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Logistics information technology usage, operations management, and networked management: Basis for supply chain agility framework

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Abstract

This paper aimed to explore logistics information technology, operations management, and network management to develop an agile supply chain framework that enables enterprises to gain competitive advantages in the global market. Specifically, it described the logistics information technology usage in the aspects of big data analysis, information system integration, intelligent warehousing and automation. Assessed the operational management in view of inventory management, supplier relations, and quality control practices. Described the networked management in terms of partnership management, supply chain visibility, and risk management. Tested the significant relationship on logistics information technology integration, operations management and networked management. Developed an agile supply chain framework that enables companies to better respond to market changes, improve supply chain efficiency, and achieve sustainable competitive advantages. 384 key stakeholders in the supply chain (including logistics professionals, managers, experts and customers). evaluated based on their knowledge of logistics information technology, operations management and network management. Purposive sampling is used to select the samples of the study. Based on the findings, the respondents generally agreed that The framework developed integrates logistics information technology, operations management, and network management to create an agile supply chain. By combining these key areas, the framework enables companies to better respond to market changes, improve the efficiency of their supply chain operations, and foster collaboration within their network of partners. The integration of real-time logistics data improves decision-making and visibility, while streamlined operations reduce waste and delays. The strong network management ensures flexibility and cooperation, leading to a more responsive supply chain. This approach allows companies to achieve sustainable competitive advantages by quickly adapting to shifting market demands and maintaining operational excellence.

Keywords: logistics information technology, networked management, operations management, supply chain agility framework

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1. Introduction

The modern business landscape is characterized by constant flux. Consumer demands shift rapidly, unexpected disruptions arise, and competition intensifies. To navigate this dynamic environment, companies require a **supply chain** that is not only efficient but also **agile.** A truly agile supply chain can adapt swiftly to changing circumstances, seize fleeting opportunities, and minimize the impact of disruptions. The increasing complexity and competitiveness of global markets have underscored the critical role of logistics information technology (IT), operations management, and networked management in enhancing supply chain agility. The integration of IT capabilities, such as big data analysis, information system integration, and intelligent warehousing, has transformed the way supply chains operate by improving efficiency and responsiveness (Abdallah et al.,2020). This enables businesses to meet the ever-growing demands for speed and flexibility, making supply chain agility a cornerstone of modern logistics strategies.

The application of logistics information technology in big data analysis, information system integration, intelligent warehousing and automation continues to develop, bringing more efficient, intelligent and sustainable solutions to the logistics industry. Using big data analytics, logistics companies can more accurately predict product demand, thus optimizing inventory management and transportation planning. Big data analysis helps to optimize distribution routes, reduce transportation time and costs, and improve transportation efficiency. Big data analysis helps to predict and manage potential logistics risks, such as weather, transportation, etc., to reduce delivery delays. The integrated use of various information systems, including supply chain management systems, to help enterprises to better coordinate and manage the entire supply chain process. Information system integration improves the real-time monitoring and control of the transportation network, which helps to improve the transportation efficiency. At the same time, EDI technology is used for the electronic data exchange between different enterprises to promote information sharing and integration. The introduction of automated technologies such as robots and automated picking systems improves the efficiency and accuracy of warehousing operations. Use sensors and Internet of Things technology to monitor inventory levels in real time, avoid the problem of excess inventory or out of stock, and realize intelligent inventory management. Logistics enterprises actively use robots and automation equipment to pick up goods, reduce manual operation, improve accuracy and speed. The combined application of these technologies makes the logistics industry smarter, more agile and more sustainable. Enterprises can better adapt to the changes in market demand, improve the service level, reduce costs, and promote the coordinated development of the entire supply chain.

