Information Management and Business Review (ISSN 2220-3796)
Vol. 18, No. 3, pp. 14-22, 2026

The Relationship Between Supply Chain Integration, Green Supply Chain Management Practices and Sustainability Performance: A Conceptual Framework

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Abstract: A survey conducted by the SME Association among 1,713 SME members revealed that 20% of the respondents were considering permanently closing their business in the next six months due to this issue. In addition, the growth of SMEs in 2021 registered at -5.6% which was lower than Malaysia's GDP in 2015. Taking note of these issues, this study is going to develop the framework for Malaysian SMEs by investigating the relationship between supply chain integration, green supply chain management (GSCM) practices and sustainability performance. Resource-based view (RBV) theory, and natural resource-based view (NRBV) theory are integrated to enlighten the probable relationship between the variables to develop a research framework. A total of 576 SME companies in Malaysia will participate in this study. The data will be collected via the survey method. Partial Least Squares (PLS) procedure will be applied to analyze the data and test the hypotheses of this study. The significance of this study will contribute to the body of knowledge and practice by providing a strong research framework for a clear understanding that describes the effect of implementing supply chain integration among SME companies and the role of GSCM practices towards sustainability performance that would be utilized by the companies and the academicians.

Keywords: *Small and Medium Enterprise, Supply Chain Integration, Green Supply Chain Management Practices, Sustainability Performance*

1. Introduction and Background

Small and Medium Enterprises are important contributors to national income, global economic development, as well as job creation. There have been several studies about the significance of SMEs to the global economy. SMEs also contribute to higher export rates, which is highly significant for business development. Due to that, many countries are aware of the need to support SMEs through various programs and policies in order to improve SME performance. Regarding total employment and GDP contribution for low-income countries, SMEs have contributed almost 60% and 70%, respectively. SMEs also contributed over 70% to GDP and 95% to total employment for middle-income countries. For high income countries, SMEs provided to over 65% of total employment and 55% of GDP for high income countries (Ramdan et al., 2022). However, two years after COVID-19 was announced as a global pandemic, the post-pandemic period has severely affected global SME performance. Particularly in Malaysia, a survey conducted by the SME Association among 1,713 SME members revealed that 20% of the respondents were considering permanently closing their business in the next six months due to this issue. In addition, the growth of SMEs in 2021 registered at -5.6% which was lower than Malaysia's GDP in 2015. In addition, considering global environmental performance, SMEs are also responsible for major carbon emissions (Shashi & Cerchione, 2018). SMEs are accountable for almost 70% of worldwide industrial pollution, necessitating immediate action to implement potential environmental prevention. Accordingly, SMEs should not only concentrate on financial performance, but also on environmental performance across their supply chain. Understanding the importance of SMEs to the Malaysian economy and the issue of post Covid and environmental issues, effective ways to quickly solve the issue are by having supply chain integration and implementing green supply chain management practices. This sector requires strong supply chain integration to ensure that SMEs strategically collaborate with their supply chain partners and collaboratively manages intra-organization and inter-organizational linkages within a company and with upstream and downstream supply chain partners. The aim is to achieve efficiencies in terms of product and service processes, share necessary information, provide high value to the customer and improve performance.

Green supply chain management practices can also be an effective strategy for SMEs to achieve sustainability performance since this practice can reduce pollution, waste and emissions.

Although supply chain integration research has been conducted in many countries such as India (Shashi & Cerchione, 2018), China (Flynn et al., 2010), the United Kingdom (Vanpoucke et al., 2014), and the United States (Kannan & Tan, 2010), there are still limited studies on supply chain integration in Malaysian SMEs. In addition, based on available literature, several studies have conducted a systematic literature review analysis to explain supply chain integration, such as (Fabbe-Costes & Jahre, 2008; Ataseven & Nair, 2017). Although much research has been done on supply chain integration, there is still limited research conducted on the effect of supply chain integration on sustainability performance specifically in the Malaysian SMEs context. On the other hand, previous studies such as Zhu et al. (2017), Razak and Ibrahim (2020), Ibrahim et al. (2021), Eltayeb et al. (2011), Green et al. (2012), and Tan et al. (2016) in their quantitative studies have investigated the implementation of green supply chain management practices and their effect on improving economic performance and environmental performance. However, there is still less research focus on GSCM practices as a strategy towards sustainability performance. Thus, this study attempts to fill up this existing gap by examining the GSCM practices among SMEs in Malaysia to achieve sustainability performance in terms of economic, environmental and social performance.

