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**Integrating Environmental Management into Supply Chains: A Systematic  
Literature Review and Theoretical Framework**

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## **Abstract**

**Purpose**—The need to integrate environmental management into supply chains has been recognized recently. Yet, there is a lack of theoretical grounding and a conceptual framework guiding such efforts to leverage resources and capabilities across supply chain partners. Grounded on stakeholder and resource orchestration theories, this paper maps the emerging practices, develops a theoretical framework, and proposes future research for understanding an emerging best-practice called ‘green supply chain integration’ (GSCI).

**Design/methodology/approach**—A systematic literature review of 142 academic articles is conducted to ensure the process of framework development is auditable and repeatable. The article selection criteria are aligned with the review question ensuring that related theories and practices are identified and evaluated.

**Findings**—The paper illustrates how stakeholder and resource orchestration theories can be used to explain an integrative approach of environmental management in supply chains. The paper identifies four GSCI practices: internal, supplier, customer, and community stakeholder GSCI. A theoretical framework and proposition also provide new research directions.

**Research limitations/implications**—The results of this paper are drawn from an extensive review of the existing literature and novel practices that have not been revealed and could have been missed. The emerging practices and theoretical framework can be used for further empirical investigation.

**Originality/value**—This paper integrates theoretical concepts and empirical findings from the disparate literature and identifies four emerging practices of environmental management by developing a theoretical framework and proposition for future research.

**Keywords:** Supply chain integration, green supply chain management, sustainability, systematic literature review

## **Introduction**

The need to integrate environmental issues into manufacturing has been highlighted since the beginning of the 1990s (Klassen, 1993). Since then, various supply chain environmental management practices have been identified and include providing environmental requirements to suppliers (Hu & Hsu, 2010; Zhu et al., 2012a), selecting suppliers based on environmental criteria (Azevedo et al., 2012; Montabon et al., 2007; Vachon & Klassen, 2008; Wong et al., 2012), monitoring/assessing environmental practices of suppliers (Rao, 2002; Vachon & Klassen, 2006; Zhu et al., 2008a), providing assistance to suppliers (Kim & Rhee, 2012; Rao, 2002; Wong et al., 2012), and collaborating with supplier and customers (Krause et al., 2009; Lai & Wong, 2012; Lee et al., 2012; Thun & Muller, 2010; Vachon & Klassen, 2006, 2008; Zhu et al., 2008b, 2010, 2012;). These practices have two common threads; first, they require integration of environmental criteria into internal management systems (Margerum & Born, 2000), engagement with supply chain members (Klassen & Whybark, 1999), and extension of environmental management practices across the supply chain (Gimenez & Tachizawa, 2012); second, they lack a theoretical foundation and a conceptual framework for recognizing the various integrative practices and explaining their performance implications.

This paper addresses the research gaps based on one central tenet: whether assisting, providing information, monitoring, or collaborating an ‘integrative’ approach to green supply chain management can ideally be more effective because it enables concerted efforts to orchestrate diverse resources within a firm and across the supply chains for implementing various environmental management best practices. The paper further address another gap: even though the need for such an integrated approach has been

highlighted by some recent literature (Gimenez & Tachizawa, 2012; Molina-Azorin et al., 2009; Sarkis et al., 2011; Seuring & Muller, 2008b), the field has not included all key stakeholders (including internal employees, supply chain partners, stockholders, government bodies, NGOs) into a comprehensive framework of integrated green supply chain management. In the proposed framework, this paper gathers the earlier work of Zhu et al. (2005), Vachon and Klassen (2006), and others that focus on ‘collaborative’ approaches to internal environmental management and upstream and downstream green supply chain practices, as well as the wider stakeholders (Sharma & Vredenburg, 1998), and further includes these stakeholders from a resource orchestration perspective (Sirmon et al., 2011).

The paper aims to advance the understanding and theory of environmental management in supply chains through theoretically and conceptually examining the critical managerial practices underlying green supply chain management that are integrated among stakeholders. This is achieved by systematically mapping different green supply chain integration (GSCI) practices and finding suitable theories for developing a theoretical framework, along with the proposition for explaining their performance implications and guiding future research. This effort is timely because different supply chain environmental management practices, some of which acknowledge the importance of an integrated approach that requires joint efforts among functions and across wider stakeholders in a supply chain, have been identified by the diverse literature. This paper advances the literature by developing a theoretical foundation for supporting the integrated approach, which takes into account integrated information exchange management systems and processes in addition to needs for collaboration with different supply chain members and stakeholders to orchestrate

resources. Furthermore, the paper takes input from studies that theorize the integration of various management and environmental management systems, which are often published in the quality management and environmental management literature (e.g., Bernardo et al., 2009, 2010; Hooper et al., 1999; Margerum & Born, 2000). By laying down an appropriate and novel theoretical foundation, the paper further outlines future research to advance supply chain environmental management theories and practices.

### **Methodology**

This paper applies the systematic literature review method outlined by Denyer and Tranfield (2009). A systematic literature review overcomes the perceived weaknesses of a narrative review (Tranfield et al., 2003). It is an evidence-informed approach based on the five-step approach: (i) question formulation, (ii) locating studies, (iii) study selection and evaluation, (iv) analysis and synthesis, and (v) reporting and using the results (Denyer & Tranfield, 2009). Figure 1 summarizes the procedures of the content analysis.

