

Determinants of Sustainable Practices in Supply Chain Management

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Abstract

This paper's goal is to analyze the external and internal pressures that lead organizations to adopt sustainable practices in order to supply chain management. The data collected by a research conducted in 131 organizations were analyzed through a CFA method. The results suggest that internal factors exercise influences on sustainable practices.

Keywords: pressures, sustainable practices, supply chain management

INTRODUCTION

Some of the great discussions that have been occurring in the business and academic world in the field of management involve sustainability in business and in organizational practices. The insertion of environmental management or social responsibility activities in organizations many times speaks of the pressures that these suffer from the government and society in general to become more responsible for the consequences that their practices could bring to the environment and community which they are in.

With the insertion of concerns for the environment in an organizational context the supply function came to be considered as a strategic factor to reach sustainability, which then propitiated the development of so-called 'green' practices in the supply chain. Srivastava (2007) argues that since the introduction of the concept of supply chains in the 1990s, it has become clear that the best practices demand the integration of environmental management with the operational area, which provokes a growing interest amongst researchers in advancing in studies of this field.

Considering that sustainable actions related to the operational field have become valuable in obtaining a competitive edge, these questions have become fundamental in terms of the management of a supply chain. The concept found in literature defines the management of a sustainable supply chain as the management of the flow of materials, information and capital, as

well as the cooperation between the companies along the supply chain, as they reach their objectives in the three dimensions of sustainability (economic, social and environmental), starting with the needs of the stakeholders and final consumers (Seuring and Muller, 2008; Linton, Klassen and Jayaraman, 2007). Therefore, the sustainable practices in a supply chain include actions and activities related to the *triple bottom line* (Elkington, 1997): planet (environmental dimension), people (social dimension) and profit (economic dimension).

Competition, clients and governmental pressures, amongst other reasons, lead some organizations to modify their structural set-ups, focusing on the building of more long-lasting and beneficial relationships between businesses, especially in terms of activities in the operational area of the organizations. Collaboration between organizations is considered essential for establishment, function and results in a supply chain. According to Zailani et al. (2012) pressure from numerous *stakeholders* presents a great challenge for the management of the supply chain in terms of the integration of the sustainable practices of the diverse participants of a chain.

The development of research with the intention of understanding the relationship between the pressure exerted by *stakeholders* (internal and external) and socio-environmental practices is justified in the arguments described by Chang, Kenzhekhanuly and Park (2013), who believe that not only environmental regulations imposed by the government, but consumers who are concerned about environmental issues demand that corporations be involved in sustainable actions. In this sense, this study intends to identify inducers or determinants which can be understood as the ‘pressures’ of social and environmental practices in the supply chain. For this purpose, 131 Brazilian transformation industries located in the state of Minas Gerais were researched. The research supplied a definition for a model of determinants of pressures obtained by means of the application of confirmatory factor analysis.

LITERATURE REVIEW AND DEVELOPMENT OF THE MODEL

Sustainable Supply Chain Management

In introducing the theme of sustainable supply chain management it is convenient to describe the factors which allow the development of this approach, its comprehension and implementation. Numerous authors who are often quoted in research on this subject, such as Seuring and Muller (2008); Kleindorfer, Singhal and Van Wassenhove (2005); Pagell and Wu (2009); Linton, Klassen and Jayaraman (2007); Carter and Rogers (2008) , present the conceptualization, the main characteristics and the evolution of the theme in their studies.

Previously, the definition of the concept of sustainable supply chain management in literature about the subject broached Green Supply Chain Management, which was the initial term defined to deal with the insertion of environmental aspects in the supply chain. Srivastava (2007) argues that Green Supply Chain Management (GSCM) began to attract attention from researchers and operational administrators with the growing degradation of the environment, the decrease in natural resources, the excess of garbage accumulated in landfills and the frequent increase in pollution levels. The addition of the ‘green’ or environmental component to supply chain management involves the establishment of a closer relationship between chain management and the environment.

The evolution of 'green' chain supply systems for that which is called sustainable supply chain management occurs with the inclusion of actions which involve the three dimensions of the *triple bottom line* (Elkington, 1997): economic, social and environmental. It is important to highlight that previously to the configuration of a specific theory about SSCM, which inserts all dimensions of TBL, traditional supply chain management directed its actions firstly to just one environmental perspective, as well as its fundamental economic objectives. The incorporation of social aspects to the integrated management of a supply chain whose focus is also aimed towards environmental issues, like a green supply chain, results in what is called Sustainable Supply Chain Management. Carter e Rogers (2008) define SSCM as a strategic integrated network in the way it reaches its social, environmental and economic objectives in a system of transparent business coordination and inter-organizational processes, for the improvement of the long-term economic performance of a focal organization and its supply chain.

