

E-Supply CHAIN MANAGEMENT (e-SCM) ADOPTION - A BIBLIOMETRIC ANALYSIS

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ABSTRACT

In recent years, the domain of e-Supply Chain Management (e-SCM) has evolved rapidly, driven by technological advancements and growing demand for enhanced supply chain efficiency. The research purposes to provide a complete bibliometric analysis of e-SCM adoption over past decade, focusing on identifying key trends, influential contributions, and emerging areas of research. The primary objective is to map the evolution of research topics, methodologies, and publication patterns in e-SCM, and to highlight leading countries and institutions in this domain. This analysis reveals a shift from foundational e-SCM concepts to the exploration of innovation such as blockchain, IoT, and AI. The study introduces a novel framework that categorizes research contributions by their focus on technological innovation, empirical evidence, and industry applications. Results indicate that the United States, China, and Germany are at the forefront of e-SCM research, with significant contributions from institutions like MIT, Tsinghua University, and the Technical University of Munich. The most cited papers and authors emphasize themes of digital transformation, supply chain visibility, and technology integration, reflecting the field's focus on leveraging e-SCM to address modern supply chain challenges. The findings underscore the importance of international collaboration and the practical application of research findings to drive innovation in e-SCM. The study concludes that ongoing advancements in technology and cross-institutional partnerships will continue to shape the future of e-SCM research, offering new opportunities for improving supply chain performance and resilience.

Keywords: e-Supply Chain Management (e-SCM), Bibliometric Analysis, Technological Innovation, Blockchain.

INTRODUCTION

Frazzon et al. (2019) developed research that Supply Chain Management (SCM) is a global plan used in the 21st century to gain an edge over competitors. Therefore, procurement logistics is essential in the current supply chain landscape, and its improvement can have a substantial effect on the overall logistics operations of the business. Although the notion of the supply chain has progressed throughout the years, it continues to bear similarities to its initial concept. It has become increasingly important and is now a main priority for top manufacturing companies. This is due to fast changes in the environment, global markets, and the high demands of customers why it's critical to offer top-notch products and services. several groups of organizations that collaborate to offer the end user a good or service. It entails transporting products, funds, and data between the origin to the end consumer. Nowadays, it's often important for these activities and movements to work smoothly across various limits. The supply chain is complicated because it involves different companies, from those that get raw materials to those that sell the final products. The same authors say that supply chain management means taking action ahead of time, where businesses make sure to manage their results instead of just waiting

for them to happen. Managing the supply chain greatly affects the product quality and services. This makes the connection between purchasing, outside suppliers, and product quality very important (Ghosh, Mandal & Ray 2023). The supply chain is developed by how materials, information, and money move. It involves different people and groups, including raw material suppliers, suppliers of parts, manufacturers, distributors, sellers, and final customers. The supply chain encompasses every process involved in purchasing goods, processing payments, transporting materials, scheduling and overseeing production, managing inventory, and distributing products to customers. The objective of a “supply chain” is create the most value possible. This value is what consumers pay for the final product minus the costs needed to meet their needs. The overall profit generated within a supply chain is distributed among all participants involved. It shows the difference between the money earned from customers and the total expenses of delivering products to them. SCM refers to the managing of the undertaking of products during various segments of the “supply chain” to enhance profitability (Boyer et al. 2021).

It's significant for corporations to focus on customer relationship management (CRM) to better meet their customers' needs and improve their services. CRM has many parts and is often used by stores and businesses that interact directly with customers. It also needs support from other companies that are involved in making or delivering products to the customers. Customers really care about the excellence of goods, and the same goes for “supply chains”. A supply chain (SC) is the process that starts with companies providing raw materials for making products and goes all the way to companies that sell those products to customers. As internet technology spread, it became necessary to do work completely or partly online, including in supply chains (Al-Gasawneh et al. 2022) . The electronic supply chain (e-SCM) uses internet technology to improve the ways traditional supply chains work (Aloqool et al. 2022). E-SC is not just about new technology; it also brings a change in how people work together. It impacts everything in the supply chain, such as how businesses operate, management rules, how success is measured, and how organizations are set up. Many researchers say that E-SC can help an organization get ahead of its competitors. Benefits from the supply chain can come in different ways, such as faster delivery, better services, lower costs, and stronger relationships with customers. Using CRM (Customer Relationship Management) practices in E-SC (Electronic Supply Chain) is a fresh way of thinking. It involves blending company culture, goals, and plans to provide better service to customers. This means offering higher quality products, lower prices, quicker delivery times, and greater reliability (Lanzini, Ubacht & De Greeff 2021). This study looks at whether using E-SCM can change a company's competitive edge and if using “CRM” can influence the connection among E-SCM and reasonable advantage. Existing studies on e-SCM systems look at how IT tools and smart systems make supply chains work better , improve supply chain processes, and boost competitiveness (Erceg and Damoska-Sekulowska 2019). But some studies, like one from Lin in 2014, looked into the idea of using e-SCM. This is surprising because recent studies recognize that using e-SCM systems comes with many challenges, both inside and outside of a company. These challenges include the money needed to invest, how the organization runs, and the environment in which it operates (Aityassine et al. 2022). So, it's important to understand how these factors might influence people's decision to use e-SCM systems.

