Understanding the influence of supply chain governance on supply chain performance

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Abstract
The aiming is to analyze the influence of supply chain governance (SCG) and its conceptions (contractual-relational-transactional) on supply chain performance (SCP). It was carried out qualitative and quantitative steps to propose and validate a model. It was identified that SCG has a positive influence on operational and financial SCP.

Keywords: Supply chain governance, supply chain performance, qualitative and quantitative method

Introduction
The supply chain has become a source of competitive differentiation and long-term sustainability of organizations in a business environment that is constantly changing (Blome et al. 2013). According to Senge et al. (1999), a form of address changes and market pressures, is designing a governance on supply chain that balances the interests of organizations and autonomous decisions of decision makers permeating all members of the supply chain.

However, traditionally the supply chain is studied with a operations and support view, with the intraorganizational or functional focus according to Jain and Dubey (2005) and Ketchen Jr. and Hult (2007). Governance, which is a topic that has been widely studied in recent years (Jain and Dubey 2005), is considered a way to analyze interorganizational relations as a multidimensional phenomenon manifested in the structures and processes of companies.

Last years the concept of governance has also been applied in supply chain area (Ferguson et al. 2005, Ghosh and Fedorowicz 2008, Zhang and Aramyan 2009), being called supply chain governance (SCG). Thus, in the administration area, more specifically, governance appears always linked to economic performance of the business and is characterized by the establishment of a number of conditions for running of any type or size of organization.

Thus, the aiming of this study is to analyze the influence of SCG and its conceptions (contractual, relational and transactional) on supply chain performance (SCP). To achieve this
objective it was carried out qualitative and quantitative steps to propose and validate a model. First it is presented concepts and the elements of SCG. Following it is presented the main concepts of supply chain performance used in this study. After we present the research model, hypotheses and the method used. Results and discussion are presented showing a positive relationship between SCG and SCP. Final remarks are present in the last part of the paper.

Supply chain governance (SCG)

Although a significant part of governance literature gives special attention to control practices and role description in organizations, other theoretical approaches broaden the understanding of its concept (Rodrigues and Malo 2006). Cornforth (2003) suggests four theoretical perspectives through which the governance concept can be viewed: agency theory, stewardship theory and, transaction costs theory and resource dependence theory.

Agency theory postulates that companies in the supply chain have different interests; thus governance emerges as a set of practices to guarantee control and coordination of actions in the supply chain. Contracts are a way to provide guarantees to companies in supply chain and allow conformities on actions performed. Many times a way to achieve the supply chain’s business goals is through the provision of incentives. Power is also a crucial element in the supply chain and is important to guaranteeing control and performance of contractual arrangements in support of the business interests involved. We call the type of governance supported by agency theory contractual governance. With transaction cost theory the organization is seen as a governance structure serving as an instrument to minimize transaction costs. Different forms of organizations are offered that aim to minimize the effects of bounded rationality and safeguard transactions against brokers’ opportunism. Transaction costs are influenced and established according to the complexity and codification of each operation. We refer to the type of governance suggested by Transaction Cost Theory as transactional governance.

In resource dependency theory organizations rely strongly on the external environment to survive, in particular with other SC business’ partners. In this context governance is a set of practices to develop a relationship with this environment aiming to attain all resources and necessary information to ensure the organization’s survival. Therefore, the characteristics of suppliers with their capacities, qualifications and flexibility take on an important role, once we analyze the SCG. Lastly, stewardship theory supposes that different partners in the supply chain may be seen as allies with common interest. In order for this to happen business partners in the supply chain must trust one another, cooperate, be integrated and committed, collaborating to achieve the supply chain’s goal. Both resource dependency theory and stewardship theory point to what we call relational governance.

Supply chain performance (SCP)

Companies seeking to achieve predetermined goals, being economics or not, through the optimization of available resources in organizations. The performance is typically associated with terms like success, effectiveness, utility maximization, and productivity improvements. These expressions at the same time demonstrate the multiplicity of views on the concepts and problems in finding a consensus on what can be considered as performance (Schiehll and Morissette 2000). According to Qureshi and Bapuji (2006) is a topic with many studies covering
a range of disciplines, but with little agreement on definitions and approaches, considered as a construct with multiple dimensions, such as its application in the area of supply chain.

