

# Supply Chain Integration: Level of Existence in Green Supply Chain Management Practices among Malaysian ISO 14001 Manufacturing Firms

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**Abstract-** This paper examines the level of existence of supply chain integration, which covers supplier integration, internal integration and customer integration. From the literature, the level of supply chain integration among Malaysian manufacturing firms has yet to be identified. This empirical research was conducted in firms that implement green supply chain management practices and are ISO 14001 certified. Results showed that manufacturing firms in Malaysia practiced a highly progressive level of supply chain integration. Between supplier integration, internal integration and customer integration, internal integration was the most adopted. These findings provided an evaluation on the current level of supply chain integration and therefore provided insights to the importance of supply chain integration in firms that implement green supply chain management practices.

**Keywords-** Supply chain integration, Green Supply Chain Management Practices, ISO 14001, manufacturing firm.

## 1. Introduction

The scarcity of resources and the increased focus on environmental issues have caused the Malaysian Government to enforce environmental incentives and regulations to address environmental problems. The issues of environment is building up in Malaysia and with the Ninth Malaysia Plan, the Malaysian Government has placed further emphasis on preventive measures to mitigate and minimize

negative environment impacts at source [1]. In Malaysia, manufacturing is the second largest contributor to the Malaysian economy and the largest polluter for the country [2]. Thereby, any effort to improve the environmental condition of these manufacturing firms may provide substantial benefits to the environmental condition of the nation. The ISO 14001 certified manufacturing firms are of interest due to the fact that these firms are implementing green practices and they have a good knowledge in greening their manufacturing activities as well as their supply chain activities [3].

In the quest of greening the supply chain activities, however, is a challenging task, because all the related activities in the supply chain require some degree of integration between supply chain members [4]. As contended by [5], in order to strengthen core competencies of Green Supply Chain Management (GSCM), firms need to coordinate their internal capabilities and integrate with supply chain members into interorganisational environmental practices. Yet, previous studies discussing Supply Chain Integration (SCI) on GSCM have yet to empirically recognize the influence of supply chain integration.

Researchers and practitioners have put much prominence on the potential and benefits of SCI as a competitive advantage and for performance improvement. The potential benefits of SCI can be achieved through a firm's efficient internal operations and solid supply chain networks [6]. Therefore, many companies tend to work closely with their supply chain members to gain exceptional synergies and benefits through integration practices, such as accurately identifying customer demand and promoting a mutual exchange of information with suppliers [7].

Despite the potential and benefits of SCI, there remains inadequacy in the literature regarding

SCI's role in facilitating firms to green their supply chain activities. Firstly, previous studies offer little insight into an in-depth view on the role of customer and supplier integration in firm performance improvement [8]. Secondly, much of the discussion on SCI is focusing on a single factor of supply chain integration and neglected the interconnection with other supply chain partners such as customer collaboration and integration [9]. Further, although the link between SCI and supply chain management has been considered as one of the most promising topics in survey-based research [8], however, there are very few studies that have investigated the role of SCI in facilitating green supply chain management practices.

Thus, this paper seeks to highlight the importance of SCI and the level of existence of SCI among Malaysian manufacturers that implements GSCM practices.

## 2. Literature Review

*Supply Chain Integration (SCI)* can be defined as the collaboration of a firm with its supply chain members to manage both intra- and inter-organizational environmental practices and could be divided into internal and external integration [10]. Internal integration focuses on removing cross-functional barriers, enhancing firms' environmental capabilities and encouraging employees to learn about environmental initiatives [11]. On the other hand, external integration involves co-operation between suppliers and customers to mutually manage cross-firm environmental issues [12]. In response to the broad definition of SCI, it is possible to link SCI with GSCM, as the backbone of supply chain requires the interconnection and cooperation among supply chain members.

*Internal integration* refers to organizational practices of combining and improving internal resources and information in order to generate knowledge sharing beyond the boundaries of individual functions or departments, to assist external integration initiatives, and to achieve organizational goals [13]. In addition [8], indicated that internal integration involves a cross-functional cooperation, or working together across different functions in process improvement or new product development. While, [14] and [15], indicated that internal integration serves as a foundation for supplier and customer integration where a firm can more rapidly absorb, interpret, and

apply external information and resources between the supply chain member while improving performance of the firm. The same foundation should be applied for the case of GSCM, where firms should be able to manage and ensure each stage of their product cycle complies with environmental regulation and contribute to sustainability. In the findings of a study by [10], found that managers should not neglect the importance of internal integration. The managers should support GSCM and take actions to remove functional barriers and improve organizational knowledge sharing. [10] also suggested that during the early stages of product design and pollution minimization, managers should integrate suppliers and customers into setting environmental goals, implementing environmental audits and delivering environmental attributes valued to the market. This can actually be realized through efficient internal integration of supply chain.

