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Supply Chain Management measurement and its influence on Operational Performance

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ABSTRACT: This paper empirically confirmed a positive relationship between Supply Chain Management (SCM) and operational performance. A measurement model of the SCM construct was developed. Operational performance was conceptualized using competitive priorities literature with four dimensions: cost, quality, flexibility and delivery. Structural equation modeling was used to analyze a sample of 103 companies, in Brazil. Results showed positive effects of SCM on all performance dimensions, offering further support for the cumulative capabilities perspective. We also found evidence of an operational competence construct mediating the effect of SCM on performance, supported conceptually by the resource-based and relational views of strategy.

Key words: supply chain management, performance, competitive priorities, resource-based view

INTRODUCTION

The Supply Chain Management (SCM) debate is central to the Operations Management field as demonstrated by the special issues of both Production and Operations Management Journal (POM) and International Journal of Operations & Production Management (IJOPM), in 2006, and the Journal of Operations Management (JOM), in 2007. It faces, however, two important and related challenges: its theoretical development is still at early stages and it lacks full empirical evidence of its benefits.

On the theoretical development, Harland et al. (2006) demonstrated that SCM is still an emerging discipline and there is no consensus about its definition and constructs resulting in a fragmented literature, with difficulties in knowledge advance (Burgess, Singh, & Koroglu, 2006; Chen & Paulraj 2004; Mentzer et al. 2001: Gibson, Mentzer, & Cook, 2005).

On the other hand the relationship of SCM with performance cannot be regarded as conclusive (Cousins, Lawson, & Squire, 2006). Despite the increase of empirical research in the last decade, important differences in research design undermine comparability: lack of consensus about the definition and dimensionality of the SCM construct, use of different units of analysis, and different approaches to performance measurement. In addition, most studies used nonprobabilistic samples, mainly of American and European companies, limiting generalization to emerging economies.

There is large evidence that cultural, social and economic aspects of each country do influence the link between SCM and performance (Harland, 1997; Mentzer et al., 2001; Kaufmann & Carter 2006). The effort to achieve generalization of the causal relationship between SCM and performance calls for empirical confirmation in diverse environments, especially emerging economies.

This paper contributes to the debate by testing the relationship between SCM and operational performance in a sample of 103 Brazilian companies. A positive and statistically significant relationship was found between SCM and all dimensions of operational performance. The research design and setting offered specific contributions to the existing body of literature. First, a parsimonious, yet integrative measurement of SCM as a second order construct with four dimensions was developed. Second, operational performance was measured using the competitive priorities and cumulative capabilities literature integrating two important streams of operations management: operations strategy and supply chain management. This approach covered performance with a broader perspective and allowed an evaluation of the existence or not of trade-offs in the impacts of supply chain. The results offered further support for the cumulative capabilities perspective. Third, building on the operations strategy and resource-based view literature the analysis supported the existence of a general operational competence mediating the relationship between supply chain management and the several dimensions of operational performance. Fourth, Brazil, being one of the largest emerging economies, offered an interesting setting for the continued effort of generalization given the late industrialization of the country, the recent opening of the economy to international trade, and its specific cultural characteristics.

This paper is structured as follows. In the next three sections we review the supply chain construct literature that supports our proposal, the theoretical and empirical relationships between SCM and performance, and the measurement of operational performance. Next, we present our hypotheses and models to be tested. Results are then discussed. A short conclusions section ends the article.

THEORY AND HYPOTHESES

The Supply Chain Management Construct

Supply Chain Management, in its essence, assumes that firms set up alliances with members of the same chain to improve its competitive advantage revealed by superior operational performance of all chain members. Influenced by many different fields like purchasing and logistics, the concept of SCM evolved from a process integration perspective to a more recent systemic and strategic view. In the process integration perspective, different members of the same supply chain join efforts to coordinate specific business activities to improve final customer satisfaction (Cooper, Lambert & Pagh, 1997). In the systemic and strategic view, firms assign resources and efforts to achieve a unique chain strategy that will lead to competitive advantage through lower costs and improved customer satisfaction (Mentzer et al., 2001).

The academic debate over the last 20 or more years contributed to develop the SCM understanding and its relevance to firm strategy. However, it also produced a fragmented literature, lacking commonly accepted frameworks and clear constructs, undermining knowledge advancement (Burgess et al., 2006; Chen & Paulraj 2004; Cousins et al., 2006; Harland et al. 2006).

The term Supply Chain Management applies to the collaborative relationships of members of different echelons of the supply chain and refers to common and agreed practices performed jointly by two or more organizations. Mentzer et al. (2001) highlighted the importance to distinguish between SCM and its antecedents. Before SCM can be developed, the supply chain members must first have specific behaviors, called supply chain orientation (SCO), like trust, commitment, common vision and goals or top management support. SCO and SCM concepts are two related but different concepts. SCO relates to the firm and precedes SCM that, in its turn, should be applied to a collection of firms, forming a chain (Min & Mentzer 2004).

