JRE OPEN ACCESS

JOURNAL OF RESILIENT ECONOMIES

PLATINUM OPEN ACCESS

Journal homepage: https://journals.jcu.edu.au/jre/index

AI-enabled Integration in the Supply Chain: A Solution in the Digitalization Era

Manh-Kha Kieu[1], Rajkishore Nayak[2], Mohammadreza Akbari[3]

Abstract

Artificial Intelligence (AI) is getting increased attention from various manufacturing industries, including fashion and textiles, due to its ability to work effectively, similar to human intelligence. This Systematic Literature Review (SLR) paper proposes potential future research directions that emphasize the impacts of AI on supply chain integration (SCI) efforts through information sharing (IS). A structured literature review of articles in the 2010-2021 period, addressing geographic location, journals, publishers, authors, research designs, and applied theories, has been used to prepare this paper. The additional discussion of AI incorporates information from the structured review to conclude the findings and suggest future research directions. The authors have used the Scopus database and prestigious peer-reviewed journals to search for relevant papers using suitable keywords. This paper concluded that the Asian region has the highest concentration of publications and that AI adoption positively affects the IS-SCI relationship. Empirical quantitative research design and resource-based view theory are prominent among the reviewed publications. This SLR paper is limited by not having the impacts of AI discussed at the subset level.

Keywords: Supply Chain Integration, Information Sharing, Artificial Intelligence, Textile and Garment, Supply Chain Resilience, Risk Management

[1] Corresponding Author, School of Business & Management, RMIT University, Ho Chi Minh City, Vietnam, Becamex Business School, Eastern International University, Binh Duong Province, Vietnam, ORCID: 0000-0002-1616-9607, Email: kha.kieu@eiu.edu.vn
[2] School of Communication & Design, RMIT University, Ho Chi Minh City, Vietnam, ORCID: 0000-0002-3510-7305, email: rajkishore.nayak@rmit.edu.vn
[3] College of Business, Law and Governance, James Cook University, Queensland, Australia, ORCID: 0000-0002-0051-1199, email: reza.akbari@jcu.edu.au

Journal of Resilient Economies (JRE) publishes original research with a multidisciplinary focus to further advance the important concept of resilience. JRE is fully supported by James Cook University Open Journal Systems (OJS), driven by the belief that knowledge has the power to change lives, and that research outputs should be freely accessible online, without barriers. To cite, include Author(s), Title, Journal of Resilient Economies, volume, issue, year and DOI. DOI: https://doi.org/10.25120/jre.2.1.2022.3919

1. Introduction

The Covid-19 pandemic will permanently change the way the global supply chain operates. Unconventional fluctuation of commodity prices, disrupted supply networks, fragmented logistics systems, and shifting consumer demands are common types of risks that have occurred during the pandemic and will continue to affect business transactions even in the post-pandemic world. Current supply chain models may not be as effective in mitigating risks compared to the pre-covid period, which urges researchers to quickly identify more suitable models for supply chain collaboration (Akbari & Do, 2021). Before the pandemic, firms along the supply chain practised integrating themselves with their partners up and down the supply chains to improve supply chain and firm performance as well as to mitigate risks (Zhu et al., 2018). Supply chain integration (SCI) has been proven to be positively correlated with firm performance (FP) at various levels, including supply chain performance, supply chain resilience, operational performance, financial performance, and risk management (Yunus & Tadasina, 2016; Yu et al., 2019). A higher level of integration will lead to higher firm performance (Wiengarten et al., 2015). Among the factors that contributed to the success of SCI efforts, information sharing (IS) plays an enormous role in any integration efforts and helps increase the depth of integration among supply chain partners (Lau et al., 2010). However, post Covid-19 environment requires businesses to revisit their supply chain strategy (Ha, Akbari, & Au, 2022), especially how to efficiently capture the full potential of IS, to ensure productivity and efficiency.

We have witnessed a magnificent development of information technology (IT) since the dawn of the 21st century. Within the two decades, numerous IT terms have been made available and have been accepted globally, such as Internet of Things (IoT), Big Data, Data Analytics, Artificial Intelligence (AI), and Industry 4.0, to name a few (Akbari & Hopkins, 2022). In just over 20 years, we have come a long way in digitalizing our transactions in all industries, which implies a paradigm shift for all businesses (Davenport et al., 2020). In this new era, firms that have the capability to adapt and use suitable technologies that harness the power of data to be more competitive, resilient, responsive, and manage risk well, will flourish (Mandal, 2018). Since the success of SCI is strongly correlated with the extent to which information is shared among supply chain entities, the adoption of advanced information systems and software to manage and make sense of massive, complicated real-time data is of utmost importance (de Vass et al., 2018; Shee et al., 2018; Dubey et at., 2019). In fact, Mandal (2018) pointed out that data creation will only increase faster and that companies will emphasize analyzing this vast amount of data to coordinate better with their partners and leapfrog their competitors. However, the discussion of advanced analysis and autonomous tools like AI in the SCI domain is limited, and the impact of this key element in this new digital era on information sharing and supply chain integration (IS-SCI) relationship has not been clearly discussed.

Hence, the objectives of this research are to combine the systematic review of the past articles in the IS and SCI field to identify the role of IT adoption and to propose future research directions in which AI is a key element. The paper will review the articles published from 2010 to 2021 in the Scopus database and other indexed journals. The paper will explicitly address the following research questions (RQs):

1. RQ1. How have the elements such as geographic locations, publishers, journals, authors, and research designs, in this field changed since the beginning of the past decade?
2. RQ2. What is the prevailing conceptual framework established among the current body of knowledge of information sharing and supply chain integration relationships?
3. RQ3. How will the application of AI contribute to the success of the IS and SCI relationship and future research directions?