<Insert Figure 1 about here>

The primary review question is as follows: “what are the theoretical tenets that are suitable for framing the different integrative approaches to green supply chain management?” Answers to this question enable the identification of the scopes and contents of the practices and related theories. The next step is to locate the relevant literature by identifying a search database and search strings. Following prior literature review studies (e.g., Burgess et al., 2005; Pozzebon & Pinsonneault, 2005) and consultation with a database expert with experience of supporting a systematic literature

review, this paper used the ABI/INFORM® ProQuest database, which is the world's most comprehensive and diverse business database available ([www.proquest.com](http://www.proquest.com)) to identify the relevant peer-reviewed journal articles from most of the diverse business and management disciplines. Given that the context of the study is the supply chain integration and environment, ABI/INFORM® ProQuest is the database with the best coverage for these fields. Three main keywords 'integration', 'supply chain,' and 'environment,' and their equivalent keywords are used so that our scope of search can be as comprehensive as possible. For example, in addition to the keyword 'environment,' its relevant keywords, such as 'environmental,' 'pollution,' 'eco,' and so forth are used for searching the relevant literature. In order to include literature from the general management and environmental management disciplines and include literature that does not use the term 'supply chain,' we apply multiple combinations of the keywords (e.g., environment, integration, and supply chain) in an attempt to thoroughly uncover all the relevant literature. For verification, three main keywords are also searched using Google Scholar to ascertain whether a list of peer-reviewed journal articles may be available through other business and management databases. A closely similar set of articles is found when using the ABI/INFORM® ProQuest database, indicating a completeness of the results of literature search and selection.

<< Insert Table 1 about here >>

Table 1 (details are provided in online appendix 1) summarizes the results of literature search and selection. Relevant articles were initially identified by searching articles with titles and abstracts using different individual and combined keywords. The



table shows that thousands of articles are located when individual keywords are used. While the majority of these articles are specific to their subject area, the articles identified using the combinations of two or more keywords are analyzed to increase the precision of identifying research papers relevant to integrating environmental management to supply chains. The abstracts for a total of 213 articles, as summarized in Table 1 (details are provided in online appendix), are reviewed based on the primary review questions for the selection and evaluation of relevant articles. Three researchers were involved in the selection and evaluation process so that no important article from the total of 213 was missed. Since these researchers have experience researching and publishing papers in the area, they provided additional articles that were not being included in the literature search. After reading the abstracts, elimination of duplication, editorial articles, and articles that do not specifically provide definitions, measurement, or theories of environmental management practices, the total number of articles was reduced to 142.

Overall, published articles since 1994 were found. During the first eleven-year period (1994–2004), there were only 31 articles. From 2005–2009, 49 articles were published, and from 2010–2012, 62 relevant articles were uncovered. This trend demonstrates an increasing interest in examining the extension of environmental management into supply chains. Initial thoughts regarding the diverse or fragmented nature of the literature were also confirmed. Altogether, 68 different journals were involved; there was no dominant journal. This clearly shows that both the general management and supply chain management disciplines research this topic in parallel, confirming the importance of the topic. To advance this research topic, we identify the common practices associated with the integration of environmental management into supply

chains. These common practices are identified in the next step of the study.

The next step involves analysis and synthesis of the selected literature. Content analysis of the 142 articles was performed. During this process, the articles were examined separately by the three researchers with a focus on identifying definitions and concepts related to the integration of environmental management into supply chains. Other similar concepts, such as collaboration, coordination, sustainability, and so on, were also considered. Each article was evaluated in terms of its relevance to the primary review question. The 142 articles were randomly divided into three groups—also analyzed by the three researchers separately—with a focus on pinpointing definitions, measurements, and theories regarding emerging practices related to the integration of environmental practices into a firm and across a supply chain. A two-day workshop was organized to allow the researchers to consolidate their findings. An excel spreadsheet was used to record reasons for further inclusion and the main theories and empirical findings of the articles.

### **Theoretical Framework**

Based on analysis of the literature, the need to integrate environmental issues into manufacturing was first discussed in the 1990s (Klassen, 1993). From an open-systems perspective, Klassen (1993) argues that there is a need to ‘integrate environmental issues into manufacturing’. Further research suggests including technology, process, resource and strategy while implementing environmental management (Klassen, 1996; Klassen & Whybark, 1999; Srivastava, 1995). The need to integrate ethical, societal, and environmental issues into business strategy and management systems was also recognized (Gond et al., 2012). The adoption of a proactive environmental strategy also

means the need to engage supply chain members (Klassen & Whybark, 1999). In fact, the need for a proactive environmentally-friendly supply chain was suggested as soon as the concept of supply chain management was introduced (Walton et al., 1998). Later, Carter and Rogers (2008) highlight the importance of integration in their definition of “sustainable supply chain:” “the strategic, transparent integration and achievement of an organization's social, environmental and economic goals in a systematic coordination of key inter-organizational business processes for improving the long term economic performance of the individual company and its supply chains” (p. 368).

The analysis of the literature identifies over twenty definitions related to environmental, green, or sustainable supply chain management shown in Table 2 (details are provided in online appendix). However, of these definitions of related concepts, few articles conceptualize environmental management or green supply chain management from an integration perspective. For instance, Margerum and Born (2000) introduce the concept of ‘integrated environmental management’, which ideally strives to address more complex problems through a more holistic, inter-connective, and effective approach. Integration is considered as both a process and an approach to attaining the environmental goals defined by the participants of the study. In addition, Rao (2002) introduces ‘supply chain environmental management’ that involves only screening suppliers for their environmental performance and undertaking business with those that meet the regulatory standards; it also entails working collaboratively with suppliers on green product design, holding awareness seminars, and helping suppliers to establish their own environmental programme. Wolf (2011) also suggests a new concept called ‘sustainable supply chain integration’ and defines it as the integration of sustainability into supply chain management. Wolf (2011) further theorizes downstream

sustainable supply chain management integration capability as the enabler for organizational integration and strategy integration, subsequently leading to environmental performance. All these studies point to the idea that integration and environmental management are closely related (Angell & Klassen, 1999; Bowen et al., 2001; Carter & Carter, 1998; Klassen, 2001; Sarkis et al., 2011; Vachon & Klassen, 2008), but there is a lack of theory to categorize such integrative approaches.

Table 2 (details are provided in online appendix) consolidates the types of integration and their theoretical perspectives found in the literature. The review indicates that the extant literature acknowledges the importance of integration and supply chain efforts to achieve environmental management. However, the majority of prior studies neglect the holistic perspective of supply chain management in environmental management that includes internal functions, suppliers, customers, and stakeholders from a resource orchestration perspective.

