

Embracing the Future: Evaluating the Strategic Impact of Digital Supply Chain Integration on Business Performance

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Abstract

The main focus of this study is to elucidate the transformative influence of digital supply chains on business operations, performance, and strategy, emphasizing the benefits, challenges, and pivotal considerations accompanying the assimilation of digital technologies in supply chain processes. The research employs stratified random sampling across various industries with a structured survey questionnaire. The collected data was analyzed using regression analysis to establish relationships. Digital supply chains offer a substantial competitive advantage by improving operational efficiency customer satisfaction, and fostering innovation. However, continuous collaboration, supplier alignment, advanced operating models, organizational flexibility, and technological competencies are paramount for successful Implementation. Despite the advantages, challenges related to cybersecurity, data privacy, and resistance to change persist. For businesses looking to transition into digital supply chain models, this research provides a foundational understanding, highlighting the benefits, necessary considerations, and potential pitfalls. The study also underscores the importance of agility, collaboration, and technology competence in ensuring a successful transition.

Keywords: Digital supply chain, Supply chain management, Digital transformation, Competitive advantage, Operational efficiency, Customer satisfaction, Innovation, Disruption, Risk management.

Introduction

Supply chains (SCs) have become more susceptible to disruptions due to their increased size and complexity due to globalization and outsourcing. Supply Chains must adopt innovative techniques to adapt quickly and economically to rapidly shifting market dynamics that are becoming more chaotic in volume and diversity (Zaman et al., 2023). Digital supply chain (SC) transformation has received more attention in recent years because of digitalization's rise to prominence as a crucial business strategy across all industries (Yu et al., 2021). (S. A. R. Khan et al., 2022) claim that through expediting the conveyance and accessibility of vital information, the digital transformation of SC has been acknowledged as a significant platform for reducing supply reaction times. Also, it offers further developed adaptability to inventory network individuals, empowering them to adjust quickly to evolving conditions, proactively expect possible dangers, and carry out suitable measures to alleviate disturbances. Additionally, digital supply chain transformation enables the establishment of global hubs, empowering supply chain members to deliver goods and services more effectively locally (Kee et al., 2023). The successful Implementation of digital SC transformation is dependent on several key elements. One of these factors is an ongoing collaboration among partners in the supply chain, which encourages efficient information sharing, goal alignment, and coordinated decision-making processes (Yang et al., 2022). In addition, suppliers need to align with the digital transformation's goals to make use of their expertise and resources in support of the

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transformation efforts. Another critical factor is the supply chain's integration of various processes and functions because it improves network coordination, visibility, and efficiency (Schneller et al., 2023).

Digital SC transformation will only be successful if operating models are highly advanced. It involves creating and executing new procedures, designs, and cycles that can adjust to the unique advanced scene (Nazir et al., 2023). Flexibility within an organization is essential for quick market responses and the adoption of cutting-edge technologies and methods. To finally realize the full potential of digital SC transformation, it is essential to develop technological competencies. It remembers effective financial planning for trend-setting innovations, for example, information examination, Web of Things (IoT), computerized reasoning (artificial intelligence), and distributed computing, which empower ongoing information trade, prescient investigation, robotization, and improved dynamic capacities (Lee et al., 2022). Digitalization is a top trend in developing the next generation of supply chains. It makes it easier to distribute products, for organizations to be more flexible when supply and demand conditions change, and makes the supply chain work better (Yu et al., 2022).

Subsequent studies have shown that not only do new digital technologies improve corporate performance, but it has also been found to improve feeding performance. Chains can move the Earth when combined with sensors, cloud solutions, and additive manufacturing (also known as 3D printing); for instance, extensive data analysis encourages customer individualization, shortens the distance and response time to the target market, and makes competitiveness profitable. Additionally, various challenges and obstacles have made some companies need help to develop digital strategies (Miao et al., 2022), and many others have failed digital strategies. Germany sees blended patterns toward digitizing small and medium ventures (SMEs) (Pfister & Lehmann, 2023).

The developing meaning of digitalization in business tasks has required the reception of computerized SC change. This change offers numerous advantages, including further developed supply reaction time, improved adaptability, and extended worldwide availability. Continuous collaboration, supplier alignment, integration, evolved operating models, organizational flexibility, and technological competencies should be prioritized by businesses to guarantee successful Implementation. Companies can effectively navigate the digital landscape and realize the potential of a digitized supply chain by prioritizing these aspects (S. Khan et al.).

The objectives of the study

- To analyze the effect of a ceaseless coordinated effort among store network accomplices on the fruitful execution of computerized inventory network change.
- To investigate the role of supplier alignment with digital transformation objectives in leveraging their expertise and resources for effective digital supply chain transformation.
- To investigate the connection between the combination of capabilities and cycles inside the production network and the digital supply chain's coordination, permeability, and effectiveness.

Theory Development and Literature Review

Digital Agility Theory (DAT)

Digital Agility Theory (DAT) is a new concept in supply chain management that focuses on the ability of organizations to respond and adapt quickly to digital disruptions and changes in the business environment. While there might not be a specific literature review dedicated solely to DAT, several scholarly articles and studies have discussed various aspects of digital agility and its implications for supply chain management (Zaman et al.).

