The Effects of Supply Chain Management Practices on SMES Manufacturing Performance in Malaysia

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Abstract

Malaysia's manufacturing economy relies on SMEs. Supply chain management is crucial for improving these SMEs' industrial performance and market competitiveness. This study focuses on the effects of supply chain management practices on Malaysian SMEs' manufacturing performance. The study seeks to uncover supply chain management practices that significantly impact manufacturing performance and offer practical advice for SMEs to improve performance through effective supply chain management techniques. The researcher collected quantitative data from Malaysia's manufacturing SMEs. The research uses survey questionnaires to collect data on these SMEs' supply chain strategy (SCS), supply chain integration (SCI), supply chain information management (SCIM), and manufacturing performance indicators. The researcher used SPSS and SmartPLS to evaluate the data to understand how supply chain management practices affect manufacturing performance. The study found that supply chain management strategies affect Malaysian SMEs' manufacturing performance. The researcher also analyses and interprets data to identify performance indicators, helping SMEs enhance operational efficiency and market competitiveness. In conclusion, this study advances Malaysian supply chain management and SME performance studies. By highlighting supply chain practices' impact on manufacturing performance, the study advised SMEs to optimize operations and grow sustainably in Malaysia's competitive business environment.

Keywords: Integration; Information management; Manufacturing performance; Strategy; Supply chain

1. Introduction

This study examines the influence of supply chain management (SCM) practices on the manufacturing performance of small and medium-sized enterprises (SMEs) in Malaysia. Given that SMEs account for approximately 5.4% of the total MSMEs in the manufacturing sector, they play a crucial role in driving the nation’s Malaysia's gross domestic product (GDP) was approximately USD 399.7 billion. The research focuses on key SCM dimensions, including supply chain strategy (SCS), supply chain integration (SCI), and supply chain information management (SCIM), to assess their impact on operational efficiency and competitiveness. Framed within the context of growing global competition and the need for lean production and integrated supply chains, the study adopts a quantitative methodology, employing structured questionnaires to analyze the relationship between SCM practices and manufacturing performance. By addressing a literature gap, this research aims to deliver actionable insights and recommendations tailored specifically to Malaysian SMEs, contributing to their ability to thrive in a dynamic and competitive marketplace.

2. Literature Review

Manufacturing Performance

The concept of manufacturing performance is fundamental to evaluating and optimizing industrial operations, focusing on effectiveness and efficiency in production processes. According to Kolasani (2024), defining measurable variables such as production output, quality, efficiency, cycle time, and cost is essential for accurately assessing performance. Kechaou et al. (2022) assert that these variables play a critical role in contributing to an organization's overall success, while Smith and Thomas (2024) emphasize the importance of clear operational definitions for consistent and accurate performance measurement. These studies collectively highlight how systematically evaluating performance allows organizations to gain deeper insights, identify areas for improvement, and make informed decisions to enhance their manufacturing processes.

Manufacturing performance is generally defined as a company's ability to meet production goals related to quality, cost, delivery, flexibility, and innovation (Kimwaki, 2024; Dekkers, 2024). For example, Priyadarshini and Gupta (2023) stress that achieving these objectives ensures organizational success in a competitive environment, while Paul et al. (2024) underline cost efficiency as a key driver of reduced production costs without compromising quality. Similarly, Emon et al. (2024) highlight delivery performance as a measure of timely and efficient production, which reflects the dependability of manufacturing systems. Moreover, innovation and adaptability are necessary for organizations to maintain competitiveness in evolving industry landscapes (Al-Swidi et al., 2024). Collectively, this body of research emphasizes the multidimensionality of manufacturing performance, where improving operational outcomes requires addressing not just cost and quality but also flexibility and responsiveness.

A critical aspect of measuring manufacturing performance lies in the use of key performance indicators (KPIs) such as throughput, defect rates, cycle times, and operational efficiency (Lee et al., 2021; Ravi, Bhatia, & Jain, 2023). Geng et al. (2024) highlight the role of monitoring and analyzing these KPIs to optimize processes and enhance efficiency. Furthermore, Glišić et al. (2024) advocate tracking KPIs as a strategic tool for evaluating performance and identifying areas for improvement, which is essential for maintaining competitiveness in dynamic markets. Meanwhile, Tannady and Jiddan (2024) emphasize resource optimization and waste reduction through effective performance evaluation. Rashid et al. (2024) underscore sustainable growth as a significant outcome of manufacturing performance monitoring, enabling organizations to make informed decisions and adapt to changing market demands. Thus, these studies collectively highlight how continuous performance optimization can lead to operational excellence and long-term industrial success.