<< Insert Table 2 about here >>

The search for appropriate theoretical foundations for explaining the emerging integrated approaches to green supply chain management and their performance implications lead us to the following conclusions. The emerging practices are consistent with the classic organization theory that considers each firm as being interdependent of other parties, e.g., suppliers, customers, and stakeholders, that are external to the firm (Thompson, 1967); therefore, the need to integrate arises to facilitate communication and cooperation among partner firms (Ettlie & Reza, 1992). Such schools of thought

are extended to the context of green supply chain management, where firms streamline intra-organizational processes, while coordinating with external parties to facilitate inter-organizational trade and business activities. Specifically, integration of supply chain activities are understood as inter- and intra-organizational processes (Flynn et al. 2010; Koufteros et al., 2005).

Broadly speaking, the emerging practices can be explained by the supply chain integration literature and stakeholder theory, which emphasize a focus on orchestrating resources (Sirmon et al., 2011) from diverse parties for achieving better environmental performance due to their legitimate interest in their collaboration for environmental management (Donaldson & Preston, 1995). The supply chain integration literature is generally grounded in the theory of collaborative advantage (Dyer & Singh, 1998) or integrative advantage (Schoenherr & Swink, 2012; Wong et al., 2011). According to this theory, benefits from collaboration and integration are achieved by developing better relationships across different functions, suppliers, customers, and stakeholders. For example, the sustainable supply chain integration concept (Wolf, 2011) and the work of Vachon and Klassen (2008) support the need for integrative and collaborative approaches.

Stakeholder theory is also considered one of the most important conceptual frameworks in the field of environmental management (Buysse & Verbeke, 2003). The analysis of environmental goals in a systematic coordination by firms through the relations that they maintain with their stakeholders, including internal functions, suppliers, customers, and other stakeholders (e.g., public groups and organizations), has brought the focus on developing and evaluating the approval of strategic decisions in green supply chains. Stakeholder theory underscores the importance of norms in

environmental management for the involved parties to gain legitimacy (Donaldson & Preston, 1995). Firms must develop relationships, encourage their stakeholders, and create systems that all parties strive to give their best to environmental management (Sharma & Vredenburg, 1998). Based on stakeholder theory, firms integrate their environmental management efforts with relevant stakeholders to coordinate with stakeholders and allow them to contribute to environmental protection; these efforts become effective when there are integrated systems to facilitate environmental management across involved parties (Donaldson & Preston, 1995; Sharma & Vredenburg, 1988).

Resource orchestration theory is considered as the potential extension of resource-based theory (RBT) by explicitly addressing the actions to effectively structure, bundle, and leverage firm resources, leading to an appropriate resource accumulation (Sirmon et al., 2011). The bundling of resources builds competencies and leverages those competencies into the market, which needs to be synchronized with an appropriate strategy across the scope of the firm in the supply chain (Koufteros, 2014). The ability to bundle and leverage resources across internal functions, suppliers, customers, and other stakeholders, such as communities, research institutions, governments, and NGOs through integration is arguably an effective means to enable resource orchestration.

Guided by the above theoretical lenses, the analysis of the literature further identifies emerging practices that largely concentrate on the integration of environmental goals, criteria, and methods into the different functions, management systems, strategies, suppliers, customers, and wider stakeholders. Acknowledging that the cross-firm coordination and exchange arrangements with suppliers, customers, and other stakeholders (e.g., government bodies and NGOs) are largely different (Frohlich &

Westbrook 2001; Wong et al. 2011), intra-organizational processes between a firm and these external parties in a supply chain should, therefore, be considered separate practices. The introduction of the concept of ‘stakeholder integration’ (Sharma & Vredenburg, 1988; Wolf, 2011) further extends the scope of integration by enlisting the communities, governments, NGOs, and so on into the integration efforts. In this paper, these practices are called ‘green supply chain integration’ (GSCI). They are largely consistent with such environmental management systems as ISO 14000 and the UNEP framework, suggesting the importance of involving internal as well as external parties in managing the environmental impact of supply chains. The involvement of internal functions, suppliers, customers, and other stakeholders can range from providing assistance, developing policies, monitoring, and identifying areas for environmental and efficiency improvement. Since there are differences across integration within internal functions, and across suppliers, customers, and external stakeholders, we posit four emerging practices in Table 3 (details are provided in online appendix).

<< Insert Table 3 about here >>

GSCI practice 1: Internal green supply chain integration. This set of practices is similar to concepts, such as environmental management strategy (Klassen, 1997; Takahashi & Nakamura 2005), integrated environmental management (Margerum & Born, 2000), internal environmental management (Zhu & Sarkis, 2004), integrated management systems (Bernardo et al., 2010; Lee & Klassen, 2008), and intra-organizational environmental practices (Shi et al., 2012; Yu et al., 2011), but it has an emphasis on resource orchestration. Internal GSCI is defined as the strategic

collaboration and integration across internal resources, such as top management, management systems, quality control and functions via an integrated management system for managing the environmental impacts of the supply chain. Based on the resource orchestration theory, internal GSCI enables firms to effectively consolidate and leverage internal resources to perform, track, and monitor environmental management efforts across functions. As summarized in Table 3, this can be achieved through integration of environmental goals into business strategies, and management systems, and implementing cross-functional collaboration for leveraging environmental protection idea and expertise. This practice is somewhat different from the commonly used concept called ‘internal green supply chain management’ (Zhu & Sarkis, 2004; Zhu et al., 2008a), which focuses on what a company does to reduce the environmental impact of its internal operations (Griffith & Bhutto, 2009; Hofer et al., 2012). The conceptualization of GSCI practice 1 emphasizes the integration of key resources e.g., organizational strategy, system, and functions, which form a basis to manage and implement environmental management practices in supply chains.