This article provides an overview of digital supply chains and their implications for supply chain management. It discusses the importance of digital agility in managing supply chains effectively and proposes a classification framework for digital supply chain technologies. This study investigates the relationship between agility and trade execution within supply chain administration. While not explicitly focused on digital agility, it highlights the importance of agility in adapting to changing business conditions. It suggests that organizations with higher levels of agility tend to perform better (Zaman et al.).

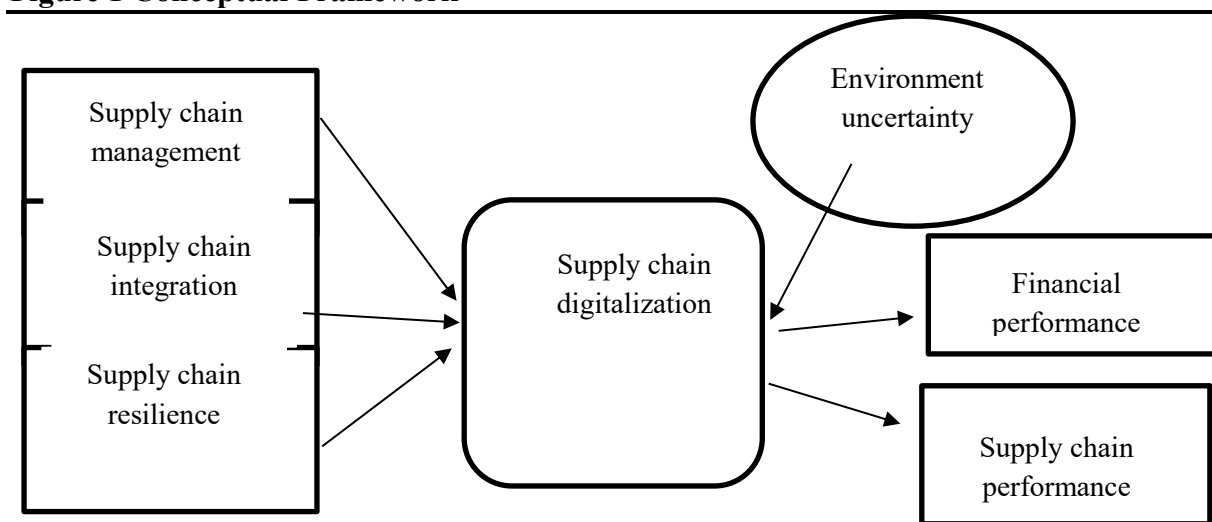
Resource-Based Theory (RBT)

Resource-based theory (RBT) is a valuable framework for analyzing supply chain management (SCM) from a strategic perspective. This theory focuses on assets and capabilities in accomplishing competitive advantage and execution enhancement. While there may not be a specific literature review dedicated to the application of RBT in SCM, numerous studies have explored this topic, and it can be considered part of a comprehensive review (Adetoyinbo et al., 2023).

Game theory (GT)

Game theory typically addresses risk in two ways—incorporating risk factors into a game theory model to determine the best trading strategy. The second is to study the competition and cooperation of different companies in the supply chain and share and reduce risks through cooperation. Game theory effectively studies SSCRM, especially when many supply chain members have conflicting goals (Namany et al., 2023). (Guo et al., 2023) use game theory to explore ways of mitigating SSC's environmental risks and study the strategies companies should adopt based on costs and benefits, government sanctions, and incentive policies. Recently, game theory has often been used to study government-related SSCRM research. For example, (Kaur et al., 2023) studied the impact of government subsidies on SSC.

Figure 1 Conceptual Framework



Supply Digitalization and Financial Performance Chain

Supply chain management and financial performance are closely related in the business context. A well-managed supply chain can significantly impact a company's financial performance and vice versa. An adequate supply chain management strategy aims to streamline processes, reduce waste, and optimize resources. By improving efficiency and eliminating unnecessary costs, companies can achieve cost savings throughout the supply chain (Kholaif

& Ming, 2023). These cost reductions can positively impact financial performance by increasing profitability and enhancing overall financial health. Strong supplier relationships are crucial for a well-functioning supply chain. Collaborating closely with suppliers can result in favorable terms, negotiated pricing, and improved availability of critical inputs (Zhou et al., 2023). Effective supplier management can lead to cost savings, better quality control, and enhanced operational efficiency, all of which improve financial performance. It should be noted that industry, company size, and specific business models may differ regarding the relationship between supply chain management and financial performance. However, a well-executed supply chain management strategy can improve financial performance through cost reduction, efficiency gains, customer satisfaction, risk mitigation, and increased agility (Mubarik et al., 2021).

Supply Chain Management and Supply Chain Digitalization

Supply chain management and digitalization are interconnected concepts that can influence each other. Supply chain digitalization refers to applying digital technologies and data-driven solutions to enhance efficiency, visibility, and collaboration within a supply chain. Digitalization enables real-time monitoring and visibility across the supply chain. It allows stakeholders to track inventory levels, monitor production processes, and gather data on various supply chain activities (S. et al., 2021). With increased visibility, supply chain managers can make informed decisions, identify bottlenecks, and optimize processes, improving overall supply chain management. Digitalization of the supply chain gives rise to a large volume of data from many sources, e.g., sensors, RFID tags, and transaction records. Advanced analytic and machine learning algorithms can analyze these figures to generate meaningful information (Bargavi & Mathivathanan, 2023). By leveraging data-driven decision-making, supply chain managers can optimize inventory levels, identify trends, forecast demand, and mitigate risks more accurately, resulting in more effective supply chain management. Digitalization complements and enhances supply chain management practices (Sani et al., 2023). It supports supply chain managers in making informed choices, optimizing processes, enhancing collaboration, and strengthening the overall performance of the supply chain by providing tools, technologies, and data-based insights. By embracing digitalization, companies can gain a competitive edge, improve customer satisfaction, and drive operational excellence in their supply chain management efforts (Zaman et al., 2023).

