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Ana Beatriz Lopes de Sousa Jabbour, PhD

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Understanding the genesis of Green Supply Chain Management: lessons from leading Brazilian companies

Ana Beatriz Lopes de Sousa Jabbour, PhD
UNESP – The Sao Paulo State University, Bauru, Brazil
Av. Eng. E. Carrijo Coube, 14-01, Vargem Limpa, Brazil, CEP 17033360
E-mail: ablsjabbour@gmail.com

Abstract
This work discusses the internal structuring processes of leading companies when adopting green supply chain management (GSCM) practices. A multiple case study approach was adopted as the research methodology, with four large Brazilian companies that are leaders in their market segments. The introduction of green products is a key step towards initiating concern for the environment among suppliers and customers. This study’s results show the importance of having green teams, a dedicated functional area, and/or green jobs that support the discussion of environmental management among a business and beyond. The practical results of this study offer new insights into the behavior of companies that are adopting GSCM practices, thereby generating new evidence for the extension of GSCM theory.

Keywords: Brazil, cleaner production in Latin America, green supply chain management, green products, green teams, environmental management, case studies.

1. Introduction and Conceptual Background

The subject of green supply chain management (GSCM) has been increasingly discussed in recent years (Zhu et al., 2013) and, according to Sarkis (2012), increasingly recognized and incorporated by industry.

Generally, the focuses of these debates have been to identify the motivations, pressures, and barriers to the adoption of GSCM practices (e.g., Govindan et al., 2014; Mathiyazhagan et al., 2014; Mathiyazhagan et al., 2013; Hsu et al., 2013a; Diabat and Govindan, 2011); to identify or propose criteria when selecting suppliers in order to build supply chains with an environmental perspective (e.g., Kannan et al., 2014; Hsu et al., 2013b; Kannan et al., 2013); to investigate the effects of adopting GSCM practices on organizational performance (e.g., Lee et al., 2013; Laosirihongthong et al., 2013; Lee et al., 2012; Green Jr et al., 2012; Zhu et al., 2012); to determine the importance of collaboration with suppliers to
structure GSCM (e.g., Caniels et al., 2013; Large and Thomsen, 2011; Bai and Sarkis, 2010); and to explore the role of internal environmental management as a prerequisite for supporting the discussion of GSCM within organizations (Jabbour et al., 2014; De Sousa Jabbour et al., 2013a; Arimura et al., 2011; Nawrocka et al., 2009; Darnall et al., 2008).

An important issue in understanding GSCM is how companies internalize this process (i.e., how the process is initiated) because, in general, empirical studies have pointed out that organizations adopt more intensity in internal GSCM practices than in external practices (De Sousa Jabbour et al., 2013b; Zhu et al., 2007; Zhu and Sarkis, 2004). Several studies highlight governance mechanisms that support GSCM as the collaboration and monitoring/evaluation of suppliers (Di Giovanni and Vinzi, 2014; Gimenez and Tachizawa, 2012; Vachon and Klassen, 2006). However, as internal practices are the precursors of GSCM (Green Jr. et al., 2012), it is important to understand the intra-organizational mechanisms for GSCM. In a literature review, Gimenez and Tachizawa (2012) identified internal mechanisms that enable sustainability practices in a focal company, such as the firm’s environmental commitment, senior management support, and the availability of resources. However, these authors did not delve into a practical discussion of these mechanisms. In addition, they have highlighted that only three of the surveyed articles had focused primarily on studying enablers; thus, there is still an opportunity to deepen this theme.

*How does the process of structuring begin in a company that is adopting these practices?* The objective of this research is to discuss the trajectory of GSCM practices in four major Brazilian companies that are leaders in their market segments through a multiple case study. As a practical contribution, this study is expected to discover some landmarks in the trajectory of GSCM practices that underpin the internal structuring of other companies seeking to enter sustainable supply chains or to make their supply chains environmentally sustainable.

