as macroeconomic policy choices, with the Belt

and Road Initiative being one of the factors behind such innovation and integration of technologies. In this evolving environment, Big Data plays an important role as a means that connects two previously separated areas, which include logistics and customer marketing. The resulting thematic map drawn through visual network analysis suggests that this connection creates channels of reciprocal exchange of predictive data.

These considerations lead to the conclusion that today, in the field of international business through electronic commerce, there prevails a philosophy focused on precision. The complex set of issues related to the risks of cross-border activities requires a fundamental shift away from conventional methodologies. This, in turn, calls for the development of open, adaptable, and real-time AI technologies that can counteract the problems resulting from borders. On the other hand, such sophisticated architectures need to be designed to help bridge significant cultural and linguistic gaps that would ensure consumer trust in foreign markets. In terms of institutional regulation, the intense reliance of AI technologies on constant exchanges of information across the borders implies the importance of having adequate models of global governance of these processes. Policymakers find themselves facing difficult questions concerning data protection, cross-network cybersecurity, and algorithmic accountability, which, however, need to be properly tackled to create a viable model of economic transactions through digital technology.

In practice, the emerging accuracy-first paradigm is entirely redefining the requirements for ensuring competitive advantage in the global market environment. The undertaking of high-risk cross-border operations, including accurate customs and duties calculation, efficient handling of extended lead times in logistics, adaptation to fragmented international regulatory environments, and effective management of reverse logistics, demands an almost flawless process of operation. Hence, organizations must urgently shift their focus from traditional, hindsight data-based strategies to more agile AI-based systems that enable them to perceive, interpret, and react to the constantly shifting dynamics of markets in real-time. In addition to minimizing operational expenses, the application of advanced AI technology assumes an integral part in establishing significant customer trust. This is because the utilization of superior natural language processing and translation capabilities helps overcome longstanding cultural and linguistic barriers, thus enabling businesses to provide an entirely seamless shopping experience for consumers.

In terms of policy making and international regulation, the inherent reliance on transnational data flows within AI algorithms demands that there be a rapid implementation of effective and holistic global governance structures. While it is true that jurisdictional differences currently abound—in particular, when it comes to consumer privacy laws, cybersecurity measures, data protection systems like the GDPR, and the ethical use of self-executing algorithms—it is also the case that it is precisely these same factors that are holding back any further growth within international e-commerce. To move past these barriers to progress, there is an urgent need globally for the standardization of international regulation. A system for secure data collaboration will be required to ensure that technological adoption continues in tandem with basic consumer rights and privacy protections.

6. IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS

Implications resulting from the proposed bibliometric synthesis are two-sided. Considering the perspective of practitioners in the industry, the prevailing trend towards using big data-based AI algorithms necessitates an investment in sustainable data structures and efficient integration of the supply chain. In order to stay ahead of the competition in an unpredictable global business environment, organizations have to shift from disparate IT systems to integrated, data-driven platforms that facilitate real-time prediction, inventory management, and decision-making (Tang et al., 2023; Wu & Lin, 2018). However, while macro-political and economic factors, such as the Digital Silk Road and the Belt and Road Initiative, provide an adequate infrastructure for facilitating international digital commerce (Zhang et al., 2020), the identified gaps in the current literature require further scholarly attention.

In order to make progress, it is essential that scholarly research addresses some key areas where current literature lacks information in an effort to shape the future direction of technology-based innovation. The first aspect to be considered is the study of the effects that AIGC has on consumer trust and risks perceptions. Considering the fast pace of technology development expected for 2024-2025, one major trend is associated with the use of AI in creating personalized marketing campaigns and multilingual descriptions of products (Zhu et al., 2023). There is a need to understand the way in which synthetic content generation influences consumers' actions in the international market and their trust.

An additional requirement is conducting a thorough analysis of the synergies that exist between Blockchain and AI in the context of international money transfers and logistics. The future research will focus on how this system can help to safeguard the international payments infrastructure, simplify the complex procedures of customs clearance and compliance in international business through smart contracts, and minimize risks associated with

international e-commerce (Deng & Ouyang, 2022). This collaboration may help to overcome information asymmetry and improve international supply chain visibility and transparency.

In conclusion, as artificial intelligence transforms itself from merely being an instrument to operate to becoming a sovereign authority which sets and controls the terms of global business, its transformational impact on cross-border e-commerce cannot be denied. It thus becomes all the more essential for policy makers and researchers to give attention to these new areas of study and research.

DECLARATION OF THE AUTHORS

Declaration of Contribution Rate: The authors contributed equally to the study.

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