This research paper will present the conceptual background of IS-SCI relationship and the application of AI to establish the theoretical foundation for this paper to answer the above research questions in the next section. It will provide a big picture of IS-SCI relationship in addition to the background and benefits of AI. The conceptual background is followed by research methodology, materials evaluation, and conclusion sections.

2. Conceptual background

2.1 Supply chain integration

The Supply chain concept and supply chain management are not very old disciplines, which were introduced in the 1980s (Keith & Webber, 1982). Despite a short presence in the industry and the academic world, this discipline has always been the centre of academic study and research in recent years (Alfalla-Luque et al., 2013; Akbari & Do, 2021). The core value of supply chain management and its contribution to the success of any business lies in how well the supply chain partners build relationships and gain competitive advantages by co-utilizing network resources (Carter & Rogers, 2008, Liu et al., 2016). Chen & Paulraj (2004) and Mentzer (2004) highlighted that the ability to coordinate efficiently among business partners in their supply chain is the key contributor to managing the supply chain successfully.

The role of coordination has been focused in the sub-channel of supply chain management which is SCI. This sub-domain emphasizes how supply chain entities work together collaboratively to establish various platforms to make the coordination more efficient. Companies can achieve such efficient coordination by integrating externally with their supplies and customers and internally with their functions (Flynn et al., 2010, Wiengarten et al., 2019; Zhao et al., 2021). Other authors found that integrating processes can also help companies attain such benefits (Leuschner et al., 2013; Steven & Johnson, 2016; Zhu et al., 2018). Planning synchronization, logistics integration, alignment of incentives and information integration are the remaining facets of supply chain integration (Huo, 2012; Liu et al., 2016).

2.2 Information Sharing

Data and information are only valuable when shared. The importance of sharing and integrating information among supply chain entities is highlighted in a vast majority of articles in this domain. Various articles have confirmed the significant impact of information sharing and integration on firm performance in the current literature. Firms occasionally decide to direct the integration efforts to their internal functions to ensure the efficient flow of information within the system

(Jacob et al., 2016; Yu et al., 2018). However, greater efforts for information integration have been put into external information integration (Zolait et al., 2010; Kumar et al., 2017; Zhang et al., 2018; Sacristán-Díaz et al., 2018). Several authors have recognized the movement in this domain from companies that actually try to integrate their information technology system with their supply chain partners in an effort to optimize business transaction efficiency (Liu et al., 2013; Vanpoucke et al., 2016; Kim, 2017; Song et al., 2019; Sundram et al., 2020). The involvement of more advanced communication technology has been confirmed to have a direct impact on the information integration effort (de Vass et al., 2018; Delic et al., 2019). Information sharing and information technology are significant factors that influence the information integration efforts of supply chain entities.

2.3 Information sharing and supply chain integration

There are three primary flows in any supply chain which include material flow, cash flow and information flow. Information has been confirmed to be one of the most significant factors contributing to efficient communication across entities in the supply chain by contemporary scholars (Lau et al., 2010; Kong et al., 2021). Despite the obvious importance of information, it does not directly influence the performance of firms but rather indirectly influences a firm's performance through supply chain integration (Kim, 2017). This finding aligns with the current body of knowledge in the supply chain integration field, in which Lau et al. (2010) pointed out that information sharing and organizational coordination are crucial for the success of supply chain integration. Further studies into this information sharing – supply chain integration relationship in various contexts is getting the same positive results (Prajogo & Olhager, 2012; Jacobs et al., 2016; Song et al., 2019). Since this is an important topic, the authors have brought the analysis to the next level of depth which describes the relationship between the sub-domains of information sharing and those of supply chain integration. The ability to ensure the information is shared efficiently and effectively across all functions within a firm is vital to its success (Jacob et al., 2016; Yu et al., 2018). This internal information sharing mechanism and top management support are the key drivers of internal integration (Shee et al., 2018).

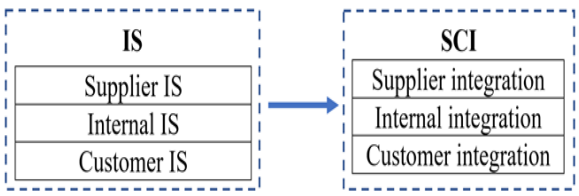

Figure 1-The IS-SCI relationship

A larger amount of data and information is transferred to and from an entity to its supply chain partners will improve its supply chain alignment and, therefore the business performance. In addition, accurate and timely communication across companies improves the agility and flexibility of their supply chains (Lee, 2004; Sacristán-Díaz, 2018). External information sharing includes information sharing with customers and with suppliers. While the internal issues and development can be controlled by the firm, firms may face different challenges in their efforts to integrate with their customers and their suppliers. Those challenges can be minimized when having the right mechanism and channels to share information (Sacristán-Díaz, 2018; Yu et al., 2018). We summarized the relationship between IS and SCI in Fig.1. Information, by itself, does not automatically provide the aforementioned benefits if an effective sharing mechanism is not in place. There are certain requirements of information that must be met, and those requirements include accuracy, timely accessibility, and transferability (Pollock, 2000; Fletcher, 2009; Wu et al., 2020). During the Covid-19 pandemic, the traditional mechanisms of information sharing seemed to be obsolete with the stress test from the environment and created disruptions in the entire global supply chain networks. The post-Covid-19 pandemic era requires updated mechanisms for information sharing in the global supply chains.