A case study in operations management can be useful if the research meets the industry’s needs (Childe, 2011). According to Pagell and Shevchenko (2014), studying sustainability is akin to studying a process of organizational transformation. Therefore, case studies are useful because they help to explain how a process has occurred. Additionally, Sheu and Talley (2011) indicate that practical studies about GSCM that address issues and solutions require further investigation. Companies from Brazil were chosen for this study because, according to Seuring and Gold (2013), there are few studies about environmental sustainability in developing countries. Furthermore, according to Jabbour and Jabbour (2014), Brazil is one of the most economically important countries of Latin America, a region that is
responsible for 7% of the world’s GDP. Moreover, according to the New National Policy on Solid Waste, in force since 2010, Brazil has an environment of institutional enabling for organizational actions linked to GSCM because responsibility for the correct management of post-consumer waste is on organizations (de Sousa Jabbour et al., 2014).

The theoretical assumptions underlying this research include the following: First, (a) GSCM refers to the integration of environmental concerns into inter-organizational practices within supply chain management, including environmental collaboration and environmental monitoring actions (Sarkis et al., 2011; Vachon and Klassen, 2006). Second, (b) according to Zhu, Sarkis, and Lai (2008), GSCM practices can be understood to be internal environmental management, green purchasing, cooperation with customers, eco-design, and investment recovery constructs. Third, (c) GSCM practices can be classified as internal and external, with internal practices including internal environmental management, eco-design, and investment recovery, and with external practices including green purchases and cooperation with customers (Zhu and Sarkis, 2004). Fourth, (d) internal practices are generally adopted more often than external practices, and among the practices, cooperation with customers is the least frequently used practice (De Sousa Jabbour et al., 2013b; Zhu et al., 2007; Zhu and Sarkis, 2004). Fifth, (e) according to Green Jr. et al. (2012), manufacturing companies first adopt internal environmental management practices and subsequently adopt green purchasing, cooperation with customers, eco-design, and investment recovery. Similarly, Zhu et al. (2012) state that, in order to improve environmental performance by adopting external GSCM practices, it is desirable for companies to implement internal GSCM practices. Additionally, Zhu et al. (2013) confirm that internal GSCM practices increase the level of external GSCM practices that are implemented. Lastly, (f) according to Gimenez and Tachizawa (2012), internal mechanisms cover factors within the focal firm that help to achieve sustainable practices. The internal enablers they identified are: the firm’s environmental commitment, senior or top management support, the availability of resources, the strategic role of the purchasing function, the development of the supply management capabilities of purchasing personnel, the role of the project leader, and appropriate performance measurement systems.

2. Research Procedures

This study was based on a multiple case study with four large companies from Brazil that are leaders in their markets. These companies were selected using the following criteria: (a) their economic importance in their respective industries and (b) their environmental reputation, based on either tradition or the recent launch of environmentally friendly products.
After the second semester of 2013, contacts were initiated with professionals in the sustainability, supply chain, or product development areas of these companies to facilitate the fieldwork. During the first half of 2014, it was possible to collect the data for this study in person at the selected companies.

An interview script that had open questions was used. The main questions were the following: “How would you describe the company’s trajectory in the search for environmental management and GSCM practices?” and “How would you describe the process of adopting GSCM practices in the company?” The interviews were personally conducted and recorded by the researcher, and a series of notes was made during the interviews.

For each case, it was possible to interview up to five people in different positions. The interview for company A corresponds to the position of highest authority in the company regarding sustainability; therefore, even though there was only a single respondent, he had knowledge of the information requested and understood the senior management’s perspective on GSCM. At Company B, the five respondents—which corresponded to those responsible for the areas of product development, environmental management, and supplier management—were gathered together in order to brainstorm about the interview’s issues. In Company C, the respondents answered their questions separately, and each answered questions relating to his area of operation. The interviews correspond to the interface positions between the environment and purchases, and the environment and product development. And, in Company D, 3 respondents—which correspond to those responsible for the areas of product development, environmental management, and sustainability—were gathered together in order to brainstorm about the interview’s issues. In addition to the interviews and the possible direct observations, secondary data were obtained to supplement the information from the respondents. Table 1 presents the data sources that were employed in this study.

