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**Supply chain management and its antecedents: An empirical investigation in  
Brazil**

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# **Supply chain management and its antecedents: An empirical investigation in Brazil**

## **Abstract**

This paper tests the impact of four dimensions - credibility, benevolence, top management support and internal relationship - on the supply chain management, using structural equation modeling and a sample of 103 companies that have operations in Brazil. Although measurement models for the constructs defined as antecedents proved to be appropriate, results did not support the literature, as the relationships were not statistically significant. A possible explanation for this is the Brazilian environment, where the relationship between chain members are still based on market negotiations and bargaining power, with a volatile and unstable demand.

**Keywords:** Supply chain management, structural equation modeling, Brazil

## **Introduction**

Supply chain management (SCM) as a discipline is still under consolidation. Only recently the most relevant constructs has been rigorously identified. The work of Chen and Paulraj (2004) has been influential in this respect. If we are still discussing how to comprehensively and rigorously define SCM, the debate about its antecedents is even more challenging. Mentzer *et al.* (2001) presented the concept of Supply Chain Orientation (SCO) as a multidimensional construct that precedes SCM, also considered as multidimensional. According to them, SCO is the internal recognition of the benefits one organization can achieve if it assigns efforts and resources to the common strategy. The main dimensions of the SCO are trust, commitment, interdependence, organizational compatibility, vision, key process leader and top management support.

An extensive review of the supply chain literature allows one to add other key aspects like internal relationships, customer focus, technology systems, and strategic purchasing.

Empirically, the relationship of these antecedents and SCM cannot be regarded as conclusive, especially due to non-probabilistic samples and the lack of an integrative framework. Another aspect is the geographic limitation of current research that focused on North American and European environments, leaving emergent countries under explored. In an era of globalization and an increasing participation of emerging economies in global supply chains, this is an important shortcoming. Mentzer *et al.* (2001) emphasized the need of further studies of the mentioned relationship across different cultures and different regions, as there is evidence of the influence of cultural, social and economic aspects of each country on the SCM.

Founded in extensive literature review, this paper proposed an integrative and parsimonious conceptual model of SCM and its antecedents. Four constructs were used to consolidate the literature on supply chain management antecedents: credibility, benevolence, top management support, and internal relationship. Credibility and benevolence are two dimensions of trust, frequently operationalized as unidimensional. SCM was also conceptualized as a multidimensional construct with four dimensions: information sharing, long term relationships, cooperation, and processes integration. The model was tested, using structural equation modeling in a sample of 103 Brazilian companies.

Although measurement models for the constructs defined as antecedents proved to be appropriate, results did not support the literature, as the relationships were not statistically significant. Possible explanation for this is the Brazilian environment, where the relationship between chain members are still based on market negotiations and

bargaining power, with a volatile and unstable demand. The measurement model for SCM proved successful, showing an acceptable fit.

The findings of this research contribute to SCM knowledge by investigating this strategy in an emergent economy as called by Mentzer *et al.* (2001, p. 20) and providing new insights for the SCM program. They also highlight the importance of researches in emergent countries to validate models and theories developed in U.S. and Europe.

This paper is structured as follows. Next section presents a literature review of SCM and its antecedents. Then we present our hypotheses and model to be tested and methodology used. Results are then discussed. A short conclusion section ends the article.

## **Literature review**

### *Supply chain management*

The evolution and the academic debate of SCM result in a discipline under development (Harland *et al.*, 2006), with no consensus about its definition or constructs (Burgess *et al.*, 2006; Chen and Paulraj, 2004; Mentzer *et al.*, 2001; Gibson *et al.*, 2005). The concept of supply chain management is still evolving from a process integration perspective, where different members of the same supply chain join efforts to coordinate specific business activities aiming to improve the final customer satisfaction (Cooper *et al.*, 1997) to a more recent systemic and strategic view, where firms assign resources and efforts in order to achieve a unique chain strategy that will lead to competitive advantage, lower costs and improved customer satisfaction (Mentzer *et al.*, 2001).