Recent research highlights that organizations leveraging advanced IT systems can effectively improve their supply chain capabilities, thus fostering organizational agility. Irfan et al. (2019) in their study argue that firms embedded in a dynamic network utilize IT-driven capabilities to enhance their market performance. These capabilities help in streamlining operations management processes, such as inventory management and quality control, further reinforcing the significance of an IT-driven approach in logistics. The robust use of information technology in logistics operations is therefore critical in shaping supply chain agility and fostering superior market outcomes. On the other hand, operations management practices, such as inventory control and supplier relationship management, are fundamental to achieving operational excellence in logistics. Research by Dubey et al. (2021) demonstrates how the alignment of operations management with IT capabilities creates synergy, enabling firms to optimize their supply chain activities. By incorporating information system integration and leveraging data-driven insights, companies can improve their supplier relations and inventory accuracy, which in turn enhances operational efficiency and supply chain resilience. Efficient operations are essential for companies to meet customer needs, shorten delivery times and improve profitability. Fujian province has a convenient

transportation network, including ports, airports, railways and highways, and smooth circulation of goods inside and outside the province. Enterprise inventory levels are sure to be neither high nor low. High inventories can lead to excessive capital spending, while low inventories can lead to stock shortages. Also ensure adequate supply chain visibility to understand supplier delivery status and inventory levels in real time. Consider building a diversified supply chain to reduce the risk of relying on a single supplier. Ensure that clear quality standards are established and clear communication with suppliers. Clear standards help to align your products and services. Establish feedback loops for quality issues to ensure they are corrected promptly and share lessons in the supply chain. Considering these aspects, the operational management effect can be evaluated and improvement plans developed to improve the overall operational performance. Considering the inventory management, supplier relationship and quality control, the operation management effect of the enterprise can be evaluated, and improvement plans can be developed to improve the overall operating performance.

Another consideration is the networked management. Network management is a process of managing partnerships, improving visibility in the supply chain, and effectively managing potential risks. Network management involves selecting and building relationships with different partners in the supply chain. Conduct regular partner performance evaluations to ensure that partners meet expectations in quality, delivery and cost. At the same time, effective communication channels and collaboration mechanisms need to be established to solve problems, share information and coordinate activities in a timely manner. Use technology and systems to monitor the entire supply chain in real time, including production, transportation, storage and other links, to obtain comprehensive visibility. Companies regularly assess potential risks in their supply chain, including natural disasters, political instability, supplier bankruptcies, etc. Companies need to adopt diversified supply chain strategies to reduce reliance on a single region or supplier to reduce risk. Effective contingency plans should also be developed to allow rapid responses in the face of emergencies to mitigate potential impact.

Effective partnership management, supply chain visibility, and risk management play a vital role in ensuring that supply chains are not only agile but also robust in the face of uncertainties (Choudhury et al., 2021). This networked approach emphasizes the need for collaboration and real-time data sharing between stakeholders, leading to a more synchronized and responsive supply chain. Digital platforms and technologies that support such collaborations can further amplify the agility of the supply chain, enabling quicker adaptation to market changes. In this context, the role of IT in driving supply chain agility cannot be overstated. Pasupuleti et al. (2024) assert that IT capabilities, such as machine learning and process optimization, can significantly enhance both logistics and inventory management, thus contributing to overall supply chain agility and sustainability. These technological advancements allow companies to better manage complexities within the supply chain, improving both performance and resilience in dynamic market environments.

As the researcher is also practitioners in logistics, it is expected that this study can gain valuable insights into how to improve organizational performance, enhance competitiveness, and adapt to the challenges and opportunities of the modern business landscape. By examining further the role of logistics information technology will provide insights into how organizations can improve transparency and responsiveness.

Objectives of the Study **-** This paper aimed to explore logistics information technology, operations management, and network management to develop an agile supply chain framework that enables enterprises to gain competitive advantage in the global market. Specifically it described the logistics information technology usage in the aspects of big data analysis, information system integration, intelligent warehousing and automation; assessed the operational management in view of inventory management, supplier relations, and quality control practices; described the networked management in terms of partnership management, supply chain visibility, and risk management; tested the significant relationship on logistics information technology integration, operations management and networked management; and developed an agile supply chain framework that enables companies to better respond to market changes, improve supply chain efficiency, and achieve sustainable competitive advantages.

2. Methods

Research Design - The study used descriptive design adopting mixed methods combining qualitative and quantitative methods. The qualitative part focuses on interview to gather in-depth insights and perspectives from key stakeholders (including logistics professionals, managers, experts and clients) as triangulation. The quantitative section will collect larger-scale data from representative samples of logistics organizations and professionals in Fujian province using the questionnaire. The investigators attempted to collect information by providing questionnaires and distributing these to their respondents. This descriptive study is useful for efficiently collecting data from the respondents.