2.4 Artificial intelligence and information sharing

In the new era of industry 4.0, the majority of the latest research in the past decade focused on AI because of its profound impacts on both society and academia. AI is defined in many ways with various approaches and perspectives. Iyer (2021) has summarized and defined AI as the ability of machines to have similar human cognition such as learning, reasoning, identifying, and solving problems. From the start of the concept, AI has been developing rapidly and has become a wide spectrum discipline that has various applications in different domains (Hariri et al., 2019; Rodríguez et al., 2020). Rodríguez et al. (2020) summarized the various branches of AI, which include expert systems (ES), machine learning (ML), multi-agent systems (MAS), neural networks (NN), and fuzzy logic and fuzzy sets (FLFS), and metaheuristics (MH). The two main categories of AI that most business-related authors refer to are ES, which includes deep learning neural networks and fuzzy rules, and ML (Van et al., 2020; Kotsiopoulos et al., 2021).

With the advances in hardware system capability developed in the past few years that can capture and analyze the amount of data we have never seen in the previous period, AI, with its functions, could be able to assist businesses (1) in integrating and make data more relevant to business operations; (2) to allow companies to automatically make an impactful real-time decision; and (3) to allow mistakes, improvements to be documented for future improvements (Hariri et al., 2019; Cheng & Yu, 2019; Rodríguez et al., 2020). This new generation of AI has the potential to completely change the way business has been sharing information for decades and could trigger innovation in the way companies integrates their supply chain to be more competitive in the marketplace (Poola, 2017; Ding et al., 2020; Iyer, 2021).

Moving forward in this digital era, the amount of information exchanged across the supply chain will only get larger. The ability to grasp and process information faster and more accurately, whether the improvement is incremental or significant, will help firms to be more resilient and risk-tolerant in the marketplace (Benzidia et al., 2021). The traditional sharing mechanisms with insufficient use of information technology will hold the position any longer by the overwhelming amount of data that needs processing. As information technology is adopted more frequently in improving the quality of information sharing, AI-powered intelligent systems will be crucial to strengthen the impact of

information sharing on supply chain integration (Akbari & Hopkins, 2022).

3. Methodology

Systematic review papers summarize the peer-reviewed publications to provide the academic community with cohesive findings in a period of time and a specific area of knowledge so that researchers can build upon and identify their research potential (Bastas & Liyanage, 2018). Although researchers have published a few systematic review articles in the SCI domain, the review of IS and SCI in the past decade was neglected. This situation urged us to conduct this systematic review paper to summarize the findings of peer-reviewed articles and to identify research gaps and future research directions in this field. **Fig. 2** describes the detailed steps that we took to collect, evaluate and conclude this paper.

The author has developed the five steps research method for systematic review and applied it in this article. The method has been adopted by Akbari (2017), and Akbari & McClelland (2020).

Step 1: This investigation collects the articles from 2010 to 2021 to draw a comprehensive picture of current literature about information sharing and supply chain integration in the last decade.

Step 2: The articles are collected from an aggregated Scopus database and from publishers' websites, including Emerald (Emerald.com), Elsevier (Elsevier.com), Growing Science (Growingscience.com), Taylor & Francis (Tandfonline.com), Springer (Springer.com), ScienceDirect (ScienceDirect.com), Wiley (Wiley.com).

Step 3: The author uses the keywords "supply chain", "integration", "information" "sharing" to search for articles in the databases as per the methodology in Akbari (2017), and Akbari & McClelland (2020).

Step 4: The selected articles were included in an Excel database and examined carefully. The data was processed by Excel.

Step 5: The paper will combine the findings from the article classification with the analysis of AI to discuss (1) the gap in the literature, (2) the significant findings, and (3) future research directions.

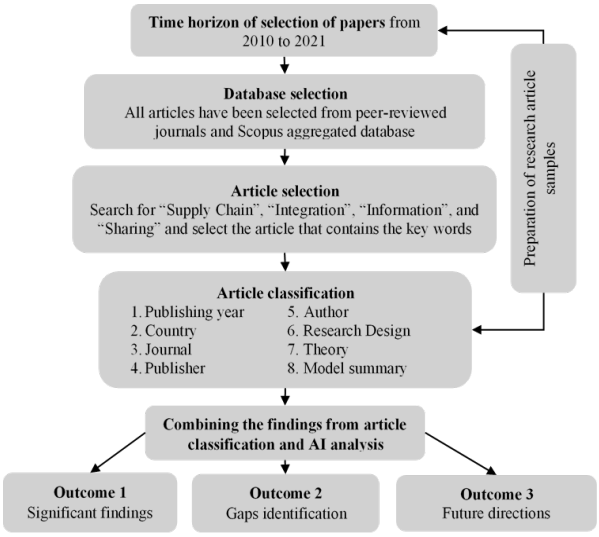

Figure 2- SLR methodology

In the initial search through the Scopus database and other publishers, the structural examination resulted in 112 relevant. The last screening phase eliminated 82 articles that did not strongly discuss the connection between IS and SCI. As a result, 30 qualified articles will be used in this SLR article.

4. Material Evaluation

4.1 Distribution of Publications by Year

This article has summarized the publication by time to analyze the trend in this domain of IS and SCI. The analysis of the distribution of publications by time is described in Fig. 3. The column chart shows the number of publications per year in the period of 12 years, the years with the highest publications and the trend toward the number of publications through time. In the period of 2010-2015, the number of publications on this topic, although 2011 and 2015 added some weights, started to get some tractions which created a good foundation for strong development in the period of 2016-2021. Although we may receive more publications in 2021, 2018 is the year with the highest number of publications. The increasing number of articles in recent years shows that more researchers, as the trajectory trend indicates, are concentrating on this topic.