In adopting the SCM, companies must carry out a consistent set of management practices. Two recent publications contributed to identify those key components of the SCM based on extensive literature review. 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, nonpower 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 both proposals and also taking in account other influential contributions suggested five constructs to represent SCM: information sharing, long-term relationship, risk and reward sharing, cooperation, and processes integration. Information sharing is the continuous flow of communications between partners that occurs in a formal or informal way and contributes for a better planning and control within the chain (Chen & Paulraj, 2004; Cooper et al., 1997; Mentzer et al., 2001). Long-term relationship assumes the members of the supply chain are committed to the relationship by investing in equipments and efforts to preserve the strategy (Cooper & Ellram, 1993; Dyer & Singh, 1998; Dwyer, Schurr, & Oh, 1987; Ganesan,1994). Risk and reward sharing is based on a win-win relationship (nonpower), where organizations share investments on assets, project costs and profits and losses (Chen & Paulraj, 2004; Cooper & Ellram, 1993; Mentzer et al., 2001). Cooperation means that all organizations are assigning complementary resources to develop and implement strategic projects or processes and to solve conflicts (Chen & Paulraj, 2004; Cooper et al., 1997; Mentzer et al., 2001); Process integration considers that organizations will work together to have a continuous and efficient flow of materials and resources (Chen & Paulraj, 2004; Cooper et al., 1997; Mentzer et al., 2001).

These five constructs were then compared with 43 empirical papers published between 1996 and 2007 in important journals of operations management (POM, JOM, and IJOPM). This set of papers can be taken as a representation of recent relevant empirical research in the field. 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 (Details are available from the authors). 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.

The Impact of Supply Chain Management on Performance

The literature of SCM was born on its practical positive impact on firm performance. Early research used to report anecdotal evidence about firms that had adopted the supply chain management approach and how this resulted in benefits for the firm and other supply chain members. Great part of this literature was descriptive, reporting practices of successful companies. The development of the SCM field was largely practitioner-led with theory following (Voss, Tsikriktsis, & Frohlich, 2002).

Burgess, Singh and Koroglu (2006) reviewed the most often used theoretical perspectives in the SCM literature, reporting that 20% of the articles had no discernible theory present. One of the relevant theoretical supports for the positive relation between SCM and performance is the resource-based view (RBV) and its extensions. The resource-based view (RBV) considers that firms are heterogeneous and achieve competitive advantage due to rare, valuable, inimitable and not substitutable resources and capabilities (Barney, 1991; Dierickx & Cool, 1989; Peteraf, 1993). The original approach of the RBV, focused on the internal resources owned by a firm, was broadened to consider the relationship as a source of competitive advantage. This gave rise to the Relational View (RV) (Dyer & Singh, 1998) integrating transaction cost theory (Williamson, 1985, 1996) and its critics (Zajac &Olsen, 1993). The RV considers relationships as potential sources of superior performance. It identifies four different sources of relational rents: investments in relation specific assets, substantial knowledge exchange, complementary and rare resources, and lower transaction costs. All these sources are influenced by more effective governance mechanisms based on informal safeguards, such as trust and reputation (Dyer, 1996, 1997; Dyer & Singh, 1998; Holcomb & Hitt, 2007; Rungtusanatham, Salvador, Forza, & Choi, 2003). As in the RBV perspective, the relational resources and capabilities should be rare, valuable, hard to imitate or to substitute in order to provide sustainable competitive advantage.

The positive impact of SCM in performance can be better understood if we interpret its constructs using the relational view. Information sharing maps directly into knowledge exchange. Long-term relationships can help to reduce transaction costs through the development of trust and reputation (Cooper et al., 1997; Mentzer et al., 2001). It also can contribute to developing knowledge exchange and assure investments in specific assets. Cooperation and process integration can lead to development of both specific assets and complementary resources.

Only recently, empirical research has been trying to test the causal relationship between SCM and performance, especially in USA and Europe. However, large differences in research design undermine comparability and limit generalization. While some studies refer to SCM as a multidimensional construct (Chen & Paulraj, 2004; Mentzer et al., 2001), others consider only some particular dimension, like cooperation or long-term relationship or assume SCM is an unidimensional construct (Wisner, 2003). Studies also differ in term of unit of analysis: the whole chain (Min & Mentzer, 2004; Wisner, 2003), the buyer-seller relationship (Carr &Pearson, 1999, Narasimham & Das, 2001) or manufacturing and distributor dyad (Griffith, Harvey, & Lusch, 2006). Finally, there is no consensus on how to define and measure performance.