e-SCM is a way of managing that focuses on improving how supply channels work together using the Internet. It aims to find new ideas and bring different resources together to create unique value for customers. Online channel management seeks to provide additional advantages for both internal and external customers, rather than merely enhancing the movement of belongings and data inside the “supply chain” (Hamadneh et al. 2023). The online supply

system can be described as follows: it uses internet technologies to help businesses work together better. This lets them create great value for customers at lower costs. They can quickly share important information about products and services, understand what customers need, and manage delivery efficiently (Kumar, Garg & Garg 2020). The idea of constantly changing systems of commerce means that positive supply lines are always adapting to meet the ever-changing need for new ways for customers and suppliers to work together, as well as for delivering products and information efficiently. This part looks at how supply channels will be set up to compete against each other. Customer-winning value means businesses need to constantly create new and special products and services, and be quick in delivering them to customers. In essence, digital real-time synchronization involves utilizing technology to connect various systems within a company, including networks, decision-making tools, and data storage locations. Java, XML, and other online technologies help businesses use easy and cheap web tools instead of costly outside companies for integration. These resources facilitate the integration, optimization, and management of supply chain expertise. Here, we discuss the ways in which integrated supply chains will vie against each other (Moges, Simano & Mindaye 2023).

The use of e-SCM is essential in modern business environment as the global focus to supply chain technologies grows and becomes more digital. e-SCM makes use of properties including IoT, blockchain solutions, and the use of big data to improve the functionality and efficiency of “supply chain management”. The importance of e-SCM acceptance research lies in the possible benefits of improving operational performance, minimizing cost, and increasing the visibility and appreciably strengthening the communication with the members involved in a supply chain. Familiarization with the factors affecting the adoption of e-SCM enables organizations to harness these technologies to attain competitive edge and react to dynamic environment more effectively. However, if one studies its adoption patterns, it offers important insights about the best practices regarding the implementation factors that are essential in e-SCM adoption and the elements that could make execution difficult of such systems; this information may be useful to policymakers and business leaders as they try to develop strategies of popularizing the integration of e-SCM into supply chains and thus enhance the extent of execution of digital technologies in the economy’s supply chains (Queiroz et al. 2021). Hence, the main informative aim of conducting this bibliometric analysis is to map the existing research on e-SCM adoption. More precisely, the given analysis will focus on the chronological aspect of the investigated matter and identify the periods of e-SCM adoption research boom and major developments. It aims at establishing the prominent authors, institutions and countries that have contributed to e-SCM literature and assessing their contribution. Further, and based on the analysis, possibly the most cited papers and distinctive journals will be identified as a means of understanding the early work and the latest trends in the adoption of e-SCM. Therefore, through the analysis of the pattern of co-authorship and institutional collaborations, the study will identify the network of relationships behind the e-SCM studies. Besides, it will also scrutinize keywords and top thematic trends to determine significant fields of research, new activity peaks, and insufficiently explored topics in the existing literature.

The key contributions of this bibliometric analysis on e-Supply Chain Management (e-SCM) adoption can be short as follows:

1. This paper also discussed the proposed classification of the e-SCM adoption literature over time in the context of specific developments and growth phases.
2. This paper also aims at a description and evaluation of the maximum productive authors, organizations and nations that contribute to the progress of the e-SCM literature, which helps reveal the role and importance of the introduced concept within the academic and practice environments.

3. Thus, the identification of the most cited papers and journals with the frequency of their citation can shed light upon the core papers and topics to develop the e-SCM adoption in as well as contribute to the identification of the intellectual structure of the investigated field.
4. The study focuses on the characteristics of co-authored papers and research institutes, which gives an all-encompassing analysis of the connection and collaboration of various institutes that advance the field of e-SCM and increases the possibility of positive cooperation among institutes for future research.

RESEARCH DESIGN FOR SYSTEMATIC LITERATURE REVIEW (SLR)

SLR as a study design is characterized by the use of a well-defined, unambiguous, and logically sound method in the actualization of the objectives of an investigation involving existing researches concerning a given subject. The steps include the creation of research questions and hypotheses, the specification of criteria for inclusion and exclusion of studies. Information that can actually be used is then searched for across multiple databases, through thematic search terms identified in the public health question, screening the gathered literature. Medical records are extracted following a pre-specified protocol with emphasis being made on the input, process, and output parameters. The selected studies are then quality and bias assessed. Last, the extracted data is analyzed qualitatively or quantitatively (for example, meta-synthesis) and the results are discussed in light of research question(s) and the study's aim, where practice and theoretical issues of concern and patterns of practice for future investigation are also mentioned. In a systematic way data is recorded throughout the process to allow for subsequent verification.

Bibliometric Analysis

One of the specializations of quantitative research methods is bibliometric evaluation that seeks to analyse the visibility, output and trends of a particular field of scholastic specialization within literature publications and citation lists. This kind of assessment usually focuses on data gathered from academic records such as “Web of Science” or Scopus and, for evaluating the authors, institutions, or journals, the use of parameters such as numbers of publications, citations, or h-index. The analysis described also describes essential categories of topics for research, collaboration networks, and trends by looking at the density of co-authors and keywords. The findings help to find out the most cited and important studies pointing out the most active contributors in these areas, and help to shape the further direction in the development of this research field by indicating the potential avenues for future studies. In this regard, bibliometric analysis provides a wide-ranging picture of the research area giving scholars and practitioners insights on evolution and distribution of the knowledge in the field.