The resource- based view (RBV) and natural resource-based view (NRBV) theories are utilized as a guiding principle to investigate and explain the relationship between supply chain integration, GSCM practices, and sustainability performance among Malaysian SMEs. According to RBV organizations are a collection of resources, some of which might be called strategic (Wernerfelt, 1984). Thus, corporations seeking a competitive edge must combine resources uniquely and distinctly from other organizations that may not be able to do so (Dyer and Singh, 1998). At the same time, they must be concerned with the disparate allocation of resources among organizations engaged in the supply chain integration process (Barney, 1991). As a result, the incentives for supply chain integration are focused on acquiring limited and specialized resources to secure and retain a competitive edge. Extended from resource-based view (RBV) theory, Hart (1995) introduced NRBV by introducing the natural environment into RBV's drivers as a competence for the firm to gain a competitive advantage which leads this study to focus on the role of the strategy of GSCM practices. Accordingly, the purpose of the present study is to investigate the effect of supply chain integration on sustainability performance. A previous study by Kumar et al. (2017) examined four dimensions of supply chain integration namely supplier integration, internal integration, customer integration, and information integration in improving performance. While employing the studies conducted by Kumar et al. (2017) and Delic et al. (2019), at the same time, this study integrates GSCM practices as a mediating role in this relationship. The originality of this study lies in its investigation of GSCM practices as the mediator while this study responds to the demand by Kumar et al. (2017) and Delic et al. (2019) for further research to introduce the role of GSCM practices as a strategy specifically as a mediating role in the conceptual framework.

2. Literature Review

Supply Chain Integration

The increasing degree of rivalry among organizations internationally has resulted in a change to do more than simply strategy design and implementation, but also to seek partnerships with other firms that would lead to a competitive edge in the marketplace (Huang et al., 2014). Manufacturing companies have spent years focusing on building strategies that will bring about the appropriate amount of transformation and operational effectiveness. Firms have understood, however, that developing strategies and integrating internal operations, suppliers, and consumers in a commercial relationship is the best way to get a competitive edge (Frohlich and Westbrook, 2001). This provided the foundation for supply chain integration (SCI) as a method used by companies seeking to improve their performance by fostering stronger linkages among supply chain links (Smart, 2008). Organizations shifted from their earlier vertical integration tactics to become an association of enterprises that collaborate to acquire, manufacture, and sell products and services to their consumers. SCI is focused on the synergy that occurs between a firm's internal processes and external activities within its supply chain, which leads to organizational performance (Chen et al., 2009).

The dimension of supply chain integration

Supplier integration denotes a situation in which suppliers are integrated into the firm's essential decision-making processes, with information about demand predictions, production, and inventory levels shared between them. It entails focus businesses collaborating with their major suppliers to optimize the advantages of the relationship, such as increasing lead times, innovation, and quality (Thun, 2010). The customer-supplier integration process should focus on strengthening connections between both parties for their mutual benefit (Furlan et al., 2006). The primary motivation for supplier integration with customers should be to improve the customer experience or to better serve them.

Customer integration in the supply chain allows enterprises to have a deeper understanding of the requirements and special demands of their customers, allowing them to serve them better. Integrating customers into a supply chain focuses on gathering information from consumers such as their purchasing habits, product preferences, and ability to acquire items, which is then utilized to make better decisions throughout the production process or sales to customers (Lotfi et al., 2013). When businesses interact with their consumers, they are able to respond quickly and efficiently to their customers, boosting order fulfilment and visibility.

For companies aiming to connect with their consumers and suppliers, **information integration** is essential (Amue et al., 2014). However, information integration is not limited to technological efficiency and applicability. It necessitates the inputs and role-playing of people, as well as technical systems, to generate, sort, process, and disseminate information to the appropriate location at the appropriate time for effective decision-making (Sadler, 2008). Data may be collected in real time when information is exchanged across the supply chain, as better communications with other supply chain members are established, leading to enhanced customer service and demand forecasts (Amue et al., 2014).