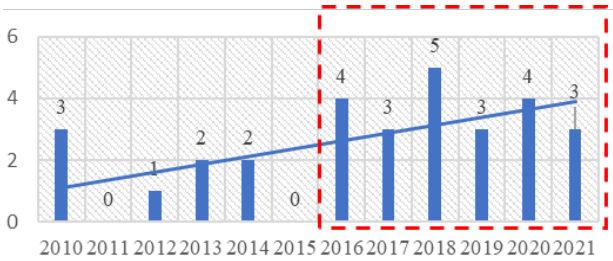

Figure 3- Distribution of publications by year

4.2 Distribution of Publications by Country

Fig. 4 summarizes the classification of reviewed papers by the country from which the data is collected. The column chart on the left illustrates the number of articles in each country as well as the ranking of the country. The world map on the right with purple circles explicitly visualizes the locations where high concentrations of articles populate. The larger circle indicates a higher concentration of articles, and smaller circles indicate a lower concentration of articles. The circle at the bottom of the map represents the number of articles that have been conducted at the global level. Overall, this topic has been studied in a number of countries around the world which resides in four continents: Asia, Europe, North America, and Oceania. At the country level, China tops the list with nine articles, followed by Australia with four articles, Vietnam and Malaysia with three articles, and Hong Kong, EU, Korea, UK, USA, New Zealand, Turkey and Indonesia with 1 article for each country. The world map shows that the majority of articles studied the Asian Pacific regions.

However, the statistical data indicates that China really stand out with 9 articles but articles in Australia really took another step toward the adoption of more advanced technology. De Vass et al. (2018) confirmed that the IoT did have a significant impact on information sharing and process integration with customers and suppliers while Shee et al. (2018) also found that the adoption of cloud-based technology will enhance the ability of firms to process data and information and therefore influenced supply chain integration. The

distribution of publications by country indicates an imbalanced distribution of articles among regions worldwide.

Figure 4- Distribution of publications by country

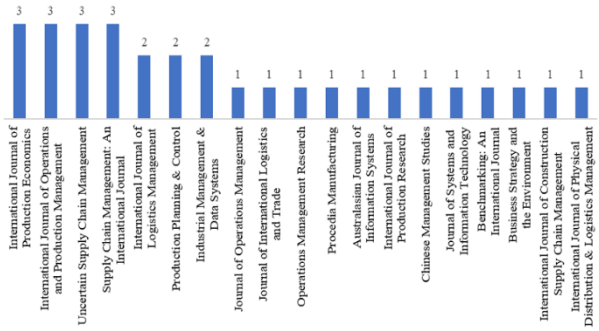

Figure 5- Classification of publications by journals

Fig. 5 summarizes the number of articles published in each journal. The chart indicates that there are no clear leading journals in this domain in which the number of publications is not significantly different across all journals. The journals that have the largest number of publications include International Journal of Production Economics, International Journal of Operations and Production Management, Uncertain Supply Chain Management, Supply Chain Management: An International Journal (3 each), followed by International Journal of Logistics Management, Production Planning & Control, Industrial Management & Data Systems (2 each) and Journal of Operations Management. Journal of International Logistics and Trade, Operations Management Research, Procedia Manufacturing, Australasian Journal of Information Systems, International Journal of Production Research, Chinese Management Studies, Journal of Systems and Information Technology, Benchmarking: An International Journal, Business Strategy and the Environment, International Journal of Construction Supply Chain Management, International Journal of Physical Distribution & Logistics Management (1 each).

The summary shows that, although there are no leading journals in the SCI and IS domain, this topic has been well-recognized among prestigious journals. Hence, it has to potential to attract much more attention to broaden this exciting literature to bring more value to both academic and practitioners' communities.

4.4 Classification of Publication by Publishers

Unlike the classification of publication by journal where there are no clear leading journals, **Fig. 6** shows that majority of articles in this area are published in Emerald with 14 publications, followed by Elsevier with four publications, Growing Science with three publications, Taylor & Francis with three publications, Springer with one publication, Science Direct with one publication, and Wiley with one publication. Three are three other ISI/Scopus databases with one publication each. The details of this classification are presented in Appendix 2. The statistical data shows that a number of researchers are paying attention to this topic and that group of researchers usually publish their papers in Emerald. The listed publishers are prominent in the academic community, increasing number of publications in these prestigious publishers signals a promising research outlook for this research area.

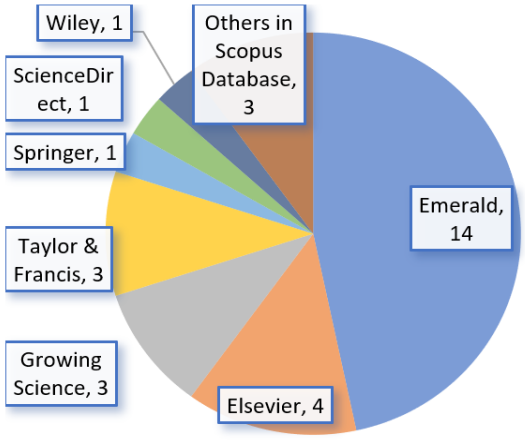

Figure 6- Classification of publication by publishers

4.5 Contribution by Authors

There are 86 authors recognized in 30 articles. The top ten authors who also have more than one contribution to this domain are listed below. **Fig. 7** presents the authors who have the highest contribution to this topic. Veera P. K. Sundram and Wantao Yu have the highest contribution (each has 3 articles), followed by Hefu Liu, Weiling Ke, Hing Kai Chan, V.G.R. Chandran, Beofeng Huo, Kwok Kee Wei, Roberto Chavez, Zhongsheng Hua (each has two contributions). The summary of publication contribution by the author indicates that this area of research is new, and the prominent authors are yet to be confirmed. This is an important finding which suggests another systematic review paper in 5 years to reidentify the prominent authors in this field.

