

The Impact of Digital Technology on Supply Chain Finance Performance of Chinese SMEs - A Systematic Literature Review

Wang Jia, Nur Aima Shafie, Eley Suzana Kasim
Accounting Research Institute, Universiti Teknologi MARA

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Abstract

Digital technologies, including blockchain, artificial intelligence (AI), and big data, are revolutionizing supply chain finance (SCF), especially for Chinese SMEs. This study conducts a systematic literature review from 2020 to 2024 using the PRISMA method to evaluate the impact of these technologies on SCF performance. A total of 81 articles from Scopus, Web of Science, and CNKI were analyzed. The results show that digital technologies significantly improve SCF by reducing information asymmetry, enhancing SMEs' credit quality, strengthening supply chain coordination, lowering transaction costs, and minimizing financial risks. Blockchain technology boosts transparency and data security, AI refines the decision-making process for financing, and big data analytics enhances forecasting accuracy for market demand and financial risks. To further advance SCF, both government policy support and digital infrastructure improvements are needed, while SMEs should accelerate their digital transformation efforts. Future research should prioritize reducing the costs of implementing digital technologies while maximizing their benefits, and should also investigate the expanding role of AI in driving SCF efficiency and innovation. Expanding empirical studies will provide a deeper understanding of how these technologies can be best utilized to enhance SCF performance.

Keywords: Digital Technologies, Supply Chain Finance (SCF), Chinese SMEs, Blockchain

Introduction

Small and medium-sized enterprises (SMEs) occupy an absolute numerical advantage in China's economy and have made a great contribution to the current Chinese economy and employment (Guo et al., 2024). However, due to their small size, low creditworthiness, and lack of capital, SMEs often find it difficult to obtain financial support from traditional financial institutions (Lu et al., 2024). Therefore, Chinese governments at all levels have been paying great attention to supporting SMEs to solve the problems of "difficult financing", "expensive financing" and "slow financing" (Rao & Li, 2022). With the help of SCF, SMEs have been given some assistance in financing, and their financing problems have been alleviated to a certain extent (Wang et al., 2023).

SCF is a financing model that combines financial services with supply chain management, in which large enterprises in SCF-related financial institutions are linked to upstream and downstream SMEs to provide them with financing products and services that can be flexibly utilized (Cen, 2023). At present, SCF has become an important way for China's economic innovation and development and support for the continuous operation of SMEs (Tang et al., 2023). According to the findings of iResearch, a leading market research organization in China, by 2025, China's SCF market size will exceed 20 trillion yuan.

The results of many empirical studies show that SCF has a positive and positive effect on SME financing (Kaur et al., 2024). For example, some scholars have verified that SCF can significantly enhance the availability of funds and the efficiency of capital flow for SMEs and reduce the risk of supply chain disruption by promoting capital flow and reducing financing constraints (Ali, 2024).

Although SCF provides innovative financial solutions to SMEs' financing problems, not all SMEs can obtain adequate and timely loans from SCF (Deng et al., 2023), and its application still faces various challenges (Kaur et al., 2024). On the one hand, due to information asymmetry and the poor influence of SMEs, large enterprises are reluctant to provide guarantees for their loans (Miller et al., 2023). On the other hand, the information on SMEs' transactions in the supply chain is easily tampered with and difficult to trace, which increases financial institutions' concern about the authenticity of their transactions (Kucukaltan et al., 2022). Financial institutions tend to offset the default risk of SMEs through high interest rates, making the financing difficulties of many SMEs unable to be effectively improved (Lu, 2024).

The rise of digital technologies such as blockchain, big data, and artificial intelligence has effectively addressed the challenges facing supply chain finance and has had a significant impact on the performance of Chinese SMEs. Digital technologies have played an important role in improving the efficiency of corporate SCF, reducing risks, enhancing transparency, and improving corporate finance performance, which has greatly contributed to the development of supply chain finance in China. However, there are also many challenges and research gaps in the current application of digital technology in Chinese SCF.

First, foundational research and core technologies are relatively weak, particularly in areas like core algorithms and high-end chips, which limits technological innovation and industrialization. Second, the integration of digital technology with SCF is insufficient, as penetration rates in agriculture, industry, and services fall below internationally advanced levels, indicating significant room for improvement. Lastly, the shortage of high-end composite talents, especially in technological innovation and industrial upgrading, hinders further research and promotion of digital technology in SCF (Mao et al., 2024).

Addressing these issues, this study reviews the current state of digital technology applications in SCF in China and summarizes its influencing factors. Previous studies often focused on defining, modeling, and outlining the development direction of SCF, with insufficient systematic and in-depth studies on the application of next-generation digital technologies, such as artificial intelligence (Chen, 2022; Song & Zhu, 2024). Additionally, earlier overviews of SCF often lack rigorous research methods. This paper will employ a combination of the

PRISMA method and econometric research methods to ensure a more systematic and scientific literature review.

Therefore, this study proposes the following research questions: research question 1 (Q1): what are the specific forms of blockchain technology application in SCF? Research question 2 (Q2): what are the specific forms of the application of big data technology in SCF? Research Question 3 (Q3): What are the specific forms of application of artificial intelligence technology in SCF? Research Question 4 (Q4): How do digital technologies affect SCF performance?

Through the literature review, this paper provides academics with a theoretical framework on how digital technologies can enhance the performance of SMEs' financial services and provides solid theoretical support for research on the application of digital technologies in the field of SCF. At the practical level, the findings provide empirical evidence and strategic recommendations for Chinese SMEs on how to utilize these digital technologies to enhance SCF performance, providing valuable references for business managers and policymakers. Ultimately, this study hopes to promote the development of SMEs and thus the economy.

