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Creating value by sustainable manufacturing and supply chain management practices – a cross-country comparison

Juliana Kucht Campos[a]*, Frank Straube[a], Sebastian Wutke[b], Patricia Alcântara Cardoso[c]

[a] Technische Universität Berlin (Technical University of Berlin). Strasse des 17. Juni 135, H90. Berlin, 10623 Germany
[b] International Transfer Center for Logistics (ITCL) GmbH. Alt-Moabit 73. Berlin, 10555 Germany
[c] Universidade Federal do Espirito Santo (Federal University of Espirito Santo). Av. Fernando Ferrari, 514. Vitória/ES, 29075-910 Brazil

Abstract

Research on the development of multinational companies towards a more sustainable business reveals country specific particularities in this process. In order to build a cross-country collaboration framework, sustainability reports of leading companies from developed and developing countries were analyzed and statistically significant differences identified. The framework contributes to comprehending the variables that influence supply chain and manufacturing performance, supporting the identification of opportunities for value creation through cross-country collaboration towards the development of sustainable innovations.

Keywords: Sustainability; supply chain; manufacturing; practices; framework; value; country; Germany; Brazil

1. Introduction and Context

Sustainable supply chain (SSC) management and sustainable manufacturing have received increased attention during the last years by companies and literature [1]. The need for changing the way people, companies, and governments behave is evident. Supply chain managers are being observed as catalysts for corporate transformation

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* Corresponding author. Tel.: +49 030 31422877;
E-mail address: juliana.campos@ufrj.br

[2] and customers as drivers towards more sustainable business practices of companies. Industry is one of the main source of greenhouse gas emissions and multinational enterprises have the power of promoting long-term and collaborative solutions that contribute to reducing emission from the entire supply chain. Due to particular characteristics and demands from regulations, market and customer [3], companies react differently. Previous researches found differences according to the industry [4] and country [5], [6], nevertheless studies about differences in practices implemented by developed and developing countries for further map of collaboration opportunities are still missing.

For the present research, companies from Germany and Brazil represent the two analyzed groups. Germany is internationally recognized as one of the leaders in sustainable development due to its investments in eco-efficient technologies, renewable energy and measures for achieving the emissions targets [7]. Companies are pressured by taxes and regulations to act more sustainable – e.g. European Union (EU)'s Renewable Energy Directive which aims to increase the share of renewable energy to 20 percent by 2020. Brazil is a leading emerging country in environmental challenges [6] and has been increasingly investing in deforestation control measures and reverse logistics processes and solutions [8]. The logic of studying initiatives implemented by companies from these two countries is that global problems such as climate change require worldwide collaboration in order to get the so-called relational rents: ''a supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners'' [9]. Instead of just analyzing how multinational companies react regarding SSC initiatives, the present research goes beyond and presents a framework based on companies' reality. In addition, by using a holistic model as research background, inter-multidisciplinary research is promoted with a global collaborative perspective.

2. Materials and Methods

In order to develop the proposed framework, the authors conducted a content analysis with 18 sustainability benchmarks, where text data is systematic classified and patterns identified [10]. The sample, displayed on table 1, consisted of large leading multinationals which are more likely to engage in SSCM [11], benchmarks in sustainable initiatives (listed in "The Newsweek Green Ranking" 2012 or 2014), from four different industries and with headquarters in either Germany or Brazil.

Table 1. Sample of companies

	Germany	Brazil
Consumer Goods	Bayer; Adidas; Beiersdorf; Henkel	BRF; Natura; Ambev; JBS
Basic Materials	Linde; BASF; Heidelberg Cement	Petrobras; Vale
Industrial Materials	Thyssenkrupp; Siemens	Gerdau
Retail	Metro	GPA

The coding scheme followed the framework for managing sustainable supply chain practices [12], which consists of three areas, seven dimensions, 21 categories and 92 types of practices. It starts with initiatives related to supplier relationship management (categories selection, assessment and collaboration), followed by those related to the internal supply chain management (governance, procurement, production, distribution and waste management dimensions) and finalizing in the target of all initiatives – customers.

