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The Role of Artificial Intelligence in Supply Chain Finance in the Context of Industry 5.0: A Systematic Literature Review †

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Abstract: This study conducts a systematic literature review based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) process. The Scopus database is our main source of data, and our data analyses comprised bibliometric, systematic, and advanced analyses conducted with the help of VOSviewer. The analysis pinpoints the various roles played by AI in SCF: the strengthening of supply chain resilience and management, especially in times of crises like the COVID-19 pandemic; the convergence of sustainability performances via better relationships with suppliers; the effective management of risks by anticipating distress and fraud; improvements in working capital and supply chain efficiency; and tracking supply chain activities while on the go with IoT (Internet of Things). However, the following major setbacks are also observed: implementation challenges, large initial investments, resistance to change, a dearth of expertise in AI, security and privacy concerns, challenges in the integration of systems, the reliability of the data's quality, etc.

Keywords: artificial intelligence; supply chain finance; Industry 5.0; risk management; sustainability; Internet of Things

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1. Introduction

For several years, the world has been steadily transitioning toward an increasingly digital landscape. In this context, Industry 5.0 has emerged as a forward-looking model that is widely recognized as being the next step in industrial evolution [1,2]. Unlike its predecessor, Industry 4.0—which emphasized automation, digitalization, and the integration of cyber and physical systems—Industry 5.0 places a stronger focus on collaboration between human intelligence and advanced technologies [3]. At its core, Industry 5.0 aims to leverage human creativity and decision-making capabilities alongside the precision, efficiency, and analytical power of intelligent machines. Its priorities include promoting sustainable, resource-efficient production by making use of human judgment; ensuring synergy between humans and machines to enable more personalized and adaptive processes; and encouraging its widespread adoption through cooperative networks involving small enterprises, academic institutions, and research centers [4].

A key enabler of Industry 5.0 is artificial intelligence (AI), which offers a range of benefits for industrial operations. AI facilitates predictive analytics that can optimize production processes and enable preventive maintenance, thus minimizing equipment downtime [5]. It also supports dynamic, real-time adjustments in production lines to better align with individual customer needs—enabling mass customization rather than standard

mass production [6]. Moreover, AI significantly enhances supply chain management by providing greater visibility and enabling faster, data-driven decisions, which ultimately reduce inefficiencies and waste [7]. The integration of AI allows businesses to increase their productivity and profitability while improving their agility and responsiveness to shifts in market demand. These capabilities are essential for maintaining a competitive advantage, particularly in sectors such as light manufacturing [8,9].

Despite growing interest in supply chain finance (SCF), the specific role of AI within this domain remains underexplored. Several scholars have emphasized the need for more focused research on the intersection of AI and supply chain management (SCM) [10,11]. This study builds on earlier work by Tunca & Zhu [12] and Wuttke et al. [13], which highlighted the importance of deeper investigations into SCF and its network dynamics. In particular, it addresses the underexamined potential of AI to enhance SCF performance under varying conditions and to generate complementary effects [14]. Additionally, Pawlicka & Bal [15] have pointed out two notable gaps in the literature from: the limited research on both sustainable SCF (SSCF) and its connection to AI, which underscores the need for more targeted inquiry in this area.

To address this gap, the present study conducts a systematic literature review focused on the role of AI in SCF within the framework of Industry 5.0. The review follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology. Data were retrieved from the Scopus database, with the search restricted to documents published between 2016 and 2023. A total of 115 relevant publications were analyzed to synthesize current knowledge, identify key thematic areas, and uncover research gaps. This comprehensive review provides a robust foundation for understanding how AI can contribute to SCF and offers practical insights for future research and implementation.

2. Methodology and Methods

2.1. Approach and Method

This study employs a systematic literature review (SLR), which is a structured method designed to address clearly defined research questions by applying a transparent and replicable process for identifying, selecting, and critically appraising relevant studies. SLRs are recognized as original research due to their rigorous methodological foundation [16].

To guide the review process, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was adopted. Originally developed by Liberati et al. [17], PRISMA was created to improve the clarity and transparency of reporting, particularly in health sciences. The updated 2020 guidelines introduced enhancements in its structure and reporting, facilitating its broader adoption across disciplines. The PRISMA methodology was chosen for this study as it aligns well with the objective of examining the role of artificial intelligence (AI) in supply chain finance (SCF) within the context of Industry 5.0.

