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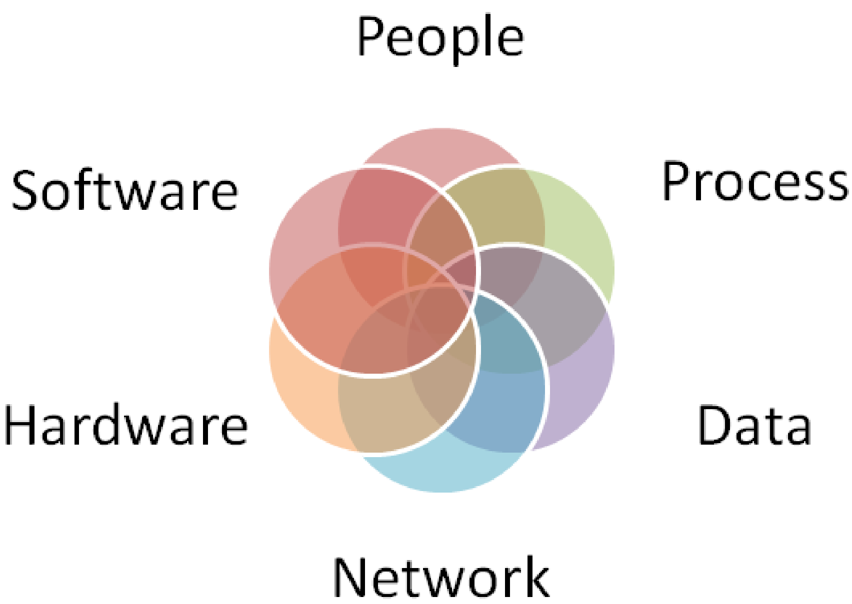

Vol. 11 No. 02 Oktober 2024

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Jurnal Sisfo Vol. 11 No. 02 (2024)

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Impact of Digital Supply Chain in Agriculture: A Systematic Literature Review

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Abstract

Supply chain management (SCM) is vital for business continuity and sustainability, including in agriculture. This research examines the impact of digital SCM in agriculture through a systematic literature review. The new aspect could involve researching the implementation of digital SCM in unexplored sectors and providing fresh insights. Relevant literature from databases is collected and analyzed. The research question explores the effects of implementing a digital SCM in agriculture. Methodology involves defining the question, designing the review process, conducting searches, applying criteria, assessing papers, and synthesizing findings. 31 research papers are analyzed. The study emphasizes the importance of advances digital technologies. Specific digital SCM technologies are identified to address challenges and enhance problems throughout agricultural industry. Decision makers can use these insights to develop effective strategies and guidelines. The findings contribute to understanding the impact of digital SCM in agriculture and suggest avenues for further research.

Keywords: Supply Chain Management, Digital Supply Chain, Agriculture, Impact, Systematic Literature Review

Histori Artikel: Disubmit 27-02-2024; Direvisi 04-09-2024; Diterima 05-09-2024; Tersedia online 30-06-2024

1. Introduction

The supply chain is a combination of networks involving many companies working together to create or distribute products from upstream (suppliers) to downstream (end users). This network of companies must be well-managed, and the management process of managing this network is also referred to as supply chain management [1]. Supply chain management (SCM) plays a key role in ensuring business continuity and sustainability in various sectors of industry, including agriculture. Supply chain management is a key component of business success as to strive to improve efficiency, productivity and quality of production results [2]. Supply Chain is the object of SCM, a network of organizations involved in various processes and activities that create value in the form of products and services in the hands of end users through upstream and downstream links [3]. A supply chain consists of two or more legally separated organizations linked by

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https://doi.org/10.24089/j.sisfo.2024.06.004

material, information, and financial flows. These organizations include companies that manufacture parts, components and finished products, logistics service providers and even the end users themselves [4].

In the agricultural context, supply chain management plays a key role in ensuring the availability of raw materials such as seeds, fertilizers and pesticides and optimizing crop production and distribution [5]. Agriculture, on the other hand, is one of the most important economic sectors in many countries. It has great potential to make a positive contribution to economic growth and poverty reduction, especially in developing countries [6], [7]. The naming of upstream and downstream sectors refers to the fundamental view that agribusiness operates within the supply chain of the food sector [8]. From the perspective of food safety, it is a primary agenda today due to significant issues such as food recalls before reaching consumers, leading to substantial losses, and impacting the reputation [9].

Numerous studies have been conducted to better understand the importance of supply chain management in the agricultural sector. One of these studies is a journal article discussing the impact of supply chain management in agriculture using a systematic literature review (SLR) approach. Such as articles by Wibowo P. and friends in 2022, in this journal explain how digital supply chain management can positively impact the agricultural sector and help ensure the availability of sufficient raw materials especially in rice farming [10]. As a differentiation from the previous research, the impact of the digital supply chain will be studied. The previous SLR may have limited its scope to specific geographic areas or agricultural sectors. The new aspect could involve researching the implementation of digital supply chains in regions or sectors that have not been extensively studied before, thus providing fresh insights into its impact and benefits.