While several studies found a positive relationship between SCM and performance (Carr & Kaynak, 2007; Chen, Paulraj, & Lado, 2004; Cousins & Menguc, 2006; Droge, Jayaram, & Vickery, 2004; Fynes, Voss, & Búrca, 2005; Gimenez & Ventura, 2005; Johnston, McCutcheon, Stuart, & Kerwood, 2004; Kaufmann & Carter, 2006; Narasimham & Das, 2001; Salvador, Forza, Rungtusanatham, & Choi, 2001; Shin et al., 2000; Vickery Jayaram, Droge, & Calantone, 2003; Wisner, 2003), others were not conclusive. Weak support for the impact of cooperation on flexibility and delivery (Fynes et al., 2005; Vereecke & Muylle, 2006) and of information sharing on overall operational performance (Krause, Handfield, & Tyler, 2007) are examples of conflicting results.

Competitive priorities and operational performance

The competitive priorities literature (Ferdows & De Meyer, 1990; Ward et al., 1998) in Operations Strategy can offer a useful approach to measure operational performance.

The idea of competitive priorities has its roots in the trade-off approach (Skinner, 1969, 1974), according to which a manufacturing operation cannot perform in all dimensions and has to define priorities, therefore the term competitive and the concept of focused factory proposed by Skinner (1974). The most basic competitive priorities were cost, quality, flexibility and delivery (Boyer & Lewis 2002; Ward et al., 1998), but Leong, Snyder, and War (1990) introduced a fifth, innovativeness, less explored in empirical studies with few exceptions (Vickery, Dröge, & Markland, 1997).

The relationship between these competitive priorities is still subjected to debate within the operations management literature. Three approaches can be identified: the trade-off, cumulative, and integrative models (Boyer & Lewis 2002). The trade-off perspective takes the position that often a better performance in one dimension comes at the expense of another dimension where the operation will inherently have a lower performance. Since resources are scarce, management would need to prioritize and choose where to focus time and energy. This would inevitably cause a lower performance in dimensions not so critically prioritized. The trade-off concept and the related focused factory solution to it were originally proposed by the seminal papers of Skinner (Skinner, 1969, 1974) and found some support in recent empirical papers (Boyer & Lewis, 2002). The cumulative perspective considers the competitive priorities complementary rather than mutually exclusive. With intense and global competition with the help of advanced manufacturing technologies companies need to excel in all dimensions, breaking the trade-offs (Corbett & Wassenhove, 1993). In fact, a stream of this literature attempts to identify a specific sequence of development of capabilities like the "sand cone model" (Ferdows & De Meyer, 1990), but there is much debate about this sequence (Flynn & Flynn, 2004; Noble, 1995; Rosenzweig & Roth, 2004). The integrative perspective attempts to explain the existence of both models. Hayes and Pisano (1996), drawing from the then emergent resource-based view of strategy, differentiated between first-order effects (those that affect the firm today) and second-order ones that relate to the consequence of capabilities the firm will develop dynamically. The trade off does not need to be present when this dynamic approach is considered since simultaneous improvement in several priorities is possible over time due to the development of capabilities. Schmenner and Swink (1998) added the concepts of operating and asset frontiers. They argued that while trade off might exist for companies that are operating at the asset frontier, for plants where the operating frontier did not reach yet the limits of the asset frontier simultaneous improvement is priorities was possible.

The competitive priorities framework can also be thought as way to conceptualize and measure operational performance, or even competitiveness. Improvements in performance can manifest themselves in different aspects like inventory reduction, lead time reduction or quality improvement. Grouping these types of improvements under the broader classes of competitive priorities as cost, quality, delivery and time can be a useful measurement approach allowing comparability, comprehensiveness and theoretical underpinning. The different priorities can be taken as different performance dimensions. Vickery et al. (1997) used a similar approach, but called these as dimensions of manufacturing strength. If the performance in each dimension is driven by a specific capability associated with this dimension the question whether what is being measured is the performance or the level of the capability is more semantic than practical.

In this paper, we measured the operational performance in each priority by asking respondents how they compare their performance with their competitors. Each of these competitive priorities was treated as latent construct and several items were used to tap this construct.

The effect of supply chain management was then evaluated in each of these operational performance dimensions. Simultaneous positive effect in several dimensions is an indication of the lack of trade-offs and further evidence in support for the cumulative capabilities perspective.