Participants of the Study - The respondents of the study are 384 key stakeholders in the supply chain (including logistics professionals, managers, experts and customers). The respondents were evaluated based on their knowledge of logistics information technology, operations management and network management. Purposive sampling was used to select the samples.

Instruments of the Study - To accommodate the needs of the study, the questionnaire was divided into three parts. Part 1 is about logistics information technology which includes big data analysis, information system integration, intelligent storage and automation, with five problems in each dimension. Part 2 is Operations Management includes inventory management, supplier relationships, and quality control. Part 3 is the Networked Management which includes partnership management, supply chain visibility, and risk management. Each indicator has five problems, and rated based on the following: 4- strongly agree, 3-agree, 2-disagree, 1-strongly disagree. The researcher used Google forms to collect data. The questionnaire is self-structured and subject validation of the experts. Pilot testing was conducted using 30 samples. Overall, the Cronbach alpha value is more than .700 which means that there is internal consistency in the contents of the questionnaire and can be used as instrument in the conduct of the study.

Table 1

Reliability Summary Table

Indicators	No. of Items	Cronbach value	Remarks
Big Data Analysis	5	0.830	Good
Information System Integration	5	0.865	Good
Intelligent Warehousing and Automation	5	0.840	Good
Inventory Management	5	0.705	Acceptable
Supplier relations	5	0.894	Good
Quality Control Practices	5	0.896	Good
Partnership Management	5	0.878	Good
Supply Chain Visibility	5	0.926	Excellent
Risk Management	5	0.865	Good

George and Mallery (2003) provide the following rules of thumb:_>.9 – Excellent, _>.8 – Good, _>.7– Acceptable, _>.6 –Questionable, _ > .5 – Poor, and_ < .5 – Unacceptable

Data Gathering Procedure - The researcher after the paper committee was finally approved the title and the objectives began to construct the questionnaire. The validation process was performed with the assistance of a research consultant and a university statistician. The researchers received permission from the Fujian industrial and commerce authorities and enterprises to distribute a questionnaire to those still working in the enterprise. Researchers sent an email to business managers to request assistance in the collection and distribution of questionnaires and inform them of the purpose of the questionnaire. Other respondents who was not able to contact by the investigators personal emails were sent and direct messages to their corporate email address or their official website to answer the questionnaire. Responses to the survey items were counted and sent to the survey statistician for statistical analysis.

Ethical Considerations - Ethical considerations were practiced in the conduct of the research work to warrant that every information that was gathered are used for research purposes only to maintain the quality and integrity of the research. The researcher asked consent through letter and communication to make sure that the

target respondents will be prepared to answer necessary questions involved in the research. It also ensured the confidentiality and anonymity of the respondents by not seeking their names as they were answering the questionnaires. The researcher also ensured that the respondents voluntarily answer the questionnaires according to their will

Data Analysis - Weighted mean and rank were used to describe the logistics information technology usage in the aspects of big data analysis, information system integration, intelligent warehousing and automation; to assess the operational management in view of inventory management, supplier relations, and quality control practices; and to describe the networked management in terms of partnership management, supply chain visibility, and risk management. The result of Shapiro-Wilk Test showed that p-values of all variables were less than 0.05 which means that the data set was not normally distributed. Therefore, Spearman rho was used as part of the non-parametric tests to determine the significant relationship. All analyses were performed using SPSS version 28.

3. Results and discussions

Table 2

Summary Table on Logistics Information Technology Usage

Key Result Areas	Composite Mean	VI	Rank
Big Data Analysis	3.58	Strongly Agree	2.5
Information System Integration	3.58	Strongly Agree	2.5
Intelligent Warehousing and Automation	3.59	Strongly Agree	1
Grand Composite Mean	3.58	Strongly Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 2 presents the Summary Table on Logistics Information Technology Usage. This showed a positive overall perception of logistics information technology usage across the three key areas: Big Data Analysis, Information System Integration, and Intelligent Warehousing and Automation. The grand composite mean of 3.58, falling within the "Strongly Agree" category, indicates a strong endorsement of the value and effectiveness of these technologies in logistics operations.