Supply Chain Strategy (SCS)

A clearly defined supply chain strategy (SCS) is pivotal in today's competitive business environment, as it enables companies to gain a significant edge by optimizing key processes such as supplier relationships, production, logistics, and forecasting (Non, 2023). Studies by George (2024) emphasize that adopting a holistic SCS improves operational efficiency, cost-

effectiveness, and responsiveness, ultimately enhancing manufacturing performance. Research has shown that organizations can thrive in dynamic markets by aligning supply chain operations with overall business goals while incorporating advanced technologies (Tripathi & Roy, 2023). This coordination ensures better resource management and promotes efficiency across the manufacturing cycle (Akam et al., 2023). Furthermore, Nnaji et al. (2024) highlight that an explicitly defined SCS improves collaboration between stakeholders while enabling businesses to adapt to evolving customer expectations and market dynamics effectively.

A significant component of SCS involves the integration of sourcing, production, and distribution processes to maximize resource utilization and enhance overall efficiency. Dev, Shankar, and Qaiser (2020) define SCS as a mechanism for aligning supply chain practices with company objectives, impacting variables like cost, quality, speed, and flexibility. Togun et al. (2024) suggest that effective supply chain oversight can optimize lead times, reduce inventory levels, and elevate customer satisfaction rates. Additionally, Dadaneh et al. (2023) emphasize the importance of synchronizing supply chain activities to ensure responsiveness and flexibility within the network, thus promoting innovation while reducing operational inefficiencies. Leveraging a well-developed SCS allows companies to streamline production planning, inventory management, and distribution, facilitating improved industrial and manufacturing performance.

The strategic alignment of supply chain operations is also critical for improving process optimization and achieving manufacturing excellence. Cui et al. (2022) assert that a robust SCS significantly reduces lead times, lowers inventory costs, and enhances responsiveness to market demands. Similarly, Tashtoush (2022) highlights the role of SCS in managing the flow of goods, information, and finances across the supply chain network. Additional research by Wang et al. (2022) and Adama et al. (2024) illustrates how aligning SCS with organizational objectives improves cost efficiency, quality assurance, and customer satisfaction in today's fast-paced market. In the context of small and medium enterprises (SMEs), Partanen et al. (2020) underscore that strategic supply chain planning is especially crucial due to the challenges SMEs face compared to larger firms. Consequently, adopting a planned and efficiently executed SCS is essential for achieving enhanced manufacturing performance, operational success, and sustained competitiveness.

Supply Chain Integration (SCI)

Supply chain integration (SCI) is recognized as a critical element for achieving operational success and maintaining competitiveness in a rapidly changing business landscape. SCI emphasizes the importance of effective coordination and collaboration among stakeholders to enhance efficiency, reduce costs, and boost overall performance (Esan et al., 2024). Research highlights its crucial role in industries such as Malaysian manufacturing, where integrating supply chain functions significantly impacts efficiency, cost-effectiveness, and global competitiveness (Mashat et al., 2024). Sondhi et al. (2024) argue that prioritizing SCI enables businesses to sustain a competitive market edge by streamlining operations and improving organizational sustainability. The integration of supply chain management (SCM) functions fosters growth and adaptability in a dynamic industrial environment, solidifying SCI's centrality to operational excellence.

Effective SCI entails the alignment of procedures, information systems, and strategic objectives across supply chain participants, including suppliers, manufacturers,

distributors, and retailers (Fan et al., 2024). According to Tiwari (2021), this integration improves visibility, synchronizes supply chain activities, and enhances market responsiveness by streamlining information and product flows. Research by Hu et al. (2024) underscores that integrating supply chain activities promotes trust, communication, and collaboration while enabling risk mitigation and inventory optimization. Moreover, real-time data sharing and process synchronization play a critical role in improving lead times, reducing costs, and increasing customer satisfaction, as observed by Liao, Hu, and Chen (2022). Lin and Fan (2024) further highlight that SCI enhances operational efficiency while ensuring businesses can adapt quickly to shifts in market demand, disruptions, and competitive pressures.

The concept of SCI is particularly important in complex markets such as Malaysia, where economic growth and global trade necessitate better supply chain alignment (Zaman et al., 2023). Research by Ruzo-Sanmartín et al. (2024) and Mackelprang et al. (2014) defines SCI as the seamless coordination, collaboration, and resource-sharing among supply chain entities to achieve shared objectives. This approach enables businesses to enhance efficiency, reduce costs, and achieve sustainable success in the global market. Zaman et al. (2023) elaborate on SCI's role in Malaysia's economic progression by illustrating how coordination of supply chain participants contributes to local and global business success. The integration of suppliers, manufacturers, and distributors allows for enhanced visibility and responsiveness, enabling businesses to remain competitive while driving customer satisfaction and operational efficiency. Ultimately, SCI emerges as a foundational strategy for organizations seeking long-term success and adaptability.