In this area there are a number of performance indicators, but a lack of consensus on what determines the performance of these supply chains (Aramyan et al. 2006). The debate escalates from the fact that the performance can be defined and assessed in several ways, and some definitions and indicators are widely accepted (Claro 2004). This lack of consensus does not mean lack of relevance of the topic. Instead, Kanter and Brinkerhoff (1981) point out a number of reasons why performance evaluation is important: to predict whether the organization can achieve the desired goals; guide management decisions, identify any difficulties and to compare the performance of a period with that of prior periods for example.

Despite the ambiguity surrounding the issue, the construct of performance in the supply chain can not be ignored as an important research topic. According to Cameron (1986), in empirical terms, performance is usually the last dependent variable in organizational studies. With regard to the supply chain, SCP may be measured by assessing the company in relation to its largest and main competitors.

For Betts and Tadisina (2009), the SCP can be measured using metrics such as volume flexibility, scheduling flexibility, quality, cost, customer satisfaction, return on investment, profit as a percentage of sales and the present value. Flynn, Huo and Zhao (2010) highlighted increased sales, increased profits and increased return on investment as measures to assess organizational performance. For Zhang and Aramyan (2009) there is a relationship between the type of governance and performance in the supply chain, which can be measured by the efficiency, flexibility and responsiveness.

Research model and hypotheses

Noteworthy is the challenge to measure the SCP, for being a difficult task for researchers (Zhang and Aramyan 2009). There are studies analyzing the effect of supply chain management in SCP (Frohlich and Westbrook 2002, Hsu et al 2008). However, few studies have attempted to understand the effects on SCG (Ferguson et al 2005, Zhang and Aramyan 2009).

There are a great number of different performance indicators in supply chain, but a lack of consensus on what determines the performance of these supply chains, making the selection of performance measures a hard task (Aramyan et al. 2006). The debate escalates from the fact that the performance can be defined and assessed in several ways, with several definitions and performance indicators widely accepted (Claro 2004).

Thus, based on the Handbook for Research in Operations Management (Roth et al. 2008) and in studies on governance, SCP variables were established. The performance of the supply chain can be measured by using different indicators such as volume flexibility, global costs, return on investment and increased sales (Betts and Tadisina 2009, Aramyan and Zhang, 2009, Flynn et al. 2010). Moreover, some studies have a focus in supply chain and interorganizational relationships using more internal measures such as efficiency, product quality and quality of deliveries, for example. From these, we attempted to measure the SCP using measures from supply chain at all. We are not used internal measures from each company, but instead we used measures comparing the company with the main competitors to try to capture the performance of the supply chain and how SCG influence this indicator. Thus, the hypotheses of this study were established relating the SCG on SCP: Hypothesis 1 – SCG positively influences SCP; Hypothesis 2 – Contractual SCG positively influences SCP; Hypothesis 3 – Relational SCG
positively influences SCP and Hypothesis 4 – Transactional SCG positively influences SCP. Figure 1 represents the study’s hypotheses, and the elements comprising each of the SCG conceptions and SCP.

![Figure 1 - Research model and hypotheses](image)

**Method**

This study used qualitative (first step) and quantitative (second step) technics to assist the researcher in obtaining a better and a more in depth understanding of the phenomenon to be studied aiming to analyze the influence of SCG and its conceptions (contractual, relational and transactional) on SCP. The methodology utilized was the analysis of multiple case studies (Yin 2005) and survey (Scheuren 2004).

Theoretical research in the previous step was used as the basis of the case study protocol, which is designed to guide the researcher when collecting data for a case study (Yin 2005). In a case study, the protocol plays an important role in ensuring reliability, providing information so that the research, repeated under the same conditions, obtains the same results (Yin 2005). Thus, the protocol used in the case study was developed taking into account the elements of SCG and variables of SCP studied by the different authors mentioned in the literature review.

The data collection in the multiple case studies, were realized in depth interviews with supply chain executives from strategic levels. Interviews were held with the top supply chain executives in each company, individuals that have a lot of experience and have been working in the supply chain area for many years. We conducted the research in two large companies from important sectors of the Brazilian economy (automotive and manufacturing industries), each with two major suppliers that are of clear importance to the company. All interviews were recorded and transcribed. In this step, the interviews represented the main source for database research; thus content analysis is applied to examine the information obtained (Bardin 1977). A thematic analysis was utilized in this study; which consists of figuring out the core values that set the communication; whose presence or appearance frequency can mean something for the analytical goal chosen.