The composite mean for big data analysis is 3.58, shows a positive perception of its benefits. This aligns with research highlighting the potential of big data to drive efficiency, decision-making, and cost reduction in logistics (Srikanth et al.,2023). A similar composite mean of 3.58 for information system integration indicates that organizations are making progress in streamlining data flows and improving collaboration across different systems. This aligns with research emphasizing the importance of integrated systems for efficient operations and decision-making (Hatamlah et al.,2023). The slightly higher composite mean of 3.59 for this area suggests a strong positive perception of the benefits of advanced technologies in warehousing. This aligns with research highlighting the potential of automation and AI to improve efficiency, accuracy, and cost-effectiveness in logistics operations (Tannad et al.,2023).

Table 3

Summary Table on Operational Management

Key Result Areas	Composite Mean	VI	Rank
Inventory Management	3.54	Strongly Agree	3
Supplier Relations	3.61	Strongly Agree	1
Quality Control Practices	3.55	Strongly Agree	2
Grand Composite Mean	3.57	Strongly Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 3 presents the summary Table on Operational Management. This reveals a positive overall perception of operational management practices across the three key areas: Inventory Management, Supplier

Relations, and Quality Control. The grand composite mean of 3.57, falling within the "Strongly Agree" indicates a strong endorsement of the effectiveness of these practices in optimizing operational performance.

In inventory Management, the composite mean for inventory management is 3.54, showing a positive perception of its effectiveness. This aligns with research highlighting the importance of inventory management for operational efficiency and cost reduction (Panigrahi et al., 2024). As to Supplier Relations, the highest-ranked area, supplier relations, has a composite mean of 3.61, indicating strong practices in building and managing supplier relationships. This aligns with research emphasizing the positive impact of collaborative supplier relationships on supply chain performance (Emon et al., 2024). Finally, Quality Control as the third-ranked area, quality control, has a composite mean of 3.55, manifesting a positive perception of quality control practices. This aligns with research highlighting the importance of effective quality control for ensuring product quality and customer satisfaction (Clancy et al., 2024). It can be said here that by optimizing inventory management particularly in implementing advanced techniques like ABC analysis, safety stock optimization, and demand forecasting improves inventory efficiency (Panigrahi et al., 2024). Fostering collaboration, trust, and open communication with suppliers may enhance supply chain performance (Emon et al., 2024).

Table 4

Summary Table on Networked Management

Key Result Areas	Composite Mean	VI	Rank
Partnership Management	3.57	Strongly Agree	3
Supply Chain Visibility	3.60	Strongly Agree	1
Risk Management	3.58	Strongly Agree	2
Grand Composite Mean	3.58	Strongly Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 4 presents the Summary Table on Networked Management. This presents a positive overall assessment, with a grand composite mean of 3.58, with the interpretation of "Strongly Agree" category. This indicates a strong endorsement of the effectiveness of networked management practices within the organization. As to Partnership Management. the composite mean for Networked Management in terms of Partnership Management is 3.57, showing a positive perception of collaboration and partnership within the network. This aligns with research emphasizing the importance of strong partnerships for effective network management (Bowser et al., 2024; Kapucu et al.,2013). In terms of Supply Chain Visibility, the composite mean for Networked Management in terms of Supply Chain Visibility is 3.60, indicating a positive perception of information sharing and data-driven decision making within the network. This aligns with research highlighting the benefits of enhanced supply chain visibility (Agrawal et al., 2024; Emon et al.,2024). For the risk Management, the composite mean for Networked Management in terms of Risk Management is also 3.58, suggesting a positive perception of risk management practices within the network. This aligns with research emphasizing the importance of collaborative risk assessment, mitigation, and response (Panneer et al., 2024; Vidović et al., 2024). Finally, the table demonstrates a strong foundation in networked management practices across the dimensions of partnership management, supply chain visibility, and risk management. By continuing to focus on these areas, the organization can further optimize its network operations, improve collaboration, and enhance overall performance.

Table 5 displays the relationship between logistics information technology usage and operational management. Big Data Analysis shows a moderately strong relationship with Inventory Management (rho = 0.464), Supplier Relations (rho = 0.518), and Quality Control Practices (rho = 0.501). This indicates that Big Data Analysis has a significant, moderately strong impact on all three operational management variables, especially Supplier Relations. Information System Integration shows a strong to very strong relationship with Inventory Management (rho=0.760), Supplier Relations (rho=0.858), and Quality Control Practices (rho=0.848). This suggests that when logistics information systems are integrated, there is a very strong and highly significant improvement in inventory management, supplier relations, and quality control practices. The correlation is particularly high with supplier relations.