Supply Chain Integration and Supply Chain Digitalization

Supply chain integration and digitalization are closely related and often go hand in hand. While these are distinct concepts, they are interconnected and mutually reinforced. Supply chain integration often involves integrating disparate systems and software applications from different stakeholders (Zaman et al., 2023). Digitalization allows the integration of these systems through technologies like Enterprise Resource Planning, Customer Relationship Management, CRM, and Supply Chain Management Software (Chanchaichujit et al., 2023). Integrated systems allow for smoother information flow, eliminating manual data entry, reducing errors, and improving overall supply chain management efficiency. Both supply chain integration and digitalization contribute to enhanced visibility and transparency across the supply chain. Integrating data from various sources and systems enables a holistic view of the supply chain, facilitating better decision-making and problem-solving (Maury et al.). Digitalization provides the tools to capture, analyze, and visualize data, enabling stakeholders to gain insights into supply chain operations and performance metrics. This visibility helps identify bottlenecks, optimize processes, and improve overall supply chain management effectiveness (S. et al. et al., 2021). Supply chain digitalization enables data collection and analysis of supply chain performance metrics. Integrated systems and digital tools provide real-

time and accurate data on key performance indicators (KPIs) such as on-time delivery, order accuracy, and inventory turnover. This data-driven approach supports performance measurement, benchmarking, and continuous improvement initiatives, leading to better supply chain integration and management outcomes (Zhao et al., 2023).

Supply Chain Integration and Supply Chain Resilience

The concept of supply chain integration and resilience is also integrated into the context of supply chain management, which complements each other. The seamless sharing of information and data among supply chain partners, allowing a smooth flow of information across the whole supply chain, is an integral part of Supply Chain Integration (Ivanov, 2023). The enhanced flow of information improves resilience in the supply chain, allowing better monitoring and facilitating a fast response to unexpected interruptions by making it possible to see what is happening in the supply chain. Integrated systems and digital platforms help ensure that critical information is readily available, promoting faster decision-making and proactive measures to mitigate risks (Mubarik et al., 2023). Supply chain integration improves the ability to identify and assess risks across the supply chain. With integrated systems and shared information, stakeholders can more effectively monitor risks and vulnerabilities in the supply chain. By having a holistic view of the supply chain, companies can identify potential points of failure and implement proactive measures to mitigate risks (Schneller et al., 2023). This proactive approach to risk management is a crucial aspect of supply chain resilience. Supply chain resilience often involves incorporating redundancy and diversification strategies to mitigate the impact of disruptions. Supply chain integration provides the necessary visibility and coordination to implement these strategies effectively. Integrated systems and digital tools help identify critical nodes and dependencies within the supply chain, allowing companies to introduce redundancy by having backup suppliers, redundant inventory, or alternative production facilities. Diversification strategies, such as sourcing from multiple suppliers, can also be supported through supply chain integration (Barbosa-Póvoa & Pinto, 2023).

Supply Chain Digitalization and Supply Chain Performance

Supply chain digitalization refers to integrating and utilizing digital technologies and systems to enhance various aspects of the supply chain. It uses technology such as the Internet of Things, Big Data Analytics, Artificial Intelligence algorithms, Blockchain, and cloud computing to streamline and optimize supply chain processes (Zaman & Kusi-Sarpong, 2023). There is a significant link between supply chain digitalization and the performance of the supply chain. Digital technologies enable the collection, analysis, and interpretation of vast amounts of data from different supply chain stages. Advanced analytics and AI algorithms can extract valuable insights from this data, enabling better decision-making across the supply chain (Bharadiya, 2023). Data-driven decision-making helps optimize inventory levels, improve demand forecasting, enhance supplier selection, and streamline transportation and logistics operations. Supply chain digitalization can help identify cost-saving opportunities. Companies can achieve cost savings throughout the supply chain by optimizing inventory levels, reducing stockouts, minimizing transportation costs, and improving production efficiency (BAHUGUNA, KAUR, & SINGH).

Additionally, digitalization reduces paperwork, manual processes, and administrative tasks, increasing productivity and reducing operational costs. Digitalization facilitates seamless communication and collaboration among supply chain partners. Through digital platforms and tools, stakeholders can exchange information, coordinate activities, and share real-time data. This collaboration reduces lead times, minimizes errors, and enhances overall supply chain coordination, improving performance (Agrawal & Narain, 2023).

Supply Chain Performance and Financial Performance

The ability of a firm to quickly modify a product to meet customer requirements; the measurements of supply chain performance are also based on the rate at which a company can adapt products to meet market demand, as well as its capacity to provide goods with immediate delivery to substantial customers (Amini & Rahmani, 2023). Supply chain managers need not be surprised to focus on improving daily supply chain performance. However, they should know how these operations have a material impact on the company's total profitability (Shen & Sun, 2023). The literature also shows how fulfilling customer expectations through the supply chain improves financial performance. In this case, financial performance is measured using the following metrics: increase in sales, profit, market share, and return on investment. Consequently, the following theory is proposed (Fang et al., 2023).