Currently technology has mastered and helped the development of agriculture. Digitalization exists along with technology. The digital field that is meant by this research is everything that helps to significantly improve in agriculture. Named, digital supply chain trend concepts [11]. Such as Internet of Things (IOT), Virtual Reality (VR), Augmented Reality (AR), Big Data, Cloud Computing, Blockchain, Machine Learning, and Artificial Intelligence (AI) [11].

Therefore, this research is done to examine several research studies and papers to provide a broader and deeper understanding of the impact of digital supply chain management in the agricultural sector. This research with systematic literature review methods provides invaluable information for both public and private agricultural industry decision makers to develop more effective and efficient strategies and guidelines for managing agricultural supply chains.

2. Material and Methods

Main purpose of this research is to review various literature related to the impact of the digital supply chain in agriculture. This paper follows a systematic literature review steps as proposed by Kitchenham and friends in 2009 [12], which include Define the research question.

1) Design the plan.
2) Search for literature.
3) Apply exclusion and inclusion criteria.
4) Apply paper assessment.
5) Synthesis.

In this research use a research question as follows: “**What is the impact of implementing Digital Supply Chain in agriculture?”**. The next step is to design the literature review process including the scope of the research. This research collected much research from various literature in several areas of studies. Then, a combination of several keywords including supply chain management, digital, framework, technology, IT, farming, and agriculture are used. Three databases are used including Emerald Insight, Science Direct, and Springer.

First, a literature search was carried out on all three databases using the search term **"Impact Digital Supply Chain in Agriculture"**. Afterwards, this research determines the inclusion and exclusion criteria for articles or studies to be reviewed. The inclusion criteria made are as follows:

1) The papers examine the use of Digital Supply Chain in the agriculture sector.
2) The research was published from 2019 to 2023.
3) The literature is in English.
4) The type of literature is research articles.

All literature that does not address the topic of Digital Supply Chain in agriculture, published before 2019, not in the form of research articles such as book chapters, conference papers, or any other kind of publication are excluded.

Afterwards, the literature is filtered again using the specified keywords. The combination of keywords that used in this research are state as follows:

In the Science Direct database, advanced search is used by typing the following keywords: "**(SCM OR "supply chain management") AND (digital OR framework OR technology OR it) AND (farming OR agriculture)**".
In the Emerald Insight database, search using boolean is used by typing the following keywords: "**(content-type:article) (AND Impact Digital Supply Chain in Agriculture AND (abstract:"SCM" OR (abstract:"supply chain management") AND (abstract:"digital") AND (abstract:"framework") AND (abstract:"technology") AND (abstract:"it") AND (abstract:"impact") AND (abstract:"farming") OR (abstract:"agriculture"))**".
In the Springer database enter the following keywords: **"Impact AND Digital And Supply AND Chain And Agriculture, AND SCM, AND supply AND chain AND management, AND digital AND it, AND framework, AND technology, AND implementation, AND farming, AND agriculture**".

After filtering based on the inclusion, exclusion, and use of the keywords, the literature is assessed based on the relevance of the literature to the research question. Thus, the abstract of the literature is perused to assess its relevance to the topic of research that are supply chain, agriculture topic, digital supply chain, and digital impact in agriculture. Based on the first assessment 33 research papers are chosen. Then, a second assessment was done to see each paper that aligned with the research question. 31 out of 33 are selected as reviewed papers. Further steps in this research which can be seen as in Table 1.

Table 1. Search result based on research criteria

No	Criteria	Science Direct	Emerald	Springer
1	Corresponding with search term	18270	2089	21639
2	Corresponding with entered keywords	10528	166	1066
3	Published in 2019-2023	1723	106	27
4	Keywords correspond with the title, abstract, and keyword	21	81	15
5	Assessment Abstract is appropriate to answer the problem formulation in this study	5	23	5
6	Paper Assessment that aligned with research question	5	21	5

To ensure the relevance and quality of the literature reviewed, a comprehensive screening process was implemented. Below is a detailed description of how the search results were filtered from over 20,000 to the final selection of 31 papers:

1) Initial Search and Data Collection: A broad literature search was conducted across three major databases: Science Direct, Emerald Insight, and Springer. The search term used was "Impact Digital Supply Chain in Agriculture."
2) Application of Inclusion and Exclusion Criteria:
    a. **Inclusion Criteria:**
        1. The paper must examine the use of Digital Supply Chain technologies specifically within the agriculture sector.
        2. The research should be published between 2019 and 2023.
        3. The paper must be written in English.
        4. The publication should be a research article.
    b. **Exclusion Criteria:**
        1. Papers not addressing Digital Supply Chain technologies in agriculture.
        2. Publications dated before 2019.
        3. Non-research documents, including book chapters, conference papers, and other types of publications.
3) Keyword Filtering: The results were further refined using specific keyword combinations in each database:
    a. **Science Direct:** Advanced search with keywords: "(SCM OR "supply chain management") AND (digital OR framework OR technology OR it) AND (farming OR agriculture)."
    b. **Emerald Insight:** Boolean search with keywords: "(content-type) AND Impact Digital Supply Chain in Agriculture AND (abstract:"SCM" OR abstract:"supply chain management" OR abstract:"digital" OR abstract:"framework" OR abstract:"technology" OR abstract:"it" OR abstract:"impact" OR abstract:"farming" OR abstract:"agriculture")."
    c. **Springer:** Keywords used: "Impact AND Digital AND Supply AND Chain AND Agriculture AND SCM AND supply AND chain AND management AND digital AND it AND framework AND technology AND implementation AND farming AND agriculture."
4) Detailed Assessment and Selection:
    a. **Keywords Correspondence:** Papers were assessed to ensure that their titles, abstracts, and keywords matched the search terms related to the Digital Supply Chain in agriculture.
    b. **Abstract Assessment:** Abstracts were reviewed to determine their relevance and appropriateness in addressing the problem formulation of this study. This step ensured that the papers discussed topics directly related to the research questions.
    c. **Final Paper Assessment:** Out of the initial results, 33 papers were identified as meeting the preliminary criteria. A detailed assessment of these papers was conducted to verify alignment with the research questions. This resulted in the final selection of 31 papers for comprehensive review.

In this study, a literature review was conducted on papers that had been accepted or passed the assessment stage. Out of the 113 papers assessed, 33 were accepted based on the assessment of their abstract section, which was deemed relevant to address the research questions. Following the abstract assessment, the entire papers of the selected 33 papers were reviewed. As a result, 31 papers were identified and categorized based on the type of supply chain management, industry type, impact of implementing supply chain management, and the case studies employed. The objective was to summarize the findings from the literature review conducted on the 31 accepted papers and facilitate a better understanding in relation to the discussed problem formulation.

The stages of grouping and classifying are carried out by codification or coding scheme which is made as a direction in the grouping and classifying process. The coding scheme applied at this stage is as in Table 5. in appendix:

After obtaining the literature to be tested, data synthesis or qualitative analysis is then carried out on the selected articles or studies to find findings that are relevant to the research question. Then, there are 31 papers that were concluded to be aligned with the research question of the study.

The last step in the methodology is synthesizing. This stage was carried out to answer the formulation of the problem identified in the introduction. The synthesis of Systematic Literature Review (SLR) was carried out with several stages which can be seen in Figure 1.

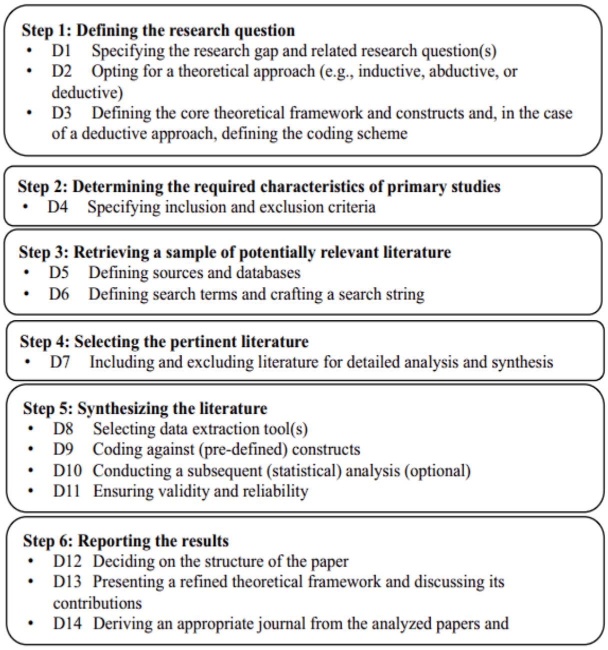


Figure 1 Systematic Literature Review Step-by-Step

So based on Figure 1, data synthesis includes collecting, grouping, and interpreting the results of the studies that have been selected. With the following steps that will be done in this research are as follows:

1) The results of the literature review on accepted papers are collected.
2) Make a list of case studies of what commodities are used in agriculture, and how it influences the use of SCM in the agricultural sector.
3) Grouping papers based on case studies of what commodities are used in agriculture, and how the influence of the use of SCM in the agricultural sector.
4) Analyze the impact of implementing supply chain management in the agricultural sector.

Therefore, in this research, researchers can make conclusions and recommendations based on the results of the data synthesis that has been done, as well as provide suggestions for further research that can be done to deepen knowledge about the impact of digital supply chain implementation in the agricultural sector.