Green supply chain management (GSCM) practices

People began to consider the notion of environmental quality in the 1990s. Beamon (1999) changed the traditional supply chain into a green supply chain to decrease waste and pollution while minimizing resource utilisation. The green supply chain was created by including recycling, remanufacturing, and reusing operations into the standard supply chain design. In the 2000s, academics were interested in the green supply chain idea and sought to understand how to implement it in a practical manner. As a result, academics began to investigate ways to manage the green supply chain and promote the notion of green supply chain management to worldwide practice (Zhu et al., 2019; Baojuan, 2008; Srivastava, 2007; Zhu & Sarkis, 2004; Kogg, 2003; Zsidisin & Siferd, 2001). Green supply chain management, according to Hajikhani et al. (2012) and Baojuan (2008), includes activities such as green designing, green production, green packaging, green marketing, and green recycling. Consumers nowadays want items that solve the problem of trash disposal (Dowie, 1994). Green supply chain management literature has expanded to include green supply chain management methods. Green supply chain management, according to Diabat and Govindan (2011), is currently regarded as a green approach that is consistent in sustaining environmental performance at all management levels and across the supply chain. The 'green practice,' according to Groznik and Erjavec (2012), is linked to the green economy, and it attempts to improve three primary things: enhancing social fairness, lowering environmental risk, and improving the ecological problem. According to Field and Sroufe (2007), the business management team is identifying green supply chain management methods to satisfy the rising demand for environmentally friendly products to enhance environmental performance and save costs.

Sustainability performance

There is no clear and agreed-upon definition of sustainability performance since it is frequently limited to environmental consequences rather than social performance (Henri and Journeault, 2010). The performance of a corporation in terms of economic, environmental, and social issues is referred to as sustainability performance. Various approaches are used to examine and monitor the effects of these factors. Much of the research on business sustainability performance has concentrated on links, such as those between environmental, social, and economic performance (Artiach et al., 2010). According to Baumgartner (2008), a systemic corporate sustainability performance evaluation that demonstrates the interconnections between the system (business, society, and environment) is necessary to determine if corporate operations have a positive impact and contribute to SD principles.

3. Proposed Conceptual Framework

The proposed research framework examines the relationships among Supply Chain Integration (SCI), Green Supply Chain Management (GSCM) practices, and Sustainability Performance (SP). The framework is underpinned by the Resource-Based View (RBV) and Natural Resource-Based View (NRBV), which posit that firms achieve superior sustainability outcomes by developing valuable, rare, and inimitable capabilities, particularly those related to organizational integration and environmental management (Barney, 1991; Hart, 1995).

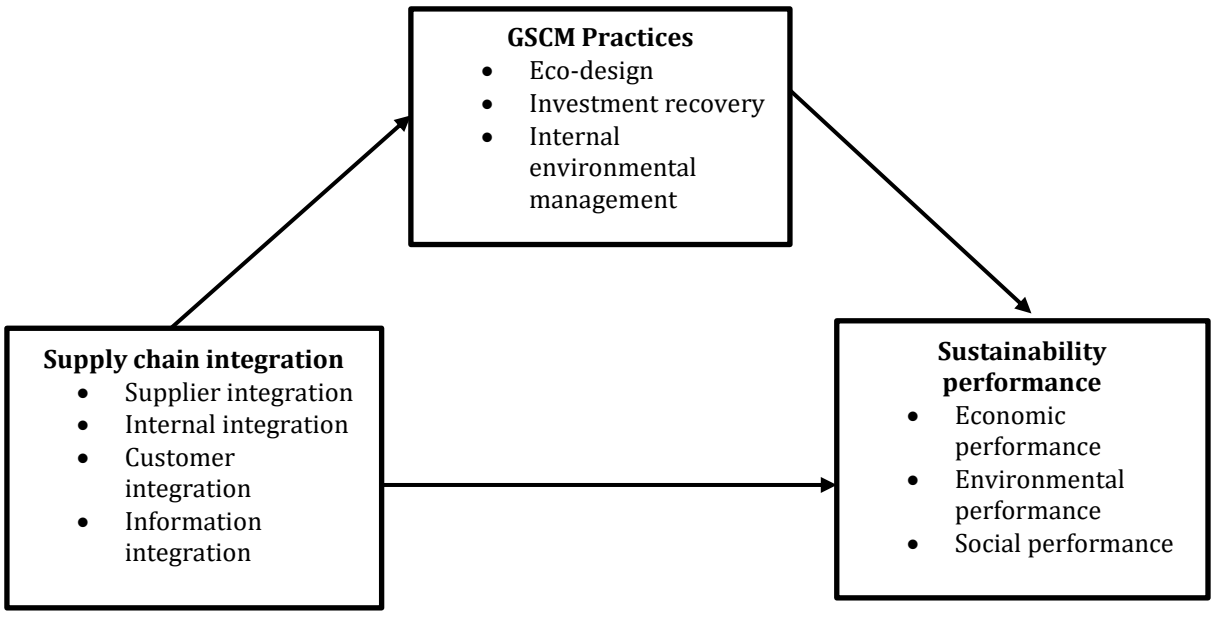
In this framework, Supply Chain Integration (SCI) is conceptualized as the independent variable and represents a multidimensional capability encompassing supplier integration, internal integration, customer integration, and information integration. These dimensions collectively reflect the extent to which a firm coordinates processes, aligns objectives, and shares information across functional units and supply chain partners. SCI is therefore considered a strategic capability that enhances operational efficiency, responsiveness, and inter-organizational coordination in dynamic supply chain environments.

