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Title: Supply Chain Management and Performance: A Conceptual Systematization of Terminology

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Supply Chain Management and Performance: A Conceptual Systematization of Terminology

Abstract

Over the last decade the concept of Supply Chain Management (SCM) has expanded and has become a key subject on Operations Management area. Therefore, a set of practices of SCM has been implemented worldwide often without having its real impact measured adequately. Thus, a significant set of recent research has sought to study the impact of these practices on business and operational performance. However, this task has been hampered by the diversity and lack of standardization of the nomenclature that characterize the SCM practices. In this context, this paper presents a conceptual systematization in the area, grouping 41 practices found in the SCM literature with different terminologies (but with similar meanings) in a set of 9 major concepts. Finally, the article reinforces the need for standardization of terminology and variables that compose the concepts of SCM practices, as well as points out demands for further researches in the area.

Keywords: Supply Chain Management practices, Business and Operational Performance, Terminology systematization

1. Introduction

The Supply Chain Management (SCM) theme has been increasingly discussed and has been of great relevance over the last years both in academic and business environments. Renowned periodicals in operations management, like the *Journal of Operations Management* and *International Journal of Operations & Production Management*, presented special editions about this subject between 2006 and 2008. Moreover, some studies revealed, for

example, that the strong attention paid to supply chain management to the inbound logistics is a key subject in big companies, especially in leading sectors of the area, such as automobile and electrical and electronic sectors. This procedure is capable of generating new competencies in productive processes and technologies, contributing to cost and time reduction during the development of new products (time-to-market) in the whole supply chain (por exemplo, PIRES, 1998; CARR e PEARSON, 1999).

All in all, recent works (BOZARTH *et al.*, 2009; CAI *et al.*, 2009; K *et al.*, 2009; LAWSON *et al.*, 2009; MARTIN e PATTERSON, 2009) have shown a clear interest in investigating the impact of SCM practices on business and operational performances. However, in spite of the successful application of studies about identification of associations between SCM practices and performance indicators, there was a great amount of practices used in these studies that show different nomenclatures. It results in a confused understanding of the fundamental concepts of the area. This fact reinforces the idea that SCM is a highly contemporary area in business management and that it is still in developing and, as a consequence, still lacking some systematization, as in its terminology (Pires, 2004). In this context, this paper presents a conceptual systematization comprehending the whole supply chain, grouping 41 practices found in the SCM literature with different nomenclatures (but with similar meanings) in a set of 9 major concepts.

The next section presents the methodological procedures for the theoretical referential analysis. At a later time, a theoretical review of the empirical studies that compared the supply chain management practices to performance is presented, as well as a taxonomy and a systematization of the used terms. Finally, the conclusions and suggestions for future works based on the limitations found in the analyzed studies are presented.

2. Research methodology

The method adopted by the authors for the bibliographical survey was the search of articles in the *Web of Science* database, which allows the access to works that were published in the most important international periodicals. Studies that empirically investigated the relation between SCM practices and business and operational performance were selected. By typing the Boolean expressions "*supply chain*" and "*performance*" in the *Web of Science* database, the results showed works published in very important periodicals on operations management area, such as: *Journal of Operations Management, Management Science, Operations Research, Decision Sciences, IEEE Transactions on Engineering Management, International Journal of Operations & Production Management, Supply Chain Management an International Journal, International Journal of Production Economics,* etc. At a later time, each article found between 1998 and 2009 was individually evaluated, collecting information on the objective of the study (specifically if it correlated SCM practices and performance), the concepts and variables it used, the method of data analysis and its main results. Twenty-one articles were revised altogether, and the study synthesis is presented in Table 1.

3. Theoretical basis: supply chain management and performance measurement

Beaumont (2005) states that the supply chain is an integrated process that involves from transformation of raw material in final product to customer delivery, being divided in at least four levels – suppliers, producers, distributors and customers. On this viewpoint, Pires (2004) reports that the SCM is a wider view of the traditional material management, now comprehending the whole supply chain – suppliers and customers of several levels – in a strategic and integrated way.