GSCI practice 2: Supplier green supply chain integration. This set of practices is similar to concepts, such as ‘environmental collaboration with suppliers’ (Vachon & Klassen, 2008), ‘green purchasing’ (Zhu et al., 2008a, 2012c), ‘sustainable supply management’ (Giupniero et al., 2012), and ‘inter-organizational environmental practices’ (Bose & Pal, 2012; Shi et al., 2012), but it is guided by resource orchestration across the supply bases. Supplier GSCI is defined as the strategic collaboration and integration with suppliers in a supply chain to manage the environmental impact of supply chain activities through orchestration resources and competencies across the supply bases. GSCI practice 2 is different from the previous conceptualization of



supplier integration because it involves efforts beyond collaboration with suppliers and assisting suppliers (Vachon & Klassen, 2008); it includes two-way exchange of environmental management knowledge (resources) in an integrative manner, collaboration with suppliers, providing assistance (a form of resources) to suppliers, integrating resources, e.g., design, sourcing, production, return, and environmental management processes with suppliers (see Table 3). This notion of supplier GSCI is in line with the tenet of resource orchestration theory. Supplier GSCI enables firms to join forces with and acquire the competencies of suppliers in the implementation of environmental management practices that firms were not able to conduct without collaborative efforts with suppliers (Rao, 2002).

GSCI practice 3: Customer green supply chain integration. This set of practices is similar to ‘downstream green supply chain practices’ (Vachon & Klassen, 2006) and the need to cooperate with customers for cleaner production and packaging (Zhu et al., 2008a), but it stresses resource orchestration across customer bases. Customer GSCI is defined as the strategic collaboration and integration with customers in a supply chain to manage the operational and environmental impact of supply chain activities through orchestration of resources across customer bases. While ‘downstream green supply chain practices’ (Vachon & Klassen, 2008) focus on a mixture of monitoring, assistance and collaboration, our analysis based on the orchestration theory suggests that the conceptualization can be widened by integrating environmental management systems (a form of resources) with customers using integrative information systems and processes (see Table 3). It allows companies to inform customers about ways to reduce their impact on the natural environment (Darnall et al., 2008) and provide visibility of the sustainability of customers’ upstream supply chains (Wong, 2013). Sharing of voluntary

information about environmental management (a form of resources) with customers can improve the efforts in greening supply chains (Gonzalez-Benito, 2008). For most companies, it is beneficial to establish an integrated end-of-life management process with the customers (Michelsen et al., 2010). Such an integrative approach also allows customer concerns on corporate social responsibility (CSR) to be integrated into efforts in managing suppliers (Angell & Klassen, 1999) and incorporating environmental criteria into new product development (Hu & Hsu, 2010).

GSCI practice 4: Community green supply chain integration. This set of practices is developed from the studies of community stakeholder pressures (Hill, 2001; Kassinis & Vafeas, 2006) and stakeholder pressures in general (Gonzalez-Benito et al., 2011; Ruiz-Tagle, 2008; Wu and Pagell; 2011; Zhu et al., 2011). Manufacturing must expand its traditional external focus on such business partners as customers and suppliers to include third-party stakeholders, e.g., government, NGO and community (Klassen, 1993; Lai & Fryxell, 2004; Murphy et al., 1994). Community GSCI is defined as the strategic collaboration and coordination with community stakeholders in a supply chain to manage the operational and environmental impact of supply chain activities through orchestration of resources across community stakeholders. It includes various means to collect feedback from and engage, inform, and collaborate with various community stakeholders (see Table 3). Feedback from the community stakeholders represents key resources because the communities and their interest groups sometimes know more about the environmental problems facing part of the supply chains than the focal firm. Though the concept is similar to the ‘stakeholder integration’ in the earlier literature, which mainly focuses on monitoring stakeholders (Sharma & Vredenburg, 1998), we argue that it is more realistic to first coordinate environmental management efforts with

the most affected communities than creating an integrated management system with a diverse society, communities, governmental agencies, and NGOs (Wagner, 2009).

The conceptualizations of the four GSCI are verified based on the properties of a 'good,' formal, conceptual definition, with a focus on precision and avoiding the use of measurable attributes for facilitating further measurement development (Wacker, 2004). Grounded in stakeholder and resource orchestration theories, these new GSCI concepts can, potentially, become new constructs that can have a broader appeal (Choi & Wacker, 2011). GSCI is about identifying the right stakeholders (internal functions, suppliers, customers, and wider community stakeholders) and orchestrating their resources and competencies to develop innovative solutions to environmental protection while maintaining competitiveness. For internal GSCI, the focus is to integrate environmental criteria into business strategy and management systems to enable cross-functional collaboration, which reflects a new way of orchestrating internal resources. For supplier and customer GSCI, the focus is to collaborate, exchange information, and integrate processes (as a form of inter-organizational resources) related to environmental management and systems. Different from customer GSCI, assisting suppliers (by providing appropriate resources) should also be part of the supplier GSCI, as it can help suppliers understand their environmental responsibilities. Communication or exchange of information, and building relationships with community stakeholders, has been recognized as important for community stakeholder integration (Lai et al., 2008; Sharma & Vredenburg, 1998) even though the literature is confined only to acknowledge the pertinence of monitoring stakeholders as well as standardization of responses to stakeholder concerns.

<< Insert Figure 2 about here >>

Figure 2 illustrates the theoretical framework relating to the theoretical foundations (stakeholder and resource orchestration theories) that drive the development of the four GSCI practices and, subsequently, their impact on possibly financial, operational, and environmental performance. Integration is the key enabler for GSCI to coordinate with diverse stakeholder groups and orchestrate their resources and competencies to achieve ‘collaborative advantage’ as a result of relational rents owing to close relationships and information sharing among functions, suppliers, customers, and stakeholders (Dyer & Singh, 1998), and this advantage is the backbone of most of the sustainable, environmental, and green supply chain management practices (Vachon & Klassen, 2006, 2008; Zhu et al., 2005). In addition, the integration of intra- and inter-organizational processes and information systems for supporting the efforts to monitor, communicate, assist, and collaborate, as well as the various environmental management processes that cut across firms in a supply chain, are required to systematically address environmental issues across the supply chain. To achieve these benefits, there is a need to include environmental criteria into the current management and information systems as well as standardize and redesign the current management and information systems to support the coordination of environmental management activities among functions and across firms. Additionally, it is crucial to orchestrate resources and innovation with different stakeholders and gain input from other stakeholders.