As defined by Mentzer *et al.* (2001, p. 18), SCM is *the systemic, strategic coordination of the traditional business functions and the tactics across these business*

*functions within a particular company and across businesses within the supply chain, for the purposes of improving the long term performance of the individual companies and the supply chain as a whole.*

Chen and Paulraj (2004) presented an SCM framework that encompassed three dimensions: supply network structure, characterized by strong linkages between members, low levels of vertical integration, non power based relationships; long-term relationships, managed with effective communication, cross-functional teams, early supplier involvement in crucial projects, planning processes; and logistics integration. Min and Mentzer (2004) represented SCM as a second order construct including agreed vision and goals, information sharing, risk and reward sharing, cooperation, agreed supply chain leadership, long term relationship and process integration. Consolidation of the proposals of these authors, taking also in account other influential contributions, suggested that key five constructs representing SCM are: information sharing, long-term relationship, risk and reward sharing, cooperation, and processes integration. This list was compared with 43 empirical papers published between 1996 and 2007 in the most important operations journals - POM, JOM and IJOPM (For the complete list of empirical studies, please contact the authors). Information sharing and cooperation were the dimensions most studied (33% each), followed by long-term relationship (23%) and process integration (19%). Risk and reward sharing was less studied (only 13%) and there was less commonality between the scales used to measure this construct. For this investigation, we decided to represent SCM as a second order construct with four first order dimensions: information sharing, long term relationship, cooperation and process integration. Information sharing is the continuous flow of communications between partners that occurs in a formal or informal way (Chen and Paulraj, 2004; Cooper *et al.*, 1997; Mentzer *et al.*, 2001). Long term relationship assumes that the members of the

supply chain are committed to the relationship investing in equipments and efforts in order to maintain the strategy (Cooper and Ellram, 1993; Dyer and Singh, 1998; Ganesan, 1994; Dwyer *et al.*, 1987); Cooperation means that all organizations are assigning complementary resources in order to develop and implement strategic projects or processes and to solve conflicts (Mentzer *et al.*, 2001; Cooper *et al.*, 1997; Chen and Paulraj, 2004). Process integration considers that organizations will work together in order to have a continuous and efficient flow of materials and resources (Cooper *et al.*, 1997; Chen and Paulraj, 2004; Mentzer *et al.*, 2001).

#### *Supply chain management antecedents*

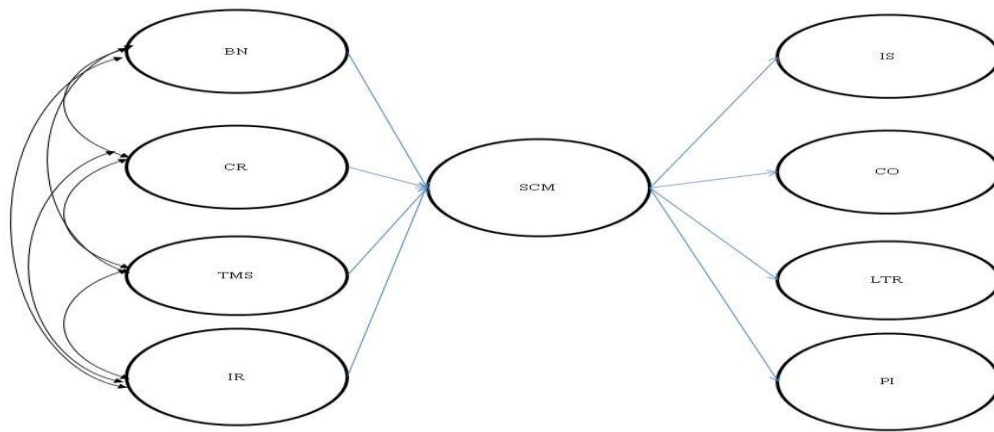
The supply chain management is a strategy adopted by different members of the same supply chain as discussed before. However, in order to be engaged, each firm should have some internal features that will enable the practice. The list of these antecedents is also under development and its relationship with SCM is still not conclusive.