To this end, this scientific review aims to provide a comprehensive overview of current research and emerging trends in the use of digital technologies in SCF. This includes how digital technologies affect the way SCF is structured and operates, particularly in terms of increasing transparency, reducing information asymmetry, and optimizing processes. The main objective of this study is to identify and analyze the important role of digital technology in SCF, to clarify the key factors of digital technology affecting SCF, and to highlight its role in reducing costs, improving financing efficiency, and controlling risks. This objective stems from the research gap in the current literature.

Methodology

To explore the impact of digital technology on the SCF performance of Chinese SMEs, this study conducts a literature review to provide new scientific insights on the application of digital technology in SCF and its impact on performance. To this end, the terms "digital technology" or "blockchain" "big data" "artificial intelligence" and "supply chain finance" were selected for this purpose. "supply chain finance" or 'supply chain finance performance' and 'small and medium-sized enterprises (SMEs)' and 'China' as representative keywords to identify scientific contributions in related fields.

In addition, during the literature search, it was found that many scholars have researched the impact of "digital transformation of SMEs," "digital finance," "digital business ecosystems," and "fintech" on supply chain finance. There are also studies focused on "digital supply chain finance," which similarly encompasses digital technologies such as big data, blockchain, and artificial intelligence. To provide a more comprehensive perspective and enhance the breadth of this study, relevant articles from these areas with a high degree of correlation have also been included in the research scope.

At the same time, the researcher found that some articles are more subdivided research on a certain digital technology, for example, blockchain technology can be divided into public chain, private chain, and alliance chain according to the type of blockchain, and some scholars

specifically focus on the impact of alliance chain on SCF. To increase the depth of the study, this part of the study is also included in the scope of the literature review.

Finally, to ensure the quality and scientific validity of the cited literature, three well-recognized and reliable databases, Scopus, Web of Science, and China Knowledge Network (CNKI), were selected. Combining these three databases increases the probability of identifying relevant contributions and improves the rigor of literature screening.

Search Strategy

In order to promote rigor in the literature review, the PRISMA method (Preferred Reporting Items for Systemic Reviews and MetaAnalyses) was adopted (Page et al.,2021). Figure 1 illustrates the literature search process based on the four main steps of the protocol guidelines - identification, screening, conformity, and data extraction. The flowchart consists of multiple boxes, each labeled with the number of studies included or excluded in each step. Ultimately, the screening process identified 81 relevant publications published between 2020 and 2024.

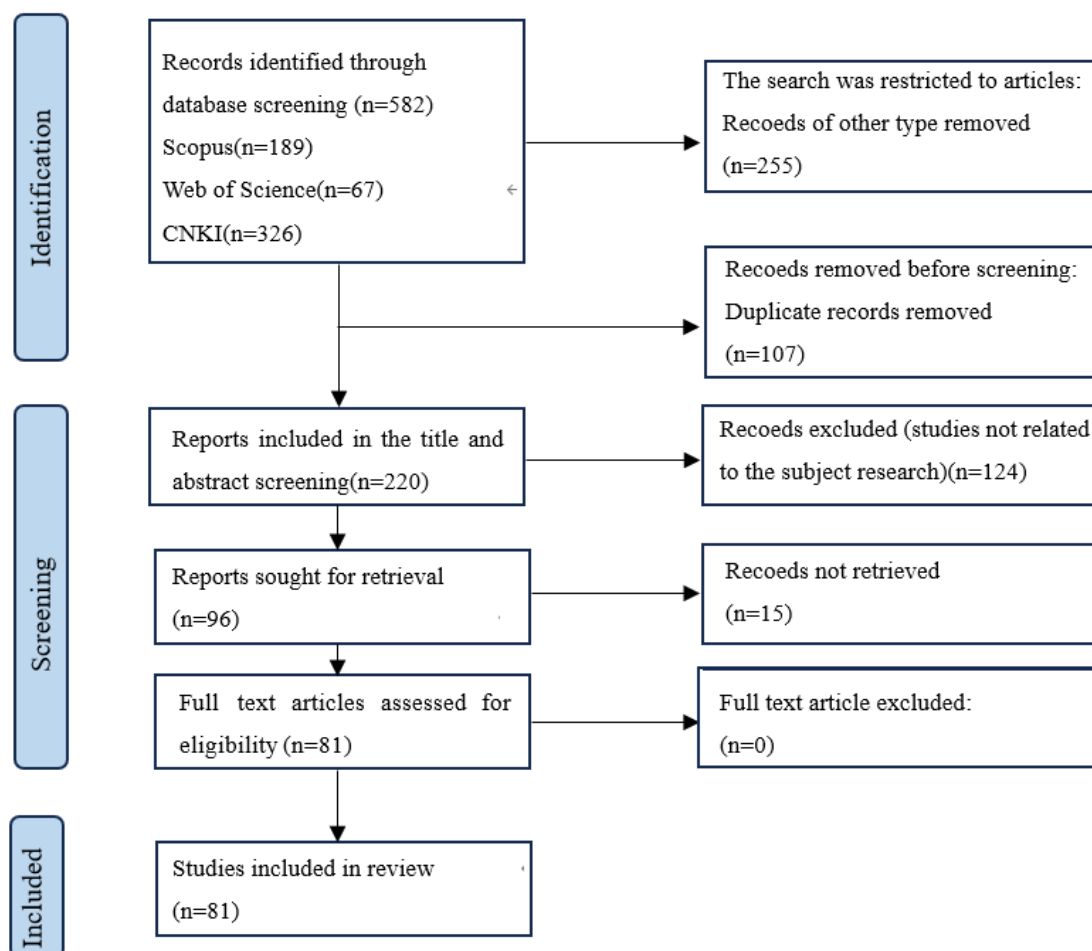


Fig.1. PRISMA flow diagram for new systematic reviews, which included searches of databases and registers only. Own elaboration following the PRISMA model.