Supply Chain Information Management (SCIM)

There Supply Chain Information Management (SCIM) plays a critical role in achieving operational success and boosting manufacturing performance in today's dynamic global landscape. Ali et al. (2021) liken SCIM to the "neurological system" of the supply chain, enabling the seamless flow of information across all stakeholders, from suppliers to end consumers. Effective SCIM ensures coordination of resources, data, and finances, significantly improving operational efficiency, agility, and innovation within manufacturing systems (Sheth & Uslay, 2023). Research supports that implementing effective SCIM strategies not only streamlines operations but also fosters a competitive edge, with Rathobei et al. (2024) emphasizing SCIM's ability to strengthen transparency and alignment among stakeholders for increased operational excellence. Ali et al. (2021) further assert that SCIM is more than operational support—it's transformative, enhancing decision-making and driving unparalleled efficiency and productivity in manufacturing environments.

The theoretical framework of SCIM underscores its revolutionary role in modern supply chain processes by integrating advanced technologies such as IoT, blockchain, and cloud computing. These innovations enhance data transparency, agility, and collaboration among global supply chain networks, thus optimizing performance (Singh et al., 2024). Odimarha et al. (2024b) highlight that SCIM enables better demand forecasting, inventory management, and logistics planning, even in volatile market conditions. Moreover, Wong et al. (2011) and Hendijani & Saei (2024b) argue that information management becomes pivotal in mitigating environmental uncertainty, particularly by aiding synchronized

decision-making and improving visibility across supply chain levels. By promoting timely data sharing and fostering collaboration, SCIM helps firms address risks, improve inventory levels, and adapt to market changes, giving them a competitive edge. Milewski (2022) adds that SCIM integrates concepts like lean management and just-in-time (JIT) approaches, further aligning supply chain operations with strategic business objectives.

The relationship between SCIM and manufacturing performance is particularly evident in small and medium enterprises (SMEs), where effective supply chain management (SCM) practices can overcome significant operational challenges. A study by Sahoo (2021) highlights the importance of SCIM in enhancing the manufacturing capabilities of Malaysian SMEs, key contributors to the nation's economy. By utilizing SCIM strategies, SMEs improve operational efficiency, reduce costs, and enhance their competitive positioning in global markets (Türkeș et al., 2024). Ruzo-Sanmartín et al. (2024) further emphasize that SCIM fosters better supply chain synchronization and agility, critical for SMEs facing limited resources or fluctuating market demands. According to Lee et al. (2022), adopting advanced SCIM methods allows SMEs to improve manufacturing standards by providing real-time insights and enabling proactive decision-making. This research ultimately reinforces SCIM's practical relevance, demonstrating how it lays the foundation for long-term success in manufacturing performance across dynamic and interconnected markets.

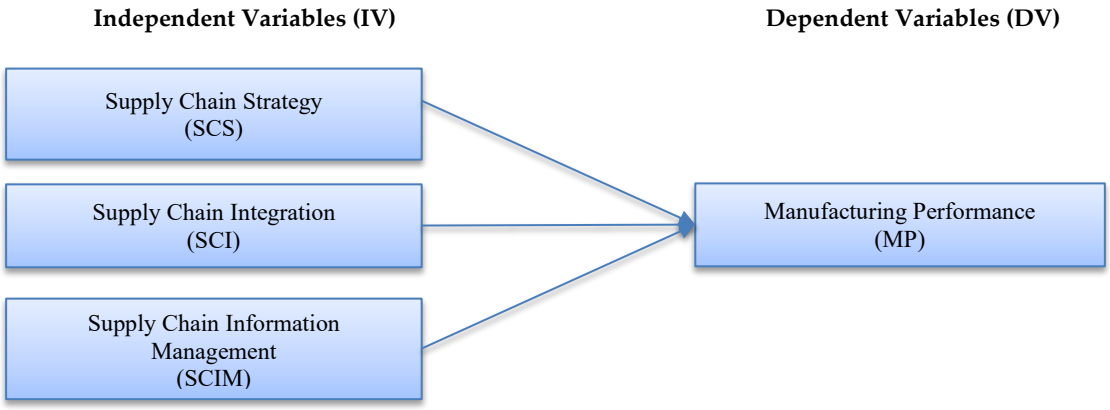

Figure 1: The relationship between of supply chain practices toward the manufacturing performance

Research Hypothesis

H1: There is significant relationship between supply chain strategy (SCS) and manufacturing performance

H2: There is significant relationship between supply chain integration (SCI) and manufacturing performance.