The interviews, which were taped and transcribed, lasted one hour and thirty minutes on average. Some characteristics of the respondents were taken into account, such as their length of time working with the supply chain, length of time at the current company and knowledge about the subject of the study. Another important feature of this research is that the companies all have a large and structured supply chain with hundreds of products and suppliers.

Categories were determined based on the (units’) core meanings, which were separated into three categories: final (three conceptions of SCG – contractual, relational and transactional –
and SCG and SCP), intermediate (SCG elements, SCG conceptions, SCP variables) and initial (definitions, uses and examples), which are presented in each case separately.

Thus, from the literature review and the qualitative step of the research, an initial data collection instrument was elaborated with 21 items related to the constructs: contractual SCG (4), relational SCG (7), transactional SCG (4) and SCP (6). After creating the research instrument, a pre-test was carried out before the questionnaire application over a larger sample called survey.

The research instrument elaborated from the multiple case studies with executives from strategic supply chain sector executives was then applied to large Brazilian companies. The methodology used was the survey (Scheuren, 2004) to identify the influence of SCG and its conceptions on SCP. The sample of this study is large sized companies and their suppliers that possess a wide and complex supply chain in Brazil. The focus of this research were managers in strategic level positions, such as, vice-president, director or functional area managers like, supply chain, logistics, commercial and operations, who hold a general view and deep understanding of the supply chain’s operation and the relationship with buyers and suppliers. The questionnaire was available and distributed to the companies using Internet based software. A few mechanisms were foreseen to augment response ratings, like the remittance of complementary information and a feedback e-mail for reinforcement.

The questionnaire was sent to executives from supply chain and logistics of the largest companies in Brazil and their suppliers. In total 197 questionnaires were returned and 185 were considered valid. The largest group of participants in the survey (57%) comprised executives occupying middle or higher administrative positions in their organizations. All executives selected hold a degree, mostly in Administration and Engineering. The 185 executives work in 121 different large sized companies from diverse and important Brazilian economic sectors. Most companies analyzed are from the automotive sector (19%) followed by white goods and electronics. More than half (55%) employ over 500 workers.

For the development of the pre-test in the quantitative stage the steps for instrument validation were utilized, as well as the constructs proposals from Koufteros (1999): instrument development, data collection, verification of the preliminary and final instrument authenticity based upon the measurement of the Corrected Item-Total Correlation (CITC) and Reliability Analysis (Cronbach’s alpha). Yet, the unidimensionality test was carried out via Exploratory Factor Analysis on the block.

In the survey, the process of refinement and validation of the final instrument followed the stages proposed by Koufteros (1999), and Koufteros et al. (2009). The data collected through the research instrument was organized and analysed with the assistance of IBM SPSS software, using multiple forms and descriptive procedures. For the structural model a structural equation format was used with the help of IBM SPSS AMOS software. Once the models were identified, statistics techniques were put in place to evaluate the research hypothesis.

Results

In the qualitative step all SCG elements were confirmed and validated by the interviewees in companies 1-6 with the exception of the element cooperation and opportunism, and new elements came up from the analysis. The contracts were separated by formal and informal. This finding is in accordance with Ferguson et al. (2005) that highlight the role of informal contracts in the interorganizational relations. Different studies were identified on cooperation, as a governance element in the supply chain (Henderson and Cool 2010). However, there is neither
consensus nor a definition over the element. Therefore, cooperation was not identified as a separate element in the relational SCG. This way, this item was eliminated from the model for being too close to the element collaboration.

The item opportunism was identified as being something negative and depreciative by the respondents, who believed in the possibility of this term to affect the interviewee’s answers and could change the understanding of this aspect. So, the respondents suggested altering the term opportunism to transparency in transaction amongst businesses in the supply chain. Lamming et al. (2001) says that opportunism cannot be seen as a fixed factor in transactions, for representing a risk to managers. Therefore, to avoid misunderstandings over this element and its influence over the answers from the executives, it was altered to transparency.

It was identified that the SCP is associated with gains and adding value to the company, its suppliers and buyers to improve the balanced and sustainable long-term results. All performance variables (overall cost, flexibility of volume, increased sales and return on investments) were confirmed. It is noteworthy that the overall costs were detailed, and so added more information about this variable with respect to transport, delivery and inventory costs. We found three new measures that were market share, return on sales and customer satisfaction. Customer satisfaction was highlighted in the cases, because the recognition of customers affects the performance of the company and its supply chain, which is in line with Betts and Tadisina (2009). The return on sales and market share have also been used in previous studies and can measure this construct (Green et al. 2012). Based upon the considerations from the qualitative stage, the model used to carry out the quantitative stage comprises 4 constructs and 25 items.