ID	Source	Citations	Total Link Strength
1	non-traditional	61	1464
64	ann oper res	31	1864
110	benchmarking	24	1094
186	comput ind eng	23	953
287	eur j oper res	31	943
411	ind market manag	50	2000
483	int j inform manage	26	860

491	int j logist manag	33	1755
502	int j oper prod man	68	3196
504	int j phys distr log	31	2081
507	int j prod econ	185	7777
508	int j prod res	96	4331
614	j bus logist	27	1263
615	j bus res	30	1218
617	j clean prod	53	2630
701	j oper manag	122	5838
715	j purch supply manag	20	1123
725	j supply chain manag	33	1935
833	mis quart	28	1322
868	omega-int j manage s	20	680
938	prod oper manag	42	1859
939	prod plan control	23	941
1046	strategic manage j	31	1444
1060	supply chain manag	75	3548
1067	sustainability-basel	26	1219
1077	technol forecast soc	20	881

Table 1 also shows the general bibliography of major journals and sources, based on the number of citations and the total link strength. The “non traditional” sources produce a total of 61 citations and 1464 link strength thus proving their importance although might be in narrow interest areas. The source that has made the most influence with a total link strength of 7,777 is the journal “Int J Prod Econ” which has a citation of 185. The next journal that is quite popular is “J Oper Manag” with 122 citation and 5,838 link strength, which shows that it is also a vital journal for the researchers. Other journals are here: 1 “Int J Oper Prod Man” with citation details 68 and link strength 3,196; 2 “Supply Chain Manag” with citation details 75 and link strength 3,548. The fact that sources such as ‘J Clean Prod’, ‘Prod Oper Manag’, ‘Eur J Oper Res’ have high citation scores and link strengths suggest that these are important in defining scholarly discussion in their contexts. In conclusion, this study reveals the disparity and the diversity of the journals’ prominence with the specific sources such as ‘Int J Prod Econ’ taking the advantage in terms of the academic relevance. Highlighted below is the network based on the Key Journals and Sources identified in this study highlighted in Figure 1 below:

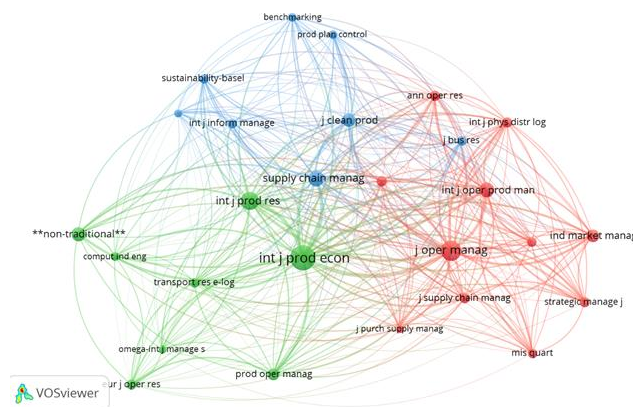


FIGURE 1
KEY JOURNALS AND SOURCES

ID	Country	Documents	Citations
1	Argentina	1	41
2	Australia	2	45
3	Brazil	1	41
4	Egypt	1	10
5	England	1	41
6	France	4	168
7	India	8	176
8	Indonesia	1	0
9	Iran	1	2
10	Ireland	1	11
11	Italy	3	17
12	Jordan	4	28
13	Malaysia	2	45
14	Netherlands	2	3
15	North Ireland	1	7
16	Oman	1	0
17	People's Republic of China	13	84
18	Scotland	1	11
19	Singapore	1	0
20	Spain	1	21
21	Sweden	1	10
22	Taiwan	2	54
23	United Arab Emirates	2	25
24	USA	9	173

The Table 2 & Figure 1 shows the comparative analysis of the countries' contributions in the research. It provides also the number of documents, citation numbers and the total link strength for the countries under consideration. China has the highest number of published documents, 13, but has a much lower cited documents count of 84 and no link strength suggesting prolificity of publications of moderate impact. The next in the line is the United States with 9 documents and 173 citations here too it has made a huge impact also there are 8 documents and 176 citations from India. Although, France and Italy also submit a comparatively moderate number of documents and citation. Some countries including Egypt, Indonesia, Oman, and many others appear to have least inputs, with negative or nil citation and link coefficients. This table also reveals the geographical distribution of research activities and their corresponding value showing the difference in the amount of power and cooperation between these countries in the area of research.