Environment Uncertainty

Environmental Uncertainty in the supply chain refers to the unpredictability and variability of external factors that can impact supply chain operations and performance. These factors can include changes in customer demand, market dynamics, regulations, technology, natural disasters, geopolitical events, and supplier capabilities. Environmental Uncertainty poses challenges for supply chain management, making planning, decision-making, and execution more complex (Petrucci et al., 2023). Environmental Uncertainty can arise from supply-side disruptions such as natural disasters, geopolitical conflicts, supplier bankruptcies, or raw material shortages. These disruptions can disrupt the flow of goods, lead to production delays, or cause stockouts. To mitigate the impact of these disruptions, supply chain managers must build resilience and develop contingency plans (Ruiz-Torres et al., 2023). Uncertainty in the supply chain is possible due to changes in macroeconomic conditions, exchange rate movements, interest rates, and market dynamics. Changes in consumer behavior, competitive landscapes, or market trends can affect demand patterns and market competitiveness. Supply chain managers must closely monitor market conditions, accurately forecast demand, and develop flexible strategies to respond to market volatility (Soliman et al., 2023).

Methodology

Data Collection and Procedure

The study's sample size was 100, calculated at a 95% confidence level and 5% margin of error. A structured survey questionnaire will be developed using a literature review and theoretical frameworks to capture digital supply chain adoption, integration, and business performance. Stratified random sampling will ensure representation from various industries. Data will be analyzed using statistical methods such as regression analysis to determine the relationship of digital practice with business performance indicators.

The Stimulus for the Study

Implementing digital supply chain strategies has received much attention from businesses looking to cut costs, improve customer satisfaction, and increase efficiency. However, empirical research is required to comprehend the tangible impact on business performance despite the growing interest and investment in digital supply chain technologies. By examining the effects of digital supply chain implementation on various business outcomes like operational efficiency, cost reduction, customer satisfaction, and financial performance, this quantitative research study aims to close this gap. This study aims to provide valuable insights and evidence-based recommendations for businesses seeking to digitally optimize their supply chain operations to examine the relationship between digital supply chain practices and business performance indicators.

Common Method Bias

VARIABLES	REFERENCES	ITEMS
Supply chain management	(Wuttke, Blome, & Henke, 2013)	3
Supply chain integration	(Naghshineh & Carvalho, 2022)	3
Supply chain resilience	(Li, Xue, Li, & Ivanov, 2022)	3
Supply chain digitalization	(Seyedghorban, Tahernejad, Meriton, & Graham, 2020)	3
Environment uncertainty	(Inman & Green, 2021)	3
Financial performance	(Leuschner, Rogers, & Charvet, 2013)	3
Supply chain performance	(Inman & Green, 2021)	3

The study instrument's variation in survey responses causes standard method bias. As a result, the study's compliance with the required protocol reduced the likelihood of common method biases. It involves modifying the established scales and measures and constructing the conceptual framework based on theoretical foundations. Again, the validity and reliability of the questionnaire on the existing data set were checked by (Gómez-Rico et al., 2023).

Data Analytic Technique

The SEM (PLS) method was selected for its aptitude in managing complex models and flexibility concerning data distribution, adeptly analyzing latent constructs amidst conditions of non-normality and smaller sample sizes. Our model considered endogenous latent variables like operational efficiency and customer satisfaction, presumed to be influenced by digital supply chain transformations. Exogenous latent variables, such as continuous collaboration and technological competencies, were incorporated due to their deterministic role in digital supply chain outcomes. The reflective measurement models encapsulated items derived from validated scales, ensuring convergent and discriminant validity, while the formative structural model elucidated relationships between digital supply chain adaptations and primary outcomes, utilizing path coefficients and significance levels for validation. This explicit methodology aims to fortify the research's reproducibility and credibility, providing a transparent framework for future research in digital supply chain transformations.

Questionnaire Design

Two parts of the questionnaire were taken into account in this study. Part 1 relates to data relating to demographics, which have been calculated nominally. In particular, the Main Study is covered by the second part of the questionnaire. It has seven factors and 21 items measured on a five-point rating scale. One is measuring strong disagreement and five highly agreement.

Table 1 Summary of questionnaire

Scales and Measurement

We took the models of previous studies and applied them to this study. Details on the source of a construct and its number of items are shown in this table. Moreover, the complete Questionnaire is attached as an Appendix questionnaire

Respondent Characteristics

In this, we have built the questionnaires and distributed them to many individuals, especially student professionals. We distributed 100 questionnaires and received 93 questionnaires. The

reason was identifying the age group view regarding the impact of the digital supply chain in business. The profile of the respondents is presented for 93 respondents, 27.95% females and 72.05 % males. In terms of age, we found 32.25% of respondents are below 20 years, 59.15% of respondents in the age bracket 21–30 years, 6.4 of 5% of respondent age range from 31 to 40 years, 2.15% of respondent age range from 40 to 40 years old. Educational stratification shows that 43% of the respondents pursue bachelor's degrees, 30% pursue A levels and 26% master's degrees.

