



Bibliometric and Visual Analysis of Digital Technology in the Logistics Field

Yuanli Yang

School of Business Administration, Henan Polytechnic University, Jiaozuo 454003, China

Corresponding Author: yyl991729@163.com

Abstract: By collecting relevant literature from the CNKI and WOS databases between 2003 and 2023, this study employs visualization tools such as Citespace, Vosviewer, and Scimago Graphica to systematically explore research hotspots and frontiers in the application of digital technology in the logistics field. The results indicate a growing trend in the application of digital technologies in logistics. Future research is expected to focus more on the in-depth application and innovation of digital technologies, as well as on leveraging digital technologies and innovative models to enhance food safety management, optimize reverse logistics networks, and improve the efficiency and quality of agricultural product transportation. This study provides a comprehensive understanding of the current frontiers and development trends of digital technology in the logistics field, offering valuable insights for promoting the digital transformation of the logistics industry.

Keywords: Digital technology; Logistics field; Bibliometrics; Knowledge mapping; Visual analysis

1. Introduction

With the rapid development of the global economy and the emergence of the digital wave, the logistics field, as one of the key pillars of modern economic activities, is undergoing unprecedented transformation and innovation. In this process, digital technology has become a significant driving force and influential factor in advancing the logistics industry. Five key digital technologies—big data, blockchain, artificial intelligence, the Internet of Things (IoT), and cloud computing—have been widely and profoundly applied in the logistics sector. Logistics enterprises utilize big data technology to efficiently store, manage, and analyze massive amounts of data, thereby optimizing transportation routes, reducing costs, and improving efficiency. Blockchain technology has revolutionized traditional supply chain management, enabling safer, more transparent, and traceable logistics operations. The application of artificial intelligence has made logistics systems more intelligent and automated. IoT technology facilitates smart connectivity and information exchange between objects, enabling real-time monitoring and management of cargo transportation processes. Cloud computing technology has driven the digital transformation and upgrading of the logistics industry, providing efficient information sharing and resource utilization methods for logistics enterprises.

Against this backdrop, this paper comprehensively reviews and analyzes the research progress of digital technology in the logistics field, explores research hotspots and development trends, and delves into the potential of digital technology in logistics. The study aims to provide valuable references and insights for academic research, industrial development, and policy formulation in this field, thereby promoting the intelligent, informatized, and sustainable development of the logistics industry.



2. Data Sources and Research Methods

Data Sources

The literature data samples used in this study were collected from the domestic database "China National Knowledge Infrastructure (CNKI)" and the international database "Web of Science." The retrieval time range spans from 2003 to 2023 (with the cutoff date being December 31, 2023). To ensure the quality of the literature data, source journals in the Chinese database were selected from SCI, EI, core journals, CSSCI, and CSCD, while source journals in the international database were selected from SSCI and SCI-E. The literature type was limited to journal articles. The search was conducted using the query "Topic = Digital Technology OR Big Data OR Blockchain OR Artificial Intelligence OR Internet of Things OR Cloud Computing AND Topic = Logistics OR Supply Chain." To ensure the relevance of the collected literature to the topic, the title, abstract, and keywords of each article were carefully reviewed and screened. Irrelevant literature such as conference papers, news articles, and other non-relevant materials were excluded, and duplicates were removed. Ultimately, 1,733 valid Chinese articles and 2,304 valid English articles were obtained.

Research Methods

This study employs bibliometric analysis and utilizes visualization tools such as CiteSpace, VOSviewer, Pajek, and Scimago Graphica to conduct visual analysis and construct knowledge maps based on the collected 1,733 CNKI articles and 2,304 WOS articles. The aim is to explore the research hotspots and development trends of digital technology in the logistics field over the past two decades, both domestically and internationally.

3. Publication Volume Statistics

The annual distribution of the number of publications can, to some extent, reflect the research progress and level of attention in a particular field. The results of the publication volume in the research on digital technology in the logistics field from 2003 to 2023 are shown in Figures 1 and 2.