Table 5

Relationship Between Logistics Information Technology Usage and Operational Management

Variables	rho	p-value	Interpretation
Big Data Analysis			
Inventory Management	0.464**	<.001	Highly Significant
Supplier Relations	0.518**	<.001	Highly Significant
Quality Control Practices	0.501**	<.001	Highly Significant
Information System Integration			
Inventory Management	0.760**	<.001	Highly Significant
Supplier Relations	0.858**	<.001	Highly Significant
Quality Control Practices	0.848**	<.001	Highly Significant
Intelligent Warehousing and Automation			
Inventory Management	0.771**	<.001	Highly Significant
Supplier Relations	0.828**	<.001	Highly Significant
Quality Control Practices	0.881**	<.001	Highly Significant

***. Correlation is significant at the 0.01 level*

Intelligent Warehousing and Automation shows a strong to very strong correlations with Inventory Management (rho = 0.771), Supplier Relations (rho = 0.828), and Quality Control Practices (rho = 0.881). This implies that the use of intelligent warehousing and automation has a highly significant and strong positive impact on these aspects of operational management, especially quality control practices. Networked Management likely improves information sharing and collaboration across the supply chain (Wahyudi, 2024). This, in turn, could enhance transparency and visibility into inventory levels throughout the network (Bai et al., 2024). Studies by Saqib et al. (2024) highlight the positive impact of technology adoption on sustainable logistics operations, potentially contributing to improved inventory management practices.

Supplier Relations and Collaboration: Effective collaboration facilitated by Networked Management may lead to stronger relationships with suppliers (Wahyudi, 2024). Shvydkyi (2024) emphasizes the role of information technology and collaboration in reverse logistics, potentially improving overall supply chain efficiency. Research by Bai et al. (2024) also suggests that information system integration within a network can lead to a strong positive impact on supplier relations. Networked Management may enable better coordination and information sharing regarding quality standards across the network. This could lead to more consistent and efficient quality control practices (Wahyudi, 2024). Bai et al. (2024) further support this notion, indicating that intelligent warehousing and automation within a network can have a positive impact on quality control practices. Overall, the strong endorsement of Networked Management practices suggests a positive influence on various aspects of operational performance, potentially leading to improved efficiency, effectiveness, and overall supply chain resilience.

Table 6

Relationship Between Logistics Information Technology Usage and Networked Management

Variables	rho	p-value	Interpretation
Big Data Analysis			
Partnership Management	0.596**	<.001	Highly Significant
Supply Chain Visibility	0.581**	<.001	Highly Significant
Risk Management	0.613**	<.001	Highly Significant
Information System Integration			
Partnership Management	0.951**	<.001	Highly Significant
Supply Chain Visibility	0.942**	<.001	Highly Significant
Risk Management	1.000**	<.001	Highly Significant
Intelligent Warehousing and Automation			
Partnership Management	0.866**	<.001	Highly Significant
Supply Chain Visibility	0.923**	<.001	Highly Significant
Risk Management	0.853**	<.001	Highly Significant

***. Correlation is significant at the 0.01 level*

Table 6 indicates the relationship between logistics information technology usage and networked

management. Big Data Analysis shows a moderately to strong relationship with Partnership Management (rho = 0.596), Supply Chain Visibility (rho = 0.581), and Risk Management (rho = 0.613). This indicates that using big data analysis is significantly correlated with improvements in partnership management, supply chain visibility, and risk management, with risk management having the strongest correlation. Information System Integration demonstrates extremely strong correlations with Partnership Management (rho = 0.951), Supply Chain Visibility (rho = 0.942), and Risk Management (rho = 1.000). These values suggest that integrating information systems has a nearly perfect and highly significant positive relationship with all three networked management variables, particularly risk management, where the rho value is 1.000 (indicating a perfect correlation).

Intelligent Warehousing and Automation shows strong to very strong relationships with Partnership Management (rho = 0.866), Supply Chain Visibility (rho = 0.923), and Risk Management (rho = 0.853). This suggests that intelligent warehousing and automation are highly significant in improving networked management variables, particularly supply chain visibility. The strong positive assessment of Networked Management practices (composite mean = 3.57) suggests significant benefits for the organization's operational performance. This, in turn, could enhance trust and communication, leading to stronger partnerships (Huda, 2024). Studies by Wahyudi (2024) also highlight the role of information technology in facilitating collaboration in supply chains. Furthermore, Kocaoglu (2024) emphasizes the importance of data management and networking in logistics information systems.