There are a series of definitions for the GSCM concept, most of which talk about 'green' supply management, involving environmental management practices in the supply chain, in order to bring improvement in performance. According to Zhu and Sarkis (2004) the definition of GSCM is influenced by the function where the concept is practiced (buying, operations, marketing or logistics). The concept of green supply chains involves actions which are reactive to environmental control on a general scale and also the development of more pro-active programs and practices, such as recycling, complaints, remanufacturing and reverse logistics of the management environment, incorporating innovations, and amplifying and differentiating the interpretation of the approach in different areas.

When considering that sustainability has become one of the competitive priorities of companies, and that the stimulus for environmental management is vital for sustainable development to occur, the concept of supply chains no longer presents a traditional set-up and is transformed into a more 'extended' version. According to Halldórsson, Kotzab and Skjøtt-Larsen (2009) a revision in sustainability in the supply chain indicates that the insertion of the theme in SCM literature was expanded by the discussion of subjects such as reverse logistics and closed loop supply chains, both logistic systems which develop actions of value recovery or of appropriate disposition of goods post-purchase, from the point of purchase to the point of origin of manufacture, involving environmental management activities. The evolution of these systems to the one which is referred to as sustainable supply chain management occurs as soon as actions are included which involve the three dimensions of *triple bottom line*. The consideration of these three pillars in the existing practices of SCM leads us to Sustainable Supply Chain Management, including the inter-organizational dimension as well as the perspective of added value and social and environmental issues.

Carter and Rogers (2008) define SSCM as a strategic integrated network, in that it reaches its social, environmental and economic objectives in a system of transparent business coordination and inter-organizational processes, for the improvement of the long-term economic performance of a focal organization and its supply chain. Seuring and Muller (2008) stress that the definition of SSCM is much broader than that of SCM and combines concepts of sustainability and chain supply management, as well as integrating principles of green supply chains as one of the parts of a vast theoretical field.

The discussion about levels of sustainability and the measurement of how much of a supply chain can be sustainable and provide good results in the TBL dimensions has been occurring since the definition of SSCM as one of the greatest approaches of an organization in

the area of operations. Questions and doubts have been pointed out not only by Pagell and Wu (2009), but previously by Kleindorfer, Singhal and Van Wassenhove (2005), who point out the question of the synergy between profits and sustainable practices as the center of the debate on the theme, especially because society often seems to be uninterested or indifferent to economic and political arguments. Government representatives, the marketplace and society in general demand an improvement in environmental performance and health and safety issues, and it is also these agents, in many cases, who are the determinants of the environmental and social actions to be practiced by businesses.

Determinants of the Sustainable Supply Chain

According to Zailani et al. (2012) pressure from numerous *stakeholders* presents a big challenge for supply chain management in that which refers to the integration of the sustainable practices of the diverse participants of a chain. In the last ten years diverse studies carried out in Asian countries, especially in China, Korea and Malaysia, as well as those of Zhu and Sarkis (2004); Zhu, Sarkis and Geng (2005); Zhu and Sarkis (2006); Zhu, Sarkis and Lai (2008); Eltayeb and Zailani (2009); Zailani et al. (2012); Chang, Kenzhokhanuly and Park (2013); Hsu et al. (2013); Zhu and Geng (2013) have presented important data about the environmental pressures and initiatives in supply chain management.

One of the pioneer studies in the field of the definition of determinants was that of Henriques and Sadosky (1996), who sought to identify whether the formulation of environmental plans was being influenced by pressure from clients, shareholders, society and governmental regulations. The authors believed that environmental regulations was one of the factors that most affected the decision-making process of an organization, and this pressure from the government was understood as necessary due to the environmental costs of a productive process, like pollution and other toxic residues. Zhu and Sarkis (2006) develop their research taking into consideration four critical groups that determine GSCM practices, and two of them is the regulatory institutions and the *stakeholders* who establish direct relationship with the organization.