3. Results and Discussion

The results of the synthesis showed that 31 papers were chosen as the sources of literature for this study. These papers encompassed a wide range of case studies from different countries, exploring various types of artifacts, types of agriculture, and types of digital supply chain. The figure below provides a visual summary of the findings, categorizing them based on artifact, country, type of agriculture, and type of digital supply chain.

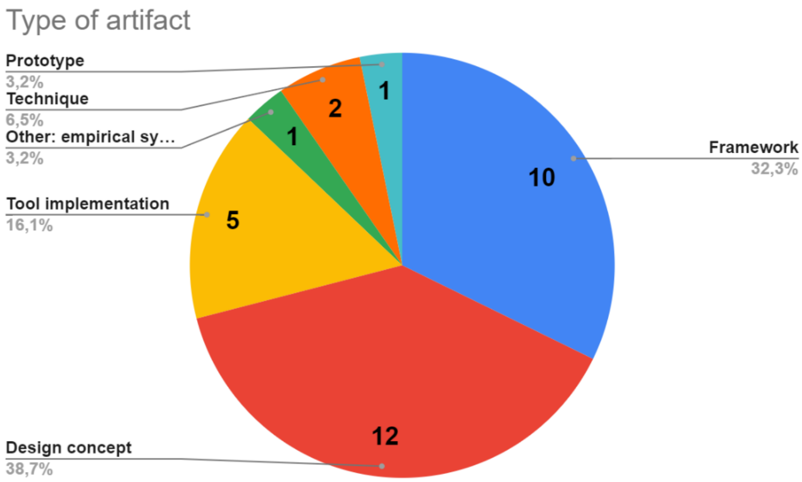
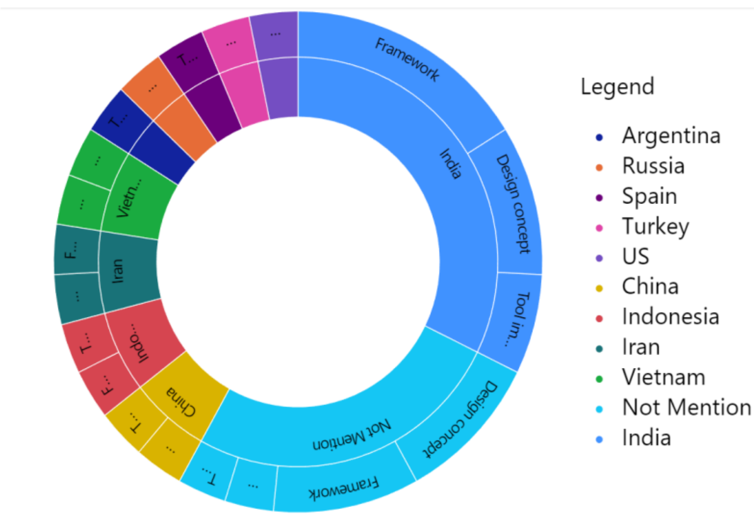


Figure 2 Classification Results based on Type of Artifact

The results shown in Figure 2, the papers that had carried out a classification process based on type of artifact. The classification process uses codification as a guide that has been developed in the previous stages. It shows 7 types of classification. 12 papers produce design concepts as artifacts, 10 papers produce Frameworks as artifacts, 5 papers produce tool implementations, 2 papers for technique, and 1 each for prototype and other define as empirical synthesis.



Type Of Country	Count of Jurnal
Argentina	
Tool implementation	1
Russia	
Design concept	1
Spain	
Technique	1
Turkey	
Design concept	1
US	
Design concept	1
China	
Design concept	1
Technique	1
Indonesia	
Framework	1
Tool implementation	1
Iran	
Design concept	1
Framework	1
Vietnam	
Design concept	1
Other: empirical synthesis	1
Not Mention	
Prototype	1
Tool implementation	1
Design concept	3
Framework	3
India	
Tool implementation	2
Design concept	3
Framework	5

Figure 3 Classification Results based on Type of Country

The results shown in Figure 3, the papers that had carried out a classification process based on type of country. The classification process uses codification as a guide that has been developed in the previous stages. The result shows 14 papers are in India, 2 papers each do studies in Iran, Indonesia, and China. Then, 1 for each study in Spain, Russia, and Argentina. Also, there are 8 papers that do not mention where their studies happen.

Furthermore, from Figure 3,this research can gain insights as to why many papers do not specify the location of their studies. This is because the resulting artifacts are in the form of frameworks and design concepts, which remain conceptual and have not been fully implemented. Therefore, these artifacts do not have specific geographical boundaries.