*Supplier integration* is defined as the organizational practice of a buying firm and its suppliers' sharing and applying operational, financial, and strategic knowledge in order to generate mutual benefits[8]. In a turbulent market situation, with the increasing international environmental regulations and growing consumer concern over environmental protection have demonstrated the importance of environmental sustainability in business operations. To cope with this situation, firms need to gain more accurate information to leverage supplier resources and networks, and also enhance customer satisfaction [16]. Therefore, it is essential for firms to actively engage in green practices including environmentally oriented product designs and manufacturing processes, in order to meet the requirements of sustainable development [17].

As for today's business operations, it is essential for a buying firm to communicate with its suppliers and to continually upgrade information accumulated through internal integration practices. As indicated by [18], for a firm to follow the environmental standards, the steps specified cover every stage of environmental management activities in a supply chain, from the product design to the end-of-life product treatment phase, which cannot be single-handedly completed by one firm. Firms need to employ supply chain integration to integrate their environmental management activities with their

supply chain members. As firms have insufficient knowledge and capabilities to handle all environmental issues generated from the product lifecycle; it is essential for firms to cooperate with the members in the supply chain especially with their suppliers.

*Customer integration* refers to organizational practices of identifying, interpreting, and utilizing customer needs in order to produce a customer-defined product and increase customer satisfaction [8]. From a marketing view, a customer is a decision maker who has a potential purchasing power and evaluates the characteristics of products [8]. Integrating with customers mainly involves sharing a set of information between a customer and a firm. Customers offer a firm their perception and judgment on a product through a survey or in person, whereas a firm provides customers with operational information [10]. In the GSCM context, customer integration refers to maintaining positive relationships and cooperating with downstream customers to assure that manufacturing, distribution and marketing conform to environmental regulations [4].

Customer integration in GSCM occurs when a firm share its know-how and experience with its customers for environmental management and planning purposes and to find solutions to environmental challenges [7]. The integration activities include the exchange of technical information and require a mutual willingness to learn about each other's operations in order to improve environmental practices [12]. This also includes collaboration to reduce the environmental impact associated with material flows in the supply chain. The common customer integration practices that have been widely discussed in the context of GSCM include joint planning with customers to achieve environmental goals [4], joint selection of eco-strategies to reduce environmental impact [12] and cooperation on cleaner production and green packaging [18]. Therefore, managers should consider involving their customers in practicing GSCM to effectively generate the benefits of environmental practices.

Hence, this study considers supplier integration, internal integration and customer integration as mechanisms for supply chain

integration that affects a firm's responsiveness toward green practices.

### 3. Conceptual Framework

This study examines the level of supply chain integration among manufacturing firms in Malaysia. SCI has received an immense attention as a crucial means in generating material and knowledge flows and leveraging the performance rooted in green supply chain management practices. In GSCM practices, major greening practices would require coordination and integration on the part of the entire supply chain in order to fully experience the benefit of the green supply chain practices. Thus, provide support for this study to investigate to what extent is SCI being implemented among the ISO 14001 manufacturing firms in Malaysia. Figure 1 depicts the rationalization of SCI in facilitating GSCM practices among ISO 14001 manufacturing firms.

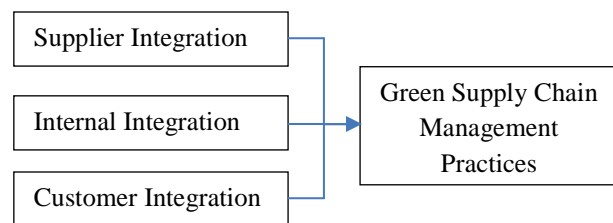


Figure 1. Theoretical Framework

### 4. Data Analysis

*Response rate-* A mail survey was used as an instrument for data collection. A total of 621 certified manufacturing firms were identified based on a sampling frame that were generated from FMM and SIRIM directory. As a result from data collection, 152 responses were obtained and finally used for data analysis.