In the quantitative step the instrument derived from the qualitative stage was pre-tested (Malhotra 2006) with 30 executives from large sized Brazilian companies. Following Koufteros (1999) stages an analysis of the reliability (Cronbach’s alpha of constructs and the instrument; and CITC) and the exploratory convergent factor analysis were applied to refine the preliminary instrument. The ratings from the alpha of constructs and the instrument came above 0.6 considered satisfactory for investigatory research (Hair et al. 2006). Items with CITC below 0.3 were discarded as pointed out by Simsion (2007). This way, the items “informal contracts”, “Flexibility” and “consumer satisfaction” were eliminated. In the exploratory convergent factor analysis, the method for determining factors chosen was the Analysis of Main Components, as it uses the total item variables; and the Varimax orthogonal rotation method. The only item that presented rating below the recommended (0.5) according to Hair et al. (2006) was “Power” which was withdrawn from the instrument. Therefore, the instrument utilized in the research has 4 constructs and 21 items.

Keiser-Meyer-Olkin sample adequacy tests and Bartlett’s test of sphericity presented acceptable ratings, respectively 0.881 and significance level 0.00 indicating the existence of important correlations between items. Besides, the instrument’s reliability was confirmed, as the constructs (0.7 - 0.91) and instrument (0.92) showed Cronbach’s alpha above 0.7. The final sample was 185 cases, considered adequate to the use of confirmatory factorial analysis based on structural equation modelling (SEM).

The Measurement Model was validated by applying the AFC following the stages proposed by Koufteros (1999). Stages 1 and 2 instrument Development and Data Collection had been previously applied. Throughout the third stage proposed the measurement model must run through specific software for SEM (AMOS 21), thus define the measurement model with the constructs and respective items.
Convergent validity is the next step, that is, observation of the t ratings and the standardized factorial values. Ratings (t) must stay above |2| or |2.576| considered significant for levels 0.001 and the standardized factorial values over 0.5 seen as significant for levels 0.001. In all constructs values t were above the indicated ratings for significance 0.001 and standardized factorial values superior 0.5.

In the 4th stage to evaluate the adequacy of ratings and unidimensionality, standardized residual covariance and modification indexes were analysed. According to Koufteros (1999) standardized residual covariance ratings between the variables or items above |2.58| and modifying index higher than 12 deserve the researchers’ attention. As for the analysis of this parameters 4 variables were above the reference values and they were discarded from the model. With regards to the construct contractual SCG, the item incentives was withdrawn from the model for presenting a standardized residual covariance with items integration and capacities at 3.242 and 4.497, respectively. In the transactional SCG transparency was removed from the model for showing a standardized residual covariance rate of 3.395 with item relationship. In the relational SCG the item commitment reported rating above the suggested with item trust and therefore eliminated. Moreover, item relationship presented high ratings of modification indexes (14.285) with item transparency, so, in the measurement model it was eliminated.

In SCP construct were eliminated two items: increased sales and market share by modification indices showed high (24.587). The first was not perceived by executives as an element to be considered when it comes to SCP related to SCG. We can inferred that it is included in item return on sales that was confirmed by respondents and identified in the literature (Green et al. 2012). Furthermore, the item market share was also not confirmed in the analysis and with the elimination of the item customer satisfaction survey in the pre-test, it can be inferred that executives didn’t identified the aspects of market (Betts and Tadisina, 2009; Green et al. 2012) as related to the SCG.

After this stage, six items were eliminated, resulting 15 items and 4 constructs in the revised measurement model. So, in stage 5 (discriminat validity) computation of the relation between the average variance extracted (AVE) and the square of the correlation between the factors were taken. All values were according the recommendation. The stage 6, reliability of the constructs, AVE was calculated and composite reliability of each construct. All values were above 0.5 for the AVE and above 0.7 for composite reliability showing reliability of the measurement model. Also, based upon the revised measurement model the adjustment indexes were calculated. All values are considered accepted. We can observe the final measurement model with the indexes in Table 1.

Finally, step 7 of Koufteros (1999) a structural model is tested. Due to the identification of a high correlation between the constructs contractual and relational governance (0.65), between the transactional and contractual governance (0.54), and between the transactional and relational governance (0.56) a possibility of the existence of a second order construct can be perceived, which may be called supply chain governance.