Table 1: Summary of articles used

Paper	Paper Objective	SCM Practices Concepts	Performance Concepts	Sample and Main Methods	Findings
Narasimhan e Jayaram (1998)	It investigates the key causal linkages in supply chain management.	(a) Strategic Outsourcing; (b) Supplier Capability	(a) Return on Production Assets; (b) Growth in Productivity; (c) Customer Responsiveness; (d) Quality; (e) cost; (f) Flexibility; (g) dependability.	2 15 / Structural Equation Modeling	The results support the notion that an integrated supply chain involves aligning sourcing decisions to achieve manufacturing goals that are set to respond favorably to the needs of customers.
Carr e Pearson (1999)	It examines a structural model of strategic purchasing and its influence on supplier evaluation systems, buyer–supplier relationships, and firm's financial performance.	(a) Supplier evaluation systems; (b) Buyer–supplier relationships; (c) Strategic purchasing.	(a) Firm's financial performance.	168 / Structural Equation Modeling	The supplier evaluation systems had a significant indirect relationship with financial performance, but it was not a significant direct relationship. The Strategic purchasing had a significant direct relationship with financial performance and a significant indirect relationship with financial performance
Carr e Smeltzer (1999)	It tests hypotheses on the relationship of strategic purchasing to supply chain management	(a) Level of Strategic Purchasing; (b) Supplier Responsiveness; (c) Supplier Communication; (d) Change in Supplier Market.	(a) Firm's performance.	739 / Regression analysis	The results indicate that strategic purchasing is positively related to supplier responsiveness, changes in the supplier market, supplier communication and the firm´s performance
De Toni e Nassimbeni (2000)	It examines the role of supplier development in establishing and managing efficient buyer-supplier operational links.	(a) Supplier development; (b) Operational link	(a) Unit cost of manufacturing; (b) Product and process quality; (c) Product delivery time.	52 / (a) Factor analysis; (b) Canonical correlation; (c) Discriminate analysis	The study demonstrates the connection existing between the operational and the supplier development practices of the buyer. This connection depends on the type of operational interaction.
Krause *et al.* (2000)	It examines the impact of supplier development strategies on performance.	(a) Direct involvement; (b) Supplier incentives; (c) Competitive pressure; (d) Supplier assessment.	(a) Performance improvement.	279 / Structural Equation Modeling	The supplier assessment and supplier incentives have a indirect impact on firm performance. Direct involvement has a direct impact on Supplier assessment.
Dong *et al.* (2001)	A model is developed and tested to determine whether the use of JIT purchasing reduces logistics costs for both suppliers and buyers.	(a) JIT Purchasing; (b) Supply chain integration; (c) Supplier JIT manufacturing	(a) Logistics costs	159 / Structural Equation Modeling	The results indicate that JIT purchasing directly reduces costs only for buyers. An indirect path, however, was found between JIT purchasing and logistics costs for suppliers
Narasimhan e Das (2001)	It explicates the concept of purchasing integration and examines its relationships with purchasing practices and manufacturing performance.	(a) Buyer-supplier relationship development; (b) Supply base leveraging; (c) Supplier performance evaluation	(a) Manufacturing cost reduction ; (b) Quality performance; (c)New product introduction time reduction performance; (d) delivery performance; (e) customization responsiveness performance	322 / Structural Equation Modeling	Purchasing integration was found to moderate the relationship between purchasing practices and manufacturing performance. Increased investments in purchasing integration were observed to lead to higher performance returns from investments in purchasing practices.