One of the most important researches about these features presents the antecedents of SCM as a multidimensional construct called supply chain orientation (SCO). According to Mentzer *et al.* (2001), SCO is the internal recognition of the benefits one organization can achieve if it assigns efforts and resources to the common strategy. The main dimensions of the SCO are trust, commitment, interdependence, organizational compatibility, vision, key process leader and top management support (Mentzer *et al.*, 2001). On the other hand, the majority of researches studies independent aspects that precede SCM, like trust, commitment, internal relationship and top management support (Wisner *et al.*, 2005; Lambert *et al.*, 1998; Tracey *et al.*, 2004; Carr and Smeltzer, 1999; Chen and Paulraj, 2004; Chen *et al.*, 2004; Wisner, 2003).

As in the previous section, one analysis of the recent empirical researches was performed in order to identify the most studied aspects that foster SCM. The final outcome list encompasses credibility and benevolence (two dimensions of trust), top management support and internal relationship. Credibility is related to the perception that the partner has the necessary experience to perform his activity effectively and is reliable. Benevolence is the belief that the partner will continue to act in accordance to informal agreement despite short term dislocations and will not take any decisions that might affect negatively the firm (Min and Mentzer, 2004; Johnston *et al.*, 2004). Top management support considers that the leadership recognizes the importance and benefits of the strategy and works directly on the relationship development, assigning people and resources to its implementation (Min and Mentzer, 2004, Chen and Paulraj, 2004). Internal relationship means that the company has an internal collaborative environment, with no “departmental silos”, where information is shared and goals are aligned (Wisner *et al.*, 2005; Tracey *et al.*, 2004; Germain and Iyer, 2006).

### **Conceptual model and hypotheses**

The proposed framework is presented in figure 1. It assumes that the antecedents of SCM, a multidimensional construct, are benevolence (BN), credibility (CR), top management support (TMS) and internal relationship (IR). Those dimensions are independent, but correlated. SCM is a second order construct that encompasses the first order dimensions of information sharing (IS), long term relationship (LTR), cooperation (CO) and processes integration (PI).



*Figure 1 – Proposed framework – SCM and its antecedents*

### *Credibility and benevolence and SCM*

According to the relational view (Dyer and Singh, 1998), trust acts as an informal safeguard that fosters jointly investments in interfirm asset specificity and long term relationships (Dyer, 1997; Dyer and Singh, 1998; Holcomb and Hitt, 2007). Empirically, there is evidence that trust promotes cooperation and information sharing (Johnston *et al.*, 2004; Fynes *et al.*, 2005; Kaufmann and Carter, 2006). As credibility and benevolence are two dimensions of trust, our first and second hypotheses are:

*H1: Credibility is one antecedent of the SCM implementation.*

*H2: Benevolence is one antecedent of the SCM implementation.*

### *Top management support and SCM*

The leadership is responsible for the strategic role of SCM and for the development of long term relationship (Carr and Pearson, 1999, Wisner, 2003; Chen and Paulraj, 2004) The top management promotes information sharing between organizations, assign efforts and resources to the chain strategy and align firm objectives to achieve chain benefits (Mentzer *et al.*, 2001; Tracey *et al.*, 2004). Our third hypothesis is:

*H3: Top management support is one antecedent of the SCM implementation.*

### *Internal relationship and SCM*

One internal collaborative environment depends on frequent information sharing between functional areas, cross functional teams and objectives alignment between departments (Wisner *et al.*, 2005; Tracey *et al.*, 2004; Lee *et al.*, 2007). The absence of departmental silos fosters information sharing and cooperation between organizations and precedes the continuous flow of material and information within the chain (Tracey *et al.*, 2004; Carr and Kaynak, 2007). The last hypothesis is:

*H4: Internal relationship is one antecedent of the SCM implementation.*

### **Methodology**

A survey research design was used to collect data for the scale development. The items tapping the theoretical constructs were developed based on extensive literature review of the recent empirical studies in the area of supply chain management and were reviewed with academics in order to reduce the list to four questions per construct, in order to increase the scale reliability (Malhotra and Grover, 1998; Forza, 2002). Each construct was measured on a five-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (5).