Previously, Zhu and Sarkis (2007) had carried out some new research in which they sought to identify the moderate effects of institutional pressure on GSCM practices and performance. The justification for the study resides in the improved strategic adaptation of organizations in better understanding the relationship between environmental pressures and how these can affect economic, social and environmental performance. More recent studies, such as those of Clark (2012) and of Chang, Kenzhokhanuly and Park (2013) evaluate the internal and external pressures of an organization as elements which influence the adoption of sustainable practices. The research of Chang, Kenzhokhanuly and Park (2013) is based on the study of Henriques and Sadosky (1996), but the results, differing to those of Zhu and Sarkis (2006), do not identify any internal nor external aspect as possible sources of pressure over sustainable practices in the supply chain.

Seuring and Muller (2008) present a model based on the revision of the literature of the most relevant publications in terms of sustainability in supply chain management, using as its database articles published in international journals. This model broaches three perspectives: stimulus for sustainable supply chain management, management of suppliers for risk and performance, and supply chain management for sustainable products. Within this approach, the initial factors which trigger the construction of the model over sustainable supply chain

management are from outside the organization, such as pressure and incentives from different groups. However, some internal aspects of organizations and the strategic directions they take can also be understood as factors that induce sustainability in the supply chain. As Gold, Seuring and Beske (2010) point out, both outside pressures and inside issues of support of the supply chain crucially determine the way sustainable supply chain management will be implemented by its members.

Taking into consideration the arguments and research results carried out by Henriques and Sadorsky (1996), Zhu and Sarkis (2006), Seuring and Muller (2008), Paulraj (2011), Ageron et al. (2012), Zailani et al. (2012); Chang, Kenzhakhanuly and Park (2013); Hsu et al. (2013); Zhu and Geng (2013), the proposal of this article has as its objective the identification of which external and internal agents are determinants for the realization of environmental and social practices of companies in the supply chain.

Definition of the Model

It is notable that since the nineties society has become alarmed at the decrease of natural resources available, the disposal of losses, and the accumulation of residues and pollution, leading to an increase in demands to the government and to organizations to give greater priority to the management of these and other environmental issues (Murphy, Poist and Braunschweig 1995). One of the roots of the question of regulation is discussed by Shultz II and Holbrook (1999) in the publication in which they revisit the dilemmas of the 'commoners', based on the conclusions of Hardin in the sixties.

The studies of Gold, Seuring and Beske (2010) confirm the assumption that external pressures, amongst which government, clients and other stakeholders work as boosting elements for a sustainable form of supply chain management. Zhu, Sarkis and Geng (2005), Welford and Frost (2006) and even Rao (2005) and Seuring and Muller (2008) emphasize the pressures exerted by the government, consumer market and suppliers in relation to the sustainable actions to be practiced by organizations in general terms. Some internal issues in a company, such as costs, involvement of higher administration, organizational values and initiatives, reputation and brand imaging, relationship with suppliers, and strategic orientation and development of competitive advantages, are all presented as inducers to sustainable practices (Carter and Rogers, 2008; Mann et al., 2010, Gold, Seuring and Beske, 2010; Ageron et al., 2012; Paulraj, 2011; Clark, 2012). Paulraj (2011) and Ageron et al. (2012) suggest that socio-environmental initiatives and strategic reasons are fundamental for businesses to develop sustainable practices within the supply chain, given that the sustainable management of supplies is characterized as an important source of competitive advantage.

Based on these conceptions, the model of measurement of Pressures proposed in figure 1 was elaborated as follows and involves 4 constructs as Government (AG), Clients (CL); Suppliers (FOR) and Internal Aspects (AI):