Please insert Table 1

An analytical narrative of each case was elaborated from the systematization of the notes taken during the interviews, the repetition of the audio from the interviews, and the complementary secondary data. From the constructed narratives, an attempt was made to list several aspects in order to better understand the process of structuring the adoption of GSCM practices among the surveyed companies from the beginning. These aspects are: (a) the antecedents to the search for internal environmental management, (b) landmarks in the internal structure’s trajectory resulting from GSCM, (c) the sequential steps of implementing
GSCM practices, (d) the role of the supplier in the structuring process, and (e) the role of the customer in the structuring process. Table 2 organizes this information by company. This analysis aimed to identify the similarities and consensuses among the cases and to draw conclusions from the research.

The following section presents and analyzes the main results of the study.

3. Results and Discussion

Table 2 presents the main results of the study, as explained in Section 2 of this article. The data sources that provided the results in Table 2 have been highlighted between parentheses. Also, some specific phrases from the respondents are in quotation marks, in order to give veracity to the research results.

Please insert Table 2
In general, the companies examined here have environmental management systems (EMS) with ISO 14001 certification for environmental management (Companies A, B, and C). In addition to certification, Companies A, B, and C have other initiatives, such as the proposition of achieving environmental targets being linked to employees’ variable rewards (company A), eco-efficiency targets among production units (company B), and the existence of green product lines (companies A, B, and C). The single exception is Company D, which had no internal environmental record before the beginning of its trajectory in pursuit of GSCM. The preceding EMS/ISO 14001 standard used to implement GSCM has been discussed by Jabbour et al. (2014), De Sousa Jabbour et al. (2013a), Arimura et al. (2011), Nawrocka et al. (2009), and Darnall et al. (2008).

The landmarks in the internal structuring of GSCM practices varied within each company, depending on the maturity of its environmental management. However, there was cohesion (among companies A, B, C, and D) at certain points, such as (a) the introduction of a new product line with an environmental perspective; (b) an internal reorientation to create an area of the company with positions that are responsible for leading environmental improvements in the company, the products, and in some cases, the suppliers (Company C was already involved in this process by promoting training with suppliers, and Company D has a working group focused on its supplier relationships); and (c) actions with suppliers, such as drafting a code of conduct (Company A), adding environmental requirements to the contractual terms of purchase (Company B), the development of metrics for assessing the environmental performance of suppliers (Company C), and the development of green teams to discuss guidelines and the supplier relationship (Companies B, C, and D). The literature has a priori highlighted the importance of supplier collaboration in structuring GSCM (Caniels et al., 2013; Large and Thomsen, 2011; Bai and Sarkis, 2010); however, the other points are also important insights that have been gained from the case study.

In this study, the steps for implementing GSCM practices generally follow theoretical principles, in that internal practices are implemented first, followed by external practices (Zhu et al., 2013; Green Jr. et al., 2012; Zhu et al., 2012). The exception is Company D, which, according to the manager of product development, started its trajectory in search of GSCM through eco-design and, “two years after the launch of a green product line, initiated the process of creating new functional areas addressing environmental management and sustainability with the creation of a sustainability committee as well as the formation of
working groups to discuss topics such as water, energy, waste, processes and people, and suppliers.”

Suppliers have a dual role because their form of cooperation in pursuit of GSCM structuring lies in meeting the environmental and legal/technical requirements imposed by the company, as well as presenting new solutions to support the co-development of products. The role of the customer is diffused among the cases, but in general, the customers’ role has been to inform, guide, or even lead the environmental improvement of products that they purchase in the studied companies. Company C is the only case in which there was a structured form of customer relationships derived from annual meetings for stakeholder engagement. The literature indicates that cooperation with customers is the GSCM practice that is least often adopted by companies (De Sousa Jabbour et al., 2013b; Zhu et al., 2007; Zhu and Sarkis, 2004).

4. Conclusions

This research aimed to understand how the structuring process begins within a company adopting GSCM practices. Based on this discussion of four major Brazilian leaders in their market segments regarding their trajectories in seeking to adopt GSCM practices, we can highlight the main points that support the internalization process of GSCM, with the first and third points serving as the theoretical and practical contributions of this research:

- The introduction of green products is an important internal trigger for GSCM and generates changes outside of the company or in the supply chain;
- Actions in partnership (training or product co-development) with suppliers or the reorientation of the relationship with suppliers (a code of conduct or contractual terms) are methods of involving suppliers in GSCM; and
- The formation of green teams or the creation of a dedicated functional area or green jobs that supports the discussion of environmental management in the company and beyond can assist in facilitating the internal structure for GSCM adoption.