As argued by the stakeholder and resource orchestration theories, GSCI practices require efforts to build trust and commitment (Vachon & Klassen, 2008) among internal functions, suppliers, customers, and stakeholders, which then allows the supply chain to

orchestrate appropriate resources to reduce costs and environmental damage (Vachon & Klassen, 2006). Many of the green supply chain activities, such as consolidation of transport, utilizes less hazardous materials, reduces energy consumption, but requires resource orchestration and cooperation across the supply chain. The orchestration of resources across diverse stakeholder groups is expected to contribute to cost savings and improvements in environmental performance, in addition to reputation. Both cost savings and a better reputation, then, form the basis for achieving better financial performance. Conversely, firms that have poor relationships or integration with suppliers, customers, and stakeholders will achieve little.

In addition, collaboration and resources orchestration can be more effective when process integration and information systems are in place to facilitate exchange of information (knowledge) and tracking of environmental performance. For example, the ability of Xerox to build a fully closed-loop supply chain depends on integrating reverse logistics processes, remanufacturing activities and recycling activities among Xerox, parts factories, and raw materials suppliers (Grant et al., 2013). Motorola used a Parts Information Management System to track supply and production of parts and the use of chemicals such that the designers across the supply chain could work together to reduce toxic substances (Hoffman, 1997). All of these examples concern how resources from internal functions, suppliers, customers, and wider stakeholders can be structured then bundled together and leveraged to enhance environmental performance. These integrative approaches have been proven effective in improving operations and finance performance and are, nowadays, being extended to improve environmental performance. Furthermore, the integration of stakeholders into GSCM efforts often leads to exchanging best-practices and prevents negative effects owing to misunderstanding. We,

thus, posit the following:

Proposition: Internal, supplier, customer, and community green supply chain integration in organizations enables acquiring, bundling, and leveraging resources and capabilities internally and externally, increasing the success of environmental management.

Our theoretical foundations and proposition advance the green supply chain management theory in a number of ways. By incorporating stakeholder and resource orchestration theories into practices described by a large number of studies that lack theory, the paper adds a new theoretical perspective in a theory-building process (Ketchen & Hult, 2011). First, instead of distinguishing supply chain integration from green supply chain management (e.g., Vachon & Klassen, 2006), the four GSCI practices include the gist of these two concepts by extending beyond managing supply chain activities in an environmentally responsible manner. It is argued that the integration with suppliers to achieve cost efficiency is very different from, and easier to achieve than, the integration with suppliers to achieve better environmental performance. Typically, supply chain integration focuses on improving efficiency and financial performance (Wolf, 2011); however, GSCI extends these aims by incorporating environmental management into the supply chain integration effort. Second, this paper provides theoretical foundations that explain what actually goes on when firms attempt to integrate environmental management best practices into their supply chains: it concerns integrating relevant stakeholders so that diverse resources can be orchestrated for achieving the coordination and collaboration required to implement supply-chain-

wide environmental management practices. The integration of supply chain for environmental management requires resource orchestration because environmental protection is about natural resource management. Third, GSCI practices are different from typical green supply chain practices due to the inclusion of wider stakeholders and the resource orchestration perspective. Previous studies found that firms could not always realize finance, operation, and environmental performance improvement by implementing green supply chain practices (e.g., Zhu et al., 2005). This is probably because the conceptualizations of green supply chain practices have not taken into account all relevant stakeholders and the ability to identify, structure, bundle, and leverage (hidden) resources in a complex supply chain. Finally, this new GSCI concept represents a new approach to green supply chain management that could form the basis for firms to achieve better finance performance as well as operations and environmental performance. In order for many firms to adopt any green supply chain practice, it is important to justify that it is possible to be green and efficient at the same time.

### **Future Research Agenda**

The framework developed in this paper introduces two alternate theories to the green supply chain management literature: stakeholder and resource orchestration theories. The framework allow future research to understand the main purposes and effectiveness of the various collaborative and integrative efforts from a different perspective: that is, to identify the appropriate stakeholders then enable integration for acquiring, bundling, and leveraging their resources instead of purely monitoring and collaborating without a focus on resources across the supply chain. Thus, further research can extend the theoretical framework by identifying the activities involved in each of GSCI practice

and empirically test their roles in resource orchestration for firms to improve environmental performance.

Further research can extend environmental management research in a supply chain context by examining the inter-relationships among internal, supplier, customer, and stakeholder GSCI, capabilities for acquiring, bundling, and leveraging resources, and their performance implications as stipulated in the proposition. The proposition developed by this paper can then be tested and further expanded by further detailing practices for acquiring, bundling, and leveraging resources (following Sirmon et al., 2011). Drawing on stakeholder and resource orchestration theories, future studies may empirically validate the relationships between GSCI and performance outcomes in terms of environmental, financial, and operational performance. The performance implications of such novel practices can be compared with known practices, such as monitoring, assistance, and collaboration (Vachon & Klassen, 2006, 2008).

Moreover, while GSCI extends beyond a focal firm's operations, supply chain partners play a significant role in facilitating its success. Future studies may examine how the performance of environmental management practices of supply chain partners affect the performance of the focal firm. This can provide insights into how a focal firm may identify supply chain partners to achieve desirable performance. Based on the buyer-supplier relationship literature, future research may consider investigating how supply chain relational aspects, e.g., supplier commitment and customer satisfaction, may affect the success of the various dimensions of GSCI.

To gain further understanding of the business and environmental values of GSCI, future research may investigate the contingency factors, such as business environmental conditions, collaborative conditions with supply chain partners, and environmental



regulations, which may affect the performance outcomes of GSCI. This will provide insights into the contextual conditions that are beneficial to implement GSCI to achieve desirable performance. This will also advance knowledge to help managers to tailor their GSCI to their organizational and supply chain context.

## **Conclusion**

The main problem facing the green supply chain literature is that there are plenty of studies that acknowledge the importance of supply chain integration, but there is a lack of theory to explain why and how integration leads to better performance, and who and what are supposed to be integrated. To address the problem, this paper reviews the literature on environmental and supply chain management and integration, with a focus on identifying the key theories and dimensions of GSCI contributing to advancing theory for explaining environmental management in supply chains. Through a systematic review of the extant literature and development of a theoretical framework grounded in stakeholder and resource orchestration theories, this paper reveals that green supply chain literature is diverse but lacks a holistic understanding on how different functions, supply chain partners, and stakeholders may integrate environmental management efforts in supply chains by identifying the relevant stakeholders and key resources to be orchestrated. As a result, we identify four emerging practices, namely internal, supplier, customer, and community stakeholder integration. The identified dimensions for the four emerging GSCI practices provide a foundation for future development of green supply chain management theory. This new concept, developed by integrating stakeholder and resource orchestration theories, represents a move towards advancing conceptual theory development in the field (Carter, 2011).