A pre-test was performed with 27 respondents to identify problems of questions understanding, clarity and ambiguity and to assess measurement reliability (Forza, 2002). Final instrument was then refined and questionnaire was sent to final samples. During the measurement model analysis, some of the constructs indicators were deleted (Appendix II). The final instrument was sent to a non-probabilistic sample of Brazilian companies drawn from the CEBRALOG directory, respondents in the personal network of the researches and students of executive logistics courses of FGV. From the 140

responses received, 103 were considered valid and complete responses. Despite the low number of responses, it was considered satisfactory for a statistical treatment of the data. The final sample was constituted for firms of more than 20 industries, with 89% of them with more than 100 employees and 31% with more than 2500; 88% of organizations with annual sales higher than US 10 million and 53% above US 75 million. 63% of respondents were managers or directors.

The samples answers were compared using ANOVA with results showing no evidence of bias being a problem. Normality tests were performed using kurtosis and skewness and no serious violation was detected.

Structural equation modeling (SEM) was used as the main statistical analysis tool in two stages: first for the measurement model, using confirmatory factor analysis and, secondly, to test the hypothesized relationships (Anderson and Gerbing, 1988).

The first stage of the measurement models analysis consisted of the unidimensionality, reliability and validity checks. Unidimensionality was assured by the literature review and item generation process and confirmed by the confirmatory factorial analysis. The reliability was assessed using Cronbach alpha values, which were all above 0.8 (Nunnally and Bernstein, 1994; Chen and Paulraj, 2004; Devellis, 2003). Convergent validity was assessed through the individual item loadings, while the discriminant validity by comparing these loadings with the average shared variance between two constructs (Hair *et al.*, 2005). Then confirmatory factorial analysis was used to verify the measurement models.

The next stage consisted in testing the relationships of the antecedents and SCM using the complete structural equation modeling. The method chosen for the estimations was the maximum likelihood ratio (ML) and the models were compared using multiple fit indexes in order to have a better understanding of the results (Anderson and Gerbing,

1988; Loehlin, 2004; Hair *et al.*, 2005; Kline, 2005; Shah and Goldstein, 2006). The overall model fit was analyzed through the use of the Chi-square test ( $\chi^2$ ) and the ratio of  $\chi^2$  and the degrees of freedom – DF. An alternative model fit, Tucker Lewis index – TLI, was used to compare alternative models and the comparative fit index (CFI) was used to compare the proposed model to baseline models. Root-mean-square error of approximation (RMSEA) was used to assess the model fit based on the population discrepancy. The SRMR (*Standardized Root Mean Square Residual*) compares the observed and expected correlations matrix. Finally, we also report AIC (*Akaike Information Criterion*), a predictive index, based on the whole population rather than the sample. AIC is also a parsimonious fit index better for simpler models, which can be used to compare different models that are not nested. Low values of AIC are evidence of good fit and these values should be lower than the ones for the independence and saturated models. Results are presented in figure 2 and table 1.