H3: There is significant relationship between supply chain information management (SCIM) and manufacturing performance.

3. Methodology and Data Collection

The study employed a random sampling method to select manufacturing SMEs in Federal Manufacturing Malaysia in the year 2023 for data collection. While this approach enhances the generalizability of the findings, it lacks a comprehensive explanation of why random

sampling was deemed the most appropriate for this context. Primary data was collected through a structured questionnaire targeting various stakeholders, including SCM experts and senior management. However, the methodology does not elaborate on how the questionnaire was designed, pre-tested, or adapted to ensure reliability and validity. The inclusion of diverse stakeholders is commendable, as it allows for multi-perspective insights into supply chain practices; yet, the process of participant recruitment and the screening criteria remains vague, raising concerns about potential biases.

To ensure a representative sample, stratified proportional sampling was also employed. This is a noteworthy addition, as stratification ensures that different subgroups within the population are proportionately represented, thereby enhancing the study's robustness. However, a critical shortcoming lies in the limited discussion of how SME strata were defined or how proportional representation was achieved. The combination of stratified proportional sampling with quantitative survey methods allows for generalizable metrics, but the lack of justification for the chosen sample size and statistical power creates a gap in methodological transparency. Moreover, while SPSS was utilized to identify data anomalies such as missing values and outliers, and SmartPLS provided a framework for statistical validation, the study could have benefitted from a clearer articulation of how these tools were integrated into the data analysis pipeline. Specifically, the choice of specific analytical techniques and their relevance to the research questions warrant deeper discussion.

The study focuses on examining the impact of supply chain management practices on Malaysian SMEs' manufacturing performance, providing practical recommendations for optimizing supply chain operations. While this effort aligns with the practical needs of SMEs in a competitive market, the methodology section falls short in critically addressing the limitations of relying solely on survey-based methods. For instance, the study does not account for the potential response biases or inconsistencies inherent in self-reported data. Furthermore, critical methodological aspects such as ethical considerations, confidentiality protocols in handling sensitive organizational data, and strategies for ensuring high response rates remain unaddressed. By addressing such gaps, the research could have enhanced its credibility and provided a stronger foundation for the validity of its finding.

4. Results

The study focuses according to Kamper (2019), reliability is the extent to which a measurement is free from error i.e., a reliable measure can yield the same answer when the same construct is measured several times. In this sense, the crux of reliability is repeatability. Two of the most used methods to establish reliability are Cronbach's Alpha and Composite Reliability (CR). The results for Cronbach's Alpha and Composite Reliability for this study are presented in Table 1. The Cronbach's Alpha ranged from 0.891to 0.935 while composite reliability values ranged from 0.894 to 0.936. As both indicators of reliability have reliability statistics over the required threshold of 0.70 (Hair et al., 2021). Hence, construct reliability is established.

Table 1: Results of reliability test analysis

Factor	Numbers of Items	Alpha (α) Value	Composite Reliability (rho_a)
Manufacturing Performance	11	0.935	0.936

Supply Chain Strategy	5	0.891	0.894
Supply Chain Intergration	10	0.934	0.935
Supply Chain Information Management	5	0.888	0.889

According to Fornell and Larcker (1981), items converge to evaluate the underlying construct, establishing convergent validity when the average variance extracted (AVE) value equals or exceeds the recommended threshold of 0.50. The current study's convergent validity results, as indicated by the AVE statistics, demonstrate that all constructs have AVE values exceed the 0.50 threshold. This suggests that there are no concerns regarding convergent validity. Table 2 displays the Average Variance Extracted (AVE) values for each of the constructions.

Table 2: Average variance extracted (AVE)

Variables	**Average variance extracted (AVE)**
Manufacturing Performance	0.633
Supply Chain Strategy	0.697
Supply Chain Integration	0.655
Supply Chain Information Management	0.691

Table 3: Fornell-Larcker criterion

	MP	**SCIM**	**SCI**	**SCS**
Manufacturing Performance	**0.795**			
Supply Chain Information Management	0.792	**0.831**		
Supply Chain Intergration	0.855	0.848	**0.809**	
Supply Chain Strategy	0.788	0.785	0.89	**0.835**

The Fornell-Larcker Criterion assesses the relationship between the square root of the Average Variance Extracted (AVE) values and the correlations among latent variables (Hair et al., 2021). According to Hair et al. (2021), the square root of the average variance extracted (AVE) for each construct should be larger than its strongest correlation with any other construct. In other words, a latent construct should have a stronger influence on the variability of its own indicator than on the variability of other latent constructs. In order to assess the Fornell-Larcker criterion, the square root of the AVE value for each variable was compared to its correlations with other constructs in this study, as presented in Table 3 shows the Fornell-Larcker criterion proved discriminant validity by showing that the constructs had a higher degree of shared variance with their associated indicators compared to other constructs.