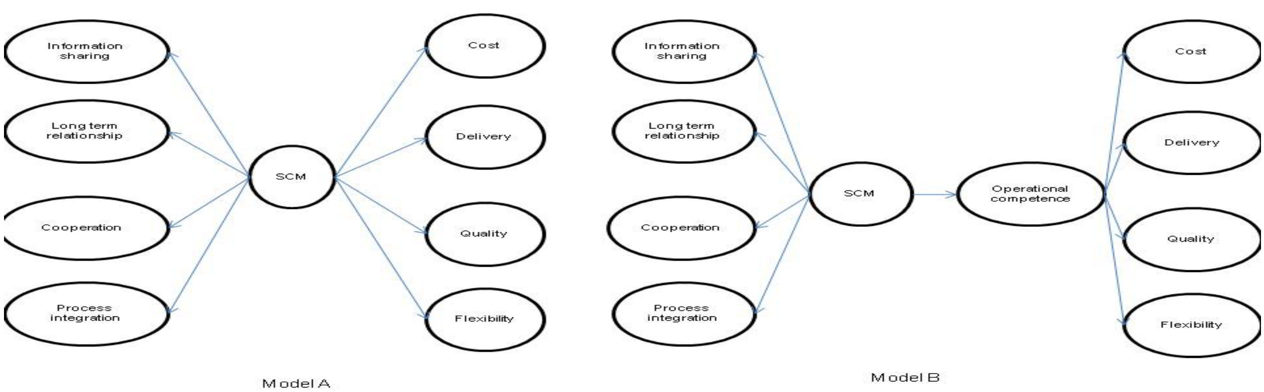
At conceptual level, one can ask whether the performance in these different operational dimensions is caused by the development of a generic, encompassing operational capability. This second order construct would manifest itself in each of the operational dimensions or specific operational capabilities associated to the priorities. Vickery (1991) suggested a similar approach, but as a formative construct where the several dimensions would be combined into this second order construct. The existence of this second order construct was supported by data and is offers further support for the cumulative model.

Research model and hypotheses

The proposed models are presented in Figure 1. Both models assume SCM as a multidimensional construct that has a positive influence on the different competitive priorities. Model B also tests this relationship mediated by another construct, called operational competence.

The positive impact of SCM on operational performance can manifest itself in all dimensions. Cooperation, process integration, long term relationship, information sharing allow processes improvement and inventories and lead time reduction (Cooper et al., 1997; Cooper & Ellram, 1993; Bechtel & Jayaram, 1997; Mentzer et al., 2001). The information sharing reduces uncertainty in the whole chain, resulting in better planning and control processes (Lee et al., 1997). Cooperation and processes integration between members of the same chain result in cost and time reduction and quality and flexibility improvements, as each organization can focus on its core competencies (Jarillo 1988) and an effective governance mechanism is chosen (Grover & Malhotra 2003). Empirically, it has been shown that cooperation and long-term relationship have positive effect on quality and delivery (Dyer, 1996; Shin et al., 2000) as well as in time reduction (Salvador et al., 2001; Vickery et al., 2003). External integration also results in time improvements, as processes design, development and improvements are developed simultaneously (Droge et al., 2004). Min and Mentzer (2004) also concluded that SCM as a multidimensional construct impacts the firm performance as a whole.

FIGURE 1: Proposed Models



If these effects create resources that are valuable, rare and costly to imitate, firms will have sustained better performance than their competitors in the several dimensions.

Therefore, our research hypotheses are:

Hypothesis 1. Supply chain management is positively related to cost performance.

Hypothesis 2. Supply chain management is positively related to quality performance.

Hypothesis 3. Supply chain management is positively related to delivery performance.

Hypothesis 4.Supply chain management is positively related to flexibility performance.

Because at conceptual level, the performance in these different operational dimensions could be caused by the development of a generic, encompassing operational capability, influenced by other initiatives beyond SCM, a fifth hypothesis is proposed:

Hypothesis 5. Operational competence mediates the relationship between supply chain management and the different competitive priorities.

METHOD

A survey research design was then used to collect data for the scale development. Items scales were developed based on extensive literature review of the recent empirical studies in supply chain management. These items were reviewed with academics to reduce the list to four to six questions for each construct (Nunnally & Bernstein, 1994). Constructs related to SCM were measured on a five-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (5). For the operational performance scales, the respondents were asked to evaluate their performance compared to their competitors, with a five-point scale ranging from much worse (1) to much better (5). Before sending the questionnaire to the final sample, a pretest was performed to identify problems of questions understanding, clarity and ambiguity and to assess measurement reliability (Forza, 2002). The refined questionnaire (Appendix I) was made available to respondents in a specific site on internet, with access limited by password and computer and IP control.