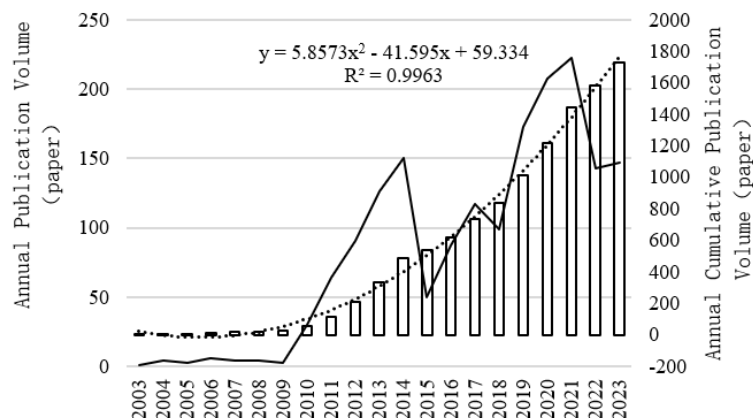


Figure 1: Statistics on the Publication Volume of Digital Technology Research in the Logistics Field in CNKI

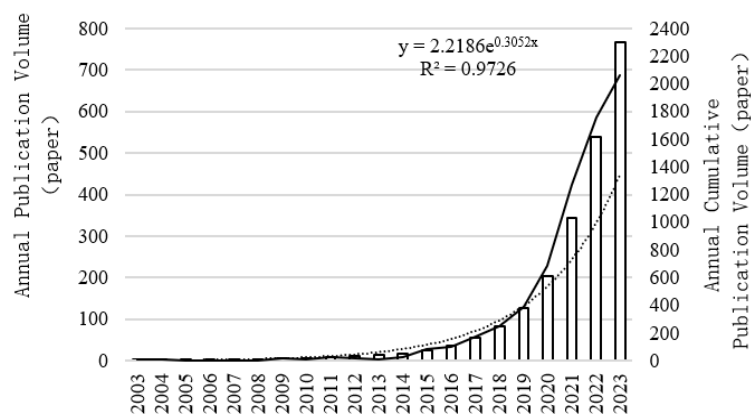


Figure 2: Statistics on the Publication Volume of Digital Technology Research in the Logistics Field in WOS



Research on Digital Technology in the Logistics Field in CNKI began to attract significant attention from scholars in 2010. Over the following five years, the annual publication volume continued to rise. However, the interest slightly declined in 2015, after which the annual publication volume fluctuated, reaching its peak in 2021.

In WOS, research on digital technology in the logistics field has shown a steady increase in annual publication volume over the past two decades, indicating a growing level of attention to this topic. A fitting analysis of the cumulative annual publication volume yielded a goodness-of-fit value of 0.9726, demonstrating that the cumulative number of publications from 2003 to 2023 generally followed an exponential growth trend. Based on the timeline, the evolution of research on digital technology in the logistics field in the WOS database can be divided into three stages: (1) The Embryonic Stage (2003–2010): The average annual publication volume was relatively low, remaining below 5 articles, with only a small number of scholars focusing on this field. (2) The Accumulation Stage (2011–2016): The average annual publication volume reached 15 articles, as the application of digital technology in the logistics field began to attract significant attention from scholars. (3) The Rapid Development Stage (2017–2023): The number of related publications continued to climb, with a total of 2,192 articles, accounting for 95% of the valid literature (2,304 articles). Research on digital technology in the logistics field entered a period of "rapid development," demonstrating immense potential for future growth.