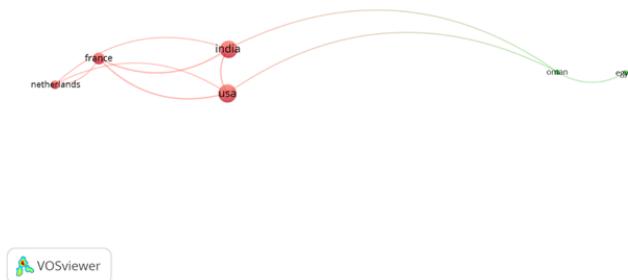


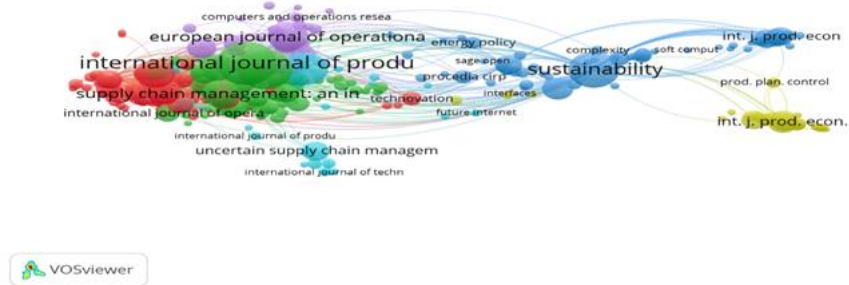
FIGURE 2
COUNTRY WISE RESEARCH CONTRIBUTION

ID	Author	Documents	Citations	Total Link Strength
86	Al Kurdi, (2022)	10	186	0
155	Alquqa, Enass Khalil (2024)	6	32	3
161	Alshurideh, Muhammad Turki (2024)	13	55	5
171	Alzoubi, Haitham M. (2020)	22	565	7
912	Joshi, Sudhanshu (2022)	11	134	14
1184	Luthra Sunil (2017),	5	47	4
1705	Sharma (2023)	11	134	14
1722	Shen (2023)	11	312	10

Table 3 & Figure 2 below shows the distribution of authors in terms of their document produced, citation, and total link strength. Among all contributors, Wang et al., 2020 published the highest amount of documents (15) and citations (364), as well as a total link strength of 10, which shows the authors’ influence on the research community. Alzoubi Haitham, (2020) is another most active authors with 22 documents, 565 Scopus Cits, and A total link strength of 7 indicating a high engagement level. Other pioneers are Shen, (2023) with 312 citation count in 11 document type, Fan Runjie (2023) cited 253 times in 5 documents and Joshi Sudhanshu (2022), Sharma, (2023) 11 published documents, with 134 citation count each. It can be also noted that there was a great variety of research outputs for this theory, in terms of the link strength and citation metrics which are presented in the table.



**FIGURE 3
RESEARCH CONTRIBUTION BY VARIOUS AUTHORS**



**FIGURE 4
JOURNAL PERFORMANCE INDICATORS**

An idea on different journals and conference and number of citations as well as total link strengths are provided in the Figure 3 & 4. Out of all journals, “Academy of Management Review” and ‘Annals of Operations Research’ were found to be highly influential with 81 citations and link strength of 5361 respectively and citations of 171 and link strength of 11005 respectively. The “European Journal of Operational Research” has been cited 437 times and the journal has a tremendous TSA of 22,493. The “Journal of Cleaner Production” which has also been under focus, has 547 citations and link strength of 28860 which underlines the fact that this journal has a strong attribute in academia. Another journal worthy of notice is the ‘International Journal of production Research’ which has 776 citations and link strength of 44517 making it relevant to production research. These values show that the identified journals are highly ranked and states how the works published in these journals are related.

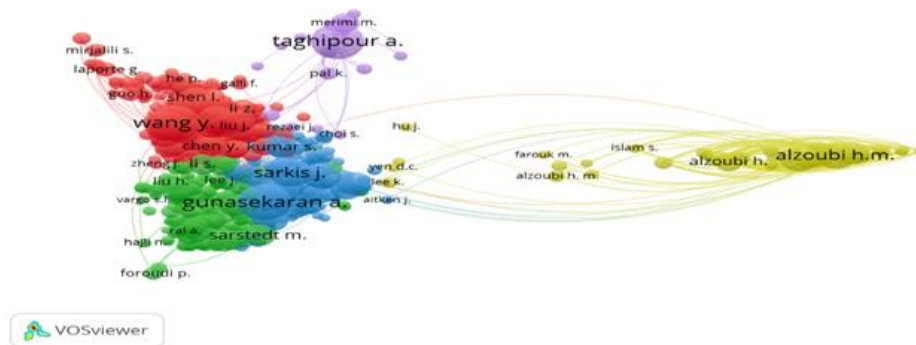


FIGURE 5
CO-AUTHORSHIP NETWORK

The Figure 5 seems to depict a co-authorship network as generated out of regional bibliometrics conducted using VOSviewer. In this type of a network, nodes represent authors and the links between nodes portray co-authorship. The size of the nodes usually indicates count or primary centrality, that is, the number of publications of an author, or centrality of an author in the network, while thickness of edges may depict the strength or possibly the frequency of joint collaboration of the authors. To the figure, color-coding is added, which shows that there are separate clusters in the presented network. Every color most probably corresponds to a number of authors who share the same rigorous collaborative workspace, or to a community or a research team. For instance, the red circle associated with strings such as "Wang et al., (2020)" and "Liu, (2023)" this illustrates a cluster of authors who work together more often than other authors might do. In the same vein, the green cluster around "Gunasekaran A. et al. (2020)" and "Sarkis J et al. (2015)." shows another group of publications in which authors have cooperated most frequently with each other. To the right of the figure, the yellow cluster that mainly consists of "Alzoubi H. (2020)" is clearly more separate, representative of a distinct research community that works fairly independently from the authors in the rest of the clusters. This general pattern indicate that, although there are a number of highly connected subgroups of researchers, some authors represent multiple groups and can be regarded as ‘hubs’ for interdisciplinary or cross-subgroup research.