The structural model aims to specify the relation between variables and describe the quantity of explained variances. This kind of modelling allows a simultaneous estimate of a series of distinct multiple equations which are related midst them. According to Hair et al. (2006) the covariance either in the first order model or the second order one can be replaced by structural relationships, based on the theory and theoretical references used. So, the structural model involving variables from the first and second order is presented in Table 1 and the respective adjustment indexes.
Discussion and verification of the research’s hypothesis

In this section we will present the discussion of results and hypothesis confirmation or not. Hypothesis 2 – Contractual SCG positively influences SCP - was supported by the data and was statistically significant (0.28 at the 0.05 level). Control and coordination of activities are essential to achieve the performance facing changes over time. The control of processes in the supply chain is crucial to improve the performance and can be achieved, at least in part, through measures and indicators (Gunasekaran et al. 2004). The flexibility of contracts affects the performance of the supply chain, when there is asymmetric information, ie, when one party knows or knows of a relevant material fact that the other party is unaware (Macho-Stadler and Perez-Castrillo 2001). Thus, contracts can improve SCP, allowing a credible communication of essential information.

Hypothesis 3 – Relational SCG positively influences SCP – and Hypothesis 4 – Transactional SCG positively influences SCP – were not statistically supported and were not confirmed by the model. The identification that these governances not influence the SCP is related to the fact that these governances can be consolidated between the companies being aspects that organizations already working in their inter-relationships and their transactions with no effect on performance. As a positive significance was identified between contractual governance in relation to the performance with a lower level. It is inferred that analyze one part of the governance and verify their influence on other elements of the supply chain can result in a decreased ability of understanding and explanation of the phenomenon analyzed.

Finally, Hypothesis 1 – SCG positively influences SCP – was statistically significant (0.55 at the 0.001 level) and confirmed. We can infer that SCG, as presented, is a more comprehensive view of the supply chain focusing more strategic aspects (Cornforth 2003, Rodrigues and Malo 2006) and long-term inter-organizational relationships. Thus, SCG effect on SCP, primarily in the operational aspects with regard to global costs. In the financial, the SCG has a more influence on return on investments, because it is necessary control the activities, coordinate processes, reduce cost of transactions, minimize the opportunism, create a solid and long-term relationship, and have trust among the companies in supply chain. These aspects influence the global costs and the return on investments of companies in supply chain. So it is necessary to examined various elements together and not just an isolated item. This finding is in
agreement with Jain and Dubey (2005), pointing to governance as a means to analyze interorganizational relations as a multidimensional phenomenon manifested in the structures and processes of companies.

**Final Remarks**

The aim of this study analyze the influence of SCG and its conceptions on SCP were established to better comprehend the multidimensional phenomenon displayed in the structures and processes carried out by companies in supply chain. This subject has been considered an advance in the area relating supply chain management, as, according to Jain and Dubey (2005), it is less related with companies’ strategies and more with supply management. Furthermore, few studies have attempted to understand the effects of SCG on SCP (Ferguson et al 2005, Aramyan and Zhang 2009), which was achieved in this work.

The objective was reached through a combination of quantitative and qualitative methods. Qualitative technique was applied (in depth interviews and two case studies among Brazilian companies) in an investigatory procedure to identify and analyse the constructs and items to refine the research model.

The use of quantitative technique, through questionnaire survey in more than 120 businesses from different segments with relevance in the Brazil’s economy permitted confirmation of two hypotheses, validation of the research model and analysis of the main results. We found a positive influence of SCG on SCP, that is according to Li et al. (2006) that pointed out a positive relationship between the supply chain practices and company performance. Thus, it is identified that the influence of SCG in performance is perceived composed through the various elements that make up this type of governance.

One of the limitations in the study was the impossibility to generalize the results obtained due to a non-probabilistic sample approach. This model was derived from extensive bibliographic review. Very few works were found in the literature connecting to all constructs. This limitation was minimized by the completion of a qualitative stage to investigate and identify items that comprise each of the constructs and how they may be connected. This research makes a contribution by providing additional confirmation of the relationships between SCG and SCP. As further research we call for studies to analyse the phenomenon across time, making possible the identification of implications different technologies in SCG and its impact on SCP. It is possible to use the questionnaire in specific segments of the country’s economy to analyse which elements of SCG prevails in SCP.

**References**