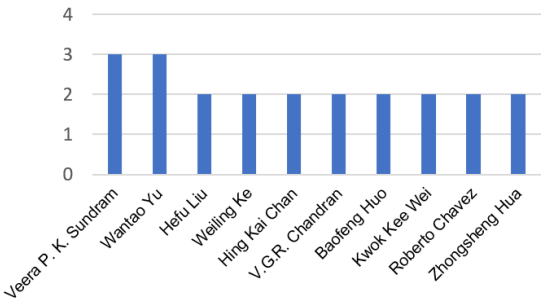

Figure 7- Contribution by authors

4.6 Classification of Publications by Research Design

Fig. 8 classifies the articles by the research designs. Akbari & McClelland (2020) pointed out that there are five

types of research design: empirical quantitative, desk quantitative, empirical qualitative, desk qualitative, and mixed empirical methods. The pie chart shows that empirical quantitative appeared in 83% of the publication while desk quantitative, empirical qualitative and empirical mixed methods are only used in less than 10% of the total publications. Desk qualitative research design has not been used in any articles in this domain. Since empirical quantitative design is most common and the missing desk qualitative and conceptual articles suggest that there are opportunities for conceptual papers which incorporate new factors to add more value to this exciting domain.

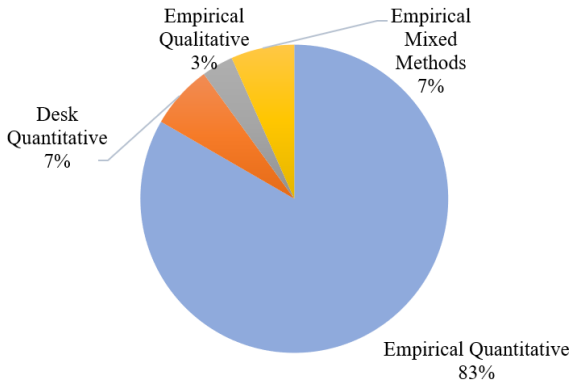

Figure 8- Classification of publications by research design

4.7 Summary of Theories Used

Among the nine theories used in the reviewed articles that have been listed in Table 1, Resource-Based View (RBV) is used most frequently in 7 publications. Information Processing Theory (IPT), Organizational Capability Theory (OCT), Dynamic Capacity View (DCV), and Social Capital Theory (SCT) support the development of the theoretical frameworks in a total of 8 articles (2 each). Each of the following theories: Relational View Theory (RVT), Research Orchestration Theory (ROT), Knowledge-Based View (KBV), and Social Contagion Theory (SCoT) supports the theoretical development in 1 article. These theories are prominent in the literature on supply chain integration and are the cornerstones for developing countless collaboration conceptual and empirical frameworks. The adoption of these important theories implies the value of sharing resources in integrating the supply chain to improve the competitive advantage.

Table 1- Summary of theories used

Theories	Authors	Articles
Resource-Based View (RBV)	Zolait et al. (2010); Feng et al. (2017); Yu et al. (2018); Shee et al. (2018); Mora-Monge et al. (2019); Song et al. (2019); Delic et al. (2019)	7
Information Processing Theory (IPT)	Sacristán-Díaz et al. (2018); Sundram et al. (2020)	2
Organizational Capability Theory (OCT)	Han et al. (2013); de Vass et al. (2018)	2
Dynamic Capacity View (DCV)	Feng et. al. (2017); Mora-Monge et al. (2019)	2
Social Capital Theory (SCT)	De Vass et al. (2016); Mora-Monge et al. (2019)	2
Relational View Theory (RVT)	Prajogo & Olhager (2012)	1
Research Orchestration Theory (ROT)	Liu et al. (2016)	1
Knowledge Based View (KBV)	Singh & Power (2014)	1
Social Contagion Theory (SCoT)	Kong et al. (2021)	1

4.8 Prevailing Conceptual Framework

Overall, the authors concluded that information sharing is positively correlated with supply chain integration (Lau et al., 2010; Song et al., 2019; Kong et al., 2021). Poor information is considered a significant barrier to supply chain integration, although the impacts of subdomains of information sharing and communication on subdomains of supply chain integration vary (Prajogo & Olhager, 2012; Vanpoucke et al., 2016; Sooriyamudalige et al., 2020). Jacobs et al. (2016) and Sacristán-Díaz et al. (2018) highlighted that sharing information internally or externally does not only affect the individual internal or external integration efforts but both internal and external integration efforts.

In addition, the rapidly increasing amount of information exchanged with internal and external partners has changed the way companies operate, and it changes how companies incorporate additional tools into their supply chain integration strategies. 18 out of 30 reviewed papers refer to information technology adoption as a capacity that firms often use to ensure the success of their integration efforts in the digitalized world. Authors have confirmed the impacts of various information technology tools and systems on supply chain integration (Yu, 2014; Vanpoucke et al., 2016; de Vass et al., 2018; Shee et al., 2018; Delic et al., 2019). However, the impact of AI on supply chain integration has not been revealed yet. The overall model for information sharing and supply chain integration relationships can be described in **Fig. 9**. This model is adapted from Lau et al. (2010), Prajogo & Olhager (2012), Liu et al. (2016), Vanpoucke et al. (2016), Zhang et al. (2018), and Song et al. (2019).