*Profile of the companies-* This study was conducted on manufacturing firms with ISO 14001 certification, that encompasses various sectors and industries, sizes, age of firm and ownership status. Table 1 summarises the profile of the responding firms.

**Table 1.** Profile of the responding firms

		Frequency	Percent
Sector	Electrical and	50	32.9

	electronic		
	Textile	6	3.9
	Paper products	15	9.9
	Food and beverages	3	2.0
	Petroleum	15	9.9
	Rubber & plastic products	10	6.6
	Basic metal	28	18.4
	Others	25	16.4
Number of employees	Less than 5	3	2.0
	5 to 75	36	23.7
	76 to 200	45	29.6
	More than 200	68	44.7
Age of firm	less than 10 years	24	15.8
	10 - 25 years	64	42.1
	26 - 50 years	59	38.8
	more than 50 years	5	3.3
Ownership type	Multinational Company	58	38.2
	GLC	3	2.0
	Local Company	64	42.0
	Joint Venture (JV)	18	11.9
	Foreign own	4	2.6
	Private Ltd	4	2.6
	Japanese based	1	0.7

The major industries of Malaysia in the manufacturing sector are electrical and electronic (E&E), textiles, food and beverages, rubber, basic metal, petroleum and paper product industries [1]. According to the responses obtained, the E&E industry made up the highest proportion of respondents, while the food and beverages industry was the least responsive. This can be explained by the fact that as the biggest group to implement environmental management practices, the E&E industry is subjected to the Western Nations scrutiny for environmental management and social compliance [19]. The second highest respondent was the basic metal industry. Other industries for chemical and metal, building materials, automotive, agriculture products and medical devices manufacturers, shared similar proportion of response with the basic metals industry. Overall, the data

revealed that the response followed a descending order i.e. it decreased from extremely scrutinized industry to the least scrutinized one. This signifies the target industries of ISO 14001 firms, where industries that are liable to strict environmental policy share a larger proportion of the total population.

The data indicated that more than 70% of the respondents were large and medium firms. These results are in parallel with the reports from previous studies and could be explained by the fact that due to huge investments involved, ISO 14001 certification is more common amongst large firms [19]. The study also found that, the majority of respondents came from firms established for more than ten years. The older firm group composed of 84.2% percent of the total response rate, whereas the firms with lesser than ten years of establishment occupied the lower positions. Finally, ownership status depicted that the major part of these certified manufacturing firms belonged to foreign ventures. These findings are also consistent with other studies where the multinational companies are additionally active in green practices than the local firms [3].

*Adoption level of SCI-* Based on the result from data analysis, SCI is practiced at a highly progressive level among the respondents, with internal integration at the highest, followed by customer integration and supplier integration. Table 2 depicts the summary of standard deviations and mean values of supply chain integration.

**Table 2.** Descriptive Statistics of SCI

	Mean	Std. Deviation
Supplier Integration	3.45	0.83
Internal Integration	4.00	0.76
Customer Integration	3.72	0.75

To be specific, the result of each dimension of SCI showed that internal integration has been the most adopted among Malaysian manufacturers, slightly at the high level with mean value of 4.00. This result is not surprising as [20] suggested that improving internal environmental management functions is the first step in greening the whole supply chain before improving external environmental management functions. Whereas, external integration including

supplier integration and customer integration were found to be less imperative, with supplier integration having the lowest level of integration with the mean value of 3.45, followed by customer integration with the mean value of 3.72. This indicates that internal coordination among the functional units within the organization is more focused than external integration during implementation of green practices by the responding firms.

## 5. Discussion

The results showed that SCI has been practiced at a highly progressive level in Malaysia among the certified manufacturing firms. Due to a growing demand for environmental protection in today's industrial activities, firms need to cooperate with their supply chain members in order to effectively handle the green related activities in their business operations. Besides that, supply chain integration appears to be a useful resource or capability for organizations to consider and incorporate into their business strategy in order to produce reliance and long-term relationships with members of the whole supply chain; not only within departments of the same organization, but also with other groups in the supply chain, including suppliers and customers that the organization has to communicate with.