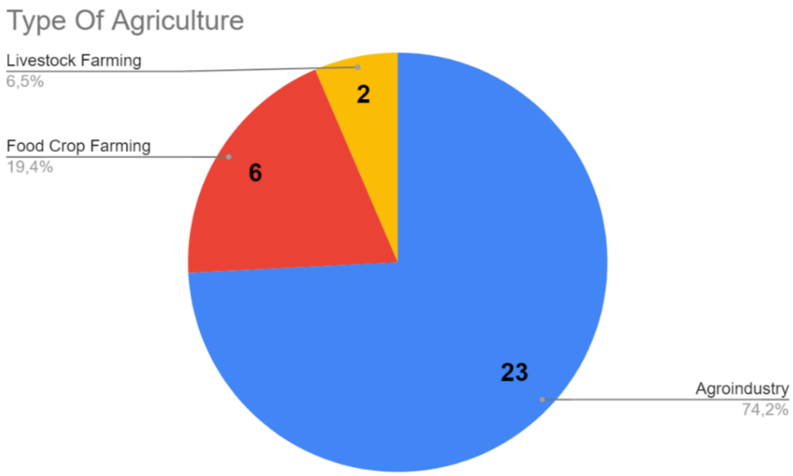


Figure 4 Classification Results based on Type of Agriculture

The results shown in Figure 4, the papers that had carried out a classification process based on type of country. The classification process uses codification as a guide that has been developed in the previous stages. The result shows 3 types of classification. There are 23 papers that study an agroindustry topic, 6 in food crop farming, and 2 about livestock farming.

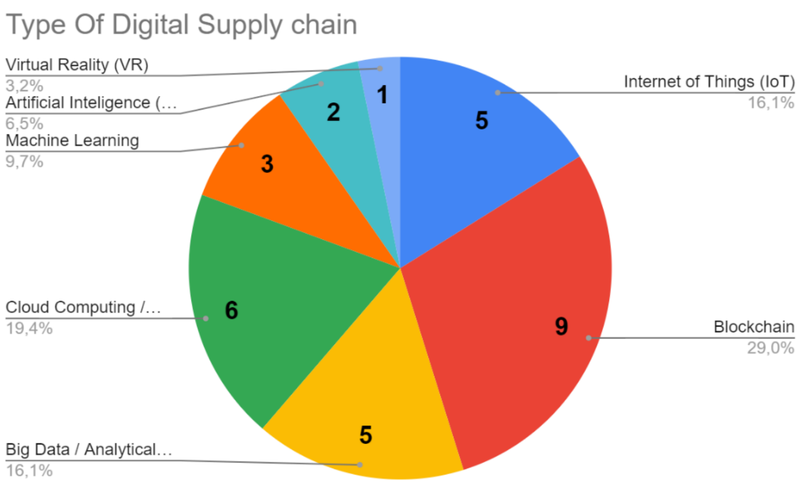


Figure 5 Classification Results based on Type of Digital Supply Chain

The results shown in Figure 5, the papers that had carried out a classification process based on type of digital supply chain. The classification process uses codification as a guide that has been developed in the previous stages. The result shows that there are 9 uses of blockchain, 6 uses of cloud computing/mobile computing, 5 for each big data/analytical tool and internet of things, 3 for machine learning, 2 for artificial intelligence, and 1 use virtual reality in the problem-solving process on paper.

From the research that has been done, Synthesizing the literature can be seen as in Table 2**.** Where it shows the classification result for the impact based on type of country, artifact, digital supply chain, and agriculture.

3.1 Type of Country Analysis

Based on Table 2, the research conducted in the field of agroindustry shows a focus on various countries, with India being the country that is most frequently studied. The lack of location specification in many research papers can be attributed to the nature of the artifacts produced, such as frameworks and design concepts. These artifacts are often conceptual in nature and have not been fully implemented, resulting in their lack of specific geographical boundaries. As a result, insights regarding the location of studies may not be provided due to the abstract and theoretical nature of these artifacts.

3.2 Type of Digital Supply Chain Analysis

Based on Table 2, there are several types of agriculture that are commonly used, namely Agroindustry, Food Crop Farming, and Livestock Farming. The most common impacts that arise in this context are increased productivity, efficiency, sustainability, and food security. The insights gathered from agroindustry highlight the potential of digital technologies such as artificial intelligence (AI), big data/analytics tools, and blockchain in enhancing productivity, stakeholder development, resource efficiency, and sustainability in the agricultural sector. In the context of food crop farming, the adoption of digital platforms, internet of things (IoT), and virtual reality (VR) technology offers opportunities for improving supply chain management, marketing strategies, and sustaining the quality of agricultural production. Similarly, in livestock farming, the integration of cloud computing/mobile computing, and other digital solutions contribute to the modernization of supply chains, enabling in-time delivery of safe and high-quality products while overcoming traditional challenges.

3.3 Type of Impact Analysis

Insights on the most widely used technologies in implementing digital supply chains in the agricultural sector indicate that Blockchain is the most extensively utilized technology, followed by Cloud Computing / Mobile Computing. These technologies demonstrate high adoption rates in various operational and supply chain management aspects within the agricultural industry.

Insights on the least utilized technologies in implementing digital supply chains in the agricultural sector reveal that Virtual Reality (VR) and Artificial Intelligence (AI) have lower adoption rates. While VR and AI are not widely employed in the agricultural context, their potential can still be explored to enhance user experiences, enable smarter decision-making, and drive innovation within the agricultural supply chain.