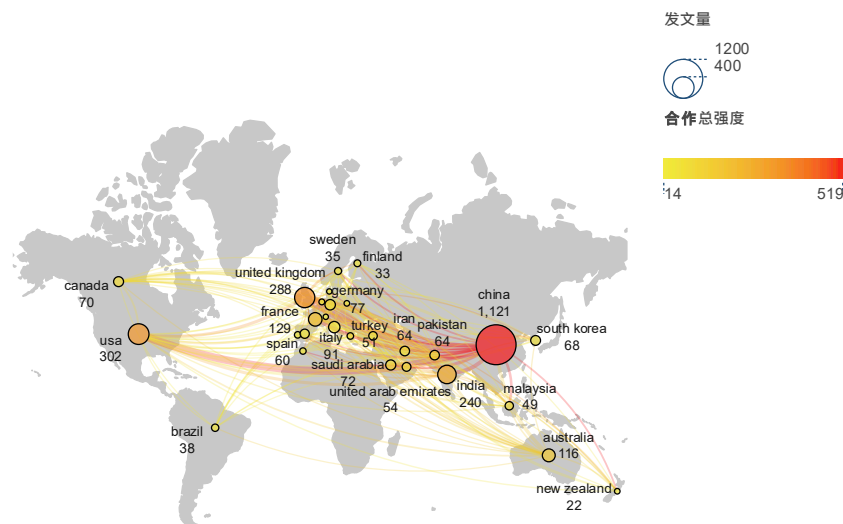


Figure 3: Country Collaboration Network of WOS Literature Samples

Based on the analysis of valid literature from the WOS database using Vosviewer and Scimago Graphica software, it is evident that 85 countries have conducted research in this field. As shown in Figure 3, China has the highest number of publications (1,121 articles), followed by the United States (302 articles), the United Kingdom (288 articles), India (240 articles), and France (129 articles). Notably, China exhibits strong collaborations with the UK, the US, India, and France, while the UK also collaborates closely with India, and the US with the UK. In terms of total citation frequency, China ranks first (20,952 citations), followed by the United States (14,561 citations), the United Kingdom (11,189 citations), France (6,489 citations), and India (6,370 citations). This indicates that China's contribution to research on digital technology in the logistics field significantly surpasses that of other countries.

4. Analysis of Research Hotspots and Development Trends

Analysis of Research Hotspots

Keywords represent the core summary of a paper. The higher the frequency of a keyword, the greater the research enthusiasm of scholars in that field. Summarizing and analyzing keywords from relevant literature in a specific field helps identify research hotspots. In this study, Citespace was used to process and analyze 1,733 sample articles from the CNKI database. The minimum occurrence threshold for keywords was set to 4,



resulting in 222 nodes. The size of each node represents the frequency of the keyword, and a purple ring around a node indicates that the keyword has been frequently cited in a short period.

Additionally, Vosviewer and Pajek software were employed to process and analyze 2,304 sample articles from the WOS database, yielding 6,956 keywords. Synonyms such as "artificial-intelligence" and "artificial intelligence" were merged. Each column represents a research theme, with larger nodes indicating higher keyword frequency. Nodes closer to blue represent earlier average appearance times, while those closer to yellow indicate more recent appearances. The thickness of the connecting lines between nodes reflects the strength of co-occurrence between keywords. For clarity and analytical purposes, only lines with stronger co-occurrence strengths are displayed, and not all connections are shown.

