

Supply chain competitiveness through agility and digital technology: A bibliometric analysis



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ABSTRACT

Supply chain competitiveness and agility are matured areas in supply chain management. While there is an ongoing evolution in digital technology alongside supply chain competitiveness and agility, the literature appears to have limited bibliometric reviews on how digital technology impacts these aspects. This study examines supply chain competitiveness with bibliometric analysis, focusing on the critical elements of supply chain agility and the impact of rapidly advancing digital technologies. The study bridges the gap between management and technology disciplines. Employing the PRISMA methodology, 147 scholarly articles were meticulously selected and analysed, adopting a multifaceted analytical approach that combines bibliometric and descriptive analyses. This thorough literature synthesis reveals a profound and intricate connection between supply chain agility and digital technology, underscoring their joint significance in fostering competitive advantage within the dynamic business landscape. This investigation contributes to the existing body of knowledge by identifying seven distinct clusters, offering a detailed map of the current research landscape. This study charts a course for future academic inquiries into this critical area and provides valuable insights for practitioners. It underscores the importance of integrating agile supply chain practices and digital technologies to maintain and enhance competitive positioning in today's fast-paced business environment.

1. Introduction

In today's rapidly changing business landscape, maintaining a competitive edge hinges increasingly on enhancing both supply chain agility (SCA) and supply chain competitive performance (SCCP) [84, 92]. SCA, defined as the successful exploration of competitive bases through the integration of reconfigurable resources and best practices in a knowledge-rich environment to provide customer-driven products and services in a fast-changing market environment ([113], p. 37), is pivotal in enabling organizations to adapt to market changes and evolving customer demands swiftly. Recent research suggests a notable shift in the focus of competition from individual companies to their supply chains, underscoring the paramount importance of optimizing SCCP for business success [1,37,46,89,101]. To effectively navigate the complexities of modern markets, supply chain managers must continually innovate and adapt their operations, especially in response to rapid technological advancements and intense market competition [13]. The absence of agility in the supply chain can critically weaken a company's

competitiveness, particularly in the manufacturing sector Baah et al. [13]. Thus, improving or maintaining SCCP is more crucial than ever in a context where supply chains are central to competitive dynamics [37].

Digital technology (DT) is pivotal in enabling effective supply chains and facilitating companies' quick response to market changes. Numerous empirical studies have established a link between DT and SCA [109,34,38,48,71,72]. Similarly, many studies have examined the connection between DT and SCCP [106,108,115,13,14,4,40,60,76,90, 102]. Despite these findings, scholars have called for further research to understand comprehensively how DT enhances both SCA and SCCP [32, 33,41,8]. Seyedghorban et al. [93] observe that the current literature lacks a well-defined categorization and roadmap for jointly studying SCA, SCCP, and DT. This study aims to fill this gap by addressing three objectives set against a multidisciplinary backdrop that spans supply chain management (SCM), operations management, computer science, engineering, and economics. Contrary to previous studies that focused on specific segments of SCM or analysed singular journals or institutions, our approach takes a more holistic route. Thus, this review delves into

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the broader spectrum encompassing SCA, SCCP, and DT.

The first objective is to comprehensively review SCA, SCCP, and DT. This review enables researchers to trace the evolution of these fields and identify existing knowledge gaps. The second objective is to categorize existing studies into related yet distinct sub-disciplines, thereby highlighting the most critical areas within the field of SCM that will allow scholars and practitioners to evolve. The third objective is to provide a valuable roadmap for future researchers who wish to delve deeper into the intricacies of SCA, SCCP, and DT.

This study employs bibliometric analysis as a critical tool to pinpoint research trends and hotspots across different areas. Its application has been particularly fruitful in SCM, as evidenced by previous research [111,44,6,74]. Contrary to previous studies that focused on specific segments of SCM or analysed singular journals or institutions, our approach takes a more holistic route. The researchers delve into the broader spectrum encompassing SCA, SCCP, and DT. As this paper seeks to map out the current landscape and trace the evolutionary trajectory in these areas, bibliometric analysis was used to spotlight contributions from prominent regions, journals, and industries, providing a comprehensive view of the interconnected fields of SCA, SCCP and DT. By meticulously analysing keyword trends and associations, it aims to sketch a vivid picture of the current research state, emerging frontiers, developmental trajectory, and the prevailing theoretical paradigms in SCA, SCCP, and DT. The structure of this paper is designed to facilitate a thorough understanding of the subject matter. It begins with a methodology section that outlines the research strategies employed, the screening of articles, and the analytical tools used. Subsequent sections employ various analytical techniques to scrutinize the selected articles, including descriptive, bibliometric, and content analysis. These sections also discuss the findings and offer a visual representation of SCA, SCCP, and DT, considering both micro and macro factors. The paper then concludes with discussions on the study's contributions, directions for future research, and any limitations encountered.

2. Methodology

In October 2022, a three-stage selection process was carried out in alignment with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [83] guidelines, which set the standard for executing systematic literature reviews. The adaptability of bibliometric analysis is showcased in its widespread application across various fields, encompassing diverse disciplines, industries, decision-making frameworks, and cutting-edge technologies. This method has proven its mettle in an array of scholarly reviews, spanning from management and economics [77] to financial literacy [51], scholarly publications [9], and even in the realm of artificial intelligence [35]. Its application has been particularly fruitful in SCM, as evidenced by previous research [111,44,6,74].

The process begins with the identification of relevant resources. The journals are from widely utilized and accessible databases, including EBSCO, Emerald, Taylor & Francis, and Google Scholar. The next step involves defining the resources by searching within these journal databases. Formulating precise keywords is critical for narrowing the scope of the literature search. Keywords instrumental in retrieving pertinent publications are "Agile," "Agility," "Supply Chain," "Technology," "IT" (Information Technology), "ICT" (Information and Communication Technology), "Digital," "Digitization," "Performance," and "Competitive." Combinations of these words used are "Agil*" AND (Competi* OR Performance)", "Agil* AND (Digita* OR Technology OR ICT)", and "Digital AND (Competi* OR Performance)".

These criteria, outlined in **Table 1**, were rigorously adhered to refine the selection of articles. The application of inclusion and exclusion criteria, as specified in **Table 1**, resulted in a reduced number of articles for consideration.

Following the initial identification of resources and the selection of keywords, the next phase is the screening and assessing eligibility. This

Table 1

Exclusion and inclusion criteria.

Include	Journal Articles Publication year 2000–2022 Articles in English Open access and have full-text papers
Exclude	Books Thesis Book chapters Conference papers

screening involves a meticulous examination of the search outcomes. The articles deemed relevant using the specified keywords are listed and detailed in **Table 2**.

Initially, a total of 779 articles were retrieved and imported into EndNote. The screening process was then implemented to remove duplicates Using EndNote, and 41 duplicate records were removed.

Subsequently, the researchers identified and filtered 432 articles specifically containing the exact phrase or combination of "Agility," "Competitiveness," and "Digital Technology". The abstracts of the articles that passed the title screening were thoroughly reviewed to ascertain their "Context = Agile supply chain + Digital Technology +Performance" AND "Supply Chain," "Discipline = Business Management." The authors conducted a detailed cross-examination of the findings to ensure accuracy and consistency. Through multiple rounds of discussion, any disagreements were resolved, and 279 articles suitable for full-text review were identified. This screening level was deemed necessary to align with the objective of our bibliometric review, which was to explore the synthesis between supply chain agility, competitive performance, and digital technology.

After the initial screening, a full-text review was conducted. During this phase, publications that met any of the following exclusion criteria were excluded:

- (1) Primary focus on Agility that did not specifically pertain to competitive performance or digital technology.
- (2) The primary focus is on digital technology but lacks agility or competitive performance context.
- (3) Content that, despite matching the keywords, was deemed irrelevant to our study's scope.

After applying these criteria, the sample was narrowed down to 147 papers. The selection process, in adherence to PRISMA [83] guidelines, is summarized in **Fig. 1**.

Comprehensively analyzing selected articles, insights into the subject domain were gained. The aim was to uncover descriptive statistics illuminating the background of the joint field of SCA, SCCP, and DT, its regional and industrial scope, and the interconnections between these factors. Additionally, content analysis was performed to delve into the fundamental concepts surrounding supply chain agility, competitive performance, and digital technology.

Furthermore, the research was complemented with bibliometric analysis. This multifaceted approach allowed me to grasp the quantitative aspects of the literature and delve deep into the qualitative factors, providing a holistic understanding of the subject matter. Various tools, such as NVivo, Microsoft Excel, and VOSviewer, were utilized for data analysis.

Table 2

Number of articles collected by database based on keywords.