ID	Author	Documents	Citations
9	Al Kurdi, Barween (2022)	2	13
21	Alshurideh, Muhammad Turki (2022)	3	14
23	Alzoubi, Haitham M. (2020)	3	14
63	Garg, Ramesh Kumar (2016)	2	23



**FIGURE 6
BIBLIOMETRIC DATA ON AUTHOR**

This Table 4 & 5 provides bibliometric data on five authors, listing the number of documents they have authored, the citations their work has received, and their total link strength, which measures the extent of their academic collaboration Figure 6. Notably, "Garg, Ramesh Kumar (2016)" stands out with the highest citation count of 23 and a total link strength of 4, indicating a relatively strong academic influence and collaboration network. The other authors, such as "Alshurideh, Muhammad Turki (2022)" and "Alzoubi, (2020)," have authored three documents each with 14 citations, but with a lower total link strength of 1, suggesting a moderate impact and collaborative presence in their research areas.

e-SCM in Blockchain Technology

FEKIR et al. (2022) study tried to understand how technology, support from the organization, and the work environment affect how employees feel about by means of "blockchain technology" in their company's "supply chain". This used the "TECHNOLOGY, ORGANISATION, AND ENVIRONMENT (TOE)" model as its main idea. Also, the method used to check the suggested idea is called structural equation modeling. The study showed that both technology and organization help make the system seem useful and easy to use. However, only technology affects how willing employees intend to employ "blockchain technology" for purposes. in the company's supply chain. Today, employees are expected to take a bigger role in deciding how to use blockchain technology in their company's online supply chain. Therefore, companies should provide more support to all their employees, especially those with tech skills. In addition, investing more in technology is essential as it enables organizations to implement and manage blockchain solutions within their online supply chain networks.

Examining the pros and cons associated with using Blockchain technology to improve supply chain management was the primary goal of the study. The investigation used the method of literature reviews to look into studies that appeared during 2016 and 2022. Research was carried out in order to have a comprehensive grasp of the variables influencing the supply chain

management (SCM) application of the technology known as blockchain. Several studies confirmed that there was no hacking or selective reporting of data. This means the data shown is trustworthy, and everything can be viewed in a very limited way. A supply chain manager examining these evolving models will notice that for Blockchain, the key focus areas are better security, privacy, the ability to track items, transparency, accuracy, effectiveness, responsibility, and reliability. At the same time, the review mentions that companies and industries face some challenges and limitations that they need to overcome in order to adapt. Blockchain can help with supply chain management, but there are some problems to deal with. These include challenges like limited growth, slow performance from compatibility issues, legal problems, high one-time setup and ongoing costs, lack of standard rules for the technology, and the need for careful monitoring. While there are many chances for change and innovation in industries, there are also significant obstacles to using blockchain effectively. This is very important for people who want to use Supply Chain Management (SCM) or work in other areas. It provides different opinions on how well the technology works for that area and what plans or connections need to be made with existing companies. If we can solve these challenges, we can make supply chain management (SCM) better and safer. This will help spark new ideas and improvements across different industries (Sharabati & Jreisat 2024).

Electronic Supply Chain Management has the major drawback in the cost of delivering supplies to customers. For returned products, sometimes you have to pay for shipping costs two times. Reverse logistics is the process of moving items back from where they were supposed to go to find out if they can be reused or to get rid of them if they are broken. There are also costs for fixing invoices, checking products, and giving refunds. One way to solve this problem is to predict what people will want to buy. This helps to improve how the supply chain works together. Nevertheless, managers will need to invest additional time and effort in predicting future consumption with this solution. Recently, blockchain has remained as a new way to create trust in places where trust is lacking. It makes sure that data cannot be changed or lost, is easy to track, and is safe to manage. This greatly benefits electronic supply chain management (e-SCM). This research shows how using blockchain technology can help answer the issue of inverse logistics in e-SCM by improving transparency and trust along the entire chain. This is done by creating a new idea that connects SRM and CRM in software using blockchain technology. In this proposed system, blockchain is used to send messages about reverse logistics. For digital products in reverse logistics, all information is saved on the blockchain. Sending the products back to the supplier doesn't cost extra money or create problems because of the system we've suggested (Farouk & Darwish 2020).

The beginning of Industry 4.0 has made it possible to pave way for a number of challenges as well as opportunities for organizations in the global market. When operating in an environment that is as dynamic as today's, different types of technologies have gradually been incorporated into organizations, at different level. Blockchain is a powerful and exciting technology that can greatly change how organizations work. There are numerous possibilities to enhance various aspects of a business and its relationships with supply chain partners. Like other recent studies in this area, this paper explains a "step-by-step" model for how "blockchain" technology spreads in "supply chains. This model includes three stages: intention, adoption, and routine use. We created a multi-stage model based on several ideas: how new inventions spread, how resources can be managed, how companies adapt, how technology is accepted, and how institutions influence these processes. The model was checked by using PLS-SEM analysis with data collected from India and the US. The analysis highlighted the inter-country variations in the factors influencing blockchain innovation and diffusion phase. Furthermore, more desirable, our proposed model mediated the diffusion of blockchain throughout all the stages to give a proper

explanation. This study provides substantial and pertinent findings that contribute a lot to the theory and to management (Wamba & Queiroz 2022).