A convenience sample of Brazilian companies was used. Although the use of non probabilistic sample is a limitation that does not support generalization, it can be used when the respondents are difficult to access and to assure that respondents were qualified to answer the questionnaire properly (Freitas, Oliveira, Saccol & Moscarola, 2000; Yu & Cooper, 1983). Therefore the companies selected were drawn from the CEBRALOG (Centro Brasileiro de Aperfeiçoamento Logístico) directory and from the FGVCELog (Centro de Excelência Logística), as well as some of personal network of the researchers. In total, 140 responses were obtained, 103 considered valid and complete. The final sample consisted of firms from more than twenty industries, with no predominance of any sector. Most relevant sample characteristics are: 89% of the firms had more than 100 employees and 31% more than 2500, annual sales were mainly above U$ 30 million, and 63% of the respondents were managers and directors. Answers of different samples and the first and second rounds of response wave were compared using ANOVA with results showing no evidence of bias. “Annual sales” was used as variable control. Four samples were identified among the respondents: Small firms with annual sales bellow U$ 5,5 million, Small to Medium firms, with annual sales between U$ 5,5 million and U$ 31 million, Medium to Large firms, with annual sales between US31 million and US80 million and Large companies with annual sales above U$ 80 million. Answers of the four groups were compared using ANOVA, with no evidence to reject the hypothesis of equal means in four samples. “Annual sales” was used as variable control. Four samples were identified among the respondents: Small firms with annual sales bellow U$ 5,5 million, Small to Medium firms, with annual sales between U$ 5,5 million and U$ 31 million, Medium to Large firms, with annual sales between US31 million and US80 million and Large companies with annual sales above U$ 80 million. Answers of the four groups were compared using ANOVA, with no evidence to reject the hypothesis of equal means in four samples.

The multivariate normality was evaluated by skewness and kurtosis indexes for each item. The skewness coefficients varied from -0,95 a +0,24, while kurtosis varied from -0,96 e +0,95, suggesting there was no evidence of significant deviation from univariate normality (Kline 2005, p. 49,50).

RESULTS

Constructs and measurement model

Following the two steps approach proposed by Anderson and Gerbing (1988), SCM and the competitive priorities (cost, flexibility, quality and delivery) measurement models were first evaluated using confirmatory factor analysis. In a second stage, structural equation modeling was used to test the relationship between constructs.

The SCM measurement model was initially evaluated considering the four original dimensions (information sharing, long-term relationship, cooperation and processes integration), without the second order latent variable. This model presented a good fit. Following Brown (2006: 332), a second order construct (SCM) was then introduced, supported by the literature. The fit of this model was then compared with the original one. The second order model cannot present a better fit than the original one as it is more restrictive. Since the second order construct is supported by theory, if the difference between the models is not statistically significant, it cannot be rejected. The difference between the models was evaluated using the chi-square test. The results for the original model were chi-square = 84.52 (p = 0.130), RMSEA = 0.043, CFI = 0.988. The difference of chi-square was only 3.46, below the critical value for one degree of freedom (p = 0.05). Therefore there is no evidence the first order model is different from the second order at a significance level of 5%. The second order construct was then used for the structural model.

The operational performance model was tested with four constructs (cost, flexibility, quality and delivery). Fit was also acceptable as can be seen in Table 1, and correlations between latent variables were all positive and statistically significant, varying between 0.63 and 0.79 (except for flexibility and quality, which correlation was 0.43).

Reliability and validity

Reliability was assessed using Cronbach alpha values, which were all above 0.8 (DeVellis, 2003). Evidences of convergent validity were also present: high correlations for the items of the same constructs and individual loadings significant and positive, in the range of 0.65 to 0.93 (Bagozzi, Yi, & Phillips, 1991). Some constructs were highly correlated implying a threat to discriminant validity. However, because they are related to multidimensional constructs of second order, the discriminant validity is more difficult to assess (Schwab, 2005: 28, 34).

Model fit

Results for measurement structural equation models, estimated by maximum likelihood (ML) are presented in table 1.

Following Kline's (2005) we used a set of different fits indices and evaluated residuals and modification indices (Brown, 2006). The overall fit of the models was evaluated by the chi-square test . The higher its value and statistical significance, higher the discrepancy between proposed model and real data. The chi-square test for both measurement models were not significant, not providing any evidence the models could be rejected. The test in the structural equation models was significant, but this was expected due to sample size and number of degrees of freedom. As the ratios of chi-square and degrees of freedom were low, other fit indexes should be considered. RMSEA (*Root Mean Square Error of Approximation*) is a parsimonious index that corrects the model's complexity. The RMSEA estimates for the current study were all below 0.08, meaning a reasonable fit. RMSEA below 0.05 is an evidence of a good model (Hu and Bentler 1998, Kline 2005, p. 139). No model had a higher limit of RMSEA over 0.10, that would be an evidence of bad fit and all cases had a lower limit were below 0.05. Therefore, it is not possible to reject the models. CFI (*Comparative Fit Index*) was used to compare the proposed models to baseline models. CFI values near or higher than 0.9 represent a good indicator of model fit (Hair, Anderson, Tatham, & Black,1998; Hu & Bentler, 1998; Kline, 2005). The SRMR (*Standardized Root Mean Square Residual*) is one index that compares the observed and expected correlations matrix. Ideally, there should not be differences and this index should be zero. Values below 0.10 are acceptable (Hu & Bentler, 1998; Kline, 2005). All models had values below 0.10, evidence of a good fit. 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.