The source of data was public available documents – annual and sustainability reports [3] from 2012 until 2015. These are powerful instruments to inform partners, investors and society about firm's commitment level with sustainability, although it is difficult to determine whether described measures and initiatives are in fact implemented or just reported to appease stakeholders [13]. On the other hand, not all measures and set targets are published in the reports. For the quantitative statistical analysis, each of the database's cells (92 practices x 32 firms) were coded 1 in case of at least one practice reported and 0 in case of absence of practices reported. The Fisher's exact test was used to identify which types of practices were statistically significant different (p-value less than 0,05) between the countries.

3. Results from content analysis

Findings show that the two groups differ significantly in four of the 21 analyzed categories of initiatives: external relationship, packaging, structure & network and customers' demands. The first identified category is *external relationship* (p-value=0,083) which shows a higher importance of governments and regulatory agencies for the Brazilian companies. Relationships are reported similarly to collaboration with public institutions to get health and security trainings, support spreading education on how to combine business and biodiversity conservation, to measure climate issues using a public satellite system, to build sectoral agreements regarding packaging, durable household goods, lighting, batteries and medications, to build a public list of companies fined for human rights violations or joint sustainable plans for developing the Amazonia region, to improve urban mobility conditions.

Investments in improvements towards sustainable *packaging* are cited by the majority of companies from both countries, however, some particularities were identified (p-value=0,078) regarding the behavior of the German ones. Within this group, more companies reported awareness in hazardous materials management – e.g. implementation of the Globally Harmonized System (GHS), explained by the strict level in European regulations. Although in Brazil there are laws for this issue, none of the companies highlighted specific initiatives in their reports. The same is observed in involving suppliers in packaging optimization programs. Although the link between these investments and benefits in terms of weight and volume during transportation, Brazilian companies seem not to be open enough to collaborate with suppliers. On the other hand, Germans profit from extending the product life cycle perspective to develop sustainable manufacturing solutions. They use these relationships to avoid emissions and costs through reduced package volume, use of less and recycled sources of fiber materials and opting for packaging that can be used for both transport and in-store presentation.

The third statistically significant difference is regarding *structure and network* initiatives (p-value=0,045). Investments in efficient land use and green construction as well as specific strategies in the logistics network for reducing emissions are considerably higher among the German companies. They identify the value of building certified sites e.g. ISO 14001, Leadership in Energy and Environmental Design and one even designed a specific manual with mandatory environmental measures for architects when building their stores. The development of automation systems and modern technologies support improvements in resources efficiency and are aligned with investments for generating renewable energy on-site. Regarding network design and optimization, e.g. the location of new warehouses and distribution centers, German companies more often emphasis ecological advantages like reduced fuel consumption and transport related emissions in their reports Initiatives to shorten distances with suppliers are for instance positioning them "wall to wall" to the production site. This approach can not only support a more flexible and stable production but also help to reduce transport related emissions . Another clear characteristic of these companies is the sharing culture, between business units and also with other companies [14]. The use of pooling systems with firms with similar product categories is vastly reported among the German firms. They highlight the advantages of increasing the percentage of fully loaded trucks, reducing the number of empty runs and consequently emissions. Brazilian companies, on the other hand, report large investments in their own infrastructure to overcome restrictions of the public one, e.g. floating cross docking stations, necessary when delivering in shallow ports.

The last identified difference relates to managing *customers' demands* (p-value=0,096), which is more intensively reported by Brazilian companies. An explanation might be due to the need of frequent and closer contact between customers and enterprises in the Brazilian market. Besides periodic satisfaction surveys, social media and press publications, they reported technical visits, co-creation platforms, specific portals e.g. "I love makeup", blogs, magazines, TV shows and short message service to update clients about their order status. According to some companies, even among international customers, there is a clear demand for adjusting products to a "local taste" and for giving instructions in different languages about health, safety and environmental issues. Initiatives that aim to change customers' behaviors are also identified – e.g. program for responsible consumption of alcoholic beverages or reduction of the use of plastic bags by customers.