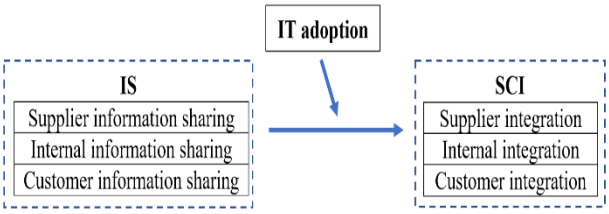

Figure 9- The proposed model for examining the role of AI adoption in the IS-SCI relationship

5. Conclusions

5.1 Important findings

This research has investigated the existing status quo of the research publications relating to AI on supply chain integration (SCI) efforts through information sharing (IS). The research collected information using the databases listed in ISI and Scopus. The following conclusions were drawn based on the findings of this research:

1. 2016-2021 was the period when the number of publications increased sharply compared to the previous period of 2010-2015 due to increasing attention to the role of information technology in the supply chain integration domain.
2. Asian countries, especially China, are taking the lead on examining the impact of information sharing and information technology on supply chain integration. African and Latin American countries have lower research in the field.
3. Although the current literature does not highlight any prominent journals and authors in this field, Emerald is the number one publisher in this domain.
4. The majority of publications employed empirical quantitative as the research design, representing 83% of total reviewed articles.
5. The argument in most publications is built upon the Resource-Based View theory, which highlights the importance of sharing resources and information among supply chain partners to achieve mutual benefits.
6. The review of articles confirms that information sharing has a positive impact on supply chain integration efforts which include internal integration, supplier integration and customer integration.
7. Information technology adoption has become a significant factor in improving the level of integration in the digitalized world, where the amount of data exchanged throughout the supply chain increases dramatically.
8. Subsets of AI, especially ES and ML are extremely useful in facilitating the vast amount of information and data flowing in the supply chain. Such an automated level of data processing will greatly contribute to achieving the expected depth of integration.
9. Through the discussion, we conclude that AI adoption will moderate the IS-SCI relationship. This finding aligns with previous studies of the impact of ML in the supply chain management discipline (Akbari & Do, 2021). It also aligns with the development of big data analytics and AI in supply chain integration field (Benzidia et. al.,2021).

5.2 Significant gaps

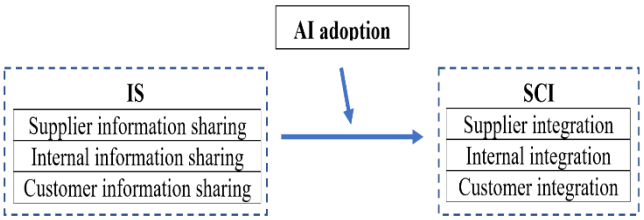

Figure 10- The moderating role of IT adoption in the IS-SCI relationship

1. Geographically, the body of knowledge in this domain is in need of research in African and Latin countries.
2. The imbalance in the distribution of research design leaves gaps in the literature which can be closed with exploratory research designs such as desk qualitative and empirical qualitative research.
3. AI has been attracting the attention of both researchers and industry leaders because of its capacity to improve efficiency through analyzing, learning, and taking faster actions. However, the impact of AI and its branches on the IS-SCI relationship has not been investigated thoroughly with empirical research.

6. Limitations and future research directions

1. This research paper conceptually develops the theoretical model illustrated in Fig. 9, by framing the findings of previous peer-reviewed articles. Future research should employ empirical methods to confirm the moderating effects of AI adoption on IS-SCI relationship.
2. The impacts of various branches of AI have not been discussed in this paper. Future research can examine the effect of the adoption of various AI branches like ML and ES, to the IS-SCI relationship.
3. There are only 30 publications included in this systematic review paper. Future researchers can use wider keywords to increase the number of collected articles to incorporate additional findings and add more value to the current literature.
4. Since AI is a very fast-evolving topic, a shorter reviewing interval should be employed to capture the most updated movement in this part of the body of knowledge.

References

Akbari, M. (2018). Logistics outsourcing: a structured literature review. Benchmarking: An International Journal, 25(5), 1548-1580.

Akbari, M. and Do, T.N.A. (2021). A systematic review of machine learning in logistics and supply chain management: current trends and future directions. *Benchmarking: An International Journa*l, 28(10), 2977-3005.

Akbari, M., & Hopkins, J. L. (2022). Digital technologies as enablers of supply chain sustainability in an emerging economy. *Operations Management Research*, (In-Press), 1-22.

Akbari, M., & McClelland, R. (2020). Corporate social responsibility and corporate citizenship in sustainable supply chain: a structured literature review. *Benchmarking: An International Journal*, 26(6), 1799-1841.

Alfalla-Luque, R., Medina-Lopez, C. and Dey, P.K. (2013). Supply chain integration framework using literature review. *Production Planning & Control*, 24(8-9), 800-817.

Bastas, A. and Liyanage, K. (2018). Sustainable supply chain quality management: A systematic review. *Journal of Cleaner Production*, 181, 726-744.

Benzidia, S., Makaoui, N. and Bentahar, O. (2021). The impact of big data analytics and artificial intelligence on green supply chain process integration and hospital environmental performance. *Technological Forecasting and Social Change*, 165, 120557.

Carter, C. G. & Rogers, D. S. (2008). A framework of sustainable supply chain management: moving toward new theory. International *Journal of Physical Distribution & Logistics Management*, 38(5), 360-387.

Chen, I. J. & Paulraj, A. (2004). Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management*, 22, 119-150.

Cheng, L., & Yu, T. (2019). A new generation of AI: A review and perspective on machine learning technologies applied to smart energy and electric power systems. *International Journal of Energy Research*, 43(6), 1928-1973.