	Total number of articles
EBSCO Host	239
Emerald	250
Taylor & Francis	200
Google Scholar	90
Total	779

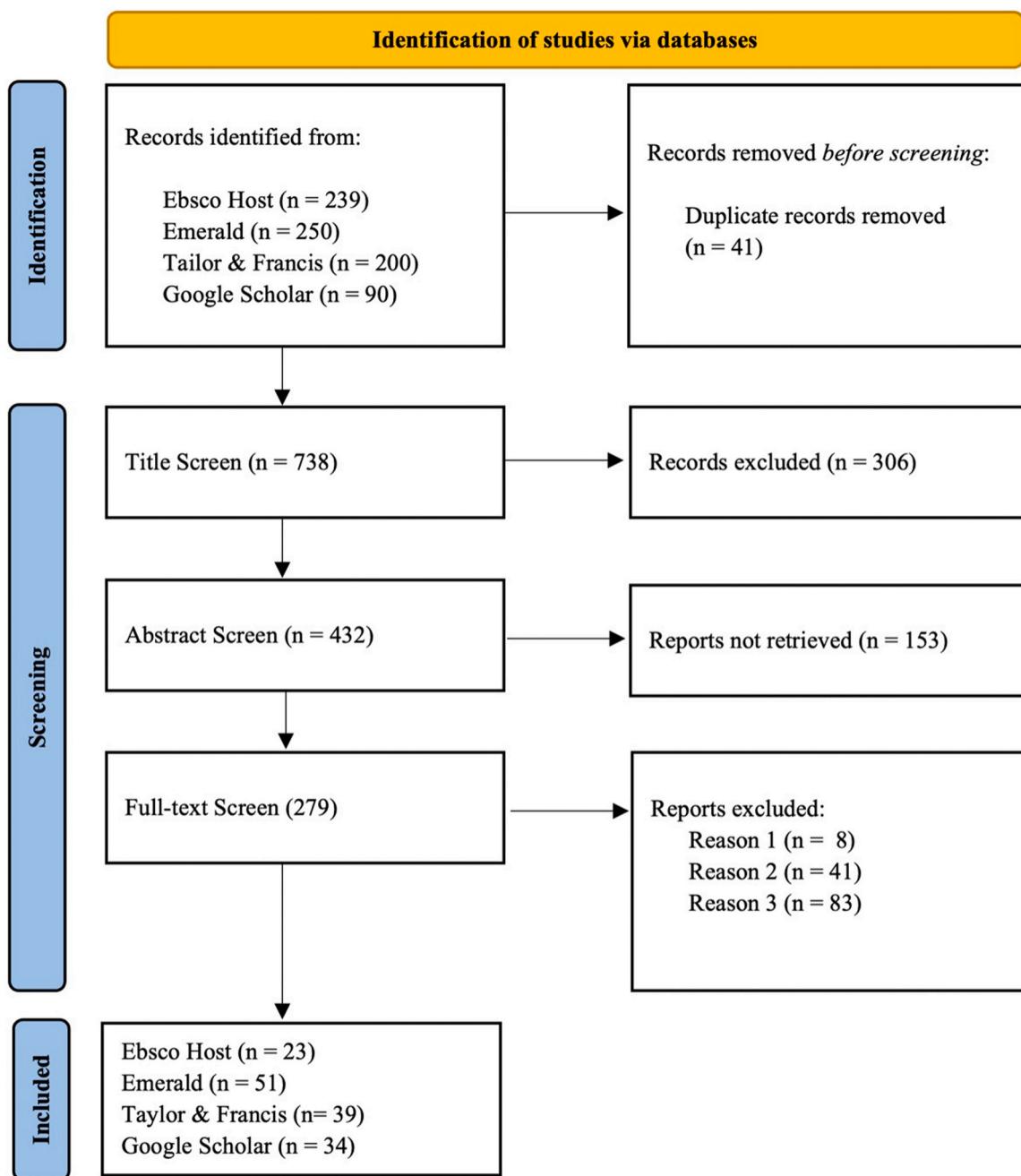


Fig. 1. Selection and screening process.

3. Analysis

This section presents the findings and discussions based on the analysis of selected articles. To analyze the content and generate visual representations, including charts, word clouds, and network analysis.

3.1. Key definitions

This chapter explores the fundamental concepts and background of SCA, DT, and SCCP. Our discussion is grounded in thoroughly analysing selected literature, offering a comprehensive understanding of these critical topics. Despite their prominence, there is a notable lack of clarity and consensus regarding these terms' precise definitions and components. This ambiguity extends to how different authors perceive and differentiate among these concepts. While some experts draw clear

distinctions between them, others use these terms interchangeably. However, a common thread acknowledged by most is that these concepts inherently involve a degree of adaptability and flexibility, which are crucial in navigating the uncertainties and volatilities of the modern business environment [95].

3.1.1. Supply chain agility

The concept of agility, particularly in its application to flexible production systems within the industrial sector, first emerged in the early 1990s as a strategic response to market volatility and unpredictability [2]. Its increasing relevance can be traced back to the diminishing importance of national boundaries and the contraction of traditional markets. This shift in the business landscape led to a heightened focus on agility, a term first popularized in 1991 by researchers at the Iacocca Institute at Lehigh University in the United States. Their work

underscored agility's significance in escalating global competition [113]. Agility, as defined by Yusuf et al. [113], encompasses,

"The successful exploration of competitive bases (speed, flexibility, innovation proactivity, quality, and profitability) through the integration of reconfigurable resources and best practices in a knowledge-rich environment to provide customer-driven products and services in a fast-changing market environment" ([113], p. 37).

Recent literature has broadened the definition of agility, emphasizing it as a business's ability to survive and thrive in a competitive and uncertain environment. This entails promptly and appropriately responding to anticipated and unforeseen changes promptly and appropriately [50,78]. Abdelilah et al. [2] further elaborate on this by describing agility as the capacity of a supply chain to demonstrate significant flexibility. This flexibility is seen as the proactive readiness of cooperating organizations to adapt to expected demand uncertainty and manage variability. Such adaptation may involve restructuring operations, reconfiguring capabilities, or realigning strategic objectives [2]. Initially, agility was conceptualized as a system endowed with exceptional internal capabilities, enabling it to rapidly adjust to the fast-changing market demands [112].

3.1.2. Competitiveness

In the current economic landscape, characterized by uncertainty, a company's ability to compete has become a critical determinant of its survival and success. The concept of "competitiveness" is diverse and context-specific, varying widely in meaning, adaptation, and achievable objectives across different companies, industries, and countries. However, there is a lack of consensus in the academic literature regarding its definition, with scholars focusing on a range of quantitative and non-price factors to assess competitiveness, especially in the manufacturing sector [55]. These factors include, but are not limited to, material and labor costs, product design, quality, innovation, and transaction costs.

Competitiveness is defined by Van Rooyen et al. [104] as the ability to sustain trade both locally and globally, highlighting its significance in today's business world. This notion is echoed by Porter [86], who argues that a company's competitiveness is reflected in its capacity to offer either lower-priced or unique goods that can command higher prices, resulting from enhanced productivity. Porter also links competitiveness to a company's ability to provide fair wages to employees and above-average returns to shareholders, necessitating a balance between quantitative (costs, prices, profits) and qualitative (quality) factors [80].

Supply chain management has become a vital strategic initiative for enhancing organizational efficiency and achieving goals like increased competitiveness. SC competitiveness, integral to a firm or industry's overall competitiveness, increasingly relies on SC processes for sustainable competitive advantage in the face of growing competition [54, 80]. It encompasses a blend of quantitative factors (such as labor cost and transport expense) and qualitative aspects (like infrastructure facilities and manufacturing standards) [17]. Metrics, including lead time performance, inventory turnover, and responsiveness to demand variability, are instrumental in evaluating a company's SC competitiveness [17]. Furthermore, SC competitiveness is the collective outcome of the efficacy of all its components – suppliers, manufacturers, and distributors [68]. Thus, achieving competitiveness across every part of the supply chain is essential for overall SC competitiveness, underscoring the importance of a comprehensive supply chain analysis to foster competitiveness.

3.1.2.1. Competitive advantage vs. competitive performance. Competitiveness and competitive performance, though distinct, are intricately linked concepts within the business realm. Competitiveness refers to various factors that enhance an entity's ability to compete effectively. These factors include elements like relative unit labor costs, exchange

rates, and the quality of products and services, as highlighted by Anca [11], Crespo Rodríguez et al. [29] O'malley and O'gorman [82]. On the other hand, competitive performance is about the tangible outcomes and achievements in competitive environments. It is shaped by elements such as customer satisfaction, market-led strategies, and efficient systems, according to Aigner and Vogel [7], Doyle and Wong [36], and Smith and Houston [97]. The importance of 'high-road' strategies, such as skills development and innovation, in achieving competitive performance [97]. Feurer and Chaharbaghi [47] suggest a comprehensive approach to defining competitiveness that incorporates factors like customer and shareholder values and the capacity for active engagement in competitive environments. The relationship between competitive advantage and performance is complex and context dependent. Grahovac and Miller [52] and Sigalas and Papadakis [96] note instances where competitive advantage and performance might not align perfectly, possibly due to market growth and internal conflicts. Conversely, Kaleka and Morgan [64] argue that competitive advantage can lead to superior performance, mainly when rooted in customer satisfaction and effective marketing strategies.

The role of marketing and resource availability in influencing performance is underscored by Doyle and Wong [36] and Christian [27]. McCarthy et al. [73] contend that competitive advantage is critical for enterprise transformation and success in the global market. Competitive performance contributes to competitive advantage, but not the only one. Majeed [70] explores the link between competitive advantage and organizational performance, highlighting competencies as crucial profitability drivers. Beatty [16] and Grahovac and Miller [52] discuss the impact of human resource management and resource value on competitive advantage and performance.

3.1.3. Digital technologies for SCM

SCM has long been recognized as crucial for efficient operations, involving the planning and controlling of physical and information flows and logistics activities with external companies. This encompasses the development of connections and shared processes between customers and suppliers, enhancing the overall efficiency and effectiveness of supply chain operations [23,63]. In recent years, SCM has become a key driver in boosting business productivity and sustainability. A strategic approach to SCM yields numerous benefits, including increased process efficiency, reduced inventory levels, improved customer satisfaction, enhanced product quality, cost reductions, and faster delivery times [28]. However, contemporary supply chains face uncertainty, high costs, complexity, and vulnerability. In response to these challenges, there is a growing necessity to adopt intelligent supply chains. These intelligent systems are underpinned by an advanced technological infrastructure integrating information and physical flows, increasing visibility, agility, and adaptability in supply chain operations.

The advent of advanced information and digital technologies has catalyzed a digital revolution within the field of SCM. This digital revolution, encompassing the implementation of digital transition technology stacks, transcends traditional business boundaries and is often referred to as DTs. DT has been transformative, developing intelligent supply chains and integrating customers more seamlessly into the supply chain ecosystem [49]. The transition from traditional supply chain practices to intelligent, digitally driven supply chains marks a significant evolution in SCM. This evolution highlights the indispensable role of SCM in modern business, where integrating physical and information flows, enhanced by digital technologies, is vital to navigating the complexities and dynamics of today's supply chain environments.