Table 2 Respondent Profile

<i>Characteristics</i>	<i>Frequency</i>	<i>Percentage (%)</i>
Gender		
Male	67	72.05%
Female	26	27.95%
Age		
Under 20	30	32.25%
21-30	55	59.15%
31-40	6	6.45%
Above 40	2	2.15%
Level of Education		
Bachelors	40	43%
A-levels	30	32.3%
Masters	26	24.7%

Results

Descriptive Analysis

The rationality and precision of the study were assessed in this section. Table 3 summarizes this analysis. The results show that the top Cronbach's alpha value is environmental uncertainty $\alpha = 0.110.000, 0.860$, and the lowest values for supply chain performance $\alpha = 0.266, 0.710$, indicate acceptable internal consistency of constructs obtained from Karachi, Pakistan. The result also shows that all the composite values are higher than 0.70, and AVE values are more significant than 0.60, so the buildup does not differ from the convergent authenticity requirement.

Discriminant Validity

The discriminant validity assessment was carried out using this study. Table 4 shows a summary of the results. The results indicate that the AVE values square root is higher than the Pearson Correlation values, suggesting that the construct used in the study was used. The study has proposed ten direct, seven mediating, and three moderating hypotheses. The hypothesis was tested by bootstrapping in the study. Table 5 shows the results of those hypotheses; in Figures 2 and 3, there are measurements and structural models. Our results support all the direct hypotheses, and of the six mediating hypotheses, our results do support all the following hypotheses: Like the two moderating relationships, our results do not support the following moderating relationship. Environment Uncertainty x Supply Chain Digitalization -> Financial Performance ($\beta = 0.015, t = 0.723, p > 0.05$).

Table 3 Descriptive analysis

	Cronbach's alpha	Mean	Composite reliability	AVE
Environment Uncertainty	0.860	0.110	0.915	0.781
Financial Performance	0.770	0.496	0.867	0.685
Supply Chain Digitalization	0.779	0.684	0.872	0.695
Supply Chain Integration	0.765	0.327	0.864	0.680
Supply Chain Management	0.744	0.419	0.854	0.665
Supply Chain Performance	0.730	0.266	0.848	0.652
Supply Chain Resilience	0.805	0.015	0.885	0.719

Discussion

The table shows whether the hypothesis impacts each variable about its outcome. It has a favorable impact on digitization of the supply chain and its financial performance, as it did in H1. A well-managed digital supply chain may have a material impact on the company's financial performance. The financial performance of Digital Supply Chains is always positively affected.

Table 4 Discriminant Validity

	EU	FP	SCD	SCI	SCM	SCP	SCR
Environment Uncertainty							
Financial Performance	0.672						
Supply Chain Digitalization	0.789	0.971					
Supply Chain Integration	0.727	0.944	0.997				
Supply Chain Management	0.818	1.051	0.961	0.901			
Supply Chain Performance	0.916	0.815	0.888	0.877	0.849		
Supply Chain Resilience	0.910	0.793	0.891	0.764	0.891	0.971	
Environment Uncertainty x Supply Chain Digitalization	0.197	0.159	0.238	0.088	0.143	0.310	0.348

Table 5 Hypothesis Results

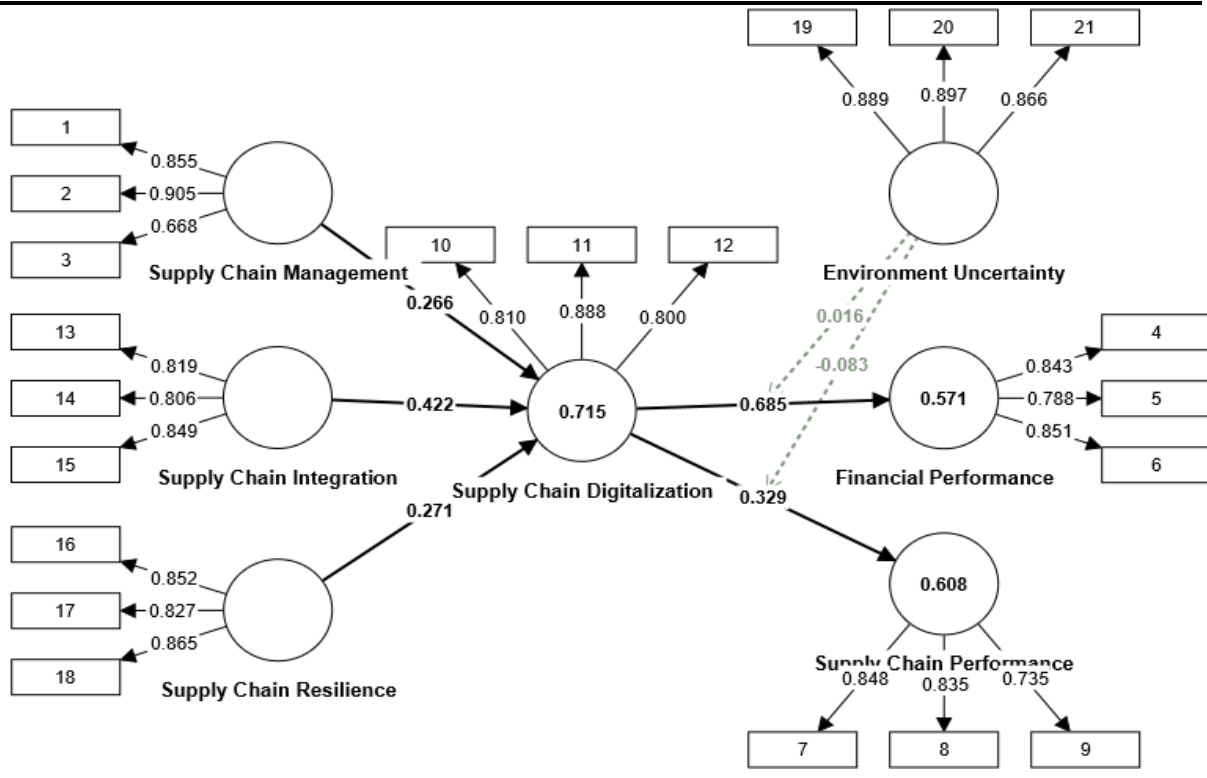
	B	T Stat	P Values	Results
Supply Chain Digitalization -> Financial Performance (H1)	0.684	16.520	0.000	Accepted
Supply Chain Digitalization -> Supply Chain Performance (H2)	0.327	8.039	0.000	Accepted
Supply Chain Integration -> Supply Chain Digitalization (H3)	0.419	9.001	0.000	Accepted
Supply Chain Management -> Supply Chain Digitalization (H4)	0.266	6.107	0.000	Accepted
Supply Chain Resilience -> Supply Chain Digitalization (H5)	0.274	4.799	0.000	Accepted
Environment Uncertainty x Supply Chain Digitalization -> Financial Performance (H6)	0.015	0.723	0.469	Rejected
Environment Uncertainty x Supply Chain Digitalization -> Supply Chain Performance (H7)	-0.082	4.658	0.000	Accepted