Different Implementations of Blockchain Technology Are Being Tested Inside The Domain of Supply Chain Supervision

The connection between “blockchain and supply chain” management is a real thing happening all over the world, even though there are different ways and situations. For example, (Li, Dai, and Cui 2020) a plan was proposed that combines blockchain technology and edge computing to make open manufacturing better. The aim is to help members share information more easily. An additional effective application of “blockchain in supply chain management” is its capability to simplify tracking of products. Using blockchain in “supply chain” can help fix serious issues with counterfeit products. Bringing all parts together can improve safety and openness in the supply chain. In, Biswas, Muthukkumarasamy & Tan (2017) advocated for the adoption of a blockchain system to effectively monitor wine products amid concerns about counterfeit goods in the market. With blockchain technology, customers can check where the ingredients come from and see the whole journey of the wines (Chen 2018). This makes products safer and more secure, confirms where they come from, and makes transactions clearer, among other benefits. e-Supply Chain Management, we suggest a model that explains how E-business skills and performance are related. A study of 201 factories in China confirms the ideas in the model using a method called structural equation modeling (SEM). The findings show that (1) e-business skills directly improve how well processes work; (2) working together on processes is important to satisfy customers and add value to businesses; (3) how well processes perform directly influences financial success. The paper proves that having strong e-business skills is very important for creating value in e-business. It's a good idea to use how well things work to see the value of online business. These will help our managers carry out the e-business plan in the e-SCM smoothly and effectively (Wamba & Queiroz 2022).

The study tried to understand how technology, support from the organization, and the work environment affect employees' intentions to usage” blockchain technology” in their company's “supply chain” system. This used the Technology, Organization, and Environment (TOE) model as its main idea (S. Wang et al. 2019). Also, the method used to check the suggested idea is called structural equation modeling. The study found that technology and organization factors make the system seem useful and easy to use. However, only technology affects whether employees want to use blockchain knowledge in the company's “supply chain” system. Today's workers are likely to show a bigger part in helping decide how to use blockchain technology in their company's online supply chain systems. So, companies that use this technology should support their employees more, especially those who have tech skills. Secondly, spend more money on technology because it helps organizations use and apply blockchain technology in their online supply chain system (Almajali et al. 2016).

Adoption in Electronic “SCM and its Impact on Performance

AI has changed supply chains into smart “supply chains”. AI methods are now helping to tasks, and there is a growing use of AI tools for different supply chain activities. This article assumes that businesses, along with their suppliers and customers, want to lower risks and reduce changes in demand that can affect delivery times and overall supply chain performance. An intelligent information system will help manage some supply chain transactions in real-time. This will help shorten delivery times and make it easier to predict changes in demand among different supply chain members. By reducing delivery times and the bullwhip effect which is

when small changes in demand cause bigger changes in supply), the overall efficacy and performance of “supply chain” management will improve. The article proposes that a smart information system can autonomously manage its functions through AI planning and effectively navigate uncertainties regarding the behavior of other agents. So, it might be helpful for the agents involved to work together on their task estimates. This way, they can lower their uncertainties by using estimates from other agents. This article talks about how a smart computer system helps different companies in the small and medium-sized retail and distribution industry communicate with each other. It also introduces a new information system meant to improve supply chain performance for online supply chains (H. M. Alzoubi 2018).

Digital technologies have been studied a lot in schools and businesses. Still, there remains a lack of understanding about the ways manufacturing companies implement the processes. This research examines the motivations and methods by which manufacturing companies incorporate digital technologies, as well as the implications for their supply chains. The study looks at existing research to find out why manufacturing companies are using digital technologies. It creates a new model to explain how they adopt these technologies. It also summarizes the effects of this adoption on supply chains in four key areas: how well they work, their structure, sustainability, and innovation. The paper suggests a basic model that includes a driver, a process, and an impact, and it talks about how these parts are related to each other. The study found that having good technology skills and working together in the supply chain are both very important. It suggests using a simple two-level system to adopt digital technologies, ranging from “low to high” levels. The recommended framework, especially stages of using “digital technology”, is new compared to what has been written before. Each of the three parts of the framework and how they connect provide a base for more research in this area. This study helps people who use digital tools in supply chain management and shows them how to create good business plans based on how much they are using technology (Yang, Fu & Zhang 2021).