4. Cross-country collaboration framework

Based on the content analysis of companies' reports and statistical tests, the framework displayed on figure 1 was built and aims to support the comparison of countries SSC practices for further identification of value creation opportunities through collaboration projects. It evidences the pressures from regulations, market and companies, which influence the market behavior differently according to the country or sector where it is set. In Germany, EU requirements are among the strongest drivers for improving SC sustainability as well as the increase in market competitiveness. Brazilian companies, on the other hand, are strongly pressured by customers, especially multinational companies that require higher sustainability standards. Under the influence of these forces, the supply chain network is motivated to change towards the development of sustainable solutions and collaborations. Therefore, overall relationships play an important role in this process. Relationship with government is directly influenced by regulatory pressures, but also oriented by culture and structural needs. In Brazil, despite the existence of regulations regarding environmental and social responsibility, relationships with governmental institutions are intensively employed for obtaining appropriate infrastructure and for developing the workforce/population in general. Two fundamental and critical requirements for reaching more efficient processes – infrastructure and people. Additionally, due to the lack of appropriate resources, companies from developing countries, consequently, invest more in relationship with society in an attempt to extend the sustainable behavior beyond corporate boundaries, establishing a cultural sustainability value.
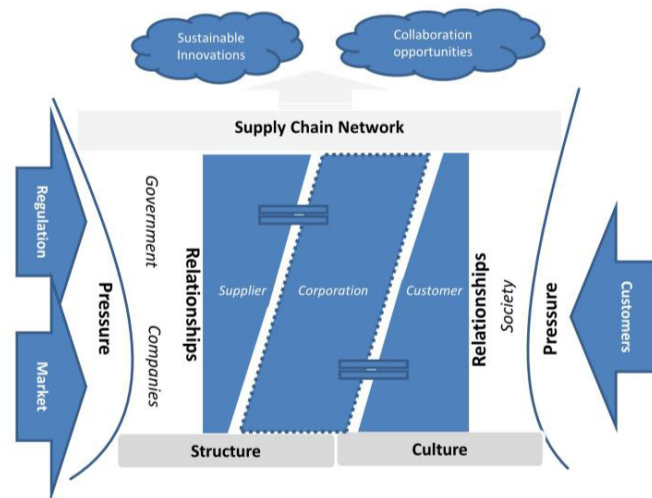

Fig. 1. Cross-country collaboration framework

In Germany, once infrastructure and people have a more mature sustainability level, companies seem to find answers for these same demands through collaborative projects with other companies, including SC members for sustainable manufacturing and more efficient SC processes. The exaggerated competitive culture in Brazil and lack of trust between companies hamper similar initiatives, thus, the relational focus is on customers that demand a closer contact.

5. Conclusions

Effective actions in extending SC sustainability are still missing in overall companies' actions [15], as well as SSC research in developing countries [16]. The combination of these two gaps evidences collaboration opportunities that exist between different countries, answering the global need for improving sustainability. This paper aims to contribute to this discussion and the authors believe that the solution should involve global implementation however

respecting each country's particularities. Therefore, the presented framework supports analyzing cross-country variables that influence SC performance and identifying opportunities for value creation through collaboration between companies from different regions.

Moreover, it evidences the benefits of designing projects together with stakeholders for improving the innovation potential of sustainable manufacturing and supply chain and removing barriers that influence the completely global value chain. In developing countries, the lack of infrastructure and sustainability knowledge can be overcome by contributions from the maturity from developed ones. On the other hand, the closer relationship with customers and partnership with government among developing countries provides insights for further manufacturing technological innovations by the other group. Among the limitations of this work are the sample of companies – large/benchmark ones and the source of information for content analysis – self reported, public reports. It is important to highlight that the lack in reported information does not mean that companies are not implementing actions towards any specific issue. However, the study was based on available information. Moreover, there is the need of testing the proposed framework with qualitative methods such as interviews in an attempt to provide more details about each of the variables and inclusion of additional ones.