Continuation

Paper	Paper Objective	SCM Practices Concepts	Performance Concepts	Sample and Main Methods	Findings
Carr e Pearson (2002)	It developments hypotheses concerning purchasing/supplier involvement, strategic purchasing and firm's financial performance.	(a) Strategic purchasing ; (b) Purchasing/supplier involvement	(a) Firm's financial performance	159 / Structural Equation Modeling	Purchasing/supplier involvement has a positive impact on strategic purchasing, and strategic purchasing has a positive impact on firm's financial performance.
Kaynak (2002)	It investigates the relationships among JITP techniques and their relation to firm performance.	(a) Top Management Commitment; (b) Training; (c) Employee Relations; (d) Supplier Value Added; (e) Transportation; (f) Quantities Delivered.	(a) inventory management performance ; (b) time-based quality; (c) Firm Performance.	214 / Structural Equation Modeling	The finding that top management commitment to Just-in-time purchasing (JITP), is directly or indirectly related to other techniques of JITP underscores the importance of leadership in implementing change in organizations.
Narasimhan e Kim (2002)	It examines the effect of supply chain integration on the relationship between diversification and a firm's competitive performance	(a) Company's integration with suppliers; (b) Internal integration across the supply chain; (c) Company's integration with customers; (d) international market diversification; (e) product diversification.	(a) Firm performance.	623 / Regression analysis	By comparing the main and interaction effects of SCI and diversification on performance, the paper shows that SCI strategy modifies the relationship between diversification and performance. Additionally, it is argued that coordinated use of SCI and diversification strategies has a significant effect on firm performance
Vickery *et al.* (2003)	It examines the performance implications of an integrated supply chain strategy, with customer service performance followed by financial performance as performance constructs.	(a) Integrative Information Technologies; (b) Supply Chain Integration.	(a) Customer Service; (b) Financial Performance.	57 / Structural Equation Modeling	The results showed positive direct relationships between (1) integrated information technologies and supply chain integration, (2) supply chain integration and customer service, and (3) customer service and firm performance. The relationship of supply chain integration to financial performance was indirect, through customer service; i.e., customer service was found to fully (as opposed to partially) mediate the relationship between supply chain integration and firm performance for first tier suppliers in the automotive industry
Chen *et al.* (2004)	It argues that strategic purchasing can engender sustainable competitive advantage by enabling firms to: (a) foster close working relationships with a limited number of suppliers; (b) promote open communication among supply-chain partners; and (c) develop long-term strategic relationship orientation to achieve mutual gains	(a) strategic purchasing; (b) communication; (c) limited number of suppliers; (d) long-term strategic relationship orientation.	(a) customer responsiveness; (b) financial performance.	221 / Structural Equation Modeling	The results provide robust support for the links between strategic purchasing, supply management, customer responsiveness, and financial performance of the buying firm