The analyzed cases also reveal the following findings: First, (a) concern regarding climate change has been a recurring motivation to pursue GSCM, which has been evidenced by concerns regarding the sustainability of a business or the carbon footprint of suppliers (Companies A and B). Second, (b) a company’s internal team of professionals assumes responsibility for leading the adoption and structuring of GSCM practices (e.g., training suppliers, preparing workshops and lectures for employees, and forming green teams) (Companies B, C and D) without the support of external actors, such as those involved in
consulting or auditing. Lastly, (c) it is important to attempt to increase customer engagement in GSCM structuring process in order to achieve a complete proposal for GSCM (as observed in Company C).

This study’s practical results offer new insights into the behavior of companies that are adopting GSCM practices, thereby generating new evidence for the extension of GSCM theory. Additionally, the highlighted findings are expected to provide insight regarding the internal structures of other companies that seek to enter sustainable supply chains or to make their supply chains environmentally sustainable. As a theoretical contribution, the findings of Tachizawa and Gimenez (2012) are complemented, thus encouraging the addition of new variables, in terms of intra-organizational mechanisms research, to facilitate GSCM.

A possible limitation of the research results is related to the methodology used, as this research employed a multiple case study to examine implementation based on the path indicated after inducting the results. In addition, there is the issue of the sample’s geographic location, which was restricted to one country.

Future studies could use survey research to investigate the points identified in this research that support the internalization process of GSCM. Additionally, based on this study’s insights, future studies can discuss the relationship between green human resources and GSCM.
### Table 1: Description of the companies studied and the data sources.

<table>
<thead>
<tr>
<th>Company</th>
<th>Company Characteristics</th>
<th>Interview</th>
<th>Secondary Data</th>
<th>Direct Observations</th>
</tr>
</thead>
</table>
| A       | Chemical sector. In 2010, the company began to produce green plastics from renewable sources, ethylene from sugarcane. | Position: Manager of Sustainability  
Duration: 1 h 30 min | Manual of Health, Safety, and Environment; Integrated Management System Manual; Sustainability Report; Data from the company’s website. | Such observations were not possible because the interview occurred in the company’s office rather than in the production unit for green plastic. |
| B       | Aeronautical sector. Production of aircraft for commercial, military, and business segments. The company is starting production of the first aircraft with a design for environmental concerns. | Position: 3 Engineers for Product Development – Design for Environment; 1 Engineer in the area of Sustainability and Industrial Operations; 1 Engineer in the area of Corporate Sustainability.  
Duration: 3 h 30 min | Sustainability Report; News from Internet portals; Data from the company's website; Video of a talk on design for the environment from the company. | Visit to the company’s production line. |
| C       | Cosmetics sector. Production of personal hygiene items. There is already a long tradition in the production of environmentally friendly products. Since the 1980s, the company has worked on the concept of refill packaging. | Position: Manager of Performance and Supplier Relationship; Manager of Science, Ecodesign, and Environmental Impact.  
Duration: 3 h 30 min | Sustainability Report; News from Internet portals; Data from the company’s website; Slides from a presentation; Video of a talk on ecodesign from the company. | Visit to the company’s production line. |
| D       | Sector of household cleaning products. In 2010, the company launched the first line of household cleaning products in Brazil with the concept of Reduce, Reuse, Recycle, and Respect Biodiversity (4Rs). | Position: Manager of Research and Product Development; Supervisor of Safety and Environment; Sustainability Analyst.  
Duration: 3 h | News from Internet portals; Slides from a presentation on the product line studied; Data from the company’s website. | Visit to the company’s production line. |
ARTICLE TYPE: NOTES FROM THE FIELD

Table 2: Results of the study.