2.2. Data Collection and Sampling

The data collection and sampling followed the PRISMA protocol (Figure 1). The initial search was conducted using the Scopus database, yielding 865 records. These were filtered by publication year and subject area, reducing the total to 528. Non-English and inaccessible documents were excluded, leaving 382 entries. A thorough screening of titles, abstracts, keywords, and full texts further narrowed the dataset to 129 studies, of which 115 were deemed eligible and included in the final review.

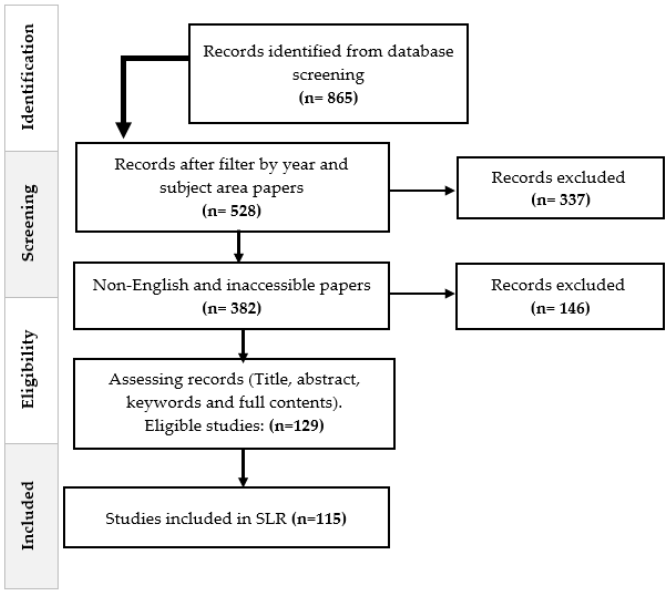


Figure 1. PRISMA research protocol.

Table 1 summarizes the structured approach used for data retrieval, including keyword selection, screening steps, and inclusion/exclusion criteria. The search terms included combinations of "artificial intelligence" or "AI", "supply chain finance", and "Industry 4.0" or "Industry 5.0", with these terms in targeted article titles, abstracts, keywords, and main texts. The exclusive use of the Scopus Elsevier database ensured a comprehensive and high-quality literature base. The inclusion criteria required the sources to be peer-reviewed articles, reviews, conference papers, book chapters, or books published between 2016 and 2023, written in English, and addressing the intersection of AI and SCF. The exclusion criteria eliminated documents outside the specified date range, on unrelated subject areas, theses or dissertations, and those lacking a clear focus on the core topics. This selection process ensured the final dataset's relevance, quality, and alignment with the research objectives.

Table 1. Data collection codes and criteria.

Keywords	(ALL ("Artificial intelligence" OR "AI") AND ALL ("Supply Chain finance") AND ALL ("Industry 4.0" OR "Industry 5.0"))	
Scanned items	Article title, Abstract, Keywords	
Database	Scopus Elsevier	
Inclusion criteria	Document type	Article, review, conference paper, book chapter, book
	Objectives	All studies that address AI and supply chain finance
	Language	Articles published in English on the topics of AI and supply chain finance
Exclusion criteria	Year	Articles published outside the date range of 2016 to 2023 were excluded
	Subject area	Papers beyond the subject area were excluded
	Type of document	Thesis and dissertations
	Objectives	Any article that does not focus broadly on AI and supply chain finance

2.3. Data Analysis

In the analysis phase, a combination of bibliometric and content analyses was conducted to explore the literature on AI in SCF within the Industry 5.0 framework. The bibliometric analysis included (1) annual publication trends (Figure 2), showing the evolution of interest over time; (2) the geographic distribution of contributions by country (Figure 3); and (3) document types and their distribution (Table 2), illustrating the diversity of the sources and disciplinary engagement.

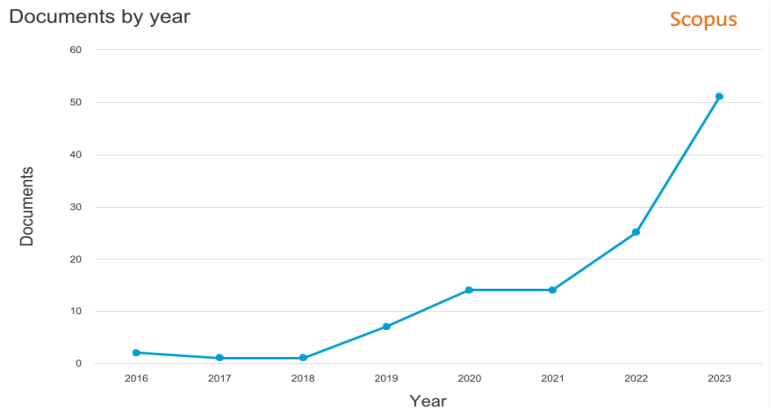


Figure 2. Documents by year.