While prior studies examine environmental management practices without integrating such critical supply chain factors as coordination of diverse resources across stakeholders and information sharing across firms, we provide insights into the various practices under each practice. Particularly, we highlight exchange of environmental information, collaboration, assistance provision, and integration of processes with suppliers constitute to supplier GSCI. By integrating such collaborative and integrative practices that take into account key stakeholders and resources for orchestration, this paper provides a comprehensive and unified framework of GSCI, setting theoretical grounds for future research and practice in GSCI. We acknowledge that every literature review is limited by the search terms it uses, and in this paper, ‘environmental marketing’ has been left out; therefore, some aspects of customer integration could be further developed. We suggest that future empirical investigations are needed to confirm and extend the understanding of what GSCI can achieve on different dimensions of performance. We believe that the present study takes a step toward theory-building and offers insightful dimensions for future research of a novel concept called GSCI.

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Table 1: Search keywords and results

Keywords	Equivalent keywords and search strings	Number of articles	
		Searched title	Searched abstract
Environment	Environment; environmental; pollution; eco; green; stewardship; sustainable, sustainability	2191	19914
Integration	Integration; Integrated; integral; collaborate; collaborative; collaboration; coordinate; coordination	1364	14963
Supply chain	Supply chain; purchasing; procurement; production; operations manufacturing; logistics	3001	16750
Environment AND integration	(Environment; environmental; pollution; eco; green; stewardship; sustainable, sustainability) AND (Integration; Integrated; integral)	101 (61)	3567
Environment AND Supply chain	(Environment; environmental; pollution; eco; green; stewardship; sustainable, sustainability) AND (Supply chain; purchasing; procurement; production; operations manufacturing; logistics)	199 (145)	2402
Environment AND integration AND Supply chain	(Environment; environmental; pollution; eco; green; stewardship; sustainable, sustainability) AND (Integration; Integrated; integral) AND (Supply chain; purchasing; procurement; production; operations manufacturing; logistics)	12 (7)	1027

Note: Numbers in ( ) indicate numbers of articles after excluding duplication and editorial articles.

Table 2: Definitions of related concepts

<ol style="list-style-type: none"> <li>1. An open-systems model is required to “integrate environmental issues into manufacturing” was highlighted by Klassen (1993).</li> <li>2. “Environmental technologies” is defined as production equipment, methods and procedures, product design, and product delivery mechanisms that conserve energy and natural resources, minimize environmental load of human activities, and protect the natural environment (Shrivastava, 1995, p. 185).</li> <li>3. “Environmental management” encompasses all efforts to minimize the negative environmental impact of the firm’s products throughout their life cycle (Klassen &amp; Whybark, 1996).</li> <li>4. “Environmental management strategy” is defined as the set of objectives, plans, and management systems that determine the manufacturer’s position and responsiveness to environmental issues and regulation along a spectrum from proactive to reactive (Klassen, 1997, p. 248); a similar definition is used for “environmental management orientation” (Klassen &amp; Whybark, 1999) and “environmental management posture” (Klassen &amp; Angell, 1998).</li> <li>5. “Environmental management posture” is defined as the degree to which managers address environmental issues along a proactive to reactive continuum (Klassen &amp; Angell, 1998, p. 178).</li> </ol>
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6. Recognizing the need to achieve a “proactive environmentally-friendly supply chain”, Walton et al. (1998) measured “environmental management” in terms of materials used in product design for the environment, product design processes, supplier process improvement, supplier evaluation, and inbound logistics processes. [I, S]
7. Customer concerns about social responsibility must be integrated with other dimensions of value when managing suppliers (Angell & Klassen, 1999). [C, S] [SCI]
8. Klassen (2001) identified three elements of “proactive environmental management orientation:” systems analysis and planning, organizational responsibility, and management controls; some of the measurement items involve elements of integration. [I, S] [SCI]
9. “Environmental management” is operationalized along two dimensions: level of environmental ambition, defined as scope of environmental efforts and level of regulatory-driven motivation (Klassen & Angell, 1998). [SH]
10. “Green supply” refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment (Green et al., 1996, p. 188). [S]
11. “Environmental supply chain management” consists of the purchasing function’s involvement in activities that include reduction, recycling, reuse, and the substitution of materials (Narasimhan & Carter, 1998, p. 6) [I, S, C]
12. “Integrated environmental management” strives to address more complex problems through a more holistic, inter-connective, and effective approach; integration is both a process and an approach to attaining the environmental goals defined by the participants (Margerum & Born, 2000). [I, S, C] [SCI] [ST]
13. “Supply chain environmental management” involves not only screening suppliers for their environmental performance and do business with those that meet the regulatory standards, but it also involves working collaboratively with suppliers on green product design, holding awareness seminars, helping suppliers to establish their own environmental programme, and so on (Rao, 2002). [S] [SCI] [ROT]
14. “Green supply chain management” consists of internal environmental management, external green supply chain management practices, investment recovery and eco-design (Zhu and Sarkis, 2004). Further empirical verification of the above measurement scales suggest that green supply chain management consists of internal environmental management, green purchasing, cooperation with customers including environmental requirements, eco-design, and inventory recovery (Zhu et al., 2008). [I, S, C]
15. “Integration of ethical behavior in purchasing decisions”, is a concept introduced by Carter and Carter (1998), which can be achieved by (1) perceived pressure from stakeholders via multiple communication channels, (2) internal ethical culture via methods of reporting, approval, and extent of punishment, and (3) multiple training sessions. [I, S] [ST]
16. “Sustainable supply chain” is defined by Carter and Rogers (2008, p. 368) as the strategic, transparent integration and achievement of an organisation's social, environmental, and economic goals in the systematic coordination of key inter organizational business processes for improving the long-term economic performance of the individual company and its supply chains. [S, C] [SCI]
17. "Environmental collaboration" is the direct involvement of an organization with its suppliers and customers in planning jointly for environmental management and environmental solutions.