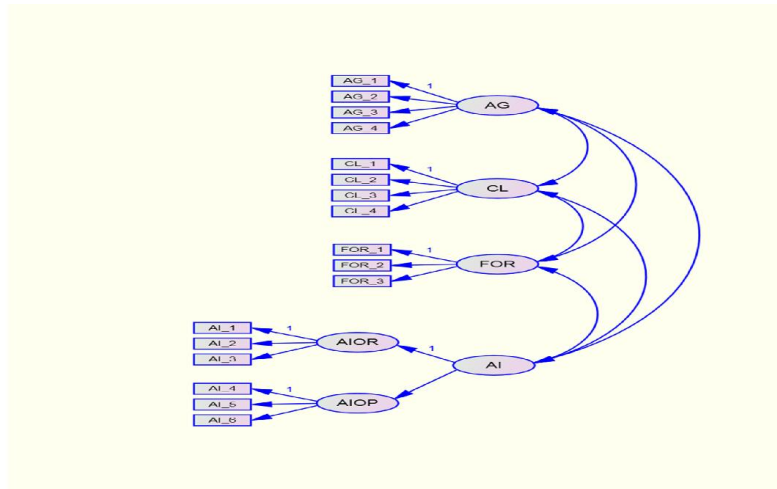


Figure 1: Model of Original Measurement of Pressures

METHOD

The instrument adopted in this research was an electronic survey which was performed through the distribution of the questionnaire via email to around 700 industries in the State of Minas Gerais. For the data collection stage the following fields were selected: the manufacture of food and drink products, textile products, cellulose and paper, wood products, chemical products, metal products, machinery and electrical equipment, basic metallurgy, preparation of leather and footwear, furniture and recycling. The conclusion of the data collection stage was done with a total of 156 questionnaires answered in an incomplete manner. At the end of the analysis of the missing values a total of 131 complete answers were obtained.

Table 1 presents the data about the companies which responded and the sector of activity of each one, as well as their participation in relation to the total of businesses contacted. For this table it is possible to observe the participation of each sector of activity in the transformation industry of the state of Minas Gerais in the sample researched. It is noticeable that the sectors which participated most were from the food industry, in which drinks and dairy manufacturers are included with 32% of participation, as well as food manufacturers; and the chemical industry, in which chemical, pharminochemical and pharmaceutical manufacturers are included with 36.6% of participation.

Table 1: Participation of transformation industries in the sample

Classification	Freq.	Participation Sample %	Total Contacted	Part.TotalCo ntact. %
Manufacture of Food Products	42	32,0%	149	28,19%
Manufacture of Textile Products	5	3,8%	12	41,67%
Manufacture of Leather and Shoes	4	3,1%	54	7,41%
Manufacture of Wood Products	1	0,8%	2	50,00%
Manufacture of Cellulose and Paper	7	5,4%	38	18,42%
Manufacture of Chemical Products Basic	48	36,6%	133	36,09%
Metallurgy	11	8,4%	158	6,96%
Manufacture of Metal Products	3	2,3%	141	2,13%

Manufacture of Mach. & Elec. Materials	2	1,5%	112	1,79%
Manufacture of Furniture	6	4,6%	60	10,00%
Recycling	2	1,5%	6	33,33%
Total	131	100%	865	----

The statistical method adopted for this research was confirmatory factor analysis, whose function allows one to evaluate how much the measured variables are capable of representing determined constructs, characterized here by the pressures exerted by agents for the realization of sustainable practices. In this way the technique makes it possible for one to delimit, measure and identify which pressure-building variables exert a greater load over practices.

ANALYSIS OF THE RESULTS

Validation of the Measurement Model

Confirmatory factor analysis was adopted as a step for evaluating the terms of error of the indicators which compose the constructs present in the Pressures Model proposed by the research. The validity of the construct was studied in the confirmatory analysis process by means of two different methods: the convergent validity and the discriminant validity. Before confirmation of the constructs, an exploratory factor analysis of the data was carried out. Through use of this technique, it was observed that some of the construct indicators of the Governmental Actions and of the Internal Aspects should be taken out of the model, as the continuation of said indicators was indicating a low rate of reliability, lower than the reference value for Cronbach's Alpha.

After numerous rounds of the Pressure model using Amos version 18 software, there was an indication for the need of the removal of the indicators which made up the Governmental Actions construct (AG), due to the low factor loadings and the fit indices below the reference values. Therefore, we opted for the exclusion of the whole Governmental Action construct. In this way the revised Pressures model presented acceptable composite reliability indices and average variance extracted, which permitted confirmation of the convergent validity, indicating that the sets of indicators defined in the model was capable of measuring each one of the constructs to which they were related.

In this model, for evaluation of the discriminant validity we used the Fornell and Lacker (1981) method, in which the square of the correlation coefficient between the latent variables is calculated and compared with the average variance extracted (AVE) of each construct. Table 2, as follows, presents the values, where on the diagonal are the AVE values (in gray) and on the part below the diagonal are the squared construct correlation indices:

Table 2: Discriminant Validity

Constructs	CL	FOR	AIOR	AIOP
CL	0,735	---	---	---
FOR	0,498	0,643	---	---
AIOR	0,350	0,299	0,568	---
AIOP	0,343	0,263	0,397	0,583