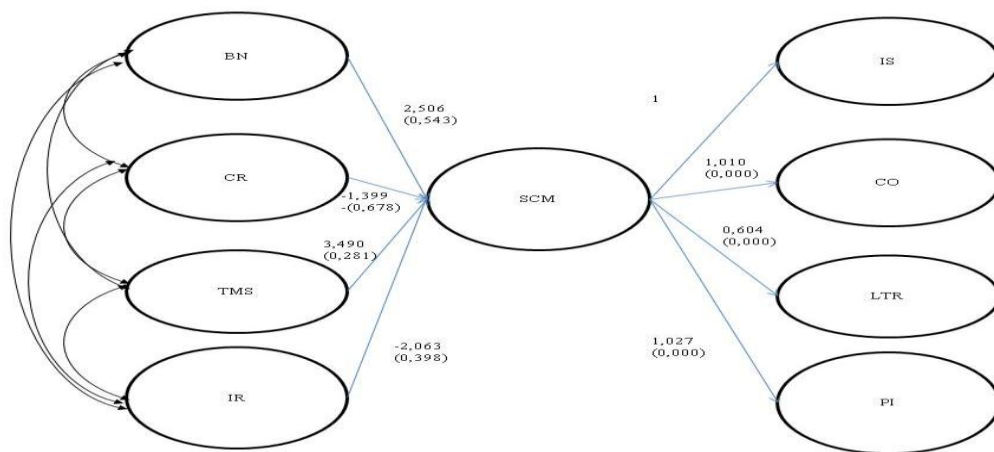


Figure 2 – Standardized results

The model's fit (Table 1) are not appropriate when compared to recommended value for most indices analyzed. Additionally all loads linking the studied antecedents

dimensions to supply chain management were not statistically significant at  $p < 0,001$  and in the expected directions as shown in figure 2. Therefore there is no evidence that H1 to H4 are valid.

### Discussion and hypotheses

Founded in previous empirical research, hypotheses H1 to H4 assumed a positive relationship between four independent dimensions and supply chain management as a multidimensional construct. Results for the present study, however, suggest that there is no evidence of the expected relationship. The main reason for the conflicting results is the sample. This is the first empirical research of the theme that is performed in Brazil, one emergent economy, with different cultural, economic and social characteristics.

*Table 1 – Fit indexes for structural equation model*

Fit indexes	Recommended values <sup>a</sup>	Antecedents → SCM
$\chi^2/DF$	< 3,0	444,390/285 =1,559
<i>p</i> -value	>0,05	0,000
RMSEA	< 0,08	0,074
TLI	>0,95	0,81
CFI	>0,90	0,92
SRMR	<0,10	0,054
AIC	< saturated and independence models	576,39
SRMR		702,00
SRMR		2388,79

According to Krishnan *et al.* (2006), trust (benevolence and credibility) is more important when there is interdependence between partners. It's also more relevant in stable and predictable environments, having lower effects in other situations. In Brazil, the relationship between suppliers and customers are still mostly based on market negotiation, although there is a perception of the benefits of jointly strategies (Vasconcelos *et al.*, 2005). Additionally, only recently the economy became stable, what could explain the secondary role of trust in the implementation of SCM. Other possible explanation is that the measurement scale considered trust between firms and not between individuals or in a situation. According to Palmatier *et al.* (2006), trust in individuals can be stronger than in organizations, fostering the SCM implementation. Ireland and Webb (2007) also emphasize that even when there is no credibility or benevolence between organizations, firms can realize the benefits of a jointly strategy and implement SCM. There are gains for all members of the chain, as weaker firms can achieve cost reduction, value increase or innovation capacity improvements (Crook and Combs, 2007).

The lack of relationship between internal relationship and the supply chain management also can be explained by the bargaining power. In dynamic markets, external relationship are promoted by the focus company prior to internal relationship (German and Iyer, 2006), although internal and external relationship are interrelated constructs, that can be implemented at the same time (Droge *et al.*, 2004; Gimenez and Ventura, 2005; Germain and Iyer, 2006).

Finally the absence of relationship between top management support and SCM can also be explained by the bargaining power. One additional explanation is that the leadership of the company is not involved directly in the coordination of the strategy.

## **Conclusions and direction for future researches**

This study contributes to and extends a growing research stream related to the antecedents of the supply chain management. Specifically we tested a measurement and integrative model of those antecedents (credibility, benevolence, top management support and internal relationship) and its relation to the SCM strategy as a multidimensional construct (information sharing, long term relationship, cooperation and process integration) in Brazil, an environment that was not studied before.