Oliveira-Dias et al. [81] categorizes DT into two distinct groups: matured and emerging. For more details, please see Fig. 2.

3.2. Descriptive statistics

This descriptive analysis aimed to categorize the articles based on criteria such as methodology, thematic focus, and geographical

Information and Digital Technologies (IDT)

Matured IDT

- Radio Frequency Identification (RFID)
- Enterprise Resource Planning (ERP)
- Advanced Manufacturing Technology (AMT)
- E-business Web Technologies

Emerging IDT

- Artificial Intelligence (AI)
- Internet of Things (IoT)
- Cloud Computing (CC)
- Big Data (BD)
- Additive Manufacturing (AM)
- Block Chain (BC)

Fig. 2. Supply chain DT classification.

distribution. This will enable us to present a structured summary of the existing literature, facilitating a more nuanced understanding of the subject matter.

The annual number of published papers is displayed in Fig. 3.

The exhibited data in Fig. 3 delineates a clear trajectory of academic output from 2005 to 2022, displaying an embryonic stage in the early years, followed by a burgeoning period, and culminating in a robust proliferation of publications towards the latter years. The initial quiescence between 2005 and 2010, characterized by a few publications, likely indicates the interconnected SCA, SCCP, and DT field's nascent status or its marginal presence in scholarly priorities. A modest uptick in the ensuing years suggests a burgeoning interest, potentially spurred by new research avenues and methodologies within the discipline. The remarkable escalation post-2016, with a pronounced spike in 2020 and 2022, points to external catalysts—perhaps the advent and integration of digital technologies within supply chains or global events such as the COVID-19 pandemic heightening the focus on supply chain resilience

and agility.

This influx of research, while indicative of a thriving academic interest, prompts a critical reflection on the substantive value of these contributions. The surge in volume necessitates discerning scrutiny to differentiate between seminal work and more perfunctory studies that may dilute the academic discourse. Additionally, the slow growth in earlier years hints at potential research lacunae that may have only recently captured academic attention, suggesting that the connected SCA, SCCP, and DT field's rapid expansion should be navigated with an emphasis on innovation and a comprehensive synthesis of past and current findings. The data signifies the context of SCA, SCCP, and DT in flux, responding to contemporary challenges and technological advancements, but it also underscores the imperative for qualitative discernment in scholarly pursuits within the context of SCA, SCCP, and DT.

The number of journal articles taken from each journal is shown in Table 3.

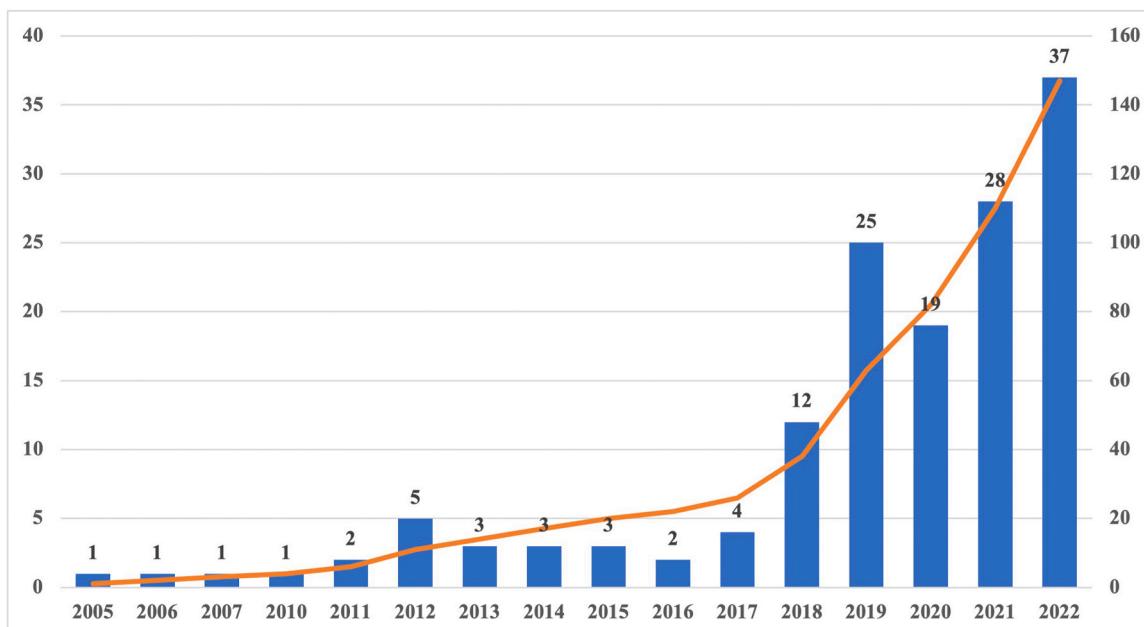


Fig. 3. Cumulative articles count from 2005 to 2022.

Table 3

Article counts by journal.

Journal name	Article count
International Journal of Production Research	20
Benchmarking: An International Journal	8
Production Planning & Control	8
Supply Chain Management: An International Journal	8
International Journal of Logistics Research and Applications	6
Journal of Manufacturing Technology Management	6
International Journal of Operations & Production Management	4
Supply Chain Forum: An International Journal	4
Management Research Review	3
Advances in Production Engineering & Management	3
Business Process Management Journal	3
International Journal of Information Management	3
International Journal of Production Economics	3
Journal of Enterprise Information Management	3
The International Journal of Logistics Management	3
Baltic Journal of Management	2
Industrial Management & Data Systems	2
Information Technology & People	2
International Journal of Advanced Manufacturing Technology	2
International Journal of Physical Distribution & Logistics Management	2
Journal of Modeling in Management	2
Kybernetes	2
Modern Supply Chain Research and Applications	2
Others	46 ^a

^a Refer to the [Appendix](#) for the list of journals under the 'Other' category.

Table 3 presents a distribution of journal articles across various publications within SCA, SCCP, and DT. A critical analysis reveals a significant concentration of articles in a select few journals, with the 'International Journal of Production Research' leading with 20 articles. This journal's prominence could indicate its broad reach and authoritative presence in production research, which aligns closely with supply chain issues. The presence of eight articles each in 'Benchmarking: An International Journal,' 'Production Planning & Control,' and 'Supply Chain Management: An International Journal' suggests these journals substantially impact the discourse surrounding supply chain management. However, it is noteworthy that the distribution is not even, and several journals contribute only a few articles each. This distribution could reflect a specialization within the context of SCA, SCCP, and DT or a possible inclination of researchers to target specific journals that align more closely with their research focus or are more prestigious within their academic networks. The significant "Others" category, encompassing 46 articles, points to a wide dissemination of research across various platforms. While this could indicate a healthy diversity in publication venues, it might also suggest a joint fragmentation in the SCA, SCCP, and DT fields, which could hinder the consolidation of research findings and theoretical advancements.

The analysis suggests an interconnection of SCA, SCCP, and DT fields with a strong presence in specific key journals, which likely act as flag bearers for the discipline. However, the wide range of journals and the many articles categorized under "Others" underscores the importance of a more integrative approach to research dissemination. This could enhance the cross-fertilization of ideas and ensure that valuable insights are more broadly shared and synthesized across the academic community in SCM and its allied areas.

Table 4 shows the classification of selected articles by the research

method employed for each project.

Table 4 categorizes research articles by methodology, revealing a distribution favouring quantitative approaches comprising 51 % of the articles. This predominance suggests that empirical, data-driven research focusing on statistical analysis and quantifiable results is highly valued within this context. The ability of quantitative methods to offer generalizable findings may be driving this preference, indicating a trend toward validating hypotheses and theories with measurable evidence. Qualitative research accounts for 46 % of the articles, underscoring the SCA, SCCP, and DT field's recognition of this approach's depth and richness in understanding complex phenomena. Qualitative studies, emphasizing contextual detail, narrative descriptions, and the exploration of meanings and experiences, provide insights that numbers alone cannot offer. This near-equitable representation of qualitative research illustrates the SCA, SCCP, and DT field's acknowledgement that numerical data must be complemented by rich, descriptive insights to capture the full scope of the subject matter. Mixed methods research, however, constitutes a mere 3 %, which could signal a missed opportunity. Mixed methods combine the strengths of both qualitative and quantitative approaches, potentially providing a more holistic understanding of research questions. Their scant representation might suggest a reluctance to engage with the complexities of integrating diverse methodologies or possibly reflect the challenges in publishing such work due to its demanding nature.

The critical takeaway from this analysis is the need for a balanced methodological approach in research. While the current trend leans toward quantitative methods, the substantial presence of qualitative research indicates a joint field of SCA, SCCP, and DT that values multiple perspectives. However, the markedly lower percentage of mixed-methods research indicates an area ripe for development. Encouraging mixed-methods studies could foster a richer, more nuanced understanding of the multifaceted issues within SCA, SCCP, and DT, bridging the gap between numerical data and the lived realities underpinning them.

Sub-classification of articles based on the research type is demonstrated in **Table 5**.

As depicted in **Table 5**, the distribution of research articles by type provides a snapshot of the methodological preferences within the joint field of SCA, SCCP, and DT. The predominance of empirical research, constituting 59 % of the articles, signifies a strong emphasis on data-driven inquiry and hypothesis testing within the existing body of literature. This inclination toward empirical studies, which typically yield quantifiable and often generalizable results, may reflect the SCA, SCCP, and DT field's commitment to evidence-based conclusions and a positivist research paradigm. Case studies, however, account for 15 % of the research, indicating a considerable interest in in-depth, contextual investigations of instances or phenomena. The case study's strength lies in its detailed exploration of complex issues, allowing for a nuanced understanding that broad, empirical approaches may sometimes overlook. Despite their rich insights, the relatively lower percentage of case study research could suggest a lesser valuation of this methodology in the broader research community or a more selective application appropriate for exploratory research rather than theory testing. Systematic literature reviews (SLRs), representing 27 % of the articles, underscore the academic community's recognition of the importance of synthesizing and evaluating existing research. SLRs provide a critical literature assessment, identifying gaps, consolidating knowledge, and often setting the direction for future research endeavors. The substantial proportion of

Table 4

Article classification by research method.