Supply Chain Integration -> Supply Chain Digitalization -> Supply Chain Performance (H8)	0.137	5.681	0.000	Accepted
Supply Chain Management -> Supply Chain Digitalization -> Supply Chain Performance (H9)	0.087	4.914	0.000	Accepted
Supply Chain Resilience -> Supply Chain Digitalization -> Financial Performance (H10)	0.187	4.856	0.000	Accepted
Supply Chain Integration -> Supply Chain Digitalization -> Financial Performance (H11)	0.286	7.729	0.000	Accepted
Supply Chain Management -> Supply Chain Digitalization -> Financial Performance (H12)	0.182	5.201	0.000	Accepted
Supply Chain Resilience -> Supply Chain Digitalization -> Supply Chain Performance (H13)	0.089	4.253	0.000	Accepted

Note(s): *Moderating

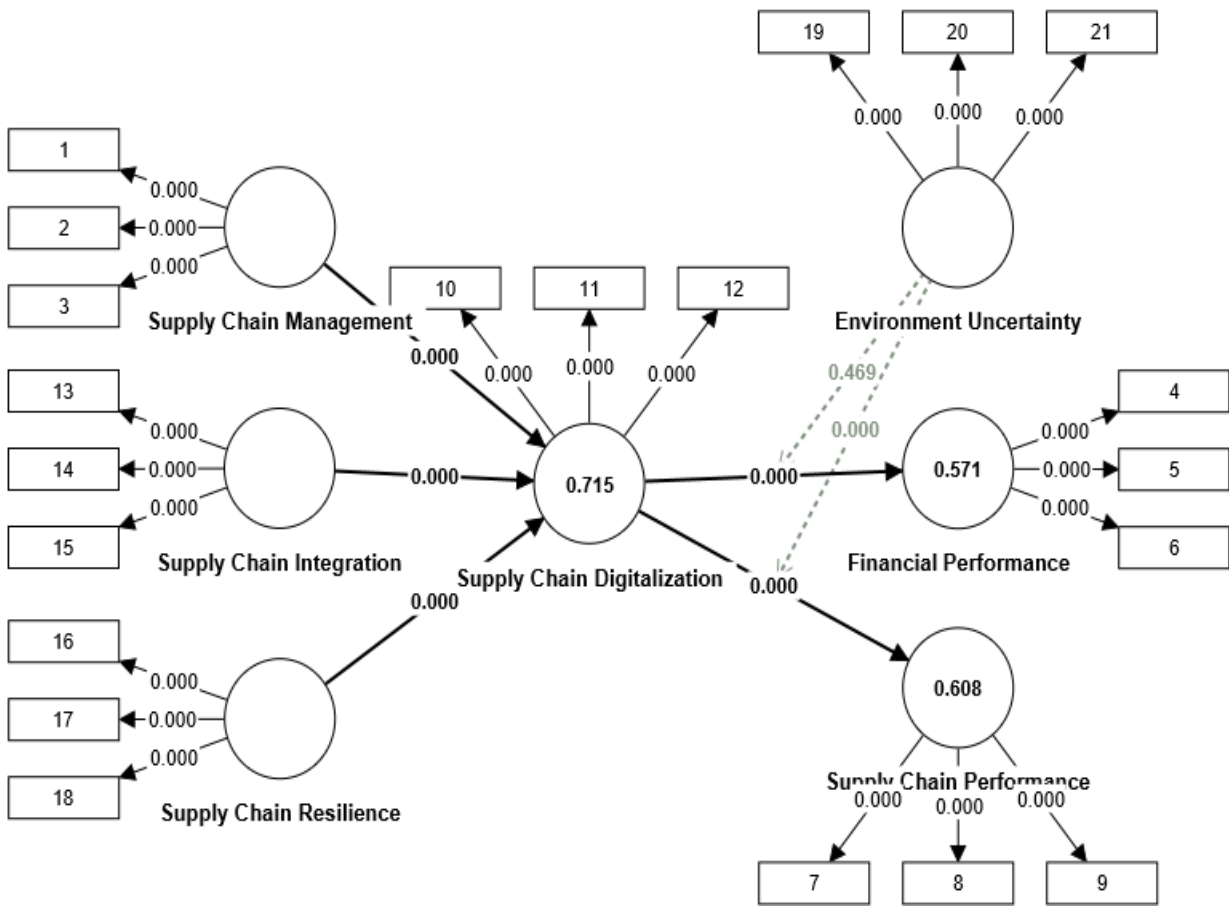
The study demonstrated that the digitalization of H2 supply chains would have a beneficial effect on the performance of the supply chain. Digitalization in the supply chain refers to integrating and using digital technologies and systems to enhance various parts of the supply chain. Involving ICT, like the Internet of Things integration in the H3 supply chain, positively impacts digitalization within the supply chain (Naghshineh & Carvalho, 2022). The seamless sharing of information and data between supply chain partners, allowing a smooth flow of information across the entire supply chain digitization process, is essential for integration in the supply chain. The impact of supply chain management in the H4 digitalization process is positive, as demonstrated by (Lee et al., 2022). Resilience has a positive effect on the digitization of the supply chain for H5. Uncertainties play a vital role in the H6 environment, moderating the digitalization and financial performance of the supply chain; uncertainties play a crucial role in the H7 environment by regulating and calming supply chain digitization and performance trends. (Inman & Green, 2021), Digitalization plays a crucial role in balancing supply chain integration with the performance of the supply chain in H8. Digitalization of the supply chain has been mediating the relationship between management and performance within the H9 supply chain. Digitalization plays a mediating role in supply chain resilience and financing performance for H10. In H11, supply chain digitalization mediates supply chain integration and financial performance. In H12, supply chain digitalization mediates supply chain management and financial performance.