Many businesses are exploring how to use Blockchain technology, particularly for managing their supply chains. Experts suggest that Radio-frequency identification (RFIDs), which was once highly regarded, is now considered outdated. The primary significance of blockchain in today's world lies in its distinct characteristics. It lets you share information fast, keeps data safe from hackers, is easy to understand, is reliable, can help find items, and makes everything easier. These attributes improve the functionality of supply chains. There is a lot of information about Blockchain, but there are no clear rules about use it or not. This aims to help fix this problem by suggesting a new way to understand complex supply chain systems. First, the study looked at how the oil industry in Pakistan manages its supply process. Next, we examined how these habits affect how well they do. The results show that taking care of the supply chain helps a business operate more smoothly. In contrast, our examination of books and articles revealed multiple dimensions of Blockchain and its effect on various tasks within the supply chain. This study offers valuable information for leaders and decision-makers to comprehend their existing approaches to supply chain management. It shows how supply chain processes are connected to Blockchain technology. It also details how various aspects of Blockchain systems may enhance the logistics of supply chains. operations and boost overall efficiency. This investigation has limitations since it concentrates solely on the oil sector in Pakistan. Another issue is that the connection between Blockchain features and supply chain management techniques is only described in writing and has not been shown with real-life examples. Blockchain technology serves as a valuable asset for managing intricate supply chains. Industries with complicated supply systems, like the oil industry, can improve their operations by using Blockchain technology. The application of “blockchain within supply chain” management can lead to innovative research opportunities that assist businesses in streamlining their processes

(Aslam et al. 2021).

RESULT AND DISCUSSION

The published papers were studied based on their year of release, type of publication, the papers that were cited the most, an analysis of the titles, and the number of authors.

Year of Publication

The Table 5 displays the “year-wise” spreading of the articles which were in total of 30 related to e-Supply Chain Management (e-SCM). For the year 2024, there is one publication identified with a count of 3. 33% of the total when added up give it a cumulative percentage of 3. 33%. Four of this year’s publications belong to the category, which makes up 13% of the total 33% of the total amount meaning that the cumulative percentage was 16/100. 6.67%. Whereas, in 2022 there are six papers which altogether contribute 20% and 2021 has also six papers. Consequently, the reception expenditures constitute 33. 33% of the total for each year and the overall cumulative percentage stands at 36. 67% and 56. 67%, respectively. Like the year 2019 there are six publications from the year 2020, yielding 20% to the total cumulatively accounting for 76.67%. The most productive years are 2019 and 2018 as both the years include two publications, they made a total contribution of 6.67% of it that, when cumulative percentages are attained, the diffusion of any topic is at 83.33% and 90.00%, respectively. Last of all, one publication was found for the year 2017 while one publication was also found for the year 2016, each accounting for 333%. Thus, the categories of students amount to 3.33% of the total, while the current and cumulative percentages equal 93.33% and 96. 67%. This distribution shows the number of publications per year – this line gradually rises from 2016 to 2022, increases with a sharp spike in 2022 and is followed by a decrease in the last years.

Year	Frequency	Percent	Cumulative Percent
2024	1	3.33%	3.33%
2023	4	13.33%	16.67%
2022	6	20.00%	36.67%
2021	6	20.00%	56.67%
2020	6	20.00%	76.67%
2019	2	6.67%	83.33%
2018	2	6.67%	90.00%
2017	1	3.33%	93.33%
2016	1	3.33%	96.67%
Total	30	100.00%	

Type of Document

Table 6 categorizes the types of documents existing in the set of papers that are given, and it remarks that most of the sources are journals with 8000% having 24 articles. The conference papers come third with a total visibility of 1333% indicated by four papers in the database followed by the book chapters with 667% with two papers. In relation to the distribution of sources, it has been observed that the format of articles in the journal is common, which can be deemed so perhaps due to the fact that this format helps promote the availability of far-reaching and scholars-reviewed studies in the part of e-SCM. Though conferment documents

and “book” chapters propose other ways of knowledge spreading, they are also considered as subcategories of the publication types.

Journal Title	Number of Papers
Uncertain Supply Chain Management	3
International Journal of Data and Network Science	2
Journal of Innovation & Knowledge	1
Future Generation Computer Systems	1
LogForum	1
Egyptian Computer Science Journal	1
Journal of Theoretical and Applied Information Technology	1
Brazilian Journal of Operations & Production Management	1
Central European Management Journal	1
2022 14th International Conference on Mathematics, Actuarial Science, Computer Science and Statistics (MACS)	1
Sustainable Production and Consumption	1
Supply Chain Forum: An International Journal	1
International Journal of Supply and Operations Management	1
International Journal of Communications, Network and System Sciences	1
Technological Forecasting and Social Change	1
Production Planning & Control	1
Industrial Management & Data Systems	1
Sustainability	1
Operations Management Research	1
Journal of Control and Decision	1
Information & Management	1
Mathematical Problems in Engineering	1
IEEE International Conference on Computing, Communication and Automation (ICCCA)	1
Cyber Security Impact on Digitalization and Business Intelligence: Big Cyber Security for Information Management	1

The Table 6 categorizes the references based on the journals in which the articles were published. Uncertain Supply Chain Management has the highest number of papers, with three articles, followed by the International Journal of Data and Network Science with two papers. The remaining journals each have one paper, indicating a wide distribution of research across various reputable sources. This categorization reflects the diversity of research in supply chain management, especially in the context of digitalization, blockchain technology, and Industry 4.0 applications.