Research method	Article count	%
Mixed	5	3 %
Qualitative	67	46 %
Quantitative	75	51 %

Table 5

Sub-classification by research type.

Research type	Article count	%
Case Study	22	15 %
Empirical Research	86	58 %
SLR	39	27 %

SLRs might reflect an ongoing effort to build a coherent body of knowledge and to ensure that research efforts are aligned with the current understanding and debates within the context of SCA, SCCP, and DT.

Critically, the data suggests a joint field of SCA, SCCP, and DT leaning towards empirical methodologies, with a significant, though lesser, acknowledgement of the value of in-depth qualitative insights offered by case studies and the evaluative and directive role of SLRs. This methodological distribution highlights the SCA, SCCP, and DT field's current priorities and potential areas for methodological expansion. The relatively lower representation of case studies could indicate a possible area for growth, encouraging researchers to delve deeper into context-specific investigations that complement the broader empirical findings. The balance between empirical research, case studies, and SLRs is crucial in fostering a diverse and robust research landscape that is evidence-based, richly descriptive, and critically informed.

Fig. 4 denotes the article distribution by country region.

The pie chart in **Fig. 4** delineates the geographical distribution of scholarly articles, offering a revealing lens through which to assess the global research landscape within a joint field of SCA, SCCP, and DT. Europe leads with 29 % of articles, indicative of a robust research infrastructure and a potentially conducive academic environment. The high output could also reflect substantial funding opportunities and collaborative networks that bolster research productivity. Following Europe, South Asia contributes 18 % of the publications, suggesting a significant and growing research engagement in this region, possibly driven by economic growth and an increasing emphasis on academic excellence. With 18 %, the Americas also demonstrate a robust research output, which well-established academic institutions and substantial research investment may underpin. Notably, East Asia and Southeast Asia collectively account for 14 % of the articles, revealing a notable presence in the research domain that could be associated with rapid technological advancements and increasing global integration in these regions. The Middle East, accounting for 11 %, suggests an emergent and active research community, potentially spurred by recent educational reforms and investment in research and development. While relatively modest, the contributions from Africa (5 %) and Latin America (3 %) signal engagement in the scholarly discourse, which various factors, including limited access to resources, research funding, or other

socio-economic challenges, may influence. Australia's contribution stands at 3 %, which may reflect a focus on quality over quantity in research outputs or indicate niche areas of specialization within the country's academic sectors. The mere 1 % contribution from West Asia could point to underrepresentation in the global research dialog, potentially due to geopolitical challenges, resource constraints, or emerging research infrastructures.

This data underscores regional strengths and disparities in research contributions and raises critical questions about the factors influencing these patterns. It suggests increased support and collaboration to bolster research capacities in underrepresented regions and highlights the importance of global academic inclusivity. Enhancing diversity in research perspectives is vital for addressing the multifaceted challenges of our interconnected world, and the data suggests there is room for growth in fostering a more balanced global research ecosystem.

Table 6 demonstrates the article distribution by industry.

Table 6 categorizes article distribution by industry sector and offers a compelling view of the research focus within these domains. With 46 % of the articles, manufacturing is undeniably the most researched sector, which may reflect its critical role in economic development and innovation. This focus is supported by the extensive literature that emphasizes the importance of manufacturing in driving technological advancement and productivity gains. The 'Multiple Sectors' category, comprising 24 % of the articles, suggests an interdisciplinary research approach, indicating the complexity and interconnectivity of modern

Table 6

Article counts by industry sector.

Industry sector	Article count	%
Manufacturing	68	46 %
Multiple Sectors	35	24 %
Generic Study	23	16 %
Services	9	6 %
Agriculture	3	2 %
Distribution	3	2 %
Construction	2	1 %
Energy	2	1 %
Pharmaceutical	1	1 %
Software	1	1 %

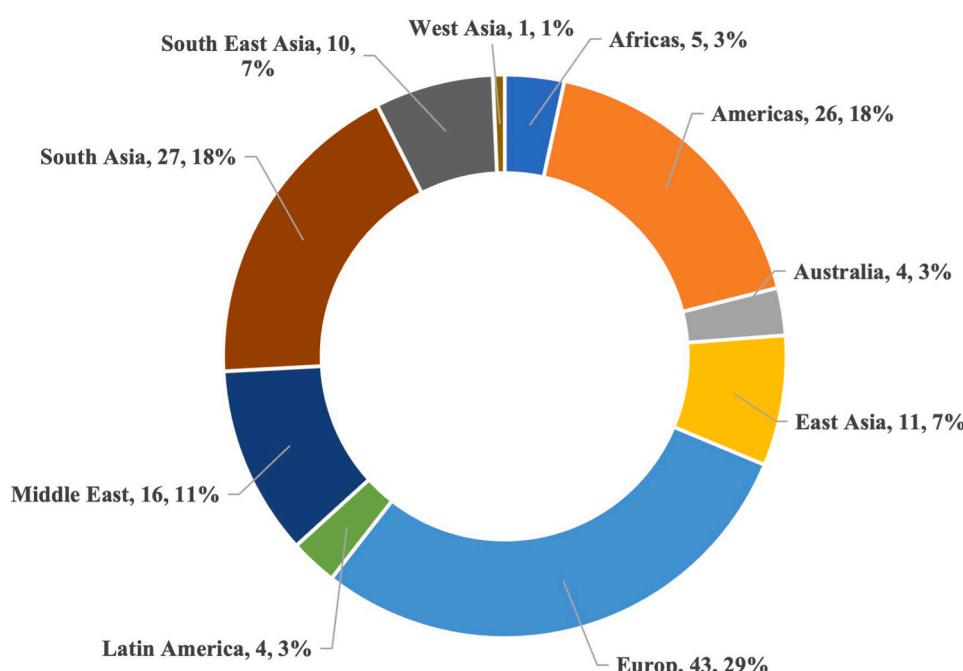


Fig. 4. Article classification by country region.

industries. It may also reflect the need to address common challenges that span various sectors, such as supply chain management, sustainability, and digital transformation. The 'Generic Study' category accounts for 16 % of the articles, pointing to a body of research that seeks to establish overarching principles or models not confined to a specific industry. This could include theoretical development or methodological studies that provide a foundation for more specialized research.

Services, with 6 % of articles, may appear underrepresented, which could be a research gap considering the growing significance of the service sector in global economies. Agriculture, Distribution, Construction, Energy, Pharmaceuticals, and Software industries show minimal representation, ranging from 1 % to 2 %. This could indicate either a nascent stage of research within these sectors or a need for increased scholarly attention, given the importance of these industries in societal advancement and global sustainability efforts.

While manufacturing dominates the research landscape in volume, studies across multiple and generic sectors underscore the multifaceted nature of contemporary industry challenges. However, the relative scarcity of research in sectors like Services, Agriculture, and Pharmaceuticals suggests potential areas for future investigation, particularly given their impact on the global economy and human well-being.

3.3. Use of theories

In SCA, SCCP, and DT, two foundational theories often serve as the theoretical bedrock: the Dynamic Capability View (DCV) and the Resource-Based View (RBV), as Table 7 outlines.

According to DCV theory, businesses must continually evolve their resources and strategies to stay competitive and adapt to fluctuating market conditions. This perspective suggests that companies can proactively anticipate market trends, innovate solutions, and reconfigure their resources to gain a competitive edge [12,15,45,91]. On the other hand, RBV posits that a firm's existing resources and competencies are the primary drivers of its competitive advantage. This theory emphasizes that if a company's resources and capabilities are valuable, rare, inimitable, and non-substitutable, it can maintain a competitive edge over its rivals [3,5,56]. The RBV framework also underscores the concept of dynamic capabilities, which include an organization's ability to recognize opportunities, adapt its resources, and create new capabilities.

The researchers argue that both RBV and DCV theories share similarities in emphasizing the role of routines in shaping an organization's dynamic capabilities, the need for adaptability to external changes, and the significance of internal resources in sustaining competitive advantage. Our literature search also revealed an article employing an Extended Resource-Based View (ERBV), which expands upon the original RBV by considering internal and external factors to sustain a competitive advantage [102]. This article emphasizes the importance of adaptable resources and collaborative networks in establishing and maintaining market competitiveness. However, it is contended that the existing literature in the SCA domain fails to explain how the SC's upstream and downstream capabilities and competencies impact SCCP.

3.4. Bibliometric analysis

Researchers have turned to co-occurrence analysis to analyze conceptual work in many fields. Clustering's advantages allow the grouping of objects with similar or dissimilar characteristics [88]. Keywords with high similarity often group together [22]. Article keywords can be used as proxies for the paper's central argument, and their occurrence and co-occurrence frequencies can shed light on the most pressing issues and heated debates in a particular field [117].

A frequency analysis was conducted in NVivo to determine which words were most frequently used in the articles.

The word cloud analysis in Fig. 5 provides a quantitative snapshot of the prevalence of terminology within the corpus of qualitative research,

Table 7
Theories used in articles.