TABLE 1: Fit indices for the measurement and structural equations models

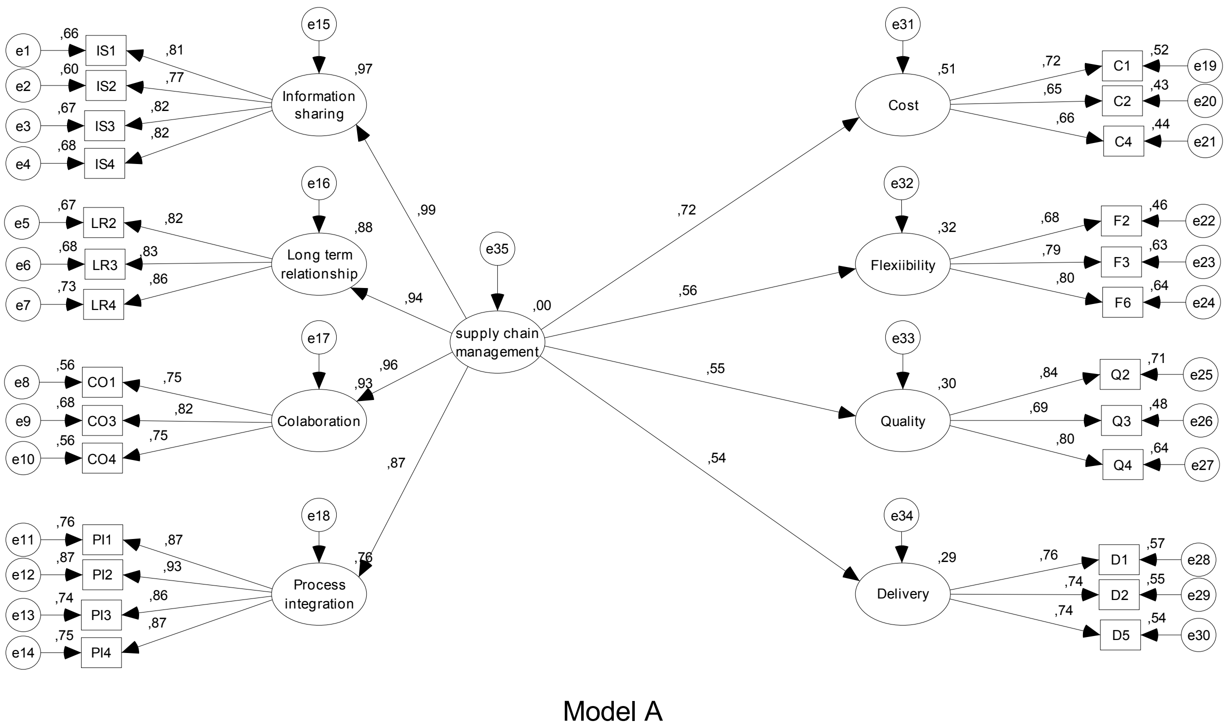
Indices	SCM Measurement Model	Operational performance measurement model	Model A	Model B	Recommended values [a]
χ^2	88.08	62.74	473.62	360.86	
Df	73	48	291	266	
χ^2/df	1.21	1.31	1.63	1.36	<3.0
p-value	0.110	0.075	0.000	0.000	>0.05
RMSEA	0.045	0.055	0.078	0.059	<0.080[a]
RMSEA (LO 90)	0.000	0.000	0.065	0.043	<0.050
RMSEA (HI 90)	0.076	0.090	0.091	0.074	<0.100
CFI	0.987	0.970	0.898	0.942	>0.90
SRMR	0.033	0.044	0.073	0.057	<0.10
AIC	152.08	122.74	593.61	478.86	< saturated and independence models
AIC sat. model	210.00	156.00	702.00	650.00	
AIC indep. model	1282.26	583.88	2164.12	1981.06	

[a] Kline (2005)