Continuation

Paper	Paper Objective	SCM Practices Concepts	Performance Concepts	Sample and Main Methods	Findings
Tracey *et al.* (2004)	It tests the impact of supply-chain management (SCM) capabilities on business performance so as to determine to what degree customer-oriented SCM issues influence competitive position and organizational performance	(a) Outside-in capability; (b) Inside-out capability; (c) Spanning capability	(a) Perceived value; (b) Customer loyalty; (c) Market performance; (d) Financial performance	474 / Structural Equation Modeling	The results indicate significant positive relationships exist among three types of SCM capabilities (outside-in, inside-out, and spanning) and business performance (perceived customer value, customer loyalty, market performance, and financial performance
Kannan e Tan (2005)	It empirically examines the extent to which just in time, supply chain management, and quality management are correlated, and how they impact business performance.	(a) JIT 1: material flow; (b) JIT 2: commitment to JIT; (c) JIT 3: supply management; (d) TQM 1: product design; (e) TQM 2: strategic commitment to quality; (f) TQM 3: supplier capability; (g) SCM 1: supply chain integration; (h) SCM 2: supply chain coordination; (i) SCM 3: supply chain development; (j) SCM 4: information sharing	(a) *market share*; (b) Return on assets; (c) Product quality; (d) Competitiveness (e) Customer service.	556 / Factor analysis / Correlation analysis.	Results demonstrate that at both strategic and operational levels, linkages exist between how just in time, total quality management, and supply chain management are viewed by organizations as part of their operations strategy. Results also indicate that a commitment to quality and an understanding of supply chain dynamics have the greatest e5ect on performance
Lin *et al.* (2005)	It identifies through the use of empirical data collected from Taiwan and Hong Kong, the factors that influence supply chain quality management.	(a) Top management leadership; (b) Training; (c) Product/service design; (d) Supplier quality management; (e) Process management; (f) Quality data reporting; (g) Employee relations; (h) Customer relations; (i) Benchmarking learning; (j) Quality-oriented supplier selection; (k) Cost-oriented supplier selection.	(a) Satisfaction level; (b) Business results.	110 / Structural Equation Modeling	The data showed that Quality Management (QM) practices are significantly correlated with the supplier participation strategy and this influences tangible business results, and customer satisfaction levels. The data also showed that QM practices are significantly correlated with the supplier selection strategy. The empirical results presented could be used to improve the management of supply chain networks in the economies studied.
Fynes, Voss *et al.* (2005)	The purpose of this paper is to investigate how the dynamics of supply chain (SC) relationships impact on manufacturing performance	(a) Communication; (b) Co-operation; (c) Trust; (d) Adaptation.	(a) cost; (b) quality; (c) flexibility; (d) delivery.	200 / Structural Equation Modeling	There was mixed support for the impact of SC relationship dynamics on manufacturing performance. Hypotheses in respect of cost and quality were supported but those in respect of flexibility and delivery were not.
Li *et al.* (2006)	It conceptualizes and develops five dimensions of SCM practice and tests the relationships between SCM practices, competitive advantage, and organizational performance.	(a) customer relationship; (b) strategic supplier partnership; (c) level of information sharing; (d) quality of information sharing; (e) postponement.	(a) Market performance and Financial performance; (b) Quality; (c) Price/cost; (d) Delivery Dependability; (e) Product Innovation; (f) Time to Market.	196 / Structural Equation Modeling	The results indicate that higher levels of SCM practice can lead to enhanced competitive advantage and improved organizational performance. Also, competitive advantage can have a direct, positive impact on organizational performance.

Continuation

Paper	Paper Objective	SCM Practices Concepts	Performance Concepts	Sample and Main Methods	Findings
Paulraj *et al.* (2006)	In this study, the effect of strategic purchasing on buyer performance are examined based on not only financial but also operational measures.	(a) Strategic Purchasing; (b) Limited Number of Suppliers; (c) Long-term Relationships; (d) Logistics Integration; (e) Two-way Communication; (f) Interorganizational Systems; (g) Supplier Involvement - General Purposes; (h) Supplier Involvement - Product Development.	(a) Quality; (b) Cost; (c) Flexibility; (d) Delivery; (e) Customer responsiveness; (f) Customer satisfaction; (g) Financial performance.	221 / (a) confirmatory factor analysis and exploratory factor analysis; (b) analysis of variance (ANOVA)	The results reveal that strategic purchasing can have a profound impact on supply chain performance for both buyer and supplier firms
Sengupta *et al.* (2006)	It compares the effect of traditional manufacturing-oriented supply chain strategies on the operational and financial performance of firms in both service and manufacturing sectors	(a) Information sharing; (b) Product and service customization; (c) Long-term relationships; (d) Hedging strategy; (e) Advanced planning systems; (f) Leveraging the Internet; (g) Supply network structure; (h) Distribution network structure.	(a) Operational Metric; (b) Financial Metric.	145 / (a) confirmatory factor analysis and exploratory factor analysis; (b) Regression analysis	The results highlight similarities and differences between the two sectors demonstrating that effective supply chain strategies in one sector may not be appropriate in the other sector. This suggests that practicing managers should identify appropriate benchmarks and competitive priorities before pursuing specific supply chain strategies. The insights provided by this research should help guide companies toward strategies that may positively affect their specific organization's operational and financial performance.
Carr e Kaynak (2007)	It extends understanding of supplier development theory by investigating the relationships among communication methods, information sharing within a firm, information sharing between firms, and support aimed at supplier development and the effects these relationships have on firm performance.	(a) Traditional Communication Methods; (b) Advanced Communication Methods; (c) Information Sharing Within; (d) Information Sharing Between; (e) Supplier Development Support	(a) Product Quality Improvement; (b) Firm's Financial Performance.	231 / Structural Equation Modeling	The main findings indicate that traditional communication methods, information sharing within a firm, and information sharing between firms, and supplier development are significant factors for improving a buyer's performance though their indirect and direct effects on firm performance vary
Krause *et al.*(2007)	It investigates the relationships between U.S. buying firms' supplier development efforts, commitment, social capital accumulation with key suppliers, and buying firm performance	(a) Buyer commitment; (b) Shared values; (c) Information sharing; (d) Supplier evaluation; (e) Supplier development; (f) Length of relationship; (g) Buyer dependence; (h) Supplier dependence.	(a) cost/total cost; (b) quality, delivery and manufacturing flexibility; (c) Environment: dynamism; (d) Annual sales.	370 / Regression analysis	Analysis of buying firms from the U.S. automotive and electronics industries provides support for the theory that buyer commitment and social capital accumulation with key suppliers can improve buying company performance. Moreover, the findings suggest that the relationships of structural and relational capital vary depending on the type of performance improvement considered