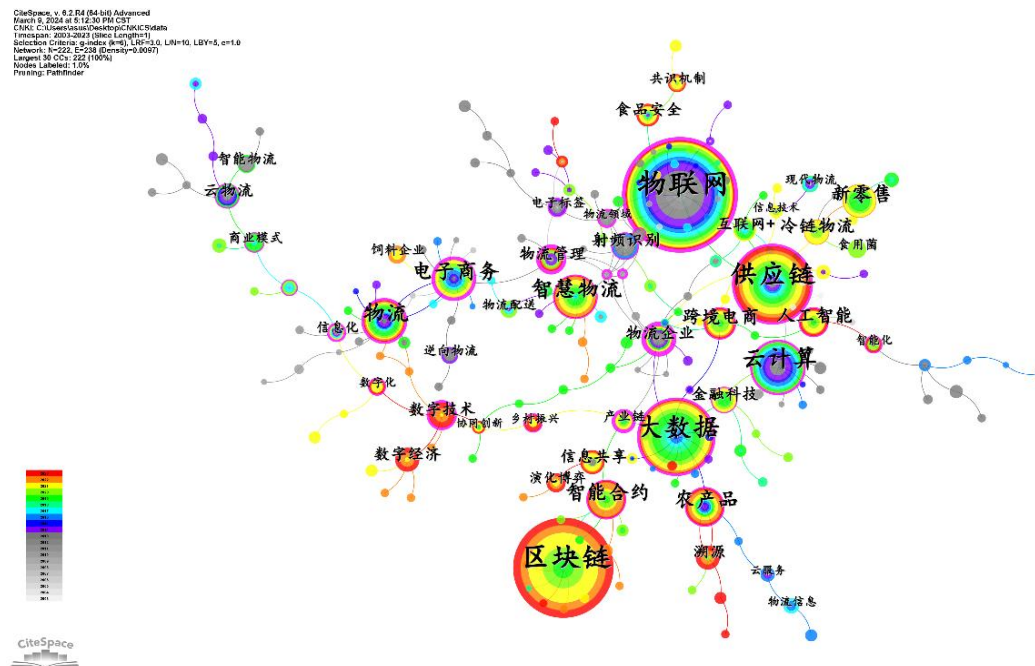


Figure 4: Keyword Co-occurrence Map of CNKI Literature Samples

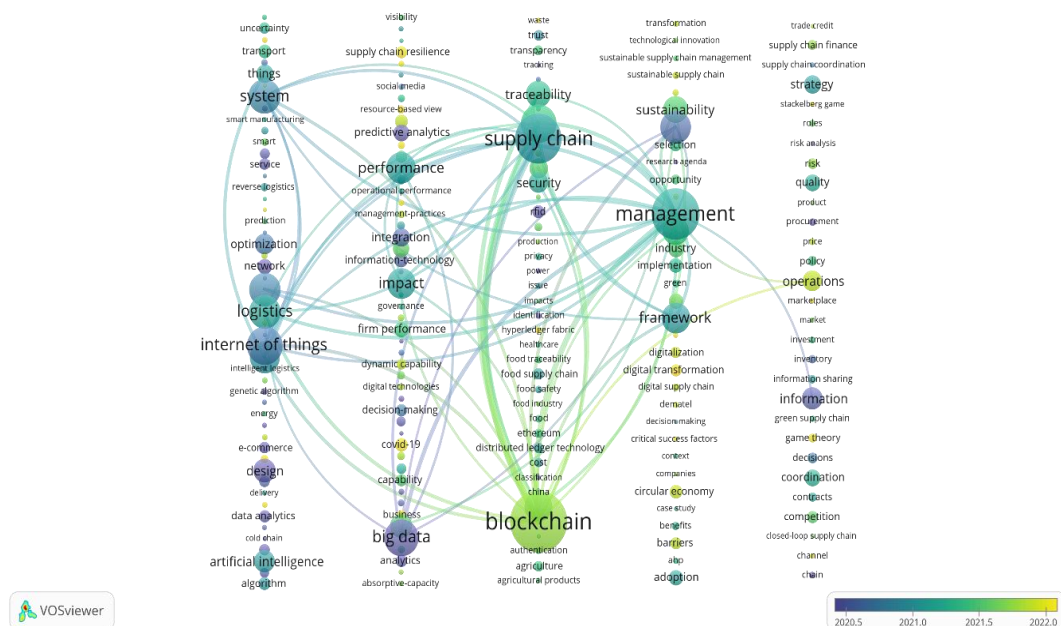


Figure 5: Keyword Co-occurrence Map of WOS Literature Samples



According to Figures 4 and 5, the research hotspots in CNKI on digital technology in the logistics field over the past two decades include: the Internet of Things (393 articles), blockchain (300 articles), supply chain (196 articles), big data (187 articles), and cloud computing (103 articles). In WOS, the research hotspots in this field include: blockchain (771 articles), management (579 articles), supply chain (550 articles), technology (354 articles), and the Internet of Things (350 articles). Among these, keywords such as the Internet of Things, supply chain, big data, cloud computing, smart logistics, and e-commerce have been frequently cited in recent years. In the WOS literature samples, blockchain shows strong connections with management and supply chain. Supply chain management involves multiple stages, including suppliers, manufacturers, and retailers, making it a complex process. The decentralized, transparent, and tamper-proof characteristics of blockchain technology can meet the high-trust information exchange requirements between various stages of supply chain management. In the supply chain management process, blockchain technology can not only record information at each stage, such as production, processing, transportation, and packaging, enabling precise traceability of goods, improving supply chain efficiency, and controlling costs, but also track all financial flows within the supply chain, enhancing supply chain security. Additionally, it can enable smart contracts, reduce intermediate supply chain links, monitor supply chain events, and automatically trigger related operations.