DISCUSSION

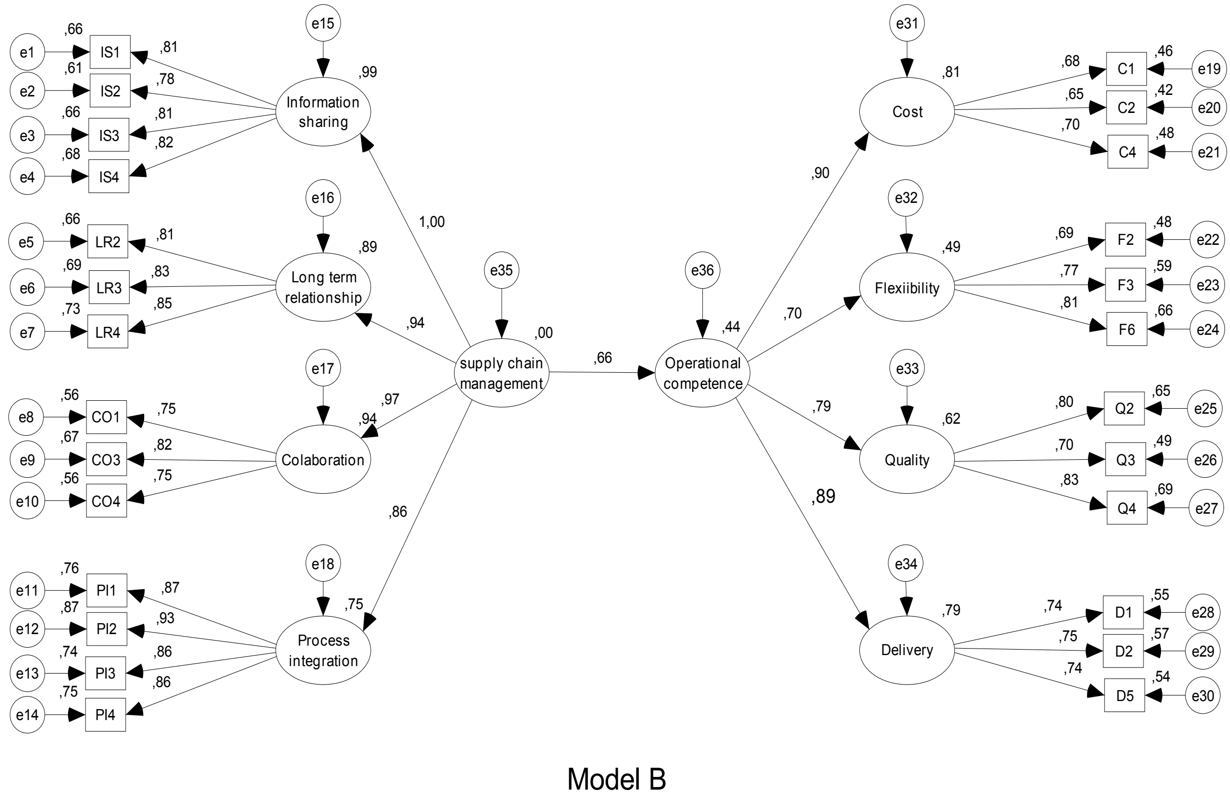
Hypotheses H1 to H4 affirm a positive relationship between SCM implementation and operational performance in terms of cost, flexibility, quality and delivery. The detailed analysis of model A is shown in Figure 2. Loads linking SCM to the four competitive priorities are positive (p-value < 0.001, t-test of 4.535 to 5.615), ranging from 0.54 for delivery to 0.72 for cost. These provided support for hypotheses H1 to H4 and signal the practical relevance of SCM to performance variability. For example, 51% of the observed variance in cost performance can be explained by the SCM variability. The results can also be seen as an empirical evidence of the absence of trade-offs, offering further support for the cumulative capabilities (Flynn & Flyn, 2004; Noble, 1995; Rozenzweig & Roth, 2004). From a managerial perspective, SCM can be thought as a source competitive advantage, reducing costs and improving flexibility, delivery and quality simultaneously.

FIGURE 2: Standardized results for model A



Hypothesis 5 asserted the existence of a construct mediating the relationship between SCM and the competitive priorities. Model B was used to test this hypothesis and results are shown in Figure 3. Following the idea of Ketchen and Hult (2007) and taking theoretical perspectives of the resource-based view (Barney, 1991; Peteraf, 1993) and relational view (Dyer & Singh, 1998), this construct can be seen as a resource that represents an integrated firm operational competence. It has positive impact in all competitive priorities, meaning the more competent the company is, the higher the performance in all these dimensions (cost, flexibility, quality and delivery). The high standardized loads between this construct and the dimensions of operational performance (between 0.70 and 0.90), all statistically significant (p-values < 0.001), provide strong support for the impact of this construct in the operational performance. SCM affects positively operational competence development as showed by the standardized load of 0.66 between these two construct (p-value < 0.001). The main difference from model A is that operational competence can be affected by other causes beyond SCM, which is expected if we take the resource-based perspective.