Considering the complexity of activities in the SCM, studies of the area have been analyzing the relation among its several practices, the integration levels and the performance of companies involved in a supply chain. Frohlich and Westbrook (2001), for instance, reviewing the chain upstream and downstream, measured the integration level taking the following practices into consideration: production planning sharing, combined utilization of electronic data interchange, knowledge level and inventory mix levels, packaging customization, delivery frequency, shared use of containers, equipment and logistic services.

Among the conclusions of the upper mentioned study, it was verified that the bigger the SCM integration level, the stronger the association with performance improvement. Nevertheless, the same study suggests future researches could consider this integration level as part of the operation strategy, as the manufacture needs to be properly lined up with all the supply chain and not only within the company boarders.

Li *et al.* (2006), on the other hand, investigated the relation among five SCM practices (strategic partnership with suppliers, customer relationship, level of information sharing, information quality and postponement), competitive advantage and organizational performance. The findings of the study highlight that the implementation of practices such as strategic leadership of suppliers, building a relationship with suppliers and postponement gave the organization a competitive advantage concerning cost, quality, reliability, flexibility and delivery.

Following the same research line, Fynes, Voss *et al.* (2005) evaluated four dimensions of the relationship with suppliers (communication, commitment, cooperation and adaptation) and its impact on the operational performance in traditional competitive priorities (quality, costs, delivery and flexibility). The research results revealed that the dimensions of relationship are a successive phase that accumulates over time, as in the adaptation phase improvement on the quality of the product and production cost reduction are conducted, but

there are no effects on the performance of delivery and flexibility indicators.

Martin and Patterson (2009) conducted a survey with 143 purchasing, logistics and material management managers. The research aimed to identify which performance measures the companies that adopted SCM practices were using to manage their first tiers. The results indicated that the practices positively affected inventory (raw material, final product and storage volume) and cycle time (inventory turnover, cycle time and order fulfillment) indicators. However, the financial performance was not significantly affected by the SCM practices adopted by the analyzed companies.

Despite the success of studies on impact identification of the SCM practices over business and operational performance, it is possible to perceive a great diversity of practices adopted by the researchers with different nomenclatures, but with strong conceptual similarity, a fact that can result in a confused understanding of the concepts. It reinforces the findings that SCM is a highly contemporary area in business management that is still in developing and, as a consequence, still lacking some systematization, as in its terminology (Pires, 2004). In this context and aiming a standardization of the terms used in the analyzed studies, a systematization of the literature was planned, as pictured in Table 2, grouping 41 practices in a set of 9 major concepts with very similar definitions. A brief definition of the 9 concepts presented in follows.

- **Buyer–supplier relationships**

Partnership on both parts (contractors and suppliers) implies a long-term relationship between a company and its suppliers and vice-versa. This relationship is destined to influence operational and strategic capabilities of organizations in order to help them achieve significant benefits. For this reason, there are joint investments in process technology, product and human resources and the contractor company usually works with few suppliers that share responsibilities on the products success.