Acknowledgements

References

[1] P. Beske-Janssen, M. P. Johnson, and S. Schaltegger, "20 years of performance measurement in sustainable supply chain management–what has been achieved?," *Supply Chain Manag. An Int. J.*, vol. 20, no. 6, pp. 664–680, 2015.

[2] I. R. Halady and P. H. Rao, "Does awareness to climate change lead to behavioral change?," *Int. J. Clim. Chang. Strateg. Manag.*, vol. 2, no. 1, pp. 6–22, 2010.

[3] W. L. Tate, L. M. Ellram, and J. F. Kirchoff, "Corporate social responsibility reports: a thematic analysis related to supply chain management," *J. Supply Chain Manag.*, vol. 46, no. 1, pp. 19–44, 2010.

[4] S. A. Waddock and S. B. Graves, "The Corporate Social Performance- Financial Performance," *Strateg. Manag. J.*, vol. 18, no. 4, pp. 303–319, 1997.

[5] L. C. Roca and C. Searcy, "An analysis of indicators disclosed in corporate sustainability reports," *J. Clean. Prod.*, vol. 20, no. 1, pp. 103–118, 2012.

[6] A. Gunasekaran, C. J. C. Jabbour, and A. B. L. de S. Jabbour, "Managing organizations for sustainable development in emerging countries: an introduction," *Int. J. Sustain. Dev. World Ecol.*, vol. 21, no. 3, pp. 195–197, 2014.

[7] M. Halme and M. Huse, "The influence of corporate governance, industry and country factors on environmental reporting," *Scand. J. Manag.*, vol. 13, no. 2, pp. 137–157, 1997.

[8] A. B. L. De Sousa Jabbour, F. De Souza Azevedo, A. F. Arantes, and C. J. C. Jabbour, "Green supply chain management in local and multinational high-tech companies located in Brazil," *Int. J. Adv. Manuf. Technol.*, vol. 68, no. 1–4, pp. 807–815, 2013.

[9] J. H. Dyer and H. Singh, "The relational view: Cooperative strategy and sources of interorganizational competitive advantage," *Acad. Manag. Rev.*, vol. 23, no. 4, pp. 660–679, 1998.

[10] K. A. Neuendorf, *The content analysis guidebook*. Thousand Oaks, CA: Sage, 2002.

[11] M. Pagell, "Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics," *J. Oper. Manag.*, vol. 22, no. 5, pp. 459–487, 2004.

[12] J. K. Campos, *Integrated framework for managing sustainable supply chain practices*, Schriftenr. Berlin: Berlin : Univ.-Verl. der TU Berlin, 2015.

[13] A. Kolk, "Trends in sustainability reporting by the Fortune Global 250," *Bus. Strateg. Environ.*, vol. 12, no. 5, pp. 279–291, 2003.

[14] J. K. Campos, F. Straube, and P. A. Cardoso, "Gestão de práticas de sustentabilidade na cadeia de suprimentos – Um Estudo Comparativo entre Benchmarks do Setor de Materiais Básicos no Brasil e na Alemanha," *Bus. Manag. Rev.*, vol. 4, pp. 428–440, 2015.

[15] A. Touboulic and H. Walker, "Love me, love me not: A nuanced view on collaboration in sustainable supply chains," *J. Purch. Supply Manag.*, vol. 21, no. 3, pp. 178–191, 2015.

[16] M. Pagell and A. Shevchenko, "Why research in sustainable supply chain management should have no future," *J. Supply Chain Manag.*, vol. 50, no. 1, pp. 44–55, 2014.