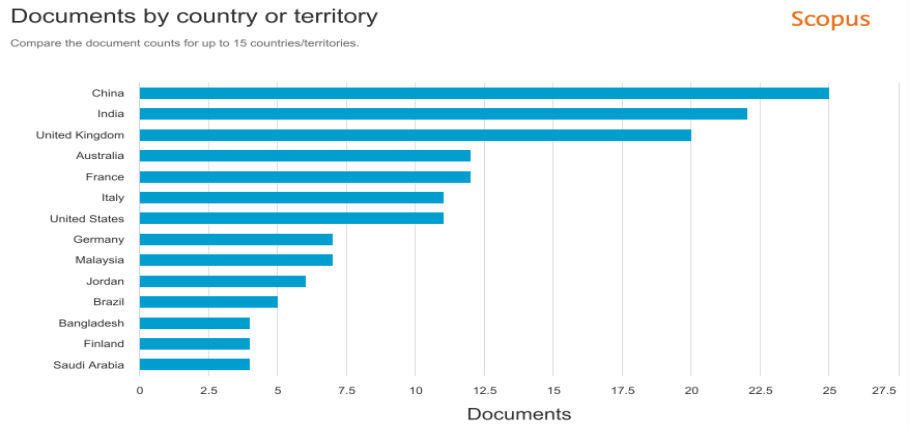


Figure 3. Documents by country.

Table 2. Documents by type.

Document Type	Documents	Frequence (%)
Article	45	39%
Conference Paper	36	32%
Book Chapter	14	12%
Review	9	8%
Book	7	6%
Conference Review	4	3%
Total	115	100%

To gain deeper insight into the emerging themes and recurring concepts in this area, a targeted analysis of the 115 selected documents was performed using VOSviewer version 1.6.20, a software tool for constructing and visualizing bibliographic networks.

This enabled the identification of frequently occurring keywords and their relationships, which are visualized in Figures 4 and 5.

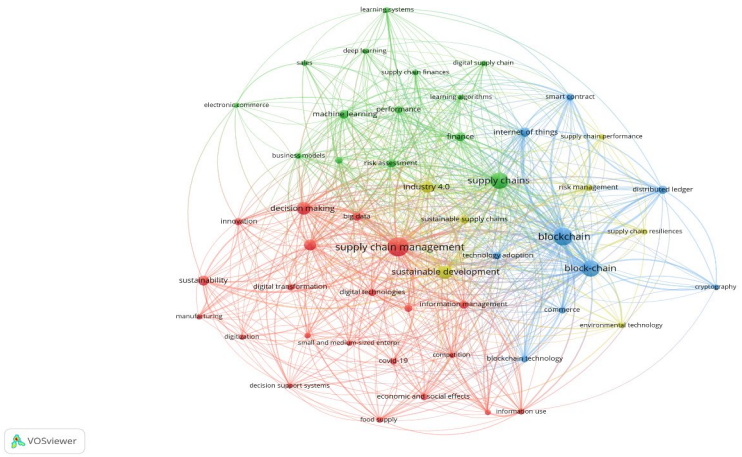


Figure 4. Density visualization.

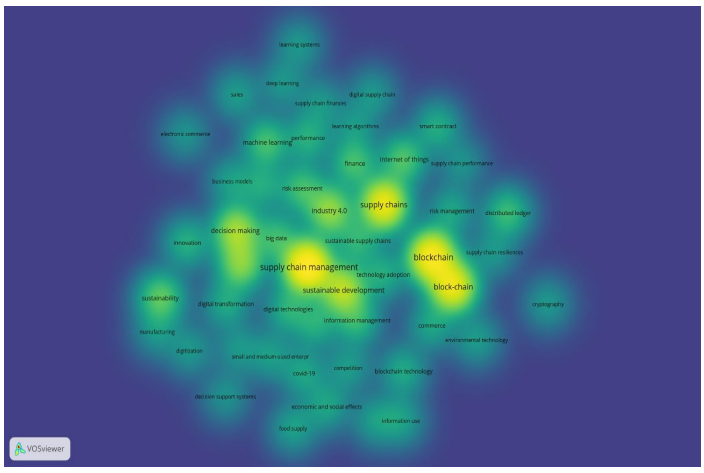


Figure 5. Thematic network analysis.