Table 4: Heterotrait-Monotrait ratio

	MP	**SCIM**	**SCI**	**SCS**
Manufacturing Performance (MP)				
Supply Chain Information Management (SCIM)	0.867			
Supply Chain Integration (SCI)	0.914	0.93		
Supply Chain Strategy (SCS)	0.861	0.881	0.974	

The Table 4 was HTMT ratio represents the relationship between the correlations among different traits and the correlations within each individual trait. The HTMT ratio is the average correlation between measurement items that assess distinct constructs, divided by the geometric mean of the average correlations between measurement items that assess the same construct. Researchers consider it more reliable, superior, and suitable than the

Fornell-Larcker criterion for identifying discriminant validity issues (Ashraf, Ahmad, Sharif, Raza, Salman Shabbir, Abbas & Thurasamy, 2020; Brand, Kopplin & Rausch, 2022). Experts have proposed various criteria for the HTMT value to assess discriminant validity. Henseler et al. (2015) asserted that in order to show discriminant validity, the HTMT value should be less than 1. This implies that we cannot adequately distinguish two constructs from each other if their correlation is 1 or higher (Henseler et al., 2015). Poon and Koay (2021) suggests using a cut-off value of 0.9 to determine discriminant validity for this investigation. Table demonstrates that all the HTMT ratio values in this investigation are below 0.90, hence validating the discriminant validity of its measurement approach

5. Discussions

The findings of this study demonstrate the critical role of supply chain management practices (SCMP) in enhancing the manufacturing performance (MP) of Malaysian small and medium-sized enterprises (SMEs). Specifically, the study identifies significant and positive relationships between supply chain strategy (SCS), supply chain integration (SCI), and supply chain information management (SCIM) with MP. The integration of these practices allows SMEs to optimize operational efficiency, reduce lead times, and improve production capabilities, aligning with the work of Wajdi, Barata, and Syamil (2023). By confirming these relationships, this study reinforces the practical applicability of strategic supply chain management for achieving operational excellence, particularly in resource-constrained SME environments.

The significant impact of SCI on MP further highlights the importance of improving coordination and collaboration across supply chain stakeholders. This finding, consistent with Lin and Fan (2024), showcases how integration technologies like real-time data sharing enable superior synchronization and responsiveness. Similarly, SCIM was shown to drive transparency and agility across supply chain functions, as supported by Singh et al. (2024). Effective information management helps SMEs streamline decision-making, mitigate risks, and better utilize resources in competitive markets. However, challenges such as high costs of technology implementation and data security concerns remain pressing issues, underscoring the importance of supportive policies and training to enable SMEs to maximize these benefits.

The study carries both theoretical and practical implications. It extends the existing SCM literature by confirming the effectiveness of SCS, SCI, and SCIM in improving MP within the context of emerging markets like Malaysia. On a practical level, it urges SMEs to embrace supply chain strategies that support integration and leverage information management technologies for long-term competitiveness. Policymakers are also encouraged to provide targeted support, such as financial incentives and capacity-building measures, to address implementation challenges. In summary, this research emphasizes the transformative potential of modern SCMP to strengthen the manufacturing performance of SMEs, fostering adaptability and operational success in an evolving global landscape (Wajdi, Barata, & Syamil, 2023; Lin & Fan, 2024; Singh et al., 2024).

6. Conclusions and Implications

In summary, this study has yielded significant findings about the impact of supply chain strategies on the manufacturing performance of small and medium-sized enterprises (SMEs). This study has demonstrated that the integration of supply chain strategy, integration, and information management are powerful factors that significantly influence manufacturing performance. This study enhances the existing literature by offering a more profound comprehension of the underlying mechanisms and routes through which these variables impact performance.

Other than that, this has practical ramifications because it emphasizes the need for researchers and supply chain professionals in Malaysia's manufacturing industry to give priority to these practices. Nevertheless, additional investigation is required to address the limitations of this study, including the implementation of longitudinal studies and the acquisition of data from external sources. Overall, this study establishes a favourable correlation between supply chain management techniques and manufacturing performance. The researcher was anticipate that this study was assist small and medium-sized enterprises (SMEs) in Malaysia to enhance their performance in the future.

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