Networked Management practices may enable real-time data sharing and improved information flow across the network (Berardi et al., 2023). This could lead to increased transparency and visibility into inventory levels, production schedules, and other critical data points throughout the supply chain (Peng et al., 2023). Research by Wahyudi (2024) further supports this notion, suggesting a positive impact of information technology on supply chain visibility. Our additional citation highlights a strong positive correlation between information system integration and supply chain visibility (rho = 0.942), suggesting this technology plays a significant role. Networked Management may facilitate better risk identification, communication, and mitigation strategies across the network (Orji et al.,2024). Our additional citation showcases a strong positive correlation between big data analysis and risk management (rho=0.613) and an even stronger correlation between information system integration and risk management (rho=1.000). This suggests that leveraging technology within a networked management framework can significantly enhance risk management efforts.

Table 7

Relationship Between Operational Management and Networked Management

Variables	rho	p-value	Interpretation
Inventory Management			
Partnership Management	0.806**	<.001	Highly Significant
Supply Chain Visibility	0.852**	<.001	Highly Significant
Risk Management	0.759**	<.001	Highly Significant
Supplier Relations			
Partnership Management	0.861**	<.001	Highly Significant
Supply Chain Visibility	0.908**	<.001	Highly Significant
Risk Management	0.858**	<.001	Highly Significant
Quality Control Practices			
Partnership Management	0.908**	<.001	Highly Significant
Supply Chain Visibility	0.925**	<.001	Highly Significant
Risk Management	0.850**	<.001	Highly Significant

***. Correlation is significant at the 0.01 level*

Table 7 presents the relationship between operational management and networked management. Inventory Management shows a strong to very strong positive correlation with Partnership Management (rho=0.806), Supply Chain Visibility (rho=0.852), and Risk Management (rho=0.759). This suggests that effective inventory management is significantly associated with improvements in these networked management areas, especially supply chain visibility. Supplier Relations has even stronger correlations with Partnership Management (rho=0.861), Supply Chain Visibility (rho=0.908), and Risk Management (rho=0.858). This indicates that strong

supplier relations greatly enhance all three aspects of networked management, especially supply chain visibility, where the correlation is particularly high. Quality Control Practices shows the strongest correlations, especially with Partnership Management (rho = 0.908), Supply Chain Visibility (rho = 0.925), and Risk Management (rho = 0.850). This implies that robust quality control practices significantly improve networked management, especially in terms of supply chain visibility and partnership management.

Research Output

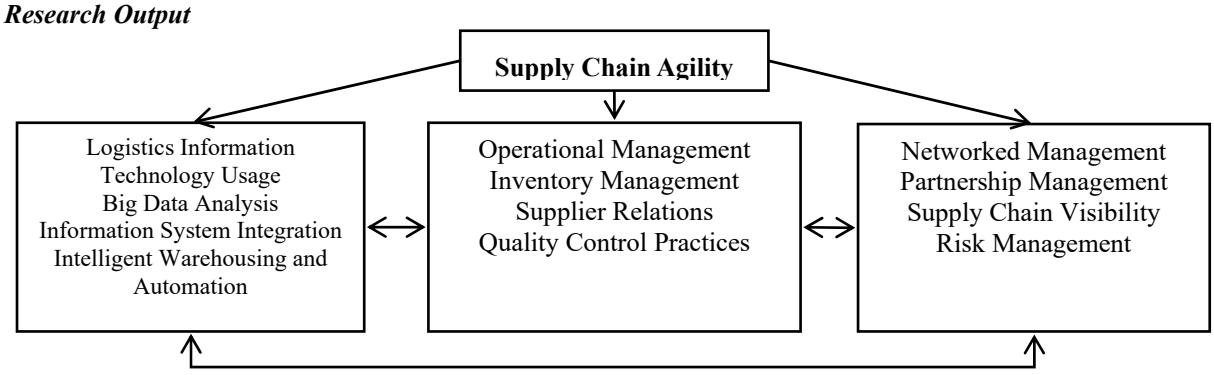

Figure 1. Supply Chain Agility Framework

The interrelationship between IT usage, operations management, and networked management forms the foundation for developing a supply chain agility framework. A study by Dubey et al. (2021) highlights the importance of integrating IT systems with both operational and networked management practices to create a highly responsive and adaptive supply chain. This integration not only improves internal processes but also enhances external collaboration, leading to a more agile and efficient supply chain network