The framework further positions Green Supply Chain Management (GSCM) practices as a mediating construct. GSCM refers to the integration of environmental considerations into supply chain activities, including internal environmental management, eco-design, and investment recovery. SCI is expected to facilitate the adoption and effective implementation of GSCM practices by improving communication flows, strengthening relational trust, and enhancing cross-functional and inter-organizational coordination. As a result, firms with higher levels of SCI are better positioned to embed environmental sustainability into their operational and strategic decision-making processes.

Finally, Sustainability Performance (SP) is specified as the dependent variable, operationalized through the Triple Bottom Line (TBL) framework, which encompasses economic, environmental, and social performance dimensions. The framework proposes that SCI contributes both directly and indirectly to sustainability performance. The direct relationship reflects the efficiency and coordination benefits of integration, while the indirect relationship operates through GSCM practices, which translate integrated supply chain capabilities into environmentally responsible actions and improved sustainability outcomes.

Overall, the model proposes a mediation-based relationship, whereby SCI enhances GSCM practices, which subsequently improve sustainability performance. This reflects the view that sustainability is achieved not merely through isolated operational improvements but through the synergistic integration of supply chain capabilities and environmental management practices.

Figure 1: Proposed Conceptual Framework of the Study



4. Proposed Research Methodology

This research will be conducted as a correlational study in determining relationships among variables with minimal researcher involvement in the natural environment (Sekaran & Bougie, 2013). The correlational study is an ideal option for this research since the objective is to investigate the relationship between supply chain integration, GSCM practices and sustainability performance among Malaysian SMEs. Simultaneously, literature reviews will be utilized to analyze the dimensions of supply chain integration. The correlational study is also cross-sectional where the data are collected and measured at a single point in time (Zikmund, 2003). This study uses a survey method because it is the most appropriate research design to achieve the objective of this study.

The sampling frame for this study is the Small and Medium Enterprise companies in Malaysia. The list of the population is obtained from SME Corp Malaysia (2022). According to SME Corp (2022) the number of populations of this study or SME companies in Malaysia is 1,226,494. For this study, the researcher used the Raosoft Calculator as a guideline to determine the random sample size from the determined population. Based on the Raosoft Calculator, the minimum sample size suggested for 1,226,494 is 385 SMEs, which also seemed to fit well with the requirement of sample size for SEM. Since this study will use SEM-PLS as a tool for data analysis, a cautious decision was made in determining the appropriate sample size for this study. Hair et al. (1998) recommended that the sample should be at least 100 observations to obtain reliable results.

For this study, a simple random sampling technique will be used, as it enables generalization to the study population (Creswell, 2014). Hair et al. (2010) have also highlighted that the simple random sampling technique could prevent bias in choosing respondents because all elements in the population have an equal chance of being selected as respondents.

Instrument

All items in the questionnaire will be adapted from previous studies and measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The measurement instruments for this study are presented in Table 1, Table 2, and Table 3, as follows:

Table 1: Instrumentation of Supply Chain Integration

Construct	Number of Items	Key Focus	Source
Supplier Integration	6 items	The degree of collaboration, coordination, and information sharing with key suppliers.	Flynn et al. (2010); Zhao et al. (2011)
Internal Integration	6 items	Coordination and collaboration across functional departments within the firm.	Flynn et al. (2010); Basnet (2013)
Customer Integration	6 items	Collaboration and information sharing with key customers.	Flynn et al. (2010); Zhao et al. (2011)
Information Integration	6 items	The use of systems and real-time data sharing across the supply chain.	Zhao et al. (2011); Flynn et al. (2010); Neubert et al. (2018)
Total	**24 items**	**Supply Chain Integration**	