Copeland, B.J., Proudfoot, D. (2007) Artificial Intelligence: History, foundations, and philosophical issues. *Philosophy of Psychology and Cognitive Science, Elsevier*. 429–482.

Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, 48(1), 24-42.

De Vass, T., Shee, H. and Miah, S.J. (2018). The effect of "Internet of Things" on supply chain integration and performance: An organizational capability perspective. *Australasian Journal of Information Systems*, 22, 1-29.

Delic, M., Eyers, D.R. and Mikulic, J. (2019). Additive manufacturing: empirical evidence for supply chain integration and performance from the automotive industry. *Supply Chain Management: An International Journal*, 24(5), 604-621.

Ding, H., Gao, R. X., Isaksson, A. J., Landers, R. G., Parisini, T., & Yuan, Y. (2020). State of AI-based monitoring in smart manufacturing and introduction to focused section. *IEEE/ASME Transactions on Mechatronics*, 25(5), 2143-2154.

Dubey, R., Gunasekaran, A., Childe, S. J., Blome, C., & Papadopoulos, T. (2019). Big data and predictive analytics and manufacturing performance: integrating institutional theory, resource-based view and big data culture. *British Journal of Management*, 30(2), 341-361.

Feng, M., Yu, W., Chavez, R., Mangan, J. and Zhang, X. (2017). Guanxi and operational performance: the mediating role of supply chain integration. *Industrial Management & Data Systems*, 117(8), 1650-1668.

Fletcher, E. (2009). Its implications for the delivery of an accurate, timely and rational space surveillance and tracking system. *6th European Space Weather Week*, 1-16.

Flynn, B.B., Huo, B. and Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, 28(1), 58-71.

Ha, N, Akbari, M., and Au, B. (2022). Last mile delivery in logistics and supply chain management: a bibliometric analysis and future directions. *Benchmarking: An International Journal,* (In-Press), 1-34.

Han, J., Lu, H., Trienekens, J.H. and Omta, S.W.F.(O). (2013) . The impact of supply chain integration on firm performance in the pork processing industry in China. *Chinese Management Studies*, 7(2), 230-252.

Hariri, R. H., Fredericks, E. M., & Bowers, K. M. (2019). Uncertainty in big data analytics: survey, opportunities, and challenges. *Journal of Big Data*, 6(1), 1-16.

Huo, B. (2012). The impact of supply chain integration on company performance: on organizational capability perspective. *Supply Chain Management: An International Journal*, 17(6), 596-610.

Iyer, L. S. (2021). AI enabled applications towards intelligent transportation. Transportation Engineering, 5, 100083.

Jacobs, M.A., Yu, W. and Chavez, R. (2016). The effect of internal communication and employee satisfaction on supply chain integration. *International Journal of Production Economics*, 171, 60-70.

Keith, O. R. & Webber, M. D. (1982). Supply Chain Management: Logistics Catches up with strategy. Outlook, 5(1), 42-47Kim, H.J. (2017). Information technology and firm performance: the role of supply chain integration. *Operations Management Research*, 10(1-2), 1-9.

Kong, T., Feng, T. and Huo, B. (2021). Green supply chain integration and financial performance: A social contagion and information sharing perspective. *Business Strategy and the Environment,* 30, 2255-2270.

Kotsiopoulos, T., Sarigiannidis, P., Ioannidis, D., & Tzovaras, D. (2021). Machine learning and deep learning in smart manufacturing: the smart grid paradigm. *Computer Science Review*, 40, 100341.

Kumar, V., Chibuzo, E.N., Garza-Reyes, J.A., Kumari, A., Rocha-Lona, L. and Lopez-Torres, G.C. (2017). The impact of supply chain integration on performance: Evidence from the UK food sector. *Procedia Manufacturing*, 11, 814-821.

Lau, A.K., Yam, R. and Tang, E.P. (2010). Supply chain integration and product modularity: An empirical study of product performance for selected Hong Kong manufacturing industries. *International Journal of Operations & Production Management*, 30(1), 20-56.

Leuschner, R., Rogers, D. S. & Charvet, F. F. (2013). A Meta-analysis of supply chain integration and firm performance. *Journal of Supply Chain Management*, 49(2), 34-57.

Liu, H., Ke, W., Wei, K. K. & Hua, Z. (2013). Effects of supply chain integration and market orientation on firm performance: Evidence from China. *International Journal of Operations & Production Management*, 33, 322-346.

Liu, H., Wei, S., Ke, W., Wei, K.K. and Hua, Z. (2016). The configuration between supply chain integration and information technology competency: A resource orchestration perspective. *Journal of Operations Management*, 44, 13-29.

Malviya, R. K., & Kant, R. (2015). Green supply chain management (GSCM): a structured literature review and research implications. *Benchmarking: An international journal*, 22(7), 1360-1394.

Mandal, S. (2018). An examination of the importance of big data analytics in supply chain agility development: A dynamic capability perspective. *Management Research Review*, 41(10), 1201-1219.

Mentzer, J. T. (2004). Supply Chain Management. In: A. Bruckner, ed. Fundamentals of Supply Chain Management: Twelve drivers of competitive advantage. Thousand Oaks, California: Sage Publications Inc., p. 16.Mora-Monge, C., Quesada, G., Gonzalez, M.E. and Davis, J.M. (2019). Trust, power and supply chain integration in Web-enabled supply chains. *Supply Chain Management: An International* Journal, 24(4), 524-539.

Nguyen, X., Doan, T. and Hoang, V. (2020). The impact of global supply chain management on performance: Evidence from Textile and garment industry. *Uncertain Supply Chain Management*, 8(1), 17-26.