<table>
<thead>
<tr>
<th>Company</th>
<th>Antecedents of Environmental Management</th>
<th>Landmarks in the Trajectory of Structuring as a Result of GSCM</th>
<th>Sequential Steps for the Implementation of GSCM Practices</th>
<th>Role of Supplier</th>
<th>Role of Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>EMS/ISO 14001 (interview and site); Concern for safety and risks of the industrial process (interview); Variable reward for employees based on the achievement of environmental goals (interview).</td>
<td>➢ Concern for aspects of climate change (interview); ➢ Preoccupation with the continuity/sustainability of the business (interview); ➢ New product – green plastic (interview and sustainability report and site); ➢ Code of conduct for suppliers (interview and site and sustainability report).</td>
<td>Internal EM - &gt; Investment recovery - &gt; Eco-design - &gt; Green purchases - &gt; Cooperation with customers (interview)</td>
<td>Meeting the environmental and legal technical requirements imposed (interview).</td>
<td>“Prompting improvements and solutions for new products” (interviewee).</td>
</tr>
<tr>
<td>B</td>
<td>EMS/ISO 14001 (interview and site); Production units have eco-efficiency goals (interview and direct observation)</td>
<td>➢ International agreement among industry players seeking a commitment to climate change (interview and news from Internet portal); ➢ Formation of an area of the company dedicated to Design for Environment (interview); ➢ Promotion of workshops and lectures for the company’s employees to internalize environmental concerns in product design (interview); ➢ In some functional areas, there is a professional to conduct the interface between the activities of the area and the environment (e.g., the Engineer for Sustainability and Industrial Operations) (green jobs) (interview); ➢ Contractual clauses for suppliers (REACH) (interview); ➢ Development of the first product with a design for environment concept (interview).</td>
<td>Internal EM - &gt; Investment recovery - &gt; Eco-design - &gt; Green purchases - &gt; Cooperation with customers (interview)</td>
<td>Meeting the environmental and legal technical requirements imposed (interview).</td>
<td>“Beginning to demand environmental requirements in the bidding process” (interviewees).</td>
</tr>
<tr>
<td>C</td>
<td>EMS/ISO 14001 (interview and sustainability report); Lines of green products (interview and site and sustainability report); Beginning of the life cycle assessment (interview).</td>
<td>➢ Matrix of materiality and stakeholder engagement (sustainability report); ➢ Internal evaluation program for the performance of suppliers (interview and slides from a presentation); ➢ Hiring a consulting firm to develop a metric of the monetization of externalities from suppliers</td>
<td>Internal EM - &gt; Investment recovery - &gt; Eco-design - &gt; Green purchases - &gt; Cooperation with customers (interview)</td>
<td>“Being innovative and proactive to achieve the expected and measured environmental performance”</td>
<td>Meeting between stakeholders (sustainability report) and “the use of digital media” (open innovation).</td>
</tr>
</tbody>
</table>
### ARTICLES TYPE: NOTES FROM THE FIELD

<table>
<thead>
<tr>
<th>D</th>
<th>None.</th>
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- Research and development of a new product line with a focus on the 4Rs (interview and slides form a presentation);
- Creation of two areas in the company dedicated to sustainability and environmental management (interview);
- Creation of a sustainability committee (interview);
- Formation of green teams dedicated to discussing proposals and solutions for environmental improvements (interview);
- Goals to obtain ISO 14001 certification (interview).

- Investment recovery - > Eco-design - > Green purchases - > Internal EM - > Cooperation with customers (interview)

| Consumer – “does not value or does not verbalize a preference for an environmentally sound product” (interviewees); Retail – “makes improvements in management practices and, through audits, causes the company to begin to think it is possible to implement new environmental management practices” (interviewees). |}

- The Evaluation Program for Suppliers “causes them to seek changes in processes (recycling) and seek improvements” (interviewee) with respect to their carbon footprint.

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- Collaborating in the process of co-developing products (interview);
  - “Introducing new solutions for composition of products” (interviewees);
  - “Providing information about the percentage of renewable sources of inputs” (interviewees);
  - Promoting benchmarking for the company “to think of new forms of management” (interviewees).
References


Research Highlights

- This study offers new insights to understand the process of adopting green supply chain management practices.
- The introduction of green products is an important internal trigger for green supply chain management.
- Green teams can facilitate the internal structure for green supply chain management adoption.