Quality Appraisal and Analysis

Several quality appraisal methods exist for systematic literature reviews (SLR), with the Critical Appraisal Skills Program (CASP) being the most prevalent in social sciences (Mohamed Shaffril et al., 2020). CASP provides a checklist to assist researchers through the appraisal process. Inclusion and exclusion criteria were established using a reproducible, scientific, and transparent approach. The search, focusing on the fields of "article title, abstract, keywords," was limited to publications from 2020 to 2024 to ensure relevance in the emerging area of digital technologies in SCF. The articles selected primarily came from SCI and SSCI databases, prioritizing papers with over 30 citations in Scopus, and included relevant Chinese papers from the CNKI database.

A search across three databases yielded 582 entries, of which 255 were excluded for irrelevance or duplication. After evaluating abstracts, the researcher identified 81 eligible publications from a total of 220 articles that met the criteria. The specific inclusion and exclusion criteria are detailed in Table 1.

Table 1

Inclusion and Exclusion Criteria

Inclusion Criteria:

The inclusion criteria for this study are limited to the following conditions:

- Papers were selected from SCI and SSCI in Web of Science, Peking University Core Journals and CSSCI in CNKI, and articles with more than 30 citations in Scopus.
- Full-text papers published in peer-reviewed journals.
- Peer-reviewed articles written in English or Chinese.
- Peer-reviewed articles published between 2020 and 2024.
- Peer-reviewed articles directly related to the research topic, specifically those examining the impact of digital technologies (such as blockchain, big data, and artificial intelligence) on the performance of supply chain finance for Chinese SMEs.

Exclusion Criteria:

The exclusion criteria are limited to the following conditions:

- Publications that do not fall under the category of peer-reviewed articles, such as reviews, conference proceedings, book chapters, unpublished theses, reports, and white papers.
 - Peer-reviewed articles that are not relevant to the research topic, especially those that do not discuss the impact of digital technologies on supply chain finance or Chinese SMEs.
 - Peer-reviewed articles that do not provide empirical research results or lack scientifically significant data analysis.
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Ultimately, no articles were further excluded. Therefore, after the collection process, 81 publications were selected and analyzed. Based on this, an econometric analysis of the articles was conducted, followed by a qualitative synthesis of the impact of digital technologies on SCF performance, and outlining the specific applications of each digital technology to SCF and how digital technologies have impacted SCF. In this way, this review aims to provide important insights into future applications of digital technologies in SCF and to advance research and practice in related areas. The next section will provide an objective

review of the selected literature and identify the key factors that influence the performance of the application of digital technologies in SCF.

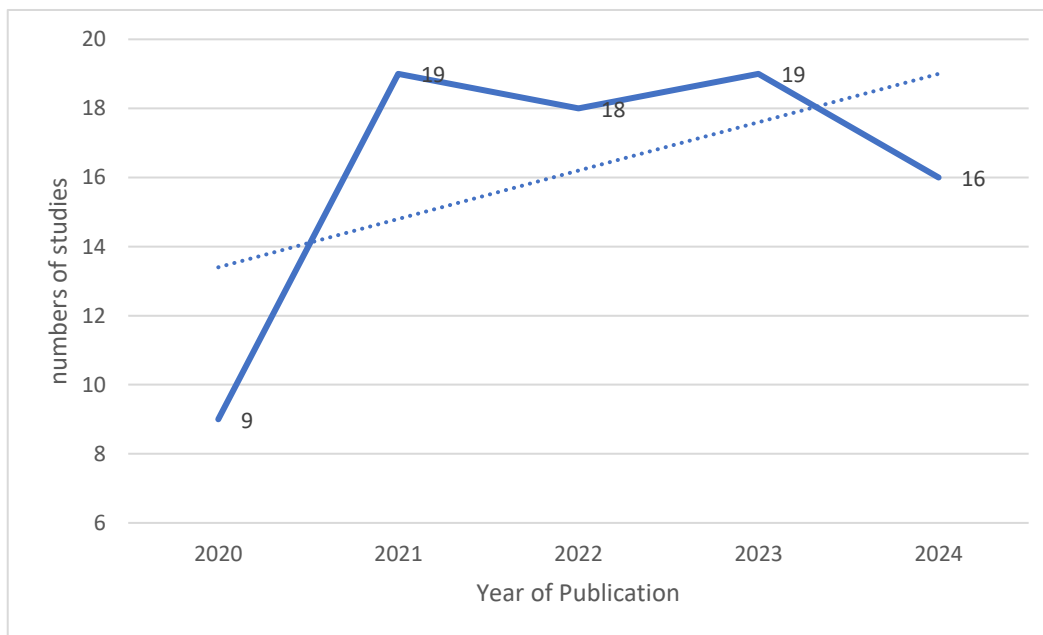
Result

This section explores the application of digital technologies, including blockchain, big data, and artificial intelligence, in SCF and their impact on SCF performance. It begins with an econometric analysis of relevant literature to assess the volume of studies and identify key variables influencing the application of these technologies. The section systematically maps these variables and analyzes their mechanisms for enhancing SCF performance. Finally, it concludes with insights on potential trends and challenges for the future development of SCF.