Realizing the benefits that can be gained from SCI, many firms are putting more attention towards better integration with their supply chain members. The result of each dimension of SCI showed that internal integration has been the most adopted, and also confirmed that internal integration has been put into focus by most of the manufacturers compared to external integration that involved supplier and customer. Owing to the reason that internal integration is essential to ensure all employees are clear about the process, objectives and commitments made by the organization in terms of greening the business as they are often at the frontline executing those policies and commitments. Therefore, it is important to improve internal environment functions before any other external functions and it is important to strengthen the internal capabilities before extending it to external capability.

Internal integration can facilitate SCI within a firm, as internal environment initiatives are conducted better than external ones [20]. This argument is also in agreement with [21], which claimed that internal integration facilitate the interaction with all supply chain members because if internal stakeholders (e.g. managers, employees) take the environmental criteria into consideration, then they will work together to reduce the environmental

impact, not only in the organization but also in supply chain activities. Given this argument, it is possible that these concerns influence the higher level of internal integration among Malaysian manufacturing firms to facilitate their green practices in supply chain management.

The result of supplier integration and customer integration were at a moderate level, with customer integration showing slightly higher adoption level than supplier integration. As suggested by [21], effective customer integration ensures continued growth and competitiveness in the market in terms of value creation. Many firms view a close relationship with customers, in turn, build on the operational capability of the firm. [22] also accentuated that the relationship between an organization and its customers is a way to achieve competitive advantage and business performance. Therefore, when it comes to green supply chain management, customers appear to be the main interest as the demand for green products and services are usually created by the customers. For instance, a firm must cooperate with its customers by taking into account issues such as eco-design, cleaner production, and environment-friendly packaging. Hence, in order to stay competitive and improve the sustainable performance, firms must actively engage with their customers.

As for supplier integration, green supply chain management requires firms to cooperate with other organizations in order to establish commitment, long-term relationships, and trust. Further, interaction between supply chain members, such as suppliers is able to make the work flow more effective and improve communication. For this purpose, a business needs to collaborate with suppliers and persuade them to be concerned about environmental issues and evaluate their environment-friendly practices, encourage suppliers to receive ISO 14001 certification, and provide design specifications on environmental requirements. Similarly, [18] also suggested that firms should integrate with suppliers in order to achieve common environmental goals; monitor their suppliers using internal audits, especially around enforcing environmental policy; and persuade them to adopt an environmental management standard, such as ISO 14001 certification. The close collaboration linkages with suppliers are essential for the GSCM implementation of the firm particularly for green practices that require supplier cooperation such as green purchasing. Additionally, [24] reported that supplier integration could offer a new opportunity to improve internal operational competencies. The strategic task of a supply relationship positively affects the capability of profit making and the integral supply

chain, as well as the manufacturer's competitive capability [24].

In sum, SCI is needed to tie the whole supply chain together in order to reduce perpetual green supply chain challenges such as functional silos, poor knowledge and information sharing and the poor formation of customer and supplier relationships. As such, SCI plays an essential role to achieve effective green supply chain management practices.

## 6. Conclusion

Environmental issues have received increasing level of attention and these issues raised questions on how can firms integrate environmental concerns in their business operations. Greening the business cannot be single-handedly completed by one firm. Firms need to employ supply chain integration to facilitate the effectiveness of GSCM practices. SCI suggests dependency when firms interdependently transfer resources and practices through supply chain that lead the reciprocal nature of practices which allows the targeted act such as green practices to improve.

Based on the results obtained, the extent of supply chain integration among Malaysian manufacturing firms is showing a progressive level of integration. Due to a growing demand for environmental protection in today's industrial activities, firms need to cooperate with their supremely chain members in order to effectively handle the green related activities in their business operations. Besides that, supply chain integration appears to be a useful resource or capability for organizations to consider and incorporate into their business strategy in order to produce reliance and long-term relationships with members of the whole supply chain; not only within departments of the same organization, but also with other groups in the supply chain, including suppliers and customers that the organization has to communicate with. Realizing the benefits that can be gained from SCI, many firms are putting more attention towards better integration with their supply chain members.

All in all, this paper holds important insights for managers of the Malaysian manufacturing firms that need to consider establishing and maintaining strong relationships with their suppliers and customers through supply chain integration (SCI). These relationships, as evidenced from the result of the study, help in transmitting knowledge and accelerate the benefits of GSCM practices. In essence, SCI can assist in the development of capabilities of organizations which enable them to embark on more intensive green supply chain management practices.

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