Phan, T., Doan, X. and Nguyen, T. (2020). The impact of supply chain practices on performance through supply chain integration in textile and garment industry of Vietnam. *Uncertain Supply Chain Management*, 8(1), 175-186.

Pollock, N. (2000). The virtual university as 'timely and accurate information. *Information, Communication & Society*, 3(3), 349-365.

Poola, I. (2017). How artificial intelligence in impacting real life everyday. *International Journal for Advance Research and Development*, 2(10), 96-100.

Prajogo, D. & Olhager, J. (2012). Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration. *International Journal Of Production Economics*, 135, 514-522.

Rodríguez, G., Gonzalez-Cava, J. M., & Méndez Pérez, J. A. (2020). An intelligent decision support system for production planning based on machine learning. *Journal of Intelligent Manufacturing,* 31(5), 1257-1273.

Rodríguez, M. Á., Alemany, M. M. E., Boza, A., Cuenca, L., & Ortiz, Á. (2020). Artificial Intelligence in Supply Chain Operations Planning: Collaboration and Digital Perspectives. *In Working Conference on Virtual Enterprises. Springer*, 365-378.

Sacristán-Díaz, M., Garrido-Vega, P. and Moyano-Fuentes, J. (2018). Mediating and non-linear relationships among supply chain integration dimensions. *International Journal of Physical Distribution & Logistics Management*, 48(7), 698-723.

Shee, H., Miah, S.J., Fairfield, L. and Pujawan, N. (2018). The impact of cloud-enabled process integration on supply chain performance and firm sustainability: the moderating role of top management. *Supply Chain Management: An International Journal*, 23(6), 500-517.

Singh, P.J. and Power, D. (2014). Innovative knowledge sharing, supply chain integration and firm performance of Australian manufacturing firms. *International Journal of Production Research,* 52(21), 6416-6433.

Song, G., Song, S. and Sun, L. (2019). Supply chain integration in omni-channel retailing: a logistics perspective. *The International Journal of Logistics Management*, 50(1), 101-121.

Sooriyamudalige, N., Domingo, N., Shahzad, W. and Childerhouse, P. (2020). Barriers and enablers for supply chain integration in prefabricated elements manufacturing in New Zealand. *International Journal of Construction Supply Chain Management*, 10(1), 73-91.

Steven, G. C. & Johnson, M. (2016). Integrating the supply chain ... 25 years on. *International Journal of Physical Distribution and Logistics Management*, 46(1), 19-42.

Sundram, V.P.K., Chandran, V.G.R. and Bhatti, M.A. (2016). Supply chain practices and performance: the indirect effects of supply chain integration. *Benchmarking: An International Journal*, 23(6), 1445-1471.

Sundram, V.P.K., Chhetri, P. and Bahrin, A.S. (2020). The consequences of information technology, information sharing and supply chain integration, towards supply chain performance and firm performance. *Journal of International Logistics and Trade*, 18(1), 15-31.

Tian, M., Huo, B., Park, Y. and Kang, M. (2021). Enablers of supply chain integration: a technology-organization-environment view. *Industrial Management & Data Systems*, 121(8), 1871-1895.

Van Pham, H. (2020). A proposal of expert system using deep learning neural networks and fuzzy rules for diagnosing heart disease. *In Frontiers in intelligent computing: theory and applications. Springer*, 1013, 189-198.

Vanpoucke, E., Vereecke, A. and Muylle, S. (2017). Leveraging the impact of supply chain integration through information technology. *International Journal of Operations & Production Management*, 37(4), 510-530.

Wang, W.Y. and Chan, H.K. (2010). Virtual organization for supply chain integration: Two cases in the textile and fashion retailing industry. *International Journal of Production Economics*, 127(2), 333-342.

Wiengarten, F., Humphreys, P., Gimenez, C. & McIvor, R. (2016). Risk, risk management practices, and the success of supply chain integration. *International Journal of Production Economics*, 171, 361-370.

Wu, J., Zhang, P., Zhang, L., Meng, W., Li, J., Tong, C., ... & Li, S. (2020). Rapid and accurate identification of COVID-19 infection through machine learning based on clinical available blood test results. *MedRxiv*

Yu, K., Luo, B.N., Feng, X. and Liu, J. (2018). Supply chain information integration, flexibility, and operational performance. *The International Journal of Logistics Management 29(1), 340-364.*

Yu, W., Chavez, R., Jacobs, M., Wong, C.Y. and Yuan, C. (2019). Environmental scanning, supply chain integration, responsiveness, and operational performance. International *Journal of Operations & Production Management*, 39(5), 787-814.

Yunus, E. N. & Tadasina, S. K. (2016). Drivers of supply chain integration and role of organizational culture - Empirical evidence from Indonesia. *Business Process Management Journal,* 22(1), 89-115.

Zhang, M., Lettice, F., Chan, H.K. and Nguyen, H.T. (2018). Supplier integration and firm performance: the moderating effects of internal integration and trust. *Production Planning & Control,* 29(10), 802-813.

Zhao, X., Wang, P. and Pal, R. (2021). The effects of agro-food supply chain integration on product quality and financial performance: Evidence from Chinese agro-food processing business. *International Journal of Production Economics,* 231, 107832.

Zhu, Q., Krikke, H. and Caniels, M.C. (2018). Supply chain integration: value creation through managing inter-organizational learning. *International Journal of Operations & Production Management*, 38(1), 211-229.

Zolait, A.H., Ibrahim, A.R., Chandran, V.G.R. and Sundram, V.P.K. (2010). Supply chain integration: an empirical study on manufacturing industry in Malaysia. *Journal of Systems and Information Technology*, 12(3), 210-221.