Table 2: Instrumentation of Green Supply Chain Management Practices

Construct	Number of Items	Key Focus	Source
Eco-Design	6 items	Green product development & design	Zhu et al. (2008, 2012); Sarkis (2012)
Investment Recovery	6 items	Waste reuse, recycling, asset recovery	Zhu et al. (2008, 2012); Srivastava (2007)
Internal Environmental	7 items	Environmental policies, management commitment	Zhu et al. (2008, 2012); Chan et al. (2012);

Construct	Number of Items	Key Focus	Source
Management			Green et al. (2012)
Total	**19 items**	**GSCM practices**	

Table 3: Instrumentation of Sustainability Performance

Construct	Number of Items	Key Focus	Source
Economic Performance	6	Profitability, cost, competitiveness	Zhu et al. (2008, 2012)
Environmental Performance	6	Pollution, energy, resources	Zhu et al. (2008, 2012); Sarkis (2012)
Social Performance	6	CSR, employees, stakeholders	Green et al. (2012)
Total	**18**	**Sustainability Performance**	

Data Analysis

The data will be coded and analyzed using SPSS Version 28 for preliminary screening and descriptive statistics. Data will be checked for missing values, outliers, and inconsistencies before analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, will be used to summarize respondents' profiles and variable distributions. Hypotheses will be tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) via SmartPLS. This method is appropriate due to its suitability for complex predictive models and minimal distributional assumptions. It allows simultaneous assessment of both measurement and structural models. The measurement model will be evaluated for internal consistency reliability (Cronbach's alpha, Composite Reliability), convergent validity (AVE), and discriminant validity (Fornell–Larcker criterion and HTMT ratio). The structural model will be assessed using bootstrapping to determine path significance, while R^2, f^2 and Q^2 will be used to evaluate explanatory power, effect size and predictive relevance.

5. Managerial Implications and Recommendations

This study contributes to the growing body of knowledge on sustainable supply chain management by integrating Supply Chain Integration (SCI) and Green Supply Chain Management (GSCM) practices in explaining sustainability performance. Recent studies confirm that GSCM practices significantly enhance economic, environmental, and social performance, particularly when supported by strong inter-firm integration and coordination mechanisms (Kamra et al., 2024; Green et al., 2012). Accordingly, the study extends the Resource-Based View (RBV) and Natural Resource-Based View (NRBV) by positioning SCI as a strategic capability that facilitates the effective implementation of green practices to achieve superior sustainability outcomes.

From a managerial perspective, the findings suggest that firms should not treat sustainability initiatives as isolated environmental actions but rather embed them within integrated supply chain systems. Strengthening internal integration and collaboration with suppliers and customers enhances information sharing, joint decision-making, and process alignment, which in turn improves the effectiveness of eco-design, internal environmental management, and other GSCM practices. This integrated approach leads to improved resource efficiency, reduced environmental impact, and enhanced competitiveness (Zhu et al., 2008; Sarkis, 2012; Green et al., 2012).

In terms of practical recommendations, managers are encouraged to invest in digital systems that support real-time information sharing across supply chain partners, as well as to develop long-term strategic partnerships with key suppliers and customers to support joint sustainability initiatives. Policymakers should further promote sustainability by providing incentives for green innovation, strengthening environmental regulations, and supporting supply chain collaboration platforms, particularly for SMEs in developing economies. Institutional and stakeholder pressures can also help accelerate GSCM adoption and improve sustainability

outcomes (Zhu et al., 2013).

This study develops a conceptual framework examining the relationships between Supply Chain Integration (SCI), Green Supply Chain Management (GSCM) practices, and Sustainability Performance (SP). Drawing on the Resource-Based View (RBV) and Natural Resource-Based View (NRBV), the framework positions SCI as a strategic organizational capability that enhances coordination, collaboration, and information sharing across internal functions and external supply chain partners.

Conclusion

The study further conceptualizes GSCM practices, including internal environmental management, eco-design, and investment recovery as a mediating mechanism through which SCI translates into improved sustainability outcomes. From a triple bottom line perspective, sustainability performance is defined through economic, environmental, and social dimensions, reflecting a holistic assessment of organizational outcomes.

The proposed framework suggests that sustainability performance is not achieved through fragmented environmental initiatives but through integrating supply chain capabilities with structured green practices. SCI plays a foundational role in enabling the effective implementation of GSCM practices, which in turn enhance overall sustainability performance. This study contributes to the literature by integrating operational and environmental perspectives within a unified model of sustainability in supply chains. It provides a basis for future empirical validation and encourages further examination of the mechanisms through which supply chain integration enhances environmental and organizational performance outcomes in complex and dynamic business environments.

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