For more easy and thorough analysis on impact. A classification is done within the impact based on their similarities in between. The definition and classification can be seen in Table 3. Based on the classification code and definition, the impacts are classified into seven categories and the results are shown in Table 4.

Table 2. Synthesizing the literature

Type Of Agriculture	Type Of Digital Supply chain	Type of artifact	Type Of Country	Impact	Reference
Agroindustry	Artificial Intelligence (AI)	Design concept	US	- Decision & Policy Making	[13]
		Tool implementation	Not Mention	- Improve Effectiveness	[14]
	Big Data / Analytical Tool	Design concept	Not Mention	- System Integration - Maintain Distribution	[15]
			Turkey	- Improve Productivity - Improve Efficiency - Increase Profit - Reduce Carbon	[16]
		Framework	India	- Improve Self-Reliance	[17]
			India	- Operational Excellence	[18]
	Blockchain	Design concept	India	- Mitigate Risk	[19]
			Iran	- Extend Sustainability	[20]
			Not Mention	- Improve visibility - Network Integration - Reduce Structure Complexities	[21]
		Framework	India	- System Integration - Improve Effectiveness	[22]
		Prototype	Not Mention	- Maintain Monitoring - Improve Financial	[23]
		Technique	Spain	- Reducing Cost	[24]
		Tool implementation	India	- System Integration - Maintain Data Security - Decrease Work Time - Improve Financial	[25]
			Indonesia	- System Integration	[26]
		Framework	Not Mention	- Increase Customer Value - Increase Profit	[27]
	Cloud Computing / Mobile Computing	Design concept	China	- Improve Financial - Decision & Policy Making	[28]
			India	- Improve Safety - Maintain Supply - Improve Resilience	[29]
		Framework	Indonesia	- System Integration	[30]
	Internet of Things (IoT)	Design concept	India	- Decision & Policy Making - Improve Adaptability	[31]
		Framework	India	- Operational Excellence	[32]
			Not Mention	- Improve Resilience - Improve Efficiencies	[33]
	Machine Learning	Design concept	Not Mention	- Increase Accessibility - Decision & Policy Making - Maintain Data - Increase Value	[34]
			Vietnam	- Decision & Policy Making	[35]
Food Crop Farming	Big Data / Analytical Tool	Design concept	Russia	- Increase Work Ethic - Increase Customer Value	[36]
	Cloud Computing / Mobile Computing	Tool implementation	India	- System Integration - Maintain Monitoring - Decision & Policy Making	[37]
	Internet of Things (IoT)	Framework	Iran	- Improve effectiveness - Decrease Work Time	[38]
		Tool implementation	Argentina	- Improve Productivity	[39]
	Machine Learning	Framework	India	- Reduce Cost	
				- Resource management - Maintain Distribution	[40]
	Virtual Reality (VR)	Framework	Not Mention	- Increase Customer Value - Improve Productivity	[41]
Livestock Farming	Cloud Computing / Mobile Computing	Other: empirical synthesis	Vietnam	- Reduce Work Time - Increase Customer Value - Improve Financial	[42]
		Technique	China	- System Integration	

Table 3. Classification Code and Definition

Code	Name	Definition
A	Enhanced Operational Efficiency	Implementing digital supply chain solutions in agriculture improves operational efficiency by automating processes, reducing manual tasks, and optimizing workflows. This leads to streamlined operations, reduced errors, and improved overall efficiency.
B	Improved Sustainability Practices	Digital supply chain solutions support sustainable agriculture by promoting environmentally friendly practices. By optimizing resource usage, minimizing waste, and adopting eco-friendly techniques, such as precision irrigation and targeted pesticide application, sustainability goals can be achieved.
C	System Integration	Include integrating organizational, people, network, communication; certainty of supply; data sharing;
D	Streamlined Inventory Management	Digital supply chain systems provide real-time visibility into inventory levels, allowing farmers and agribusinesses to effectively manage their stock. Accurate inventory data helps prevent stockouts, minimize overstocking, and optimize supply chain efficiency.
E	Enhanced Decision-Making and Planning	Digital supply chain tools provide valuable data insights, predictive analytics, and real-time information, enabling informed decision-making and effective planning. This helps in optimizing production schedules, supply chain operations, and resource allocation, leading to improved efficiency and cost savings.
F	Improved Customer Satisfaction	Digital supply chain solutions enable better customer engagement and satisfaction by providing visibility into product origin, quality, and delivery. Enhanced traceability, personalized services, and timely communication contribute to improved customer satisfaction and loyalty.
G	Increased Profitability	By optimizing operations, improving productivity, reducing waste, and enhancing supply chain efficiency, digital supply chain implementation ultimately leads to increased profitability for farmers, agribusinesses, and stakeholders across the agricultural value chain.