Analysis of Research Frontiers

Research frontiers, to some extent, reflect research dynamics and emerging trends. Burst terms, which indicate the rate of increase in the usage frequency of keywords over a specific period, can reveal research frontiers and predict future development directions.

Top 25 Keywords with the Strongest Citation Bursts

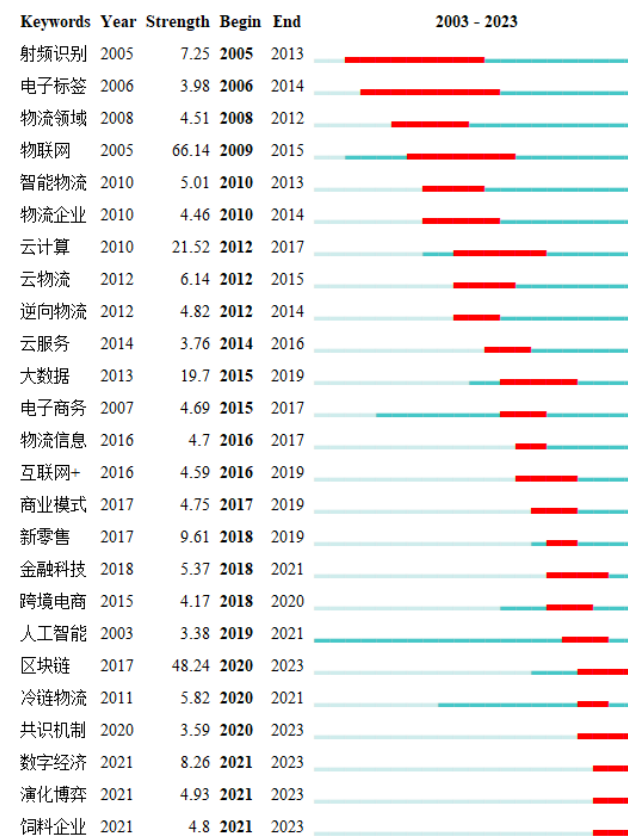


Figure 6: Keyword Burst Map of CNKI Literature Samples

Figure 6 presents the keyword burst map of CNKI literature samples related to digital technology in the logistics field. From the perspective of the emergence time nodes and existence cycles of new terms, the keywords "radio frequency identification (RFID)" and "electronic tags" have relatively long burst periods, indicating their significant applications in the logistics field since the early stages. Future research may focus more on the



intelligent application of RFID and electronic tag technologies in logistics supply chains, as well as their deep integration with other digital technologies. Keywords such as "radio frequency identification," "electronic tags," "logistics field," and "Internet of Things" gained attention and research focus before 2010. Among these, "electronic tags" exhibit a lower burst strength compared to other keywords, suggesting that electronic tag technology has not received as much attention as RFID or the Internet of Things in research and practice. Keywords such as "new retail," "financial technology," and "cross-border e-commerce" represent the integration trends between the logistics field and other industries. Future research may place greater emphasis on the deep integration and innovative development of new retail, financial technology, cross-border e-commerce, and logistics supply chains.