The relationships of benevolence, credibility, top management support and internal relationship to SCM were not confirmed. Although conflicting with previous empirical research, possible explanation for the results is the Brazilian environment, where the relationship between chain members are still based on market negotiations and bargaining power, with a volatile and unstable demand. The economic, cultural and social aspects of the Brazilian market differ from the American and European, where previous research has been done. The findings of this research contribute to SCM knowledge by investigating this strategy in an emergent economy as called by Mentzer *et al.* (2001, p. 20) and providing new insights for the SCM program. Therefore this paper provides new research questions to investigate. What are the antecedents of SCM in a country like Brazil? Why the studied dimensions are not relevant? Do the results apply to all industries? Do the results vary between Brazilian regions? Can they be broadened to South America countries?

Despite the relevance of the research, it is important to highlight its limitations. The small size of the sample and the use of non-probabilistic sample don't allow to generalize the results beyond the respondents. To increase the statistical power of the analysis, new researches should consider a larger sample. Additionally some of the antecedents of SCM and some constructs of SCM were not considered in the proposed

model due to the complexity of the questionnaire. New researches should include aspects like commitment, bargaining power, organizational compatibility, risk and return sharing and chain leadership to broad the SCM concept. New research also should consider the whole chain as the unit of analysis. It's also recommended a longitudinal study to confirm findings.

## **Appendix - Questionnaire**

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### Information sharing

IS1 We share information (financial, production, design, etc.) with our suppliers.

IS2 Exchange of information with our supplier (formal or informally) is frequent.

IS3 Any event or change that might affect the other party is immediately communicated to other.

IS4 Any information that might help the other party is provided for them.

### Long term relationship

LR1<sup>a</sup> The suppliers see our relationship as a long term alliance.

LR2 The relationship with this supplier is based on a long term project.

LT3 Both parties (this firm and its suppliers) foster the long term relationship based on cooperation.

LT4 We expect our relationship with this supplier to last a long time.

### Cooperation

CO1 Our key suppliers are involved in new processes and product development

CO2<sup>a</sup> There are meetings / conferences with our suppliers to discuss sales forecast and planning.

CO3 Both parties (this firm and its supplier) establish jointly objectives.

There are cross-functional teams with our suppliers for continuous  
CO4 improvement

#### Process integration

PI1 Interorganizational logistics activities are closely coordinated.

Our logistics activities are well integrated with the logistics activities of our  
PI2 suppliers.

Our distribution, warehousing and transport processes are integrated with  
PI3 our suppliers' processes.

PI4 The materials flow between organizations is effective.

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#### Credibility

We believe that this supplier will work hard in the future to maintain a close  
CR1 relationship with our company

CR2 Promises made by our suppliers are reliable

We feel that this supplier can be counted on to help us in emergence  
CR3<sup>a</sup> situations.

CR4 We feel that we can trust this supplier completely.

#### Benevolence

The important information shared with our supplier is not used in an  
BN1<sup>a</sup> opportunistic manner.

The more powerful party in the relationship restrains the use of power in  
BN2 attempting to get its way.

When making important decisions, our supplier is concerned about our  
BN3 welfare.

When we share our problems with our supplier, they respond with  
BN4 understanding.

### Top management support

TM1 Top management considers SCM to be a vital part of our corporate strategy.

TM2<sup>a</sup> Top management emphasizes the SCM function's strategic role.

TM3 There are exclusive resources assigned to relationship development.

TM4 Top management supports information sharing with our supplier.

### Internal relationship

IR1<sup>a</sup> Our work environment is cooperative.

The departments of our firm share useful information with other functions to

IR2 achieve firm goals.

The departments' goals of our firm are aligned in order to achieve a better

IR3 firm performance.

IR4 There are many conflicts between internal functions in our firm.

<sup>a</sup>Disregarded during purification process

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