Figure 2 Measurement model



In H13, supply chain digitalization mediates supply chain resilience and performance (Piprani et al., 2023). Supply chain digitalization enables data collection and analysis of supply chain performance metrics. Integrated systems and digital tools provide real-time and accurate data on key performance indicators (KPIs) such as on-time delivery, order accuracy, and inventory turnover. Supply chain Digitalization allows a massive amount of information to be collected, analyzed, and used throughout the supply chain. Businesses can use technologies such as Big Data Analytics, AIAI, and Machine Learning to gain detailed information on their daily functioning, discover patterns and trends, or make informed decisions in real time. It helps optimize inventory levels, streamline processes, and respond quickly to changing customer demands. Automation plays a vital role in digitalizing the supply chain. Robotic process automation (RPA) and autonomous systems can handle repetitive tasks, such as order processing, inventory management, and warehouse operations, with increased speed and accuracy. It reduces human error, increases operational efficiency, and allows employees to focus on more strategic and value-added activities. Digitalization makes it easier for partners in the supply chain, such as suppliers, manufacturers, distributors, and customers, to collaborate and connect. Real-time information sharing, efficient communications, and seamless coordination are facilitated through cloud computing platforms, collaboration software, and sharing of data repositories. It leads to better demand forecasting, reduced lead times, and enhanced customer satisfaction. Digital technologies enable end-to-end visibility across the supply chain, providing real-time insights into inventory levels, order status, production schedules, and shipment tracking. This visibility allows businesses to proactively address bottlenecks, mitigate disruptions, and optimize their supply chain performance. It also enables improved customer service through accurate and timely delivery of information.

Figure 3 Structural model



Conclusion

This study was shown through its framework to examine the Impact of the digital Supply chain in business. It shows all the theories that support Supply chain digitalization. The research paper has reviewed the complete set of factors related to supply chain management, including Supply Chain Integration, Supply Chain Resistance, and Supply Chain Efficiency, as well as how these platforms improve supply chain performance. The study has also examined the role of moderating Environmental uncertainty on supply chain performance and financial performance. It shows the data received after responses from individuals from diverse groups. The finding suggested the hypothesis on the variable. In addition, the development of digital technology has facilitated cooperation and communication across supply chain partners, resulting in better connections and enhanced overall supply chain performance.

However, it is critical to recognize the difficulties associated with deploying digital supply chain solutions. Organizations must invest in effective cybersecurity solutions to secure sensitive data and preserve the integrity of their digital systems. Furthermore, businesses must address employee reluctance to change and give enough training and support to ensure a seamless transition to digital procedures.

Overall, the study's findings demonstrate that digital supply chain management has become necessary for firms seeking to remain competitive in today's digital economy. It provides several chances for businesses to improve operational efficiency, optimize decision-making, and improve customer service.