Bibliographic Analysis

The combination of SCF and digital technology has been a rapid development in recent years, especially with the rise of blockchain, big data, artificial intelligence, and other technologies to promote the digital transformation of SCF (Hu, 2021; Zhao, 2023). The results of the literature search show that 2015 is an important node. After 2015, it began to increase year by year, especially after 2020, demonstrating a clear growth trend, as shown in Fig. 2.

Fig. 2. Number of articles published per year, between 2020 and 2024, selected for this review.



To provide a comprehensive overview of the relevant academic fields, the researcher conducted econometric statistics on the journals in which the literature was published, which showed that the articles were from 57 different reputable journals, of which 35 were from reputable Chinese journals and the other 48 were from international journals. As shown in Figure 3, these journals are from several scientific fields, such as computer science and information technology, information systems and e-commerce, supply chain management and operations management, economics and management, environmental science and sustainable development, and decision support and systems engineering. The largest percentage of journals is from the field of Economics and Management.

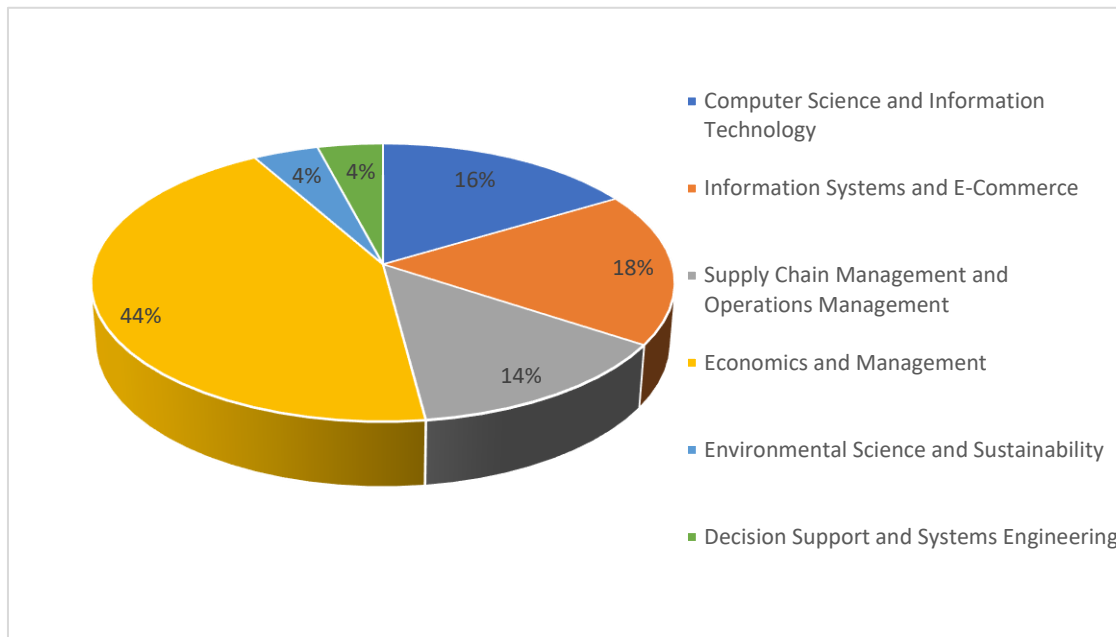


Fig. 3. Distribution of Journal Articles Across Different Research Fields

To provide a clearer picture of the origin of these articles, the researcher performed a descriptive statistical analysis of the journals in which these 81 articles were published. Figure 4 illustrates the names of journals that published 2 or more articles, providing the distribution of these journals in the literature.

As shown in Figure 4, a total of 15 journals from China and other countries are displayed. The first 8 are core journals from China, with the number of articles published above China Finance, Theory and Practice of Systems Engineering, Research on Management of Science and Technology, and Friends of Accounting each having as many as 3 articles. The next seven are internationally recognized journals, of which three articles have been published in "INTERNATIONAL JOURNAL OF PRODUCTION RESEARCH". Except for these 15 journals, the remaining 42 journals published only one paper on this topic. Overall, the distribution of papers is relatively even.



Fig. 4. Statistical Analysis of Journals with a High Number of Published Articles

This study utilized VOSviewer software to analyze the keywords of the selected documents, as illustrated in Figure 5. The econometric results indicate that “SCF” is the most prominent term, closely linked to SMEs, aligning with the thesis's focus. The nearest and largest node to SCF is blockchain, highlighting its prominence among digital technologies in current research. Blockchain is associated with terms such as “technology,” “big data,” and “management.” Additionally, big data, artificial intelligence, and the Internet of Things are also recognized as significant digital technologies in SCF, with some scholars examining the overall impact of digital technologies on SCF performance. The associations emphasize that the influence of digital technologies on SCF is primarily reflected in efficiency, transparency, and sustainability.