Table 2: A Conceptual Systematization of Terminology that characterize the SCM practices

Taxonomy of major concepts	**Others terminologies**
Buyer–supplier relationships	(1) Adaptation (FYNES, VOSS e BÚRCA, 2005); (2) strategic supplier partnership (LI *et al.*, 2006); (3) Long-term realtionship (PAULRAJ, CHEN e FLYNN, 2006; SENGUPTA, HEISER e COOK, 2006); (4) Buyer–supplier relationships (CARR e PEARSON, 1999; NARASIMHAN e DAS, 2001); (5) Supply chain integration (VICKERY *et al.*, 2003); (6) Supplier value added (KAYNAK, 2002); (7) Supply chain development (KANNAN e TAN, 2005); (8) Long-term orientation (CHEN, PAULRAJA e LADO, 2004); (8) Shared values (KRAUSE, HANDFIELD e TYLER, 2007); (9) Company's integration with suppliers (NARASIMHAN e KIM, 2002)
Strategic purchasing	(1) Strategic purchasing (CARR e PEARSON, 1999; CARR e SMELTZER, 1999; CARR e PEARSON, 2002; CHEN, PAULRAJA e LADO, 2004; PAULRAJ, CHEN e FLYNN, 2006); (2) Strategy development (TRACEY, LIM e VONDEREMBSE, 2004); (3) Purchasing integration (NARASIMHAN e DAS, 2001); (4) Seleção de fornecedores orientados para o custo (LI *et al.*, 2006)
Trust	(1) Trust (FYNES, VOSS e BÚRCA, 2005)
Dependence and interdependence	(1) Dependence and interdependence (FYNES, VOSS e BÚRCA, 2005)
Supplier evolution system	(1) Purchasing/Supplier involviment (CARR e PEARSON, 2002); (2) Supplier Involvement - General Purposes (PAULRAJ, CHEN e FLYNN, 2006); (3) Direct involviment (KRAUSE, SCANNELL e CALANTONE, 2000); (4) Supplier participation—Kaizen projects/workshops (LIN *et al.*, 2005); (5) Co-operation (FYNES, VOSS e BÚRCA, 2005); (6) Supplier development support (CARR e KAYNAK, 2007); (7) Supplier incentives (KRAUSE, SCANNELL e CALANTONE, 2000); (8) Supplier performance evaluation (KRAUSE, SCANNELL e CALANTONE, 2000; NARASIMHAN e DAS, 2001); (9) Supplier evaluation systems (CARR e PEARSON, 1999); (10) Evolução dos fornecedores (KRAUSE, HANDFIELD e TYLER, 2007); (11) Supplier Capability (NARASIMHAN e JAYARAM, 1998); (12) Internal integration across the supply chain (NARASIMHAN e KIM, 2002); (13) Supplier assistance and training (DE TONI e NASSIMBENI, 2000);
Information sharing	(1) Level of information sharing (LI *et al.*, 2006); (2) Supply Chain Integration (DONG, CARTER e DRESNER, 2001); (3) Interorganizational Systems (PAULRAJ, CHEN e FLYNN, 2006); (4) Advanced communication methods (CARR e KAYNAK, 2007); (5) Integrative Information Technologies (VICKERY *et al.*, 2003); (6) Information sharing (KANNAN e TAN, 2005; SENGUPTA, HEISER e COOK, 2006; KRAUSE, HANDFIELD e TYLER, 2007)
Postponement	(1) Supply base leveraging (NARASIMHAN e DAS, 2001)
Quality of information sharing	(1) Communication (PAULRAJ, CHEN e FLYNN, 2006); (2) Information dissemination (TRACEY, LIM e VONDEREMBSE, 2004); (3) Information sharing between firm (CARR e KAYNAK, 2007); (4) Quality of information sharing (LI *et al.*, 2006)
Outsourcing	(1) Strategic outsourcing (NARASIMHAN e JAYARAM, 1998)

Fynes *et al.* (2005; 2005a; 2005b) name this adaptation process, including variables that involve investments by the suppliers in specialized tools and equipment according to the client company products, variables that represent changes in the production system, according to the client company product requests.