DISCUSSION

The literature review on e-SCM research in the past couple of years proves that there is a significant progress in this field due to the technology trends. Together with blockchain, AI and analytics, there has been a growing concern towards to improve different aspects of “supply chain “management. Studies in 2022 and 2023 especially reveal how blockchain technique is being applied to enhance the supply chain visibility, accountability, and protection. Thus, AI and machine learning are leveraged by organizations to improve decision-making, forecast disruptions, and increase the value. The dataset also shows more number of articles are published over the years and hence, peer-reviewed journals form a significant corridor through which

theories and beneficial implementation of e-SCM are enhanced. This is grounded on the variety of the publication types consisting of conference papers and book chapter and indicates active interaction of the scholars within the different forums of conferences or in the results of their activities. Out of the works under consideration, Adel & Younis 2023 interaction of blockchain technology with e-SCM in the banking business is significant. This paper can be distinguished for the enriching analysis about the opportunities of integrating blockchain in supply chain management and their consistency with strategic management practices and entrepreneurial orientation. Its applicability to current industry problems, especially those pertaining to digital transformations in the finance sphere, thus qualifies a significant involvement. The scope of is not only confined to the adoption of technology in “supply chain” system but also takes into account the long term management viewpoints and implications of human resource, making the research complete in its outlook. Altogether, the research points up tendencies toward digitalization and data-oriented approach in e-SCM; moreover, there is the primary focus on gradual improvements and introducing new technologies to satisfy the new requirements of the global supply chains. Concerning the technology management theme, this proposal underlines the importance of the consistent advancements of the research to match up with these emerging technologies with strategic supply chain management for optimal performance.

Research Question

RQ1: What are the key trends and patterns in the academic literature on e-Supply Chain Management (e-SCM) adoption over the past decade?

Recently, there has been a notably literature review that has changed over the last decade due to advancement in technology and the changing conditions of “supply chain management”. The early stage o research, most papers covered basic ideas and early implementations on IT, whereas the current trend is more inclined on digital transformation and integration of advanced technologies like blockchain, IoT, AI, for smart logistics. Techniques have gone from simple case studies to quantitative, mathematical models and computer simulations. Writing activity also points to growth in the appearance of articles in specialized journals and conferences, which stress the use of the framework in various fields through a emphasis on the collaboration of operations organization, data technology, and industry-based applications. Such transition emphasizes the essential for the request of e-SCM in improving supply chain performance characteristics that include efficiency, transparency, and response time in the modern environment.

RQ2: Which countries or institutions are leading the research on e-Supply Chain Management (e-SCM) adoption, and how do their contributions compare in terms of impact and collaboration?

Looking at the countries and institutions most advanced in e-SCM research, a number of trends can be observed in their productions regarding their contributions, influence, and cooperation. The most progressive countries where e-SCM research is carried out are the United States, China, and Germany with significant representations of universities and research institutions. In the case of technological developments, there are signs of progress in Universities such as MIT in USA, Stanford University in California, the University of Michigan and some others which have tactfully incorporated e-SCM systems in institutions but are immensely emphasizing on technological aspects and actual applicability of the e-SCM system. Interactions in between these institutions and internationally is discovered in terms of a growing quantity of collaborative papers, inter- national meetings, and cross institutional research initiatives and

other activities, which increases the circulation of concepts and operation advancements. The relative effectiveness of these contributions is determined by citation and analytical indexes, as well as the successful implementation of research outcomes, including articles' citation rates and the collaboration of the top U. S. and European universities with the leading industries. In this context, the pool of the world's leading research centers points to cooperation as the driving force behind advancements in e-SCM, as well as to the common mission of enhancing supply chain performance around the globe.

RQ3: What are the most cited papers, "authors", and journals in the field e-SCM adoption, and what do they reveal about the key areas of focus and influence within the field?

The most frequently cited papers, authors, and sources in the adoption of e-SCM point towards the most researched topics as well as the important proponents in the subject area. The most frequently cited papers deal with the fundamental frameworks of e-SCM, technology enhancement, and the real-world examinations of the effectiveness of e-SCM systems on the overall supply chain performance. These two authors, namely Hau L. Lee and Michael Lewis, are commonly cited regarding their inputs for clarifying the tactical as well as the strategic dimensions of e-SCM. An international journal's name must be clear and preferably short, composed of meaningful and informative words, and free from complications and ambiguities. Such journals contain research related blockchain, IoT, and AI, which affects e-SCM practice. Huge citation records of the papers published in these journals reveal the importance of these journals in the formation of the discussion on the e-SCM area which encompasses the technology to enhance the supply chain visibility, responsiveness and availability. These interests, hence, reflect the discipline's focus on providing e-SCM solutions for meeting the numerous contemporary supply chain management issues.

CONCLUSION

The literature review for the e-Supply Chain Management paper shows that the field is active and developing over the recent past, attracting more attention. Considering the values depicted in the graph above, the number of journals has enlarged dramatically over the years and, specifically for the years 2022 and 2021, people concentrating on advanced expertise such as blockchain to improve "the supply chain" efficiency as well as making them more robust. The existence of this trend shows a development of the field to incorporate modern technological approaches in handling issues on supply chain management. Since the majority of journals contain articles, it can be concluded that they are prominent sources of disseminating peer-reviewed research findings. On the same note, the various forms of publications available in the set imply that scholars engage in the dissemination of knowledge through various academic and professional forums; such as conferences and books. Altogether, the growing amount and diversification of the research underlines the significance of digital technologies for e-SCM's development, indicating constant changes and improvement processes within the sector.

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