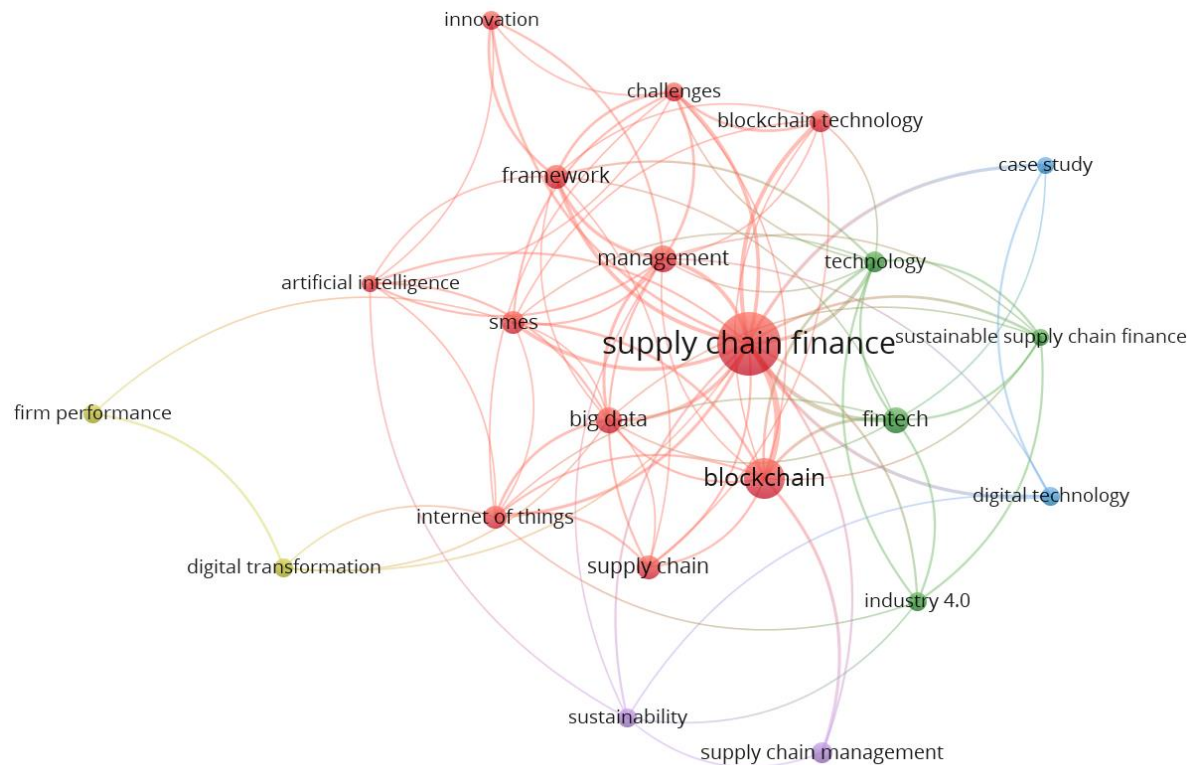


Fig 5. Analysis results of the keywords from the included literature using VOSviewer software-network visualization

Moreover, the analysis revealed the terms “challenges” and “innovations.” The connection between “challenges” and technologies like SCF and blockchain indicates that, despite the benefits of digital technologies, barriers such as technology readiness, regulatory issues, and costs persist. Conversely, “innovation” is closely related to SCF, suggesting that new solutions are being developed to address existing challenges through the integration of digital technologies.

Finally, in terms of research methodology, most of the studies adopted the case study method, thus it can be seen that the current relevant research in this field still remains at the qualitative research stage and lacks scientific quantitative research, which is also a matter of concern in the future.

From the overlay visualization, we can see the future direction of research in this field. As can be seen in Figure 6, the yellow part represents the latest research areas, which are mainly concentrated on the words “artificial intelligence”, “challenges” and “digital technology”. It shows that the future development of SCF still faces many challenges, and the application of artificial intelligence in SCF may be an effective means to help us solve the problem. In the future, research on the impact of digital technology on SCF will remain a popular field, especially the use of quantitative research methods, which can make up for the shortcomings of the current research.

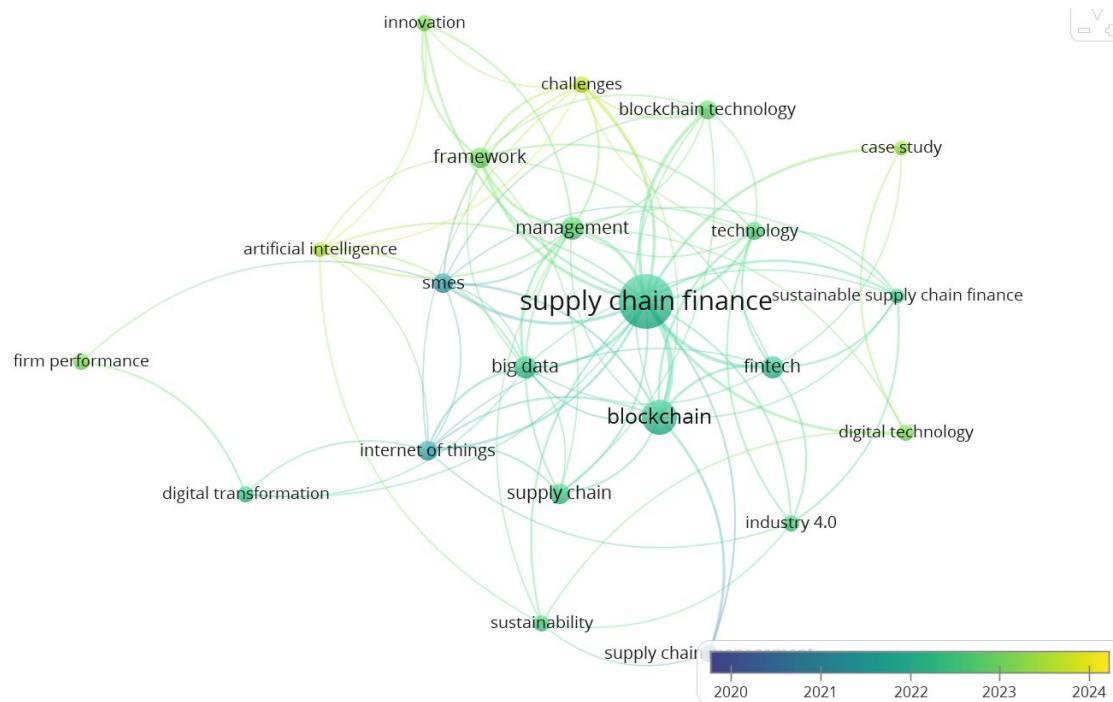


Fig 6. Analysis results of the keywords from the included literature using VOSviewer software-overlay visualization