It can be noted on table 2 that none of the squared construct correlation index values was greater than the AVE coefficients in relation to each construct (diagonal), which guarantees the discriminant validity of the model. It can therefore be concluded that the defined constructs for this model diverge from each other, proving that the construct is unique and measures situations that other constructs are unable to measure. For a better appreciation of the results found in the confirmatory factor analysis of the Pressures model, table 3 shows the main adjustment measures of the original and revised models:

Table 3: Summary of the Results of the Fit Indices

Indices	Original Model	Revised Model	Parameters
Chi-Squared	223,039	83,0	----
Degrees of Freedom	109	48	----
(χ^2 /gl) Ratio	2,046	1,729	$1 \leq \chi^2/g. l. \leq 3$
p value	0,000	0,000	----
GFI	0,835	0,855	$\geq 0,90$
RMSEA	0,090	0,075	$\leq 0,07$
CFI	0,901	0,960	$\geq 0,90$
TLI	0,876	0,945	$\geq 0,90$

Discussion of the Data

The Governmental Actions construct was removed from the Pressures model after the execution of the confirmatory factor analysis. This does not mean that governmental actions are not an aspect which has a significant influence on the adoption of socio-environmental practices in organizations. However, considering the sample studied in this research and the indicators related to the measurement of the construct, this was not validated by the statistical techniques used. One of the issues that deserves highlighting is the fact that the indicator characterized as regulatory actions was not confirmed in the measurement model of these pressures, mostly due to the fact that although the index of results collected converged toward this alternative, it is believed that the other indicators analyzed jointly were not enough to justify the governmental pressure on the companies researched.

Unlike Henriques and Sadorsky (1996) who evaluate the pressures within categories where clients are measured by just one indicator, in this research the clients were analyzed by four indicators. Amongst the measurement indicators of the construct, clients kept within the final model of Pressures measurement, one can observe the clients' concerns about the environment, their satisfaction and expectations. Confirmatory factor analysis enabled the validation of the Pressures measurement model with the permanence of the 'Suppliers' construct and its three indicators, even though one of them presented less-than-desirable factor loadings according to the reference values.

The pressures measurement model was validated containing the dividing factor in two constructs: internal organizational aspects and internal operational aspects. The statistical results are, in a way, justified by the characterization of the indicators that measure each of the two sub-constructs. The indicators AI_1, AI_2 and AI_3 are mostly related to organizational issues, like the involvement and concern of the higher administration of the company (directors and managers) with environmental and preservation of natural resources issues, as well as the

presence of environmental initiatives from employees. The indicators AI_4, AI_5 and AI_6 that measure the other sub-construct are indeed related to operational activities (AI_5), like the necessity to reduce waste at the end of the process and the reduction of production costs (AI_6). The other indicator refers to the activity sector of the company, which is also characterized by the researched industry's type of activity, and directly affects the necessity and/or obligation to reduce waste in the production process.

FINAL REMARKS

Over recent years the studies of Chang, Kenzhekhanuly and Park (2013); Zhu and Geng (2013); Hsu et al. (2013) have approached the issue of the determinants of *Green Supply Chain Management*, highlighting the relationship between the external and internal pressures on organizations and the environmental practices carried out in the supply chain. Conducting specific research about this relationship is justified by the need to improve practices in the *Green Supply Chain* developed by the company and broaden the commitment and involvement of the companies which participate in the supply chain through the integrated elaboration of correct environmental strategies.

The revised pressure measurement model allows one to deduce that the development of social actions by clients does not represent significant pressure if considered together with the other variables, or in other words, the execution of socially responsible activities by clients does not represent the set of pressures to be evaluated as determinants of the practices used by the company. Part of the literature referenced in this study indicates that the laws, policies, environmental regulation, clients, and other external *stakeholders* exert significant pressure so that companies, especially those which are established as having a focus on the supply chain, adopt sustainable practices. However, in the case of this research specifically, the majority of the participating companies is small or medium-sized and is not characterized as the focal firm in the chain. This fact could also contribute to the justification of the differences found in this research in comparison to other studies on the same theme which have been carried out with larger companies, which suffer and exert greater pressure over the other participants of the chain.

The study also finds that the internal *stakeholders* are more relevant in the determination of practices when compared to the external *stakeholders*, considering the universe studied, under the conditions met. The involvement, concerns and commitment of the management and the employees to environmental initiatives are determinants for the company to perform a socio-environmentally responsible role, in terms of what socio-environmental practices propose to achieve in supply chain management.

ACKNOWLEDGEMENTS

We thank to UFU, FGV-EAESP and FAPEMIG for providing financial support for this research.

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