FIGURE 3: Standardized results for model B



Models A and B can be compared by examining the fit indices in Table 1. Model B presented a better fit in all criteria. The comparison of AIC values can be used to compare nonnested models and points out model B as a better fit for the data. This is a clear evidence of a mediator variable, providing support to H5. Also, introducing the operational competence construct improves the explanation of the percentage of variability in the competitive priorities. Taking cost as one example, 51% of its variability is explained by SCM in model A, while in model B, this value increases to 81%. As the operational competence construct is a result of different sources of performance influences. Lower AIC index is an additional support for preferring Model B against Model A.

CONCLUSIONS

This study is a contribution to the growing research stream trying to clarify the impact of supply chain management on performance. Specifically, we explored the impact of the supply chain management as a multidimensional construct (information sharing, long-term relationship, cooperation and process integration) on different competitive priorities (cost, flexibility, quality and time). The research setting was the emerging Brazilian economy, a less researched environment.

The empirical results provided evidence of a positive impact of SCM on operational performance, supporting previous empirical research and contributing to generalization (Hubbard, Vetter, & Little, 1998). Main contribution, however, resides on the integrative model that tested SCM a multidimensional construct and the use of the competitive priorities literature to conceptualize dimensions of operational performance. Previous studies have only partially studied this relationship, as they tested the impact of SCM as an unidimensional construct on a multidimensional operational performance (Fynes et al., 2005; Shin et al., 2000) or the impact of the SCM on different competitive priorities (Carr & Kaynak, 2007; Chen et al., 2004; Droge et al,. 2004; Germain & Iyer, 2006; Vickery et al., 2003). Findings suggested that SCM impacted positively the operational performance as a whole and all the competitive priorities, providing support for the cumulative capabilities perspective. We also found encouraging evidence for an operational competence construct mediating the relationship between SCM and the several dimensions of operational performance. This operational competence is influenced by SCM, but also by other factors. Drawing from the resource-based view, it can be thought to be an encompassing resource summarizing the impacts of several operational initiatives (among them SCM).

From a managerial perspective, results reinforce the importance of pursuing SCM in emerging economies and that it can be a source of competitive advantage leading to superior performance in all dimensions simultaneously. By providing further evidence for the cumulative capabilities perspective, it also suggests managers should recognize the pursuit of competitiveness in one dimension (for example, cost) does not need to be done at the expense of a lower performance in a related dimension.

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. Are there other key dimensions of SCM, such risk and reward sharing or common vision and goals, in a country like Brazil that affect performance? Do the dimensions studied also affect financial performance? Do the results vary between Brazilian regions? Can they be broadened to South America countries? One additional and important opportunity is to evaluate if the same results are accomplished if we considered the firm-customer instead of the buyer-supplier relationship.

Despite the contribution of this research, we need to reinforce its limitations: The small and non probabilistic sample avoids generalization of the results beyond the responses. New researches should consider the chain as the unit of analysis and new data to overcome the limitation of complete reliance on perceptual performance measures. The idea of the operational competence construct can be further explored conceptually and empirically.

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APPENDIX

Questionnaire

Scale: 1 Totally disagree; 2 Disagree; 3 Neutral; 4 Agree; 5 Totally agree

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 [a]	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[a]	There are meetings / conferences with our suppliers to discuss sales forecast and planning.
CO3	Both parties (this firm and its supplier) establish jointly objectives.
CO4	There are cross-functional teams with our suppliers for continuous improvement

Process integration

PI1	Interorganizational logistics activities are closely coordinated.
PI2	Our logistics activities are well integrated with the logistics activities of our suppliers.
PI3	Our distribution, warehousing and transport processes are integrated with our suppliers' processes.
PI4	The materials flow between organizations is effective.

Scale: 1 Much worse than average 2 Worse than average 3 In the average; 4 Better than average; 5 Much better than average

Cost

C2	Production cost.
C3	Inventory turnover.
C4[a]	Capacity utilization
C5	Productivity

Flexibility

F1[a]	Volume flexibility
F2	Process flexibility
F3	Customization flexibility
F4 [a]	New products into production flexibility.

F5[a]	Product mix
F6	Rapid capacity adjustments.
Quality	
Q1[a]	Product performance
Q2	Number of defects
Q3	Conformance to design specs
Q4	Number of customer´s complaints
Delivery	
D1	Delivery time
D2	On-time delivery
D3[a]	Production cycle time
D4[a]	New products time to market
D5	Time to solve customer complaints
D6[a]	Customer order processing time

[a]Discarded in the measurement model process

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