Digital Technology in Supply Chain Finance

Digital technologies such as blockchain and big data are gradually becoming the core driving force in the field of SCF (Dou, Gao & Zheng, 2020; Ge, 2023). In this section, the researcher further analyzes the content of each article, extracts the key information and main ideas in the literature, and divides the 81 pieces of literature into four categories based on the title, abstract, and content of the article, which are the application of blockchain technology in SCF, the application of big data technology in SCF, the application of artificial intelligence in SCF, and the digital technology as a whole that plays a role. These four categories correspond to the four research questions of this study. The number of documents under each dimension, the corresponding research questions, and the represented authors and represented viewpoints are presented in Table 2.

Table 2

Content Analysis and Categorization of Selected Literature

Dimension Name	Quantity	Corresponding Research Question	Representative authors	Representative views
Blockchain	28	what are the specific forms of blockchain technology application in supply chain finance?	Shu et al. (2024), Liu et al. (2021)	Blockchain significantly enhances supply chain finance efficiency by increasing trust, lowering costs, accelerating cash flow, and reducing errors.
Big Data	14	what are the specific forms of the application of big data technology in supply chain finance?	Jiang et al. (2024), Feng (2023)	Risk Prediction Models Based on Big Data Sets Can More Effectively Predict Supply Chain Customer Failure Risks
Artificial Intelligence	11	What are the specific forms of application of artificial intelligence technology in supply chain finance?	Ronchini(2024), Luo, Xing,& Zhao(2023)	artificial intelligence significantly impacts various stages of the SCF innovation process by supporting credit assessments, fraud detection, supplier categorization, and administrative task acceleration, while also presenting benefits and challenges. using more and deeper digital technologies improves supply chain financing performance, with supply chain transparency playing a key role, and financing alignment affecting how digital technology impacts transparency
Digital Technology as a Whole	28	How do digital technologies affect supply chain finance performance?	Lu, Jiang& Wang(2024), Mao et al. (2024)	

Blockchain Technology in Supply Chain Finance

The application of blockchain technology in SCF has become an area of research that has received widespread attention in recent years, especially in reducing financing risks and enhancing the transparency and security of funds, showing great potential(Li& Wang, 2021; Li, Zhu& Li, 2020). As a comprehensive technology originating from cryptocurrency,

blockchain combines multiple disciplines such as the Internet, computer programming, cryptography, etc., and is characterized by decentralization, traceability and strong tamper-proof (Li et al., 2023; Lin et al., 2021). These technological features provide new solutions for SCF, especially SME financing.

Research has shown that blockchain technology can significantly reduce information asymmetry, thereby reducing financing risks. This is particularly important for SMEs that have traditionally struggled to access bank credit, as blockchain can reduce financing costs and facilitate the flow of funds by enhancing credit assessment and financing transparency (Lin & Zhao, 2022; Lin, Li & Jiang, 2021).

In addition, blockchain's decentralization and immutability ensure more transparent and secure financial and information flows in the supply chain. Financial institutions can verify the authenticity of transactions in real time through the blockchain platform, which not only reduces the manual approval process, but also lowers the cost of trust, which in turn accelerates the speed of capital turnover in SCF (Liu & Li, 2021; Liu, 2021). Some researchers also point out that blockchain's decentralized trust mechanism replaces traditional intermediaries, such as banks and guarantee companies, further reducing transaction friction and improving the overall efficiency of the supply chain (Qu & Li, 2023).

Smart contracts, as one of the important applications of blockchain technology, also have a positive impact on the operational efficiency of SCF (Liu et al., 2023). Smart contracts can automatically execute transactions based on preset conditions, such as automatic payment of funds upon delivery of goods or completion of services, thus reducing human intervention and approval delays and significantly improving the efficiency of capital flow (Zhan et al., 2024).

In addition, the distributed ledger system in blockchain technology enables parties in the supply chain to access and share the same transaction data in real time, ensuring data transparency and trustworthiness (Chen et al., 2021). Transaction records between SMEs and large corporations can be stored on the blockchain, and financial institutions are able to verify these records in real time, thus reducing the pressure for financing approval and improving the overall performance of the supply chain (Deng et al., 2023). The efficiency of accounts receivable and inventory management in the supply chain is significantly improved by real-time tracking and verification through blockchain technology (Boakye et al., 2024).

Some scholars have also proposed risk assessment models based on blockchain technology, such as the standardized risk assessment model and entropy weight model, aiming to improve the accuracy of risk assessment in SCF. The decentralization and immutability of blockchain ensures the authenticity of data in the supply chain, thus optimizing the financing decision-making process (Rao & Li, 2022). Empirical studies have also shown that the application of blockchain technology in SCF can improve financing efficiency (Liu et al., 2021), reduce financing costs (Sun et al., 2024), and enhance the overall benefits of supply chain members (Yu et al., 2021). In supply chain alliances, as the scale of cooperation expands, the use of blockchain technology further enhances the cooperative benefits of all parties and promotes the Pareto-optimal state of the supply chain system (Zhang et al., 2023).