Paulraj *et al.* (2006) subdivide the mentioned concept in *long-term relationship by*

relational integration, limited number of suppliers and *long-term relationship*. The authors highlight that the long-term relationship with a limited number of suppliers also means the participants share risks and benefits. On the other hand, Narasimhan and Das (2001) emphasize that the cooperative relationship between supplier and buyer is more interesting for buyer companies when shopping items are highly overriding and the sources of suppliers are limited.

- **Strategic purchasing**

The concept of development and integration of suppliers is understood as a strategic view of shopping function, involving suppliers and shopping function in the strategic planning of a company.

Narasimhan and Das (2001) formulate that the purchasing *integration* is related to the strategic importance of shopping activity, which is discussed in the strategic planning of the company. The authors emphasize the lining up of shopping objective, action plans, competitive priorities of the manufacture and business objectives.

- **Trust**

It happens when a company believes the other company (partner) will perform actions that will result in positive benefits for the development of both companies. When a continuous relationship for the development and increase of communication is assumed, the level of trust (concerning the integrity and support) between both parts will increase (FYNES, VOSS e BÚRCA, 2005).

- **Dependence and interdependence**

The relation of dependence between suppliers and contractors is made of three elements: (a) there is a profit contribution percentage from one company to the other as long as the businesses are successful; (b) the communication and commitment about the marketing strategy aimed by both companies; (c) sharing risks and difficulties involving cost and

struggle if both companies decide to bring the existing partnership to an end (FYNES, VOSS e BÚRCA, 2005).

- **Supplier evolution system**

The process integration and management with suppliers refer to: (a) suppliers commitment on the development of new products (CARR e PEARSON, 2002); (b) formation of inter-functional teams between suppliers and companies centered in general purposes, like just-in-time manufacture, cost reduction and initiatives of total quality and processes improvement (PAULRAJ, CHEN e FLYNN, 2006); (c) investments on training activities and personal education of suppliers; (d) work and communication of suppliers with the company concerning continuous improvement projects and workshops (LIN *et al.*, 2005); (e) collaboration of both parts concerning subjects such as quality, development and process of products, information system and value analysis; (f) companies investment in resources and time, mainly investments concerning product improvement training, high quality of material production and its parts; (g) incentives for the suppliers such as prizes according to the market expectations, resulting in an induction of performance improvement, aiming the increase of business with the contractor company (KRAUSE, SCANNELL e CALANTONE, 2000); (h) monitoring suppliers performance evolution (NARASIMHAN e DAS, 2001).

- **Information sharing**

Level of information sharing refers to the extent to which critical and proprietary information is communicated to one's supply chain. The information might be strategic or tactic, about logistic activities, about costumers and market, product availability, inventory levels, expeditions and production requirement status (LI *et al.*, 2006; PAULRAJ, CHEN e FLYNN, 2006).

The means used for information integration are derived from implantation of the following communication technologies or methods: Electronic Data Interchange - EDI, a

group of integrated management in product development, information and work sharing with suppliers for the improvement on second layer supplier management, management systems like ERP (Enterprise Resource Planning) (DONG, CARTER e DRESNER, 2001; VICKERY *et al.*, 2003; CARR e KAYNAK, 2007).

- **Postponement**

It means to postpone almost to the deadline one or more operations or activities (decisions, delivery, etc.) on the last phase of the operations chain (Li *et al*. 2006) in order to obtain a cost reduction and an increase on the customization of products on the supply chain. Postponing product parts eventually includes the adoption of group technology practices and identification of families of pieces as well, making the gain of productive programs for one or more suppliers possible (NARASIMHAN e DAS, 2001).

- **Quality of information sharing**

It includes aspects such as accuracy, genuineness and credibility of information exchange. Information quality is related to "what", "how" and "when" information is shared. Different interests of agents (links) of the supply chain usually affect the quality of information. The basic idea is that information must be seen as a patrimony with the minimal flux of distortion and delay (Li, et al. 2006).