Theoretical, Practical, and Managerial Implications

Navigating through the nexus of theoretical and practical facets, this study, deeply rooted in the contingency theory and dynamic capabilities framework, unveils a substantive interplay between digital supply chain management and enhanced business operations. Digital supply chain platforms stand out as catalysts propelling a surge in overall supply chain performance and as mechanisms that foster intensified cooperation, comprehensive risk mitigation, and abatement of environmental uncertainties, thereby imparting a positive trajectory on financial outcomes. From a pragmatic standpoint, the lens of managerial strategy must sharply focus on several pivotal anchors: the strategic investment in digital technologies, ensuring the automation and streamlining of supply chain processes; the harnessing of data through adept analytics skills to pave the way for informed, data-driven decision-making; a robust commitment to cybersecurity and privacy through the rigorous implementation of secure measures and stringent privacy policies; a vested interest in nurturing talent and skills pivotal for the adept management and safeguarding of digital technologies; and the deployment of digital platforms to solidify and enhance collaborative relationships with partners and suppliers, ensuring optimized delivery times and augmentation of supply chain flexibility. The study underscores that the intertwined narrative of theoretically-embedded frameworks and practical application of digital supply chain technologies offers a tapestry where enhanced communication, risk mitigation, and innovation become paramount across supply chain operations. Thus, businesses, through strategic investments in digital infrastructure, talent, and a meticulously crafted digital supply chain strategy, carve a pathway towards harnessing the multifaceted benefits of digitization, ensuring a sustained competitive advantage in an ever-evolving digital business milieu.

Limitations and Future Recommendations

Other than the results, the consequences of the review have a few constraints, too. To begin with, the findings of this study should be based on Karachi, Pakistan; this research framework applies to a multicultural and comparative Digital Supply Chain Study conducted by tomorrow's researchers. Second, the study's small sample comprises a student sample from a central location. To improve the study's generalizability, future researchers can select a non-student sample and increase the sample size. Future researchers will apply this model to a single or multiple supply chain performance. The present research model also considers several factors relevant to the digital supply chain. Future researchers also consider the financial performance of the supply chain resilient to be a facilitator and a mediator.

As future researchers, we should explore the gap that we have given so that businesses can focus on enhancing data security, improving infrastructure and connectivity, continuous skill development, and addressing integration and compatibility challenges. By addressing these limitations and implementing appropriate strategies, organizations can maximize the benefits of digital supply chains, improving supply chain resilience, performance, management, digitalization, and financial performance. In H13, supply chain digitalization mediates supply chain resilience and performance (Piprani et al., 2023). Supply chain digitalization enables data collection and analysis of supply chain performance metrics. Integrated systems and digital tools provide real-time and accurate data on key performance indicators (KPIs) such as on-time delivery, order accuracy, and inventory turnover. Supply chain Digitalization allows a massive amount of information to be collected, analyzed, and used throughout the supply chain. Businesses can use technologies such as Big Data Analytics, AIAI, and Machine Learning to gain detailed information on their daily functioning, discover patterns and trends, or make informed decisions in real-time. It helps optimize inventory levels, streamline processes, and respond quickly to changing customer demands. Automation plays a vital role in digitalizing the supply chain. Robotic process automation (RPA) and autonomous systems can handle

repetitive tasks, such as order processing, inventory management, and warehouse operations, with increased speed and accuracy. It reduces human error, increases operational efficiency, and allows employees to focus on more strategic and value-added activities. Digitalization makes it easier for partners in the supply chain, such as suppliers, manufacturers, distributors, and customers, to collaborate and connect. Real-time information sharing, efficient communications, and seamless coordination are facilitated through cloud computing platforms, collaboration software, and sharing of data repositories. It leads to better demand forecasting, reduced lead times, and enhanced customer satisfaction. Digital technologies enable end-to-end visibility across the supply chain, providing real-time insights into inventory levels, order status, production schedules, and shipment tracking. This visibility allows businesses to proactively address bottlenecks, mitigate disruptions, and optimize their supply chain performance. It also enables improved customer service through accurate and timely delivery of information.

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Appendix: Questionnaire

- 1) Do you Strongly believe that a flexible and responsive supply chain is important for an organization's success?
- 2) Do you believe that supply chain agility enhances customer satisfaction?
- 3) In your opinion, does a highly agile supply chain contribute to reducing lead times and improving delivery performance?
- 4) Do you Strongly believe that integrating various components of a supply chain leads to improved overall efficiency?
- 5) Do you believe that effective information sharing among supply chain partners enhances integration?
- 6) Do you believe that integrating different stages of the supply chain can lead to cost savings and improved customer service?
- 7) In your opinion, does a resilient supply chain enable organizations to recover quickly from unexpected events?
- 8) Do you agree that investing in technologies and processes that enhance supply chain resilience is a worthwhile endeavor?
- 9) Do you believe that a well-managed supply chain positively impacts an organization's financial performance?
- 10) Do you believe that having alternate sourcing options enhances the resilience of a supply chain?
- 11) Do you believe that optimizing supply chain costs leads to improved profitability?
- 12) In your opinion, does a high-performing supply chain contribute to increased revenue and market share?
- 13) Do you believe that measuring key performance indicators (KPIs) is essential for evaluating supply chain performance?
- 14) Do you agree that continuous monitoring and improvement of supply chain processes lead to enhanced performance?
- 15) In your opinion, does a high-performing supply chain result in improved customer satisfaction and loyalty?
- 16) Implementing digital technologies in the supply chain can improve operational efficiency.
- 17) The adoption of digital technologies in the supply chain can lead to cost savings.
- 18) Adopting digital technologies in the supply chain can enhance supply chain visibility and transparency.
- 19) Do you agree that Environmental uncertainties significantly impact business operations in the industry?
- 20) Do you agree that proactive management of environmental uncertainties can create a competitive advantage for the organization?
- 21) Do you believe that Environmental uncertainties significantly impact business operations in the industry?