In a nutshell, the main application of blockchain technology can be summarized in two aspects, one is to realize the fidelity and constraint of the whole process of information in transmission through consensus mechanism, smart contract, decentralization, etc.; and the other is to transfer the credit of the whole industrial chain to the deep suppliers, and to improve the efficiency and flexibility of the circulation of bills. Blockchain technology enhances the transparency, security, and efficiency of SCF, especially in the field of small and medium-sized enterprise financing to show a wide range of application prospects(Zhou& Wu, 2020). It not only improves the financing ability of enterprises but also provides financial institutions with a more reliable means of credit assessment and promotes the sustainable development of the supply chain financial system(Yu et al, 2022; Zhao et al., 2023).

Big Data Technology in Supply Chain Finance

In the existing literature, scholars have extensively studied the application of big data technology in SCF and summarized that its main role is reflected in three aspects. First, the application of big data technology in credit assessment is particularly significant. By collecting and analyzing transaction data, behavioral data, and market information in the supply chain, big data technology can help financial institutions more accurately assess the credit risk of SMEs. This compensates for the limitations of traditional credit assessment methods, and is especially important for SMEs that lack a complete credit history (Soni et al., 2022).

Specifically, by integrating various types of data from enterprises in production, sales, and logistics, big data technology breaks the single credit assessment model of traditional financial institutions relying on financial statements(Wang & Song, 2023), and provides a more comprehensive digital portrait of the enterprise(Song et al., 2021), thus creating a more accurate and dynamic credit model (Li & Huang, 2021).

Secondly, big data technology also shows its importance in demand forecasting and optimization. Through in-depth analysis of historical data, market trends and consumer behavior, big data technology can effectively predict future market demand fluctuations(Wang et al., 2020). Research has shown that big data can help companies accurately predict product demand and thus optimize production and inventory management by analyzing sales records(Tseng et al., 2021), seasonal demand changes(Jiang et al., 2024), and consumer feedback from social media (Hu, 2021; Zhao, 2023). Such demand forecasting not only reduces inventory backlogs but also improves the efficiency of capital utilization, which contributes to the rational allocation of funds in the supply chain and avoids the risk of idle or shortage funds (Zhao, 2022; Zhou, 2021). By optimizing inventory management and capital flow, big data technology significantly improves the overall performance of SCF.

Third, precision financing is another important application of big data technology in SCF. By analyzing historical transactions, inventory levels, and cash flows in the supply chain, financial institutions can tailor financing solutions for SMEs, thereby improving the efficiency of capital use and reducing financing costs (Yu et al., 2021). For example, Alibaba integrates the transaction data of SMEs through its big data platform and builds a credit assessment system based on big data(Zhu et al., 2022; Zhu et al., 2023). The system can provide SMEs with a quick credit assessment based on their transaction history and cash flow, thus obtaining financing support more efficiently (Tian et al., 2021).

Overall, big data technology accurately identifies the risks of financing targets by building customer portrait models and carries out comprehensive risk monitoring before, during, and after lending(Feng, 2023), thus effectively solving the problems of asymmetric financial information, high transaction costs and unsound risk control models (Liu, 2022).

Artificial Intelligence in Supply Chain Finance

Existing literature suggests that artificial intelligence (AI) technology is increasingly used in SCF, and plays an important role in risk assessment of SMEs in particular. Through AI technology, financial institutions can assess the credit risk of SMEs more quickly and accurately, and even those enterprises that lack traditional credit ratings can obtain financing with digital SCF platforms(Yang et al., 2020).AI technology effectively alleviates the bottlenecks of SMEs in the flow of funds, helps them to finance more smoothly, and improves the SCF efficiency(Olan et al., 2024).

In addition, AI has the capability of dynamic pricing and credit assessment. By learning from historical data, AI can flexibly adjust credit lines and interest rates based on an enterprise's current financial situation and the real-time dynamics of the supply chain (Ronchini et al., 2024). This real-time updated credit and financial information enables financial institutions to adjust their financing programs promptly when the market changes or supply chain risks occur, preventing capital flow disruptions and improving the flexibility of capital flows(Olan et al., 2022). This flexibility helps SMEs to cope with external shocks and uncertainties and increases their competitiveness in SCF(Figueiredo et al., 2023).

The role of AI in automated decision support cannot be ignored. Through machine learning and deep learning algorithms, AI can process a large amount of supply chain data, analyze market dynamics, enterprise financial status, and supply chain operations in real time, and then automate loan decisions(Wang et al., 2023). For example, AI technology can automatically adjust loan amounts and conditions for SMEs according to changes in market demand (Li et al., 2022). This feature reduces manual intervention and improves the speed and accuracy of loan decisions(Shu et al., 2024).

In addition, AI is also important for supply chain optimization.AI technology can monitor and optimize the logistics, production, and inventory in the supply chain in real time, thus helping SMEs to improve the efficiency of the supply chain, which in turn enhances their capital liquidity and financing ability (Luo et al., 2022). Through the optimization of AI algorithms, enterprises can reduce the inventory backlog and increase the turnover rate, which in turn improves the liquidity and financing conditions(Zhou et al., 2020).

Overall, the application of AI in SCF is mainly reflected in the iterative risk management models through data mining, deep learning, and knowledge graph technologies, which accurately identify and quantify fraud risks and assist institutions in decision-making, thus realizing the efficient operation and automated management of business (Yang et al., 2020). The application of these technologies effectively improves the risk control capabilities of financial institutions and enhances the financing capabilities of SMEs in SCF.