Theory	Ref.
Dynamic Capability View (DCV)	Abdelilah, El Korchi and Amine Balambo [2]; Abeysekara, Wang and Kurupparachchi [3]; Ahmed et al. (2019); Al Naimi et al. (2021); Altay et al. (2018); Ayoub and Abdallah [12]; Bahrami and Shokouhyar [14]; Bahrami, Shokouhyar and Seifian [15]; Cadden et al. (2022); Chan, Ngai and Moon (2017); Do et al. (2021); Dubey and Gunasekaran [38]; Edwin Cheng et al. [40]; Eslami et al. [41]; Fernandez-Giordano et al. [45]; Fosso Wamba and Akter [48]; Hallikas, Immonen and Braa [56]; Irfan, Wang and Akhtar (2020); Jahed et al. (2022); Kazancoglu et al. (2022); Mandal [72]; Martinez-Sanchez and Lahoz-Leo (2018); Sanchez, Pérez-Pérez and Vicente-Oliva [91]
Resource Based View (RBV)	Abeysekara, Wang and Kurupparachchi [3]; Aggrey et al. [5]; Agarwal and Jain (2022); Ahmed et al. (2019); Ayoub and Abdallah [12]; Baah et al. [13]; Bagheri et al. (2014); Blome, Schoenherr and Rexhausen (2013); Fosso Wamba and Akter [48]; Gligor, Esmark and Holcomb (2015); Gligor and Holcomb (2012); Hallikas, Immonen and Braa [56]; Hwang and Rho [60]; Jahed et al. (2022); Mandal [72]; Martinez-Sanchez and Lahoz-Leo (2018); Meriton et al. (2021); Sanchez, Pérez-Pérez and Vicente-Oliva [91]; Sheel and Nath (2019); Wong et al. [109]
Contingency Theory (CT)	Dubey, Gunasekaran and Childe (2019); Irfan, Wang and Akhtar (2020); Kazancoglu et al. (2022)
Network Theory (NT)	Aggrey et al. [5]; Liu, Zhang, and Wang (2021)
Information Processing View (IPV)	Mustafid, Karimaraiza and Jie [76]
Extended Resource-Based View (ERBV)	Tigga, Kannabiran and Arumugam [102]
Information Theory (IT)	Yang (2014)

(continued on next page)

Table 7 (continued)

Theory	Ref.
Practice-Based View (PBV)	Lofli and Sodhi (2022)
The concept of PBV has been extensively utilized in literature to illustrate how implementing a variety of practices, which are "imitable, commonly available, and transportable from one firm to another," profoundly impacts firm performance and explains variations in performance among firms.	
Stakeholder Theory (ST)	Adel [4]
The rationale behind stakeholder management in supply chain formation envisions firms at the center of an association of stakeholders. Stakeholders of a firm encompass any group that can influence or be impacted by the firm.	
Knowledge-Based View (KBV)	Shamout (2020)
The knowledge-based view (KBV) integrates various research streams focusing on the significance of knowledge within the firm. KBV provides an alternative rationale for the firm's existence, diverging from the traditional transaction cost approach.	
Social Exchange Theory (SET)	Aggrey et al. [5]
Social exchange theory serves as a framework for understanding the outcomes of procedural and distributive justice in supply chain relationships. It revolves around the idea that individual relationships are formed through a cost-benefit analysis.	
Resource Dependent Theory (RDT)	Meriton et al. (2021)
Resource dependence theory presents inter-firm governance as a strategic response to uncertain conditions and dependencies between exchange partners. Drawing from a social exchange theoretical perspective, RDT focuses on how certain firms become reliant on others for essential resources, such as goods and materials, and how companies can adeptly manage such relationships.	

revealing the frequency of specific terms and their relative weight in the discourse. The analysis indicates a strong focus on 'supply' and its variations, which, as the most prominent term at 2.46 %, underscores the fundamental importance of supply chains in the literature. The prominence of 'supply' and 'chain' in this context may reflect the burgeoning interest in the intricacies and optimization of supply chain mechanisms, a trend supported by the extensive scholarly attention towards supply chain integration and performance. Notably, 'agility' features prominently reflect the increasing emphasis on flexibility and responsiveness within organizational strategies, aligning with the agility literature highlighting the need for adaptability in rapidly changing market conditions. The term 'technology' also emerges significantly, suggesting a strong focus on technological advances and their impact on operational efficiencies, a theme echoed in the burgeoning research on digital transformation within supply chains [43].

It indicates that 'data', 'integrity', 'manufacturing', and 'capable' also appear frequently, indicating an overarching concern for data-driven decision-making, the integrity of processes, manufacturing efficiency, and capability development. These findings align with calls for a data-centric approach in supply chain management and manufacturing processes [53]. The appearance of terms like 'blockchain', 'digitizing', and 'resilient' suggests an engagement with cutting-edge technologies

and a focus on resilience, perhaps in response to recent global supply chain disruptions. This resonates with recent literature advocating for the transformative potential of blockchain in enhancing transparency and the need for resilience in the face of uncertainties [61]. Conversely, terms like 'pharmaceutical', 'energy', 'construction', and 'agriculture' receive relatively less emphasis, which may indicate a saturation in research within these areas or a need for increased scholarly attention given their global significance.

The word cloud analysis reveals a landscape of qualitative research deeply engaged with themes of agility, technology, and data integrity, all within the broader context of supply chain management. The results highlight the critical areas of current research focus and suggest potential gaps where future research could contribute further to the discourse. The analysis underscores the importance of considering the frequency of terms and their contextual significance within the body of literature.

3.5. Network analysis

Using VOSviewer, the relationships between the keywords have been mapped out and are highlighted in Fig. 6.

The zoom and scroll features of VOS viewer help zero in on specific regions of a map, and the tool's ability to display both clusters and maps simultaneously is also beneficial. It is possible to infer keyword frequency from node size; more frequently used keywords will result in larger nodes. The line width between them graphically represents the strength of a connection between two terms. The manufacturing industry is intrinsically linked to performance, SCA, and technology. Therefore, more study is required.

The color was used to group related keywords into six distinct clusters to illustrate the connections in the network. Grouped keywords cover similar topics. Some categories have significantly more or less frequent occurrences of topic keywords. It is promising to see many different angles taken to study SC agility. The breakdown of each group as an outcome of VOSviewer is shown in Table 8.

The keywords from the cluster analysis can be grouped into distinct themes that encapsulate the primary focus of each cluster.

3.5.1. Cluster 1: supply chain agility

Cluster 1 concentrates on enhancing the agility and performance of supply chains, emphasizing keywords such as "Flexibility," "Leagility," "Leanness," and "Responsiveness." This focus underscores the importance of SCs being agile and sustainable while effectively leveraging information and communication technology. SCA is increasingly recognized as vital for achieving sustained competitive advantage in today's dynamic business environment. Agility within the SC allows organizations to swiftly respond to shifts in market demand, technological advancements, and unforeseen disruptions like the COVID-19 pandemic. According to Dubey et al. [37], effective information sharing and SC connectivity resources significantly influence SC adaptability, agility, and alignment, mainly when there is strong top management commitment. The ability to be agile and remain flexible in food supply chains proved crucial in navigating the sudden changes in food consumption patterns during the pandemic [57]. Consequently, investments in agility provide resilience during adversity and contribute to long-term SC innovation and value creation.

3.5.2. Cluster 2: strategic management and innovation

Cluster 2 focuses on the strategic dimensions of manufacturing and organizational culture, emphasizing keywords such as "Agile Manufacturing," "Innovation," and "Strategic Planning." This cluster underscores the importance of organizations being both innovative and agile in their strategic approaches. Within Strategic Management and Innovation, Cluster 2 highlights the significance of agile manufacturing and strategic planning in fostering a creative and agile organizational culture. As Waiganjo et al. [105], strategic planning is crucial in



Fig. 5. Keywords word cloud.

promoting long-term innovation, particularly during crises like the COVID-19 pandemic. Dwikat et al. [39] further elaborate on the importance of structured strategic planning and strategic business innovation, which significantly impact the long-term performance of manufacturing SMEs, especially in volatile business environments. Additionally, Cruz-Ruiz et al. [31] emphasize strategic management's role in brand-building through open innovation, stressing the need to understand the perceptions of travelers and inhabitants for effective planning. Consequently, organizations aiming to be resilient and competitive in today's fast-paced market must integrate agile manufacturing, innovation, and strategic planning into their operational frameworks.

3.5.3. Cluster 3: resilience and trust

Cluster 3 revolves around resilience, particularly in the face of disruptions, as indicated by keywords such as "Disruptions," "Resilience Capabilities," and "Trust." Birkie et al. [18] underscores the significance of resilience capabilities in mitigating supply chain disruptions, suggesting that a certain level of supply chain complexity may enhance the effectiveness of operational recovery post-disruption. Moreover, Mishra et al. [75] highlight the role of supply chain resilience in maintaining

operational excellence amid the COVID-19 pandemic, stressing proactive and reactive measures such as collaboration and coordination. Similarly, Faruque et al. [42] explore the nexus between digital transformation, trust, and collaborative problem-solving in bolstering supply chain resilience, cautioning against viewing digital technologies as a substitute for trust. Furthermore, Zighan et al. [116] delve into the entrepreneurial focus's role in cultivating resilience capabilities for SMEs, underscoring the importance of balancing short-term operational actions with long-term strategic foresight. Consequently, fostering trust and resilience-building capabilities are paramount for preparing for and effectively navigating supply chain disruptions.