Environmental collaboration includes the exchange of technical information and requires a mutual willingness to learn about each other's operations in order to plan and set goals for environmental improvement. It also implies cooperation to reduce the environmental impact associated with material flows in the supply chain. Environmental collaboration comprises a good understanding of each other's responsibilities and capabilities in regard to environmental management (Vachon and Klassen, 2008, p. 301). [S, C] [SCI] [ST]

18. "Environmental monitoring" involves activities of gathering and processing supplier information through publicly disclosed environment records, company-specific questionnaires, and audits conducted by either the buyer or an independent third party (Vachon and Klassen, 2006). [S, C, SH]
19. Different management systems, such as QMS, EMS, audit systems, and other functional management systems can be integrated to form a single "integrated management system (IMS)" (Bernardo et al., 2010). [I]
20. "Green supply chain management" is about integrating environmental concerns into the inter-organizational practices of SCM including reverse logistics (Sarkis et al., 2011). [S, C] [SCI]
21. "Sustainable supply chain management integration" is a concept proposed by Wolf (2011); it means the integration of sustainability into supply chain management. Based on this concept, Wolf (2011) proposes a framework suggesting downstream sustainable supply chain management integration capability as the enabler for organizational integration and strategy integration, and subsequently, such integration leads to environmental performance. External stakeholder, internal integration, and external supplier integration are considered factors which enable or impede the integration of sustainability into supply chain management. [I, S, SH] [ST]
22. "Green supply chain management characteristics" are categorized in terms of two broad NRBV constructs: intra-organizational environmental practices (intra-OEPs), which involve the causally ambiguous resources, and inter-organizational environmental practices (inter-OEPs), representing the socially complex resources (Shi et al., 2012). [I, S, C] [ROT]

Types of integration: I = internal functions, S = supplier, C = customers, SH = stakeholders.

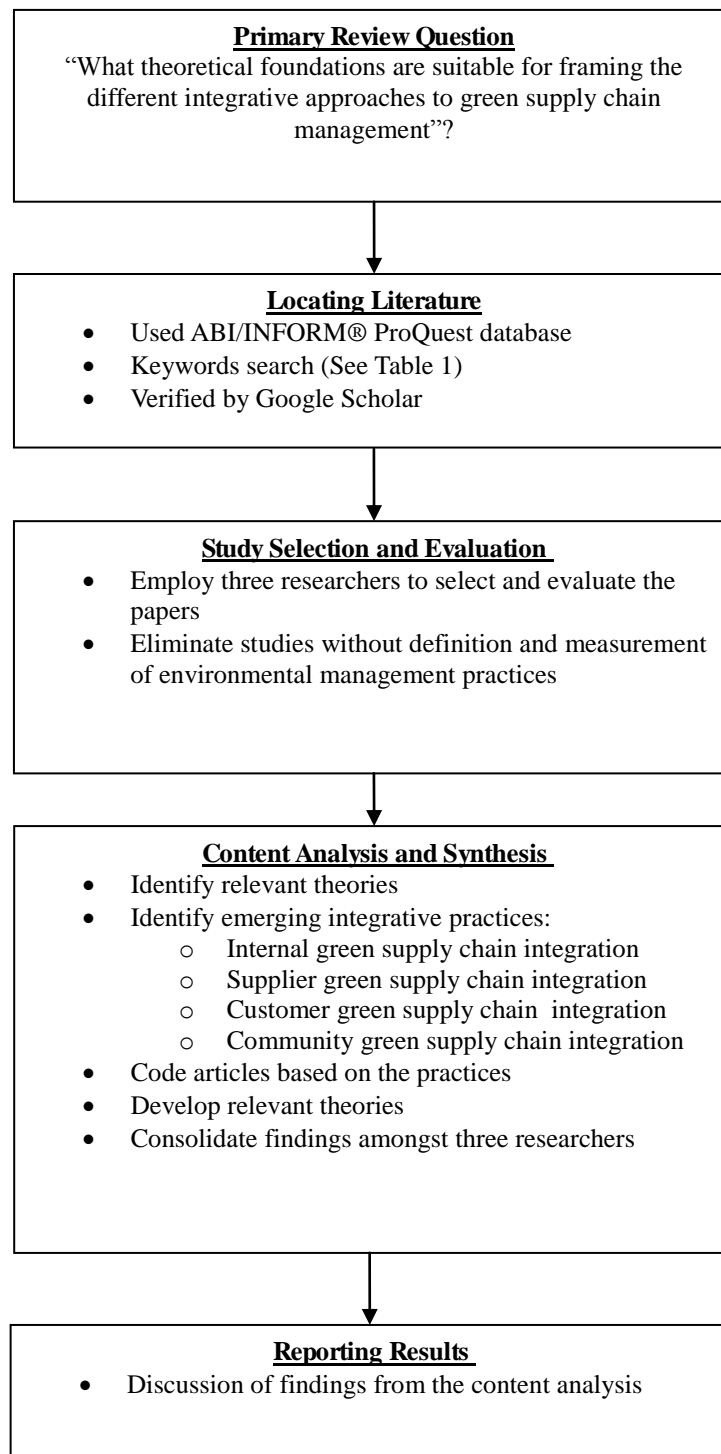
Theoretical perspective: SCI = supply chain integration, ST = stakeholder theory, ROT = resource orchestration theory