Finally, by analyzing the literature, we found that IoT is also a very important digital technology. Some scholars have also studied IoT, pointing out that IoT devices, such as

sensors and RFID tags, can track the location, status, and transportation conditions of goods in the supply chain in real time (Argyropoulou et al., 2024). This provides more security for funding in SCF because financial institutions can obtain accurate logistics data through IoT to ensure the existence and status of goods and reduce the risk of assessing the value of pledged goods. It has also been noted that with real-time data from IoT devices, firms can more accurately manage inventory, transportation, and delivery times, which in turn reduces inventory holding costs and the risk of supply chain disruptions (Yang et al., 2020).

Mapping the Main Variables of Digital Technologies that Affect the Performance of Supply Chain Finance

Digital technology plays a crucial role in enhancing the performance of SCF for small and medium enterprises (SMEs) by significantly reducing information asymmetry. Improved information transparency allows financial institutions to access real transaction data, leading to better credit ratings and reduced risk management costs (Song et al., 2023). Technologies such as big data analytics and artificial intelligence facilitate timely information sharing between SMEs and financial institutions, thereby decreasing the likelihood of defaults and alleviating financing bottlenecks (Han & Deng, 2020; Liu & Li, 2022).

Moreover, digital technologies enhance the credit quality of SMEs by optimizing resource allocation and increasing productivity. Research indicates that these technologies not only improve SMEs' repayment abilities but also foster a positive credit culture through enhanced information symmetry (Mao et al., 2024; Lu & Xu, 2021). By automating production processes and managing resources effectively, digital technology increases the willingness and capacity of SMEs to repay loans, ultimately improving SCF performance (Han et al., 2024).

The collaborative potential facilitated by digital platforms is another key advantage for SMEs. Such platforms enable better cooperation with upstream and downstream partners, enhancing resource sharing and optimizing operational efficiency (Banerjee et al., 2021). The integration of blockchain technology further promotes collaboration by improving information sharing among supply chain members, thereby increasing the flexibility and responsiveness of the supply chain (Lu et al., 2023). This synergy reduces fund retention time, leading to improved turnover efficiency and greater market competitiveness for SMEs (Song et al., 2024).

Digital technology also contributes to lowering transaction costs by minimizing the number of intermediaries in SCF. Smart contracts and automated processes streamline transactions, allowing SMEs to allocate more resources toward market expansion (Song, Han & Liu, 2022). Furthermore, these technologies enhance operational efficiency by optimizing production processes and inventory management, resulting in reduced costs for enterprises (Banerjee et al., 2021).

In terms of risk management, digital technologies mitigate supply chain disruption risks by improving cash flow management and providing real-time monitoring of capital flow and logistics (Lu et al., 2024). When issues arise in the supply chain, digital platforms can promptly alert SMEs, enabling quick adjustments and enhancing their competitiveness (Song, Tao & Yang, 2022). Additionally, real-time visibility into funds and logistics helps SMEs navigate complex supply chain challenges, significantly reducing operational risks (Wang et al., 2024).

Finally, digital technologies enhance financing efficiency by automating the SCF process and expediting capital turnover (Zheng et al., 2022). Traditional SCF methods often involve lengthy manual processes; however, automation allows for rapid approvals and real-time risk monitoring, enabling SMEs to secure necessary funds more swiftly (Yang et al., 2020). This efficiency is vital for SMEs aiming to respond quickly to market changes and capitalize on emerging opportunities (Soni et al., 2022).

Overall, the integration of digital technology into SCF not only improves information transparency and credit quality for SMEs but also fosters collaboration, reduces costs, enhances risk management, and accelerates financing efficiency. As digital transformation continues to evolve, its potential to revolutionize SCF practices for SMEs is increasingly evident.

Conclusion

Digital technologies hold significant promise for enhancing SCF performance among SMEs. However, several critical areas require further investigation. Despite existing research on blockchain applications, its specific role—especially regarding the consensus mechanism—in improving SCF remains underexplored (Hung et al., 2020). Future studies should delve into how to effectively leverage blockchain technology to enhance the stability and efficiency of SCF, addressing challenges such as high interest rates, information asymmetry, and moral hazards in financing.

Moreover, the digital transformation of SCF faces notable challenges. Regions in China with underdeveloped digital infrastructure hinder SMEs' adoption of digital technologies (Kucukaltan et al., 2022). Additionally, a shortage of skilled digital professionals within SMEs restricts their ability to implement these technologies effectively (Nuseir et al., 2024). Future research should focus on strategies to bolster the digital capabilities of SMEs and investigate methods to promote digital technology adoption in these areas.

Policy recommendations are crucial for overcoming these obstacles. Governments should prioritize the improvement of the credit environment for SMEs, particularly by encouraging blockchain technology adoption. Financial subsidies and tax incentives can effectively lower SMEs' investment costs in digital technologies, thereby enhancing their supply chain performance.

Investing in digital infrastructure is equally important. Establishing a secure and efficient data network will support the data processing needs of SCF, while developing data security standards will safeguard enterprise and customer privacy. Such initiatives can create an enabling environment for digital transformation in SMEs.

In summary, collaboration between government and enterprises is essential to promote the efficient development of Chinese SMEs in SCF through policy support and technology application. Future research should explore specific challenges associated with implementing digital technologies and identify best practices to foster continuous progress in the field. This collective effort will ultimately drive the advancement of SCF practices among SMEs, enhancing their competitiveness in the market.

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