The coding process used in this study aims to identify and classify the impacts of digital technologies on agricultural supply chains, as summarized in Table 4. Table 5 provides a detailed coding schema that serves as the basis for evaluating and categorizing various aspects of the reviewed literature. Table 5 Coding Schema includes:

1) Focus and Intent of Paper: Helps identify the general objective of each paper, providing context for understanding how digital technologies are adopted and their intended impacts.
2) Research Component: This category codes technologies like Algorithm, Tool Implementation, Prototype, Method, Technique, Design Concept, and Framework, based on their descriptions and applications in the agricultural digital supply chain. For instance, a paper introducing an Algorithm for decision-making in this context is specifically coded and its impact assessed accordingly.
3) Agriculture Type: Classifies the type of agriculture discussed, such as Food Crop Farming or Livestock Farming, to understand the specific context and impact on sub-sectors.
4) Country: Identifies if a paper includes a country case study, helping to understand the geographical and policy influences on technology adoption.
5) Digital Supply Chain Type: Codes the types of digital technologies, such as IoT, VR, Big Data, and Cloud Computing, to map their impacts in Table 4.

Using this coding schema, each reviewed study was analysed to determine how specific technologies relate to particular impacts in the agricultural digital supply chain. For example, a paper discussing Blockchain's role in improving system integration would be coded under Research Component and Digital Supply Chain Type in Table 5, and its impact would be recorded in Table 4 under Category (System Integration).

Table 4. Classification of Impact by Digital Supply Chain

Code	IoT	VR	Big Data/ Analytical Tools	Cloud & Mobile Computing	Blockchain	ML	AI
A	4	2	**5**	2	3	-	1
B	**1**	-	**1**	**1**	-	-	-
C	-	-	-	3	**5**	1	-
D	-	-	1	2	1	**3**	-
E	**3**	-	-	2	**3**	2	1
F	-	-	**3**	1	2	2	-
G	-	-	-	2	**3**	-	-

From this classification results on Table 4, there are several findings that been found:

1) To achieve impact enhanced operational efficiency can utilize Big Data / Analytical Tool and IOT as digital supply chain. Because both of the digital supply chains are used in most papers.
2) To achieve impact, improved sustainability practices can utilize Big Data / Analytical Tool, Cloud & Mobile Computing, and IOT as digital supply chain. Because all of the digital supply chains are used in paper.
3) To achieve impact system integration can utilize Blockchain as a digital supply chain. Because it is used in most papers.
4) To achieve impact streamlined inventory management can utilize Machine Learning and IOT as digital supply chains. Because both of the digital supply chains are used in most papers.
5) To achieve impact enhanced decision-making and planning can utilize Blockchain and IOT as digital supply chains. Because both of the digital supply chains are used in most papers.
6) To achieve impact improved customer satisfaction can utilize Big Data / Analytical Tool as a digital supply chain. Because it is used in most papers.
7) To achieve increased profitability can utilize Blockchain as a digital supply chain. Because it is used in most papers.

Other findings that are interesting, it has been known that traditional approaches such as system integration relying on cloud & mobile computing are not necessarily the solutions. However, our findings indicate that blockchain technology has emerged as a viable alternative for achieving effective system integration. Furthermore, it is evident that blockchain surpasses cloud and mobile computing in terms of utilization within the digital supply chain domain.

However, cloud & mobile computing is the most decorative type of digital supply chain. This digital supply chain is used in all categories of impact. Nevertheless, despite blockchain being the most widely utilized technology, cloud and mobile computing continue to play a crucial role in the digital supply chain landscape. To easily read and find the papers for the analysis between impact and digital supply chain can be seen in Table 6 in Appendix.

4. Conclusion

4.1 Conclusion

The research findings reveal that the digital supply chain plays a crucial role in agriculture. The study focuses on the impact of digital supply chain management in the agricultural sector, utilizing a systematic literature review methodology. The literature review involved 31 selected papers that covered a wide range of case studies from different countries, exploring various artifacts, types of agriculture, and digital supply chain technologies. The results show that the research is concentrated in India, with other countries also contributing to the literature. The artifacts produced include design concepts, frameworks, tool implementations, and techniques, with various digital supply chain technologies such as blockchain, cloud computing, big data, internet of things, machine learning, artificial intelligence, and virtual reality being utilized. The agriculture types examined are agroindustry, food crop farming, and livestock farming. The research findings highlight the impact of digital supply chain management in areas such as decision-making, policy-making, operational excellence, system integration, improved effectiveness and efficiency, increased customer value, risk mitigation, sustainability, and financial improvement. Overall, the study provides valuable insights for decision makers in the agricultural industry and suggests further research opportunities to deepen the understanding of digital supply chain implementation in agriculture.

4.2 Recommendations

For further research, we recommend conducting a more detailed impact on the company from the paper, as well as comparing the type of artifact, country, agriculture, and digital supply chain. So thorough identification can be known in order to find out how to get impact and use artifacts along with the digital supply chain so that the impact can be achieved properly.