3. Results

The results section begins by presenting the findings from the bibliometric and descriptive analyses.

3.1. Bibliometric Analysis

3.1.1. Year of Publication

Figure 2 indicates a rising trend in the number of papers published, with the number of papers published apparently increasing significantly from 2016 up to the present year (2023). The data reveals a marked increase in research interest and output related to the role of AI in SCF within the context of Industry 5.0. Notably, the year 2023 saw the highest production with 51 documents (n = 51), followed by 2022 with 25 documents (n = 25).

3.1.2. Documents by Country

Figure 3 shows the distribution of documents by country, reflecting the global contributions to research on the role of artificial intelligence in SCF within the context of Industry 5.0. China leads with the highest number of publications, at 24 documents, followed closely by India, with 22 documents. The United Kingdom also shows significant

research output, with 18 documents, followed by Australia, France, and the United States, which each contributed 14 documents.

3.1.3. Documents by Type

The distribution of documents by type, as detailed in Table 2, shows the variety of the sources contributing to the research on artificial intelligence in SCF within the context of Industry 5.0. Articles make up the largest category, with 45 documents, accounting for 39% of the total. This is followed by conference papers, which make up 36 documents (32%). Book chapters contribute 14 documents (12%), while reviews account for 9 documents (8%). There are also 7 books (6%) and 4 conference reviews (3%).

3.2. Advanced Analysis

3.2.1. Density Visualization

The density map (Figure 4) highlights areas of concentrated research activity. Core themes include "supply chain management", "blockchain", "decision-making", and "supply chains". These dense regions reflect the central role of digital technologies and strategic frameworks in research on AI in SCF. Other emerging keywords—such as "Industry 4.0", "sustainable development", and "risk management"—indicate growing interdisciplinary interest.

3.2.2. Thematic Network Analysis

The thematic network analysis (Figure 5) reveals clustered research topics. The green cluster groups themes like "supply chain management", "Industry 4.0", and "Big Data". The blue cluster centers around "blockchain" and related technologies. The red cluster emphasizes "decision-making", "sustainability", and "digital transformation". These interlinked topics showcase the multifaceted and interconnected nature of current research on AI and SCF.

Taken together, these visual analyses underline the relevance of strategic decision-making, digital technologies, and sustainability considerations in shaping the future of supply chain finance within the broader Industry 5.0 paradigm.

4. Conclusions, Practical Implications, and Future Research Directions

In the context of Industry 5.0, this paper presents a comprehensive investigation into how artificial intelligence (AI) impacts supply chain finance (SCF). Drawing on a systematic literature review, the study highlights both the advantages and limitations of incorporating AI into SCF processes. Evidence from recent global disruptions, such as the COVID-19 pandemic, underscores AI's critical role in enhancing supply chain resilience and management. This resilience is largely supported by the continuity and stability of supply chain operations.

AI also contributes significantly to sustainability objectives by fostering stronger relationships between supplier and enabling more collaborative interactions. It supports the achievement of long-term environmental and financial sustainability goals. Moreover, AI's ability to predict the financial distress of suppliers and detect fraudulent activities enhances risk management, ensuring the integrity of transactions and reducing exposure to financial risks. Additionally, AI improves supply chain efficiency and optimizes the management of working capital, which is vital for achieving both financial and operational excellence.

Through technologies such as the Internet of Things (IoT), AI enables the real-time tracking of supply chain activities, thereby increasing visibility and enabling timely decision-making and proactive management. However, this study also identifies several barriers to successful AI adoption in SCF. These include the complexity and high initial

costs of implementing AI technologies, limited expertise among supply chain professionals, and resistance to innovation. Concerns related to data privacy and security must also be carefully addressed, particularly given the sensitivity of financial information.

Furthermore, the challenges associated with integrating AI into existing systems require strategic planning and careful execution. The quality and availability of data also significantly affect the performance of AI algorithms, making robust data management practices essential.

In summary, while AI presents significant opportunities for advancing SCF within the Industry 5.0 framework, realizing its full potential depends on effectively addressing the challenges related to its implementation. This study provides valuable insights for both academics and practitioners, guiding future developments in SCF that leverage modern AI technologies.

Future research should further explore specific intersections between AI, SCF, and financial performance. Key areas could include AI's role in financial risk assessment and forecasting within supply chains. Moreover, evolving drivers of business success—particularly "soft" factors such as customer service and marketing—are likely to become increasingly influential in shaping future supply chain strategies.

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