3.5.4. Cluster 4: risk and uncertainty management

Cluster 4 focuses on managing risk and uncertainty within logistics and customer service domains, as highlighted by keywords like "Risk Management," "Uncertainty," and "Supply-Demand." Choi et al. [25] address the complexities of aligning service PCs while mitigating risks, stressing the importance of robust risk management strategies. Additionally, Pellathy et al. [85] delve into logistics customer service intricacies, advocating for middle-range theorizing to grasp practical aspects and contextual factors influencing risk and uncertainty. Kang

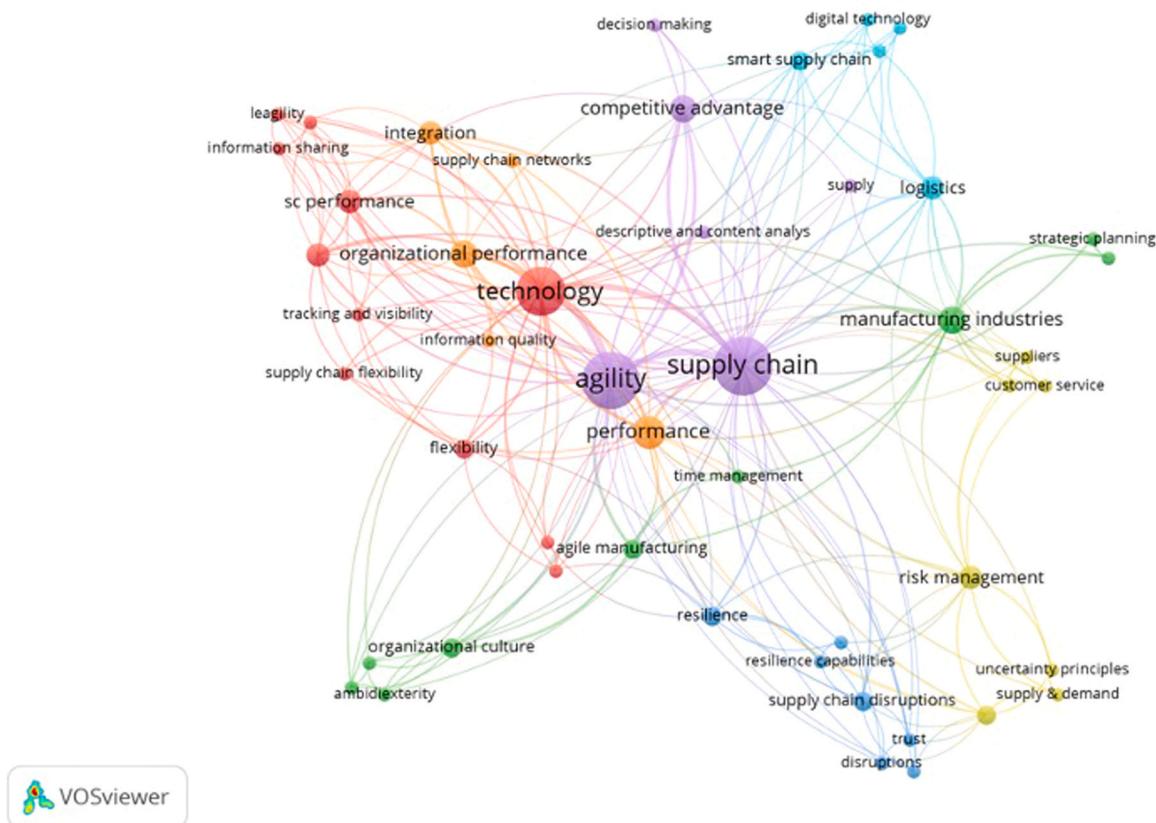


Fig. 6. Keywords co-occurrence network visualization.

Table 8
Cluster details.

Cluster	Number of keywords	Keywords
1	11	Flexibility; information and communication technology; information sharing; leagility; leanness; responsiveness; SC performance; supply chain flexibility; sustainable supply chains; tracking and visibility
2	9	Agile manufacturing; ambidexterity; innovation; manufacturing industry; organizational culture; strategic planning; sustainability; technological innovation; time management
3	7	Disruptions; disruptive innovations; resilience; resilience capabilities; supply chain disruption; supply chain resilience; trust
4	7	Customer service; logistics service; risk management; suppliers; supply-demand; uncertainty; uncertainty principles
5	6	Agility; competitive advantage; decision making; descriptive and content analysis; supply; supply chain
6	5	Artificial intelligence; digital technology; fast-moving consumer goods; logistics; smart supply chain
7	5	Information quality; integration; organizational performance; performance; supply chain networks

et al. [65] investigate the repercussions of shipment consolidation policies amidst customer order uncertainty, devising mathematical models for long-term SCM. Meanwhile, Wang et al. [107] propose a conceptual framework for managing SC risks among Chinese third-party logistics providers, particularly within the One Belt One Road initiative. Effectively navigating risks and uncertainties in the supply-demand dynamics is paramount for optimizing logistics performance and enhancing customer service.

3.5.5. Cluster 5: competitive strategy and decision-making

Cluster 5 delves into the strategic aspects of supply chains, mainly focusing on agility and competitive advantage. Keywords such as "Agility," "Competitive Advantage," and "Decision Making" underscore the emphasis on strategic decision-making processes aimed at gaining a competitive edge. The research focuses on competitive strategy and decision-making within supply chain management. Wu et al. [110] explore how businesses leverage supply chain agility to attain a competitive advantage, especially in times of uncertainty. Kou et al. [66] analyze the impact of Fintech investments in European banks, identifying "competitive advantage" as a critical determinant of Fintech-driven success. Hosseini et al. [58] delve into the influence of competitive advantage on new product development, including factors like quality, efficiency, and innovation. Furthermore, Cao et al. [19] investigate the relationship between information-processing ability and competitive advantage, revealing that decision-making effectiveness partially mediates this relationship. These studies highlight the significance of agility, technological investments, and efficient decision-making in shaping a firm's competitive strategy within the supply chain domain.

3.5.6. Cluster 6: technology and logistics

Cluster 6 underscores the pivotal role of technology in SCM, particularly within the fast-moving consumer goods sector. Keywords such as "Artificial Intelligence," "Digital Technology," and "Smart Supply Chain" highlight a strong focus on technological advancements in SCs. The cluster emphasizes integrating digital technology into SCM processes, especially within the dynamic realm of fast-moving consumer goods. Zhang et al. [114] explore the role of artificial intelligence in enabling sensing technologies within the 5 G/Internet of Things era, stressing the importance of digital twins and sensor fusion technologies. Raja Santhi and Muthuswamy [87] delve into the impact of blockchain technology on manufacturing SCs and logistics, noting its potential to enhance security, agility, and transparency. Nozari et al. [79] examine the

challenges of implementing Artificial Intelligence of Things in SCs, highlighting cybersecurity and infrastructure as critical concerns. Tsolakis et al. [103] investigate the integration of AI and Blockchain Technology in SCs, proposing a cohesive framework for data monetization and sustainability. Collectively, these studies underscore the transformative potential of technology, encompassing artificial intelligence and blockchain, in modernizing logistics and SC operations.

3.5.7. Cluster 7: performance and integration

Cluster 7 focuses on the relationship between information quality and organizational performance within supply chain networks. Key-words such as "Information Quality," "Integration," and "Organizational Performance" highlight a concentrated effort to explore how integrated information systems can enhance overall performance. This cluster emphasizes the significance of information quality and its impact on organizational systems. Chavez et al., [21] Investigates the mediating role of information quality between customer integration and operational performance, highlighting its potential to enhance delivery, flexibility, and cost-efficiency. Suter et al. [99] address the challenges in measuring integrated care and suggest a unified measurement framework, stressing the importance of performance measurement and information systems. Mahara [69] examines the adoption of Enterprise Resource Planning (ERP) systems in Indian SMEs, suggesting that integrated information systems significantly improve organizational performance. Lancharoen et al. [67] assess hospital information integration readiness, identifying key capability factors influencing performance and offering a decision-making framework for healthcare networks. These studies collectively underscore the critical role of information quality and integration in enhancing organizational performance within supply chain networks.

The more significant number of keywords in theme Cluster 1 indicates that this area is of greater interest to academics. For this reason,

the fields in Cluster 1 are the densest in the entire cluster.

3.6. Network density analysis

To provide a deeper understanding of the significance of these terms, an item density visualization is depicted in Fig. 7. In this visualization, items are represented as nodes, like those in a network map. The color of each node indicates its feature density, ranging from red to blue on the color wheel. A node that appears closer to black signifies a higher concentration of features, indicating a greater mass of items in that vicinity. Conversely, a node is more likely to appear yellow when surrounded by fewer items with lower feature weights.

Our research reveals that keywords such as "agile," "supply chain," "technology," and "performance" are densely interconnected, suggesting that these subjects have been extensively studied [10,59]. However, it is essential to note that the orange and yellow regions on the map contain more keywords than the red regions. This can be interpreted as an indication that there are fewer foundational areas of study, many of which are still emerging.

Additional connections are observed with information and communication technology, competitive advantage, tracking and visibility, and flexibility, as illustrated in Fig. 8.

The network diagram presents an interwoven cluster of concepts central to current supply chain discourse, with 'supply chain', 'agility', and 'performance' forming the nexus. The visualization elucidates the close interrelation between SCA and technology and their collective influence on performance. Critically examining the cluster, the 'supply chain' is situated at the core, indicating its role as the foundational element of the network. Surrounding it, 'agility' and 'performance' are prominent, suggesting that flexibility and responsiveness within supply chain operations are integral to achieving high performance. The proximity of 'technology' to these terms underscores the vital role of