Keywords with more recent bursts, such as "blockchain," "consensus mechanism," "digital economy," "evolutionary game theory," and "feed enterprises," represent topics that have gained attention in recent years. These keywords reflect the development trends of digitalization, intelligence, and networking in the logistics field, as well as the need for logistics enterprises to continuously explore and address new challenges in the face of increasingly complex market competition and regulatory environments.

Future research trends in the CNKI logistics field may focus more on the in-depth application and innovation of digital technologies, particularly in areas such as smart logistics, the Internet of Things, cloud computing, big data, artificial intelligence, and blockchain, to promote the digital transformation and intelligent development of the logistics industry.

Top 25 Keywords with the Strongest Citation Bursts

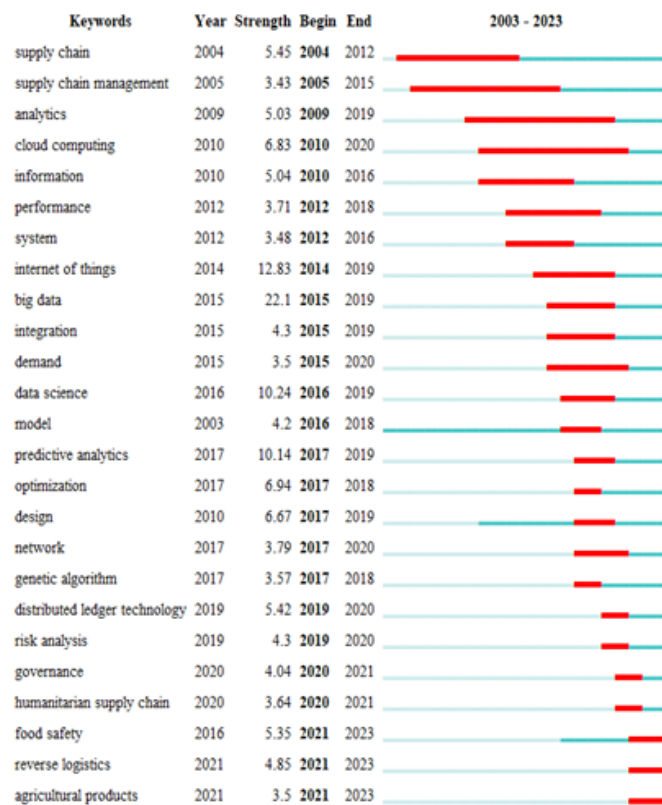


Figure 7: Keyword Burst Map of WOS Literature Samples

Figure 7 presents the keyword burst map of WOS literature samples related to digital technology in the logistics field. Keywords such as "Supply Chain," "Supply Chain Management," "Analytics," and "Cloud Computing" have relatively long burst periods, indicating sustained attention over the past decade. The supply chain has always been one of the core themes in the logistics field, and "Supply Chain" and "Supply Chain Management" have attracted significant attention from scholars in the early stages. Future research trends may include explorations in supply chain network optimization, sustainable supply chain development, and supply chain risk



management based on digital technologies. Consistent with CNKI, the keyword "Internet of Things (IoT)" also exhibits the highest burst strength, but compared to CNKI, it gained attention relatively later. In the future, the application of IoT technology in the logistics field will continue to expand, providing more possibilities for achieving smart logistics and supply chain optimization. Emerging technologies and research areas such as data science, predictive analytics, distributed ledger technology (blockchain), and risk analysis have gradually gained attention and play important roles in the logistics field. These emerging technologies will continue to drive the development of the logistics industry.