Networked Management practices likely foster information sharing and collaboration across partner organizations within the network. This, in turn, could enhance trust and communication, leading to stronger partnerships (Huda, 2024). Studies by Wahyudi (2024) also highlight the role of information technology in facilitating collaboration in supply chains. Furthermore, Kocaoglu (2024) emphasizes the importance of data management and networking in logistics information systems. Our additional citation further strengthens this notion by indicating very strong positive correlations between inventory management (rho = 0.806), supplier relations (rho = 0.861), and quality control practices (rho = 0.908) with partnership management, suggesting that effective operational practices within a networked management framework can significantly enhance collaboration.

Networked Management practices may enable real-time data sharing and improved information flow across the network (Berardi et al., 2023). This could lead to increased transparency and visibility into inventory levels, production schedules, and other critical data points throughout the supply chain (Peng et al., 2023). Research by Wahyudi (2024) further supports this notion, suggesting a positive impact of information technology on supply chain visibility. Our additional citation showcases strong positive correlations between all three operational aspects (inventory management - rho = 0.852, supplier relations - rho = 0.908, and quality control practices - rho = 0.925) with supply chain visibility, highlighting the significant contribution of effective operational practices within a networked management system to achieving superior visibility.

Networked Management may facilitate better risk identification, communication, and mitigation strategies across the network (Orji et al.,2024). Our additional citation also highlights a positive correlation between inventory management (rho = 0.759), supplier relations (rho = 0.858), and quality control practices (rho = 0.850) with risk management. This suggests that strong operational practices within a networked management framework can contribute to improved risk management capabilities. Networked Management practices likely contribute to more sustainable operations within the energy sector (Losada-Agudelo et al.,2024). Improved collaboration, information sharing, and risk management can lead to more efficient resource utilization, reduced

waste, and enhanced environmental performance (Garrido et al., 2024). The research by Dubey et al. (2021), referenced in our additional citation, emphasizes the importance of integrating IT systems with both operational and networked management practices. This integrated approach can create a highly responsive and adaptive supply chain network. Networked Management practices, when combined with strong operational practices, can lead to improved internal processes, enhanced external collaboration, and ultimately a more agile and efficient supply chain (Dubey et al., 2021).

The strong endorsement of Networked Management practices suggests a positive influence on various aspects of operational performance. By fostering collaboration, information sharing, and leveraging technology within a framework of strong operational practices, Networked Management can lead to improved efficiency, effectiveness, overall supply chain resilience, and potentially contribute to more sustainable operations.

4. Conclusions and recommendations

The respondents demonstrate a strong agreement on the robust reliance on information technology such as big data analysis, information system integration, and intelligent warehousing and in their logistics operations. There is strong agreement among respondents showing the vital role of inventory management, supplier relations, and quality control practices in achieving operational excellence in logistics. There is strong agreement among respondents that emphasizes the essential role of partnership management, supply chain visibility, and risk management in effective networked management within the logistics operations. There is highly significant relationships among information technology usage, operational management; and partnership management. An agile supply chain framework was develop which will enables companies to better respond to market changes, improve supply chain efficiency, and achieve sustainable competitive advantages

The logistic companies may enhance information technology adoption to improve logistics operations and data-driven decision-making. The logistic companies may strengthen operational practices to refine inventory management, foster strong supplier relationships, and implement rigorous quality control to improve overall operational excellence in logistics. The top management may continue develop collaborative partnerships to improve supply chain visibility, and implement robust risk management strategies to create a resilient and efficient logistics network. Logistic companies may adopt the developed agile supply chain framework to enhance responsiveness to market changes, optimize supply chain efficiency, and maintain sustainable competitive advantages in a dynamic environment. Future researchers may focus on investigating the impact of emerging technologies, such as artificial intelligence and blockchain, on logistics operations and their integration with existing information systems to identify innovative solutions for enhancing efficiency and competitiveness.

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