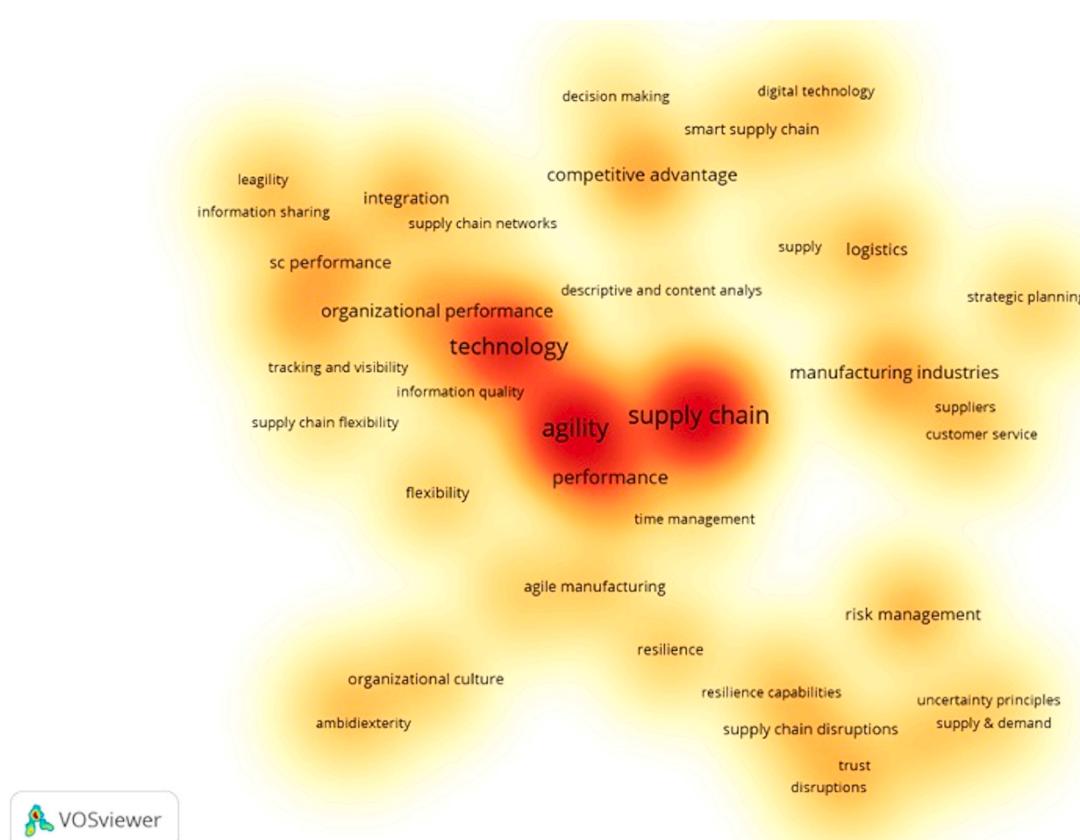


Fig. 7. Density visualization of keywords.

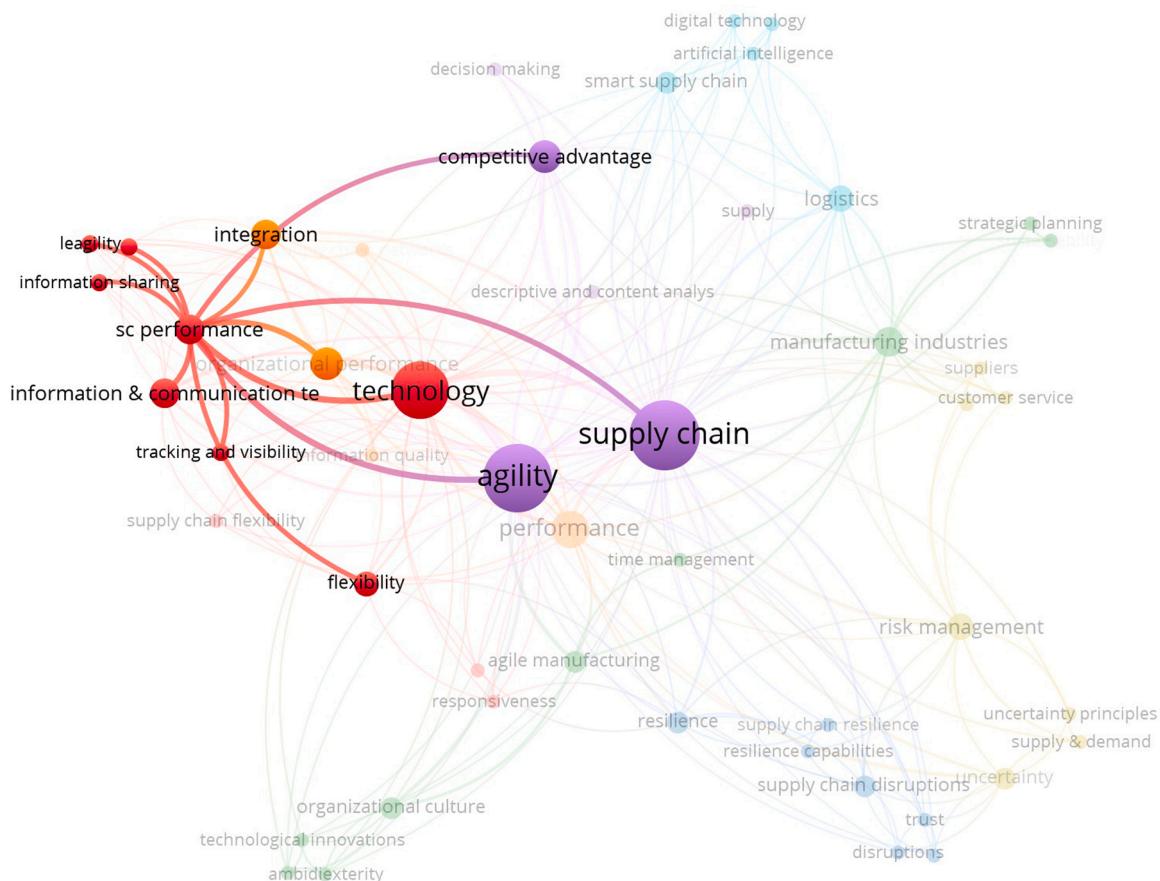


Fig. 8. SC performance and connecting nodes.

digital innovation in enhancing agility. This aligns with scholarly arguments that digital technologies are critical enablers of agility, providing the tools and platforms necessary for supply chains to respond dynamically to market fluctuations and disruptions. The connecting threads to 'competitive advantage' and 'integration' further highlight that agility and technology are not only about internal efficiency but also about competitive positioning and the seamless coordination of supply chain activities. In this context, the concept of 'integration' often refers to the strategic alignment of business processes and information systems, which is crucial for achieving a holistic and agile response to external and internal stimuli.

The diagram also suggests a connection between 'supply chain' and 'information sharing', 'flexibility', and 'risk management', revealing that an agile supply chain relies on the free flow of information, the ability to adapt to changing circumstances, and the capacity to mitigate risks effectively. These links are supported by studies highlighting the importance of transparency, adaptability, and risk assessment in maintaining a robust and responsive supply chain.

The network diagram critically visualizes the connections between supply chain agility, digital technology, and performance. It encapsulates the complex interdependencies and suggests that digital technology is a critical catalyst for agility, which drives performance. This analysis aligns with existing literature and reinforces the strategic imperative for organizations to invest in digital capabilities to enhance their supply chain's responsiveness and competitive edge.

4. Discussion

This review and bibliometric analysis meticulously synthesize the evolving dynamics and current understanding of SCA, DT, and SCCP. Employing the PRISMA approach with analytical tools such as NVivo,

Microsoft Excel, and VOSviewer, our analysis uncovers critical insights and interconnections among these key areas.

Addressing the first objective, the paper explores that the concept of SCA has significantly evolved from its initial focus on flexibility and adaptability within industrial sectors to encompass a firm's rapid response capability to market changes and uncertainties. This evolution marks transitioning from an operationally focused perspective to a strategic, market-oriented approach. The literature increasingly recognizes agility in the supply chain as a vital contributor to competitive performance, with agile supply chains being more adept at adapting to market demands, responding to customer needs, and managing disruptions effectively.

Concurrently, DT has emerged as a transformative force in SCM. Integrating digital technologies has revolutionized traditional SCM practices, developing intelligent, digitally driven supply chains. This digital revolution has streamlined operations and strategically integrated customers into the supply chain ecosystem, enhancing SCA and SCCP. Digital technologies, through their facilitation of real-time data analysis, predictive modeling, and automated decision-making, significantly contribute to increased agility and competitive performance.

Our review also underscores significant trends and geographical focuses in research. The growing volume of publications from 2005 to 2022 indicates an increasing academic interest, with Europe, South Asia, and the Americas being predominant contributors. This disparity in research output points to potential gaps and future research opportunities, particularly in underrepresented regions. Industry-specific analyses reveal that manufacturing remains a dominant sector in supply chain research, reflecting its global economic impact. However, the emergence of cross-sector studies highlights the interdisciplinary nature of supply chain research and the universal applicability of SCA, DT, and SCCP principles.

Theoretically, the literature is grounded in the DCV and the RBV. These frameworks, emphasizing adaptability, resource management, and competitive advantage, offer a solid foundation for understanding the interplay among SCA, DT, and SCCP. However, there is an opportunity for further theoretical development, particularly in integrating these perspectives to explain the nuanced relationships among these concepts more comprehensively.

Delving deeper into the theoretical frameworks, our comparison of the DCV and the RBV provides a more nuanced understanding of their shared and divergent tenets. Scholars such as Ayoub and Abdallah [12], Bahrami et al. [15], and Hallikas et al. [56] have previously conducted comparative research, emphasizing the shared emphasis on adaptability, routines, and the critical role of internal resources. On the other hand, our research goes a step further by identifying essential gaps in the existing literature, particularly the nuanced interplay between upstream and downstream capabilities within SCCP. Such insights highlight the importance of academic inquiry and pave the way for future research directions [102].

Our study also delves into the methodologies employed in the selected articles, revealing a predominant inclination towards quantitative research methods. This suggests that the context of SCA, SCCP, and DT is driven mainly by empirical, data-centric approaches that facilitate statistical analysis and generalizable findings. However, qualitative methods, which offer in-depth insights and contextual understanding, are also well-represented. Interestingly, a noticeable gap in mixed-methods research indicates a potential area for future exploration [21,99].

Addressing the second objective of this study, bibliometric and network analyses reveal interconnected themes and areas of dense academic interest, such as agility, technology, performance, and competitiveness, alongside emerging fields of study. There are seven clusters: agility, strategic management and innovation; resilience and trust; risk and uncertainty management; competitive strategy and decision making; technology and logistics; and performance and integration. These clusters indicate both a maturation and a continuous evolution in these domains.