Table 3: Four emerging GSCI practices

<b>GSCI Practices</b>	<b>Definitions and measures</b>	<b>Main literature</b>
<b>GSCI practice 1: Internal green supply chain integration</b> (Schiefer, 2002; Magrini & Lins, 2007; Nawrocka, 2008; Zhu et al., 2008a, b, c; D'Amato & Roome, 2009; Asif et al., 2011; Montabon et al., 2011; Gond et al., 2012; Lai and Wong, 2012; Tari et al., 2012; Liu et al., 2012)		
Integration of environmental goal into business strategy	Integration of environmental goals and responsibilities into business strategies and top management reward, and attempts to balance commercial, societal, and environmental goals for achieving sustainable growth.	Ammenberg et al., 2001; Russo & Harrison, 2005; Koroljova et al., 2007; Montabon et al., 2007; Berrone & Gomez-Mejia, 2009; Carmody & Zeppel 2009; Pagell & Wu, 2009; Wagner, 2009; J D'amato & Roome, 2009; Jabbour, 2010; Carter & Easton, 2011; Gond et al., 2012; Hofer et al., 2012
Integration of environmental goal into management systems	A single integrated management system that incorporates environmental goals, performance, and responsibilities into code of conducts, functional commercial decisions, and human resource decisions among different functions	Klassen, 1997; Deans, 1999; Hooper et al., 1999; Margerum & Born, 2000; Schiefer, 2002; Forman & Jørgensen, 2004; Montabon et al., 2007; Magrini & Lins, 2007; Nawrocka, 2008; Hu & Hsu, 2010; Tari & Molina-Azorin, 2010; Jabbour, 2010; Teng, 2011; Wagner 2011; Yu et al., 2011; Shi et al., 2012; Gond et al., 2012
Cross-functional collaboration for environmental management	Cross-functional communication, coordination and collaboration to reduce environmental impacts and to achieve environmental goal collectively	Klassen, 1997; Hooper et al., 1999; Carter & Dresner, 2001; Zhu & Sarkis, 2004; Russo & Harrison, 2005; Margerum & Born, 2008; Montabon et al., 2011; Zhu et al., 2012
<b>GSCI practice 2: Supplier green supply chain integration</b> (Rao, 2002; Vachon & Klassen, 2006 & 2008; Narasimhan & Schoenherr, 2012)		
Exchange of environmental information with suppliers	Exchange of information about goals, responsibilities, strategies, benefits, best-practices, performance standards related to environmental issues with suppliers using an integrated environmental information system	Klassen, 2001; Rao, 2002; Hervani et al., 2005; Vachon & Klassen, 2006; Seuring & Muller, 2008a; Hu & Hsu., 2010; Arimura et al., 2011; Fiona & Rowlinson, 2011; Zhu et al., 2012; Lai et al., 2012; Green et al., 2012; Kim & Rhee, 2012; Shi et al., 2012; Zailani et al., 2012; Bose et al., 2012; Wittstruck & Teuteberg, 2012
Collaboration with suppliers for environmental improvement	Work closely with suppliers to achieve collective environmental goals by creating mutual understanding and collaborative environment and joint planning and management of environmental initiatives	Rao, 2002; Handfield et al., 2005; Hervani et al., 2005; Kleindorfer et al., 2005; Vachon & Klassen, 2006; Montabon et al., 2007; Zuo et al., 2009; Sharfman et al., 2009; Hu & Hsu, 2010; Yang et al., 2010; Arimura et. al, 2011; Seuring, 2011; Zhu et al., 2012; Lai & Wong, 2012; Tate et al., 2012; Kim & Rhee, 2012; Hojmosse et al., 2012; Beske 2012; Yen & Yen, 2012; Zailani et al., 2012; Oruezabala & Rico, 2012
Provide assistance to suppliers for environmental improvement	Provide technical assistance, resources, support and guidance for process and environmental improvement and even financial support for achieving environmental performance	Rao, 2002; Hu & Hsu, 2010; Kim & Rhee, 2012; Wong et al., 2012; Gopalakrishnan et al., 2012
Integrate process with suppliers for environmental	Coordinate, standardize, and integrate closed-loop forward and reverse supply chain processes and related planning, performance measurement,	Bowen et al., 2001; Kleindorfer et al., 2005; Montabon et al., 2007; Zuo et al., 2009; Bai et al., 2010; Hu & Hsu, 2010; Kim & Rhee, 2012; Yen & Yen, 2012

improvement	and environmental management processes with suppliers	
<b><u>GSCI practice 3: Customer green supply chain integration</u></b> (Rao, 2002; Vachon & Klassen, 2006 & 2008; Zhu et al., 2008)		
Exchange of environmental information with customers	Exchange of information about goals, responsibilities, strategies, benefits, best-practices, and performance standards related to environmental issues with customers using an integrated environmental information system	Vachon & Klassen, 2006; Darnall et al., 2008; Gonzalez-Benito & Gonzalez-Benito, 2008; Zhu et al., 2008b; Hazen et al., 2011
Collaboration with customers for environmental improvement	Work closely with customers to achieve collective environmental goals by creating mutual understanding, collaborative environment, and joint planning and management of environmental initiatives	Deans, 1999; Vachon & Klassen, 2006 & 2008; Zhu et al., 2008a; Zhu et al., 2012; Lee et al. 2012; Beske 2012
Integrate process with customers for environmental improvement	Coordinate, standardize, and integrate closed-loop forward and reverse supply chain processes and related planning, performance measurement, and environmental management processes with customers	Murphy et al., 1994; Angell & Klassen, 1999; Vachon & Klassen, 2006; Hu & Hsu, 2010; Michelsen & Fet, 2010; Chan et al. 2012
<b><u>GSCI practice 4: Community green supply chain integration</u></b> (Hart, 1995; Sharma & Vredenburg, 1998; D'Amato & Roome, 2008; Carter & Rogers 2008)		
Coordinate with community stakeholder in environmental initiatives	Coordinating environmental initiatives with community stakeholders via communication, engagement, voluntary agreement, relationship building, community initiatives, monitoring, and standardization of responses.	Klassen, 1993; Amadou, 1999; Angell & Klassen, 1999; Madsen & Ulhoi, 2001; Margerum & Born, 2000; Christmann, 2004; Oskarsson & Fredrik, 2005; King, 2007; Montabon et al., 2007; Margerum, 2008; D'Amato & Roome, 2008; Carter & Rogers 2008; Wagner, 2007; Wagner, 2009; Seuring, 2011; Ho & Choi., 2012

**Figure 1. Systematic Literature Review Procedures**



**Figure 2.** Theoretical framework