Keywords with more recent bursts in WOS include "Food Safety," "Reverse Logistics," and "Agricultural Products," which are current research hotspots in the logistics field. With the increase in global trade and the complexity and opacity of food supply chains, concerns about food safety have been growing. Therefore, research on how to leverage digital technologies to improve food safety management efficiency and quality, as well as enhance traceability and emergency response capabilities, has gradually become a hotspot. With the support of digital technologies, the management and optimization of reverse logistics have become more feasible. For example, by utilizing big data analytics, enterprises can better understand the demands and trends in reverse logistics processes, thereby optimizing reverse logistics networks and processes, and improving resource utilization and recovery rates. The application of logistics technology can enhance the transportation efficiency and quality assurance of agricultural products. For instance, IoT technology can be used to achieve traceability and monitoring of agricultural products, ensuring their freshness and quality. Meanwhile, reverse logistics can also play an important role in the circulation of agricultural products, such as addressing issues of surplus and loss, thereby reducing resource waste.

Future research in the WOS logistics field will primarily focus on leveraging digital technologies and innovative models to improve food safety management, optimize reverse logistics networks, and enhance the transportation efficiency and quality of agricultural products. It will also explore the deep integration of digital technologies such as big data, the Internet of Things, and cloud computing, as well as innovative applications in emerging technologies and research areas, to achieve intelligent, efficient, and sustainable logistics operations.

In the WOS keyword burst results, the strength of keywords is relatively uniform, with no significantly prominent high values, indicating a balanced distribution of keyword usage in its research. In contrast, the CNKI keyword burst results are mainly concentrated on the application and research of digital technologies in the logistics field, with a focus on logistics, digital technologies, cloud computing, and big data. The WOS keyword burst results are broader, covering more aspects such as supply chain management, analytics, and technology.

5. Conclusions

Through a comprehensive analysis of the research progress and frontiers of digital technology in the logistics field based on the CNKI and WOS databases, the following conclusions can be drawn:

First, research on digital technology in the logistics field has shown a continuous growth trend, particularly in the application of key technologies such as big data, blockchain, artificial intelligence, the Internet of Things, and cloud computing. Over time, research on these technologies in the logistics field has gradually matured, with expanding breadth and depth, providing rich theoretical support and practical experience for the digital transformation of the logistics industry.

Second, there is a certain level of collaborative research between domestic and international scholars in the field of digital technology in logistics. China has established close research collaborations with countries such as the United States, the United Kingdom, India, and France. Such collaborations facilitate the sharing and exchange of research outcomes, promoting the global development of the logistics field.

Additionally, there are some differences between the CNKI and WOS databases in terms of research focus on digital technology in the logistics field. CNKI research primarily concentrates on the application and study of digital technologies in logistics, particularly in areas such as the Internet of Things, cloud computing, big data, and blockchain, with an emphasis on how digital technologies can enhance logistics efficiency and management levels. In contrast, WOS research is broader, covering multiple aspects such as supply chain management, analytics, and technology, reflecting a more diversified and comprehensive research approach.

Finally, future research trends in digital technology in the logistics field are likely to focus more on the in-depth application and innovation of digital technologies, particularly in areas such as smart logistics, the Internet of



Things, cloud computing, big data, artificial intelligence, and blockchain, to drive the digital transformation and intelligent development of the logistics industry. Furthermore, research will center on leveraging digital technologies and innovative models to improve food safety management, optimize reverse logistics networks, and enhance the transportation efficiency and quality of agricultural products. The deep integration of digital technologies such as big data, the Internet of Things, and cloud computing, as well as the exploration of innovative applications in emerging technologies and research areas, will be key to achieving intelligent, efficient, and sustainable logistics operations.

With the continuous innovation and development of digital technologies, research in the logistics field will face more challenges and opportunities. It is essential to strengthen interdisciplinary collaboration, enhance international exchanges and cooperation, deepen technological innovation, and promote the digital transformation and intelligent development of the logistics industry.

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