Nevertheless, while these themes are robustly theorized, emergent areas within them beckon deeper theoretical engagement. Core themes and areas of interest within the joint field of SCA, SCCP, and DT, such as supply chain, agility, performance, manufacturing, and technology, were identified through co-occurrence and keyword frequency analysis. While extensively studied, these themes still present emerging areas that warrant further exploration.

Addressing the third objective, the nine promising areas for future study have emerged due to this work.

4.1. Direction 1: mixed method approaches in SCA research

The existing literature on SCA is heavily skewed towards qualitative or quantitative research methods, with a mere 3 % of studies employing a mixed-methods approach. This represents a significant research gap, as mixed-methods research can provide a more exhaustive understanding of complex SC dynamics. Creswell and Clark [30] advocate using mixed methods research because it allows for data triangulation, improving the validity of the research findings. Similarly, Johnson and Onwuegbuzie [62] argue that by combining the quantifiable precision of quantitative methods with the contextual depth of qualitative methods, mixed-methods research can provide richer insights. Tashakkori and Teddlie [100] emphasize the importance of mixed methods research in social science, which could be applied to SCA studies.

4.2. Direction 2: geographical diversification

While the current body of research on SCA is concentrated in Europe, South Asia, and the Americas, there is a glaring absence of studies from Africa, Australia, and Latin America. This geographical imbalance limits

the global applicability of existing research findings. The "International Journal of Production Research" has been identified as a significant outlet for SCA research and could serve as a platform for more geographically diverse studies.

4.3. Direction 3: exploration of understudied sectors

The overwhelming focus on the Manufacturing sector in existing SCA research leaves a significant gap in understanding SC complexities in other sectors like Agriculture, Distribution, and Energy. According to Soon et al. [98], the agricultural industry faces distinct SC challenges that require specialized research. Shehabi et al. [94] also emphasize the importance of additional research in the Energy sector, particularly in sustainable SCM. A study by Carter and Rogers [20] emphasizes the significance of sustainability in various sectors.

4.4. Direction 4: upstream and downstream capabilities in SCCP

The current literature primarily focuses on upstream or downstream aspects of the SC, rarely examining how these two impact SCCP. Tigga et al. [102] suggest employing the ERBV as a theoretical framework to explore this interaction. A study by Chopra et al. [26] also emphasizes the need for integrated research considering upstream and downstream elements.

4.5. Direction 5: interconnectedness of SCA, DT, and SCCP

The interconnectedness of "agile," "technology," and "performance" in the SC is a fertile ground for research. While Hu and Zhang [59] conducted research in these areas, more empirical research into their synergistic effects is required. Additional research on agility and competitive advantage by Wu et al. [110] and Kou et al. [66] could provide frameworks for this exploration.

4.6. Direction 6: emerging areas in SCCP

The review indicates that several emerging areas in SCCP have not been extensively studied. These include topics like sustainability, ethical sourcing, and the role of big data analytics in SCM. The works of Chavez et al. [21] and Suter et al. [99] provide initial insights but lack comprehensive empirical evidence.

4.7. Direction 7: role of DT in SCCP

Integrating DT tools like Artificial Intelligence, the Internet of Things, and blockchain technology in SCM is another area ripe for exploration. Zhang et al. [114] and Raja Santhi and Muthuswamy [87] have initiated discussions on this topic, but the joint context of SCA, SCCP, and DT is still in its infancy.

4.8. Direction 8: competitive advantage and strategic integration in SCCP

This direction focuses on how SCs can be strategically managed to gain a competitive advantage. Topics may include strategic sourcing, supplier collaboration, and the role of innovation in SCM. The works of Hosseini et al. [58] and Cao et al. [19] offer a starting point for this research direction.

4.9. Direction 9: risk management in supply chains

Given the SC's increasing complexity and globalization, risk management has become a critical area of study. Future research could focus on developing frameworks and models for assessing and mitigating risks in SCs. Choi [24] have laid foundational work in this area.

Each research direction offers a rich set of opportunities for scholars to contribute to understanding and advancing SCCP. This paper serves as

a roadmap for these future explorations, highlighting the gaps in current knowledge and providing a scholarly foundation to build.

5. Conclusion

In synthesizing the findings, it is argued that the domains of SCA, SCCP, and DT are deeply theoretical realms that intersect with broader paradigms of strategy, innovation, and organizational theory. These domains' intricate work of art, woven with agility, technology integration, and performance optimization threads, offers a rich theoretical landscape for scholarly investigation.

Our study delves into the nuanced relationship between SCA, SCCP, and DT, which has captivated scholarly interest for decades. By employing descriptive and bibliometric analyses, this research offers a substantial theoretical contribution to understanding these interrelated concepts, charting the trajectory of academic output, and reinforcing the argument that comprehending the historical development of scholarly discourse is paramount. This approach elucidates shifts in academic thought and serves as a beacon, guiding subsequent research explorations. A pivotal finding from our analysis is the topic's inherently interdisciplinary appeal, as evidenced by the breadth of its presence across diverse academic journals. This reflects an increasing recognition of the topic's applicability and significance, transcending traditional disciplinary boundaries. By mapping out this extensive distribution, our study underscores the pervasive influence of SCA, SCCP, and DT within the academic community. The theoretical implications of our work extend the boundaries of current literature, suggesting a fusion of disciplines as a fertile ground for innovation in thought. This sets the stage for future investigations that may continue to break new ground, fostering a holistic understanding of how agility and digital transformation can be leveraged to enhance competitive performance in the context of the supply chain.

This study offers three significant contributions across its three main objectives. Firstly, it delves into the evolution of pivotal concepts in SCA, SCCP, and DT within the scholarly domain. Secondly, it identifies and explores seven distinct clusters that provide scholars with a structured framework for categorizing knowledge generation in this field, offering a more organized and comprehensive perspective. Thirdly, it outlines nine future research directions, offering valuable insights for scholars to further advance knowledge in SCM. These directions pave the way for future inquiry and serve as fertile ground for the next generation of scholars to make meaningful contributions.

This study is an invaluable resource for business practitioners, shedding light on pivotal focus areas and emerging trends within supply chain management. By embracing these insights, businesses can navigate the intricacies of today's supply chain landscape with greater agility, positioning themselves for sustained success in the future. In the dynamic realm of modern business, the increasing prominence of SCA, SCCP, and DT is evident through the surge in publications on these subjects. This trend underscores the importance of businesses harnessing DT to bolster their supply chain agility. This enables them to swiftly adapt to market fluctuations and potential disruptions, enhancing their competitive edge. The diverse distribution of articles across various journals underscores the interdisciplinary nature of SCM. This highlights that businesses must embrace a holistic approach, drawing insights from multiple disciplines to tackle supply chain challenges effectively. Such

an approach enables businesses to develop comprehensive strategies that are better equipped to address the complexities of today's interconnected global markets.

Furthermore, the geographical distribution of research offers valuable insights into regional supply chain dynamics. This knowledge can be instrumental for businesses looking to expand or tailor their strategies to specific regions. The sectoral focus, particularly the significant concentration of research in the manufacturing sector, indicates the unique supply chain complexities businesses face in this domain. However, it is worth noting that industries like Agriculture and Distribution remain underexplored, presenting potential opportunities for businesses to innovate and gain a competitive edge. Moreover, the transformative potential of digital technology in modernizing supply chains cannot be overstated. The study's emphasis on terms like "digital technology" and its association with competitive performance underscores the need for businesses to prioritize integrating advanced technologies, such as AI and blockchain, into their supply chain operations.

Recognizing and addressing the limitations inherent in our study methodology is imperative. Given the dynamic nature of fields like SCA, SCCP, and DT, it must be noted that new articles may have been published since our article selection process concluded. The potential for valuable contributions in recent literature that may have been overlooked is recognized. However, this does not diminish the significance of the findings presented in this paper, as the research has predominantly drawn from established scholarly databases in this research. Furthermore, our focus solely on English articles could potentially restrict the breadth of the findings, as valuable insights and perspectives may be available in articles written in other languages. Therefore, while the study provides useful insights within its scope, future research endeavors are encouraged to consider a more comprehensive approach to database selection and language inclusivity to ensure a more holistic understanding of the subject matter.

CRediT authorship contribution statement

Amila Jayarathne: Writing – review & editing, Validation, Supervision. **Emmanuel Susitha:** Writing – review & editing, Writing – original draft, Visualization, Validation, Investigation, Formal analysis, Conceptualization. **Renuka Herath:** Supervision.

Declaration of Competing Interest

None.

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Declarations of interest

None.

Appendix

The list of journals under the 'Other' category listed in [Table 3](#).

Journal name
Arabian Journal for Science & Engineering
Asia Pacific Business Review
Asia Pacific Journal of Marketing and Logistics
Cogent Business & Management
Cogent Engineering
Construction Innovation
Decision Sciences
Decision support systems
Economics & Management
Enterprise Information Systems
EUREKA: Physics & Engineering
European Journal of Operational Research
Information Development
International Journal of Agile Systems and Management
International Journal of Emerging Markets
International journal of management reviews
International Journal of Management Science and Engineering Management
International Journal of Organizational Analysis
International Journal of Technology Management & Sustainable Development
Journal of Agribusiness in Developing and Emerging Economies
Journal of Business & Industrial Marketing
Journal of Business logistics
Journal of Business Management
Journal of Cleaner Production
Journal of Computer Information Systems
Journal of Construction Engineering & Management
Journal of Decision Systems
Journal of Family Business Management
Journal of Global Operations and Strategic Sourcing
Journal of Industrial and Production Engineering
Journal of Industrial Engineering & Management
Journal of Open Innovation
Journal of Operations and Supply Chain Management
Journal of operations management
Journal of Science and Technology Policy Management
Jurnal Teknologi
Management Decision
Measurement
Measuring Business Excellence
Procedia-Social and Behavioral Sciences
Sensors
Systematic Reviews in Pharmacy
Technology Analysis & Strategic Management
The Journal of Strategic Information Systems
Uncertain Supply Chain Management
Wireless Networks

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