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6. Appendix

Table 5. Coding Schema

Category	Coding criteria	Relevant codes		Coding instructions
Focus and intent of paper	Goal of the paper	Free Text		Identify the general research objective that is stated in the paper
Research Component	Artifact	Artifact	Does the paper introduce a new artifact?	Yes/No plus explanation
	Type of artifact	Algorithm	An algorithm is a set of step-by-step instructions that guides the decision-making process in the agriculture digital supply chain.	Select one only. If multiple codes could apply, select the most prominent code that best represents the type of inquiry described in the paper.
		Tool implementation	Tool implementation involves the development and deployment of software tools that automate and streamline tasks within the agriculture digital supply chain.	
		Prototype	A prototype is a preliminary model that showcases the functionalities and features of a technology or solution in the agriculture digital supply chain.	
		Method	Method refers to a systematic approach or procedure used to accomplish specific goals or solve problems in the agriculture digital supply chain.	
		Technique	Techniques are specific approaches or methods applied to achieve a desired outcome. In the context of the agriculture digital supply chain, techniques can include data mining, machine learning, sensor integration, or remote monitoring. These techniques enable efficient data analysis, automation, and decision support in agricultural processes.	
		Design concept	Design concepts in the agricultural digital supply chain involve creative ideas and principles that consider user requirements, usability, functionality, and sustainability, aiming to enhance user experience, efficiency, and overall performance.	
		Framework	A framework provides guidelines and standards for organizing and managing processes in the agriculture digital supply chain.	
		Other	Please specify	
Agriculture	Type of Agriculture	Food Crop Farming	Production of food crops such as rice, corn, wheat, soybeans, legumes, vegetables, and fruits.	Specify the type of Agriculture (in the wording the authors use). Enter a brief description.
		Livestock Farming	Livestock farming activities including the raising of cattle, goats, sheep, pigs, poultry (chickens, ducks, quails), and fish in aquaculture.	
		Fisheries	Cultivation and capture of fish, shrimp, clams, lobsters, and other marine resources.	
		Horticulture	Cultivation of ornamental plants, medicinal plants, horticultural crops (such as flowers, orchids, cut flowers, and other ornamental plants), as well as botanical gardens.	

		Plantations	Production of commercial crops such as palm oil, rubber, tea, coffee, chocolate, cocoa, tobacco, and tropical fruits.	
		Agroindustry	Processing of agricultural products such as food processing, beverages, processed plant-based products, food preservation, animal feed, and other agricultural processing industries.	
Country	Does the paper have a country case?	Processing if there is country study case in the paper		Yes/No Then, Specify the Country of Study Case (in the wording the author use). Enter a brief description.
Digital Supply Chain	Type of Digital Supply Chain	Internet of Things (IoT)	The network of physical objects, devices, vehicles, buildings, and other items embedded with sensors, software, and connectivity capabilities that enable them to collect and exchange data over the internet.	
		Virtual Reality (VR)	VR technology creates a simulated environment that can be experienced through visual and auditory stimuli. In the context of the digital supply chain, VR can be used for virtual warehousing, training simulations, or remote inspections.	
		Augmented Reality (AR)	AR overlays digital information onto the real-world environment, enhancing the perception of reality. In the digital supply chain, AR can assist in order picking, maintenance, and quality control tasks by providing real-time guidance and information.	
		Big Data	The collection, processing, and analysis of large volumes of data from diverse sources. In the context of the digital supply chain, big data analytics can uncover valuable insights, optimize inventory planning, predict demand patterns, and enable predictive maintenance.	Specify the type of Digitalization (in the wording the author use). Enter a brief description.
		Cloud Computing	Cloud computing is another type of digital supply chain that delivers computing services over the internet. It allows users to access and utilize storage, processing power, and software applications remotely. Cloud computing offers scalability, flexibility, and cost-effectiveness, as resources can be easily adjusted based on demand. It enables efficient data storage, collaboration, and on-demand access to applications and data from anywhere with an internet connection.	

Table 6. Classification Impact with Digital Supply Chain.

Code	Internet of Things	Virtual Reality	Big Data/ Analytical Tools	Cloud & Mobile Computing	Blockchain	Machine Learning	Artificial Intelligence
A	[32], [37], [38]	[40]	[15], [16], [18], [40]	[29]	[20], [22], [25]	-	[29]
B	[37]	-	[16]	[41]	-	-	-
C	-	-	-	[36], [42]	[21], [22], [25], [26]	[33]	-
D	-	-	[15]	[29], [36]	[23]	[33], [39]	-
E	[30], [33]	-	-	[28], [36]	[19], [21]	[33], [34]	[13]
F	-	-	[16], [35]	[41]	[23], [27]	[33], [39]	-
G	-	-	-	[28], [41]	[24], [25], [27]	-	-