Fynes *et al.* (2005) consider communication as the sharing of opportune (in time), significant, informal and formal information between contractor and suppliers. The authors highlight there are three aspects of information behavior that are important for the relationship: information quality, how information is shared and the level of contribution from both parts for the common objectives and plans.

- **Outsourcing**

Outsourcing means the sub-hiring of activities, services or product parts that are not the core business of the company, usually aiming cost reduction, quality improvement, delivery

lead time reduction and increase on the productive flexibility (Narasimhan and Jayaram, 1998). For Pires (2004), outsourcing is a practice in which part of the group of products and services used by a company in a supply chain is provided by an external company, in a collaborative and interdependent relationship. The supplier develops and continuously improves the competence and infrastructure to serve the client, who does not totally or partially own them anymore. However, the client continues to maintain a close collaborative integration with the supplier. The outsourcing process usually implicates in a transformation of variable in fixed costs.

In the analyzed studies the frequent use of performance constructs was noticed. The constructs are described below:

- **Financial performance**

The variables that usually measure the performance construct are: investment return (NARASIMHAN e JAYARAM, 1998), profit percentage on sales and invoicing gross value (Chen, Paulraj and Lado, 2004), invoicing increase, financial liquidity (NARASIMHAN e KIM, 2002).

- **Performance on quality of market response**

The variables that measure this construct are extremely important for clients, such as pre-sale service, pos-sale service, costumer sensibility, fast and reliable delivery (VICKERY *et al.*, 2003), as well as quick production orders confirmation and quick executions of customers complaints (CHEN, PAULRAJA e LADO, 2004; FYNES, VOSS e BÚRCA, 2005; PAULRAJ, CHEN e FLYNN, 2006).

- **Delivery/reliability performance**

The delivery, reliability, quickness or velocity terms have a very similar conceptuality. Delivery performance is related to quick delivery and reliability on the products promised deadline (LEONG, SNYDER e WARD, 1990; STONENRAKER e LEONG, 1994;

NARASIMHAN e JAYARAM, 1998; FYNES, VOSS e BÚRCA, 2005; PAULRAJ, CHEN e FLYNN, 2006; KRAUSE, HANDFIELD e TYLER, 2007). For Pires (1995) reliability is the client trust in relation to delivery deadline and it also indicates velocity/quickness on products delivery.

- **Flexibility performance**

It is related to flexibility on the mix (product lines variety) and volume (NARASIMHAN e JAYARAM, 1998; FYNES, VOSS e BÚRCA, 2005).

Li *et al.* (2006) named the *product innovation* construct, presenting variables with product customization characteristics, customer needs knowledge and new product characteristics as response, as required by the demand. The authors also named the *time to market* construct, involving variables of new products introduction in the market before the competitor and having a shorter period of time than the average for developing new products and quickness on the development of new products.

However, the characteristics of both constructs presented by Li *et al.* (2006) were already established in the seminal study of Gerwin (1987), which describes the five dimensions of manufacture flexibility performance: (a) replacement of product components over a certain period of time; (b) transformation or changes in the process of products development; (c) changes on production itineraries; (d) material adjustment or raw material adaptation in the production process; (e) changes in production sequence because of limitations and incertitude about the environment during the processing of products.

- **Cost performance**

It is related to the production of low unitary cost products (Narasimhan and Jayaram, 1998) or to the presentation of a product that is cheaper than or the same price as the competitor's one (FYNES, VOSS e BÚRCA, 2005).

- **Quality performance**

Quality performance is widely defined. Some studies think about the concept as a synonym for toughness (Narasimhan and Jayaram, 1998), conformity with technical project specifications and sales leadership in presenting products with quality characteristics (CARR e KAYNAK, 2007). However, Garvin (1988) subdivides the concept in five perspectives (transcendent vision, product, user, production and value) and eight dimensions (performance, characteristics, reliability, conformity, durability, customer service, esthetics and perceived quality).

- **Storage management**

The inventory indicators are related to the raw material volume, finished and semi-finished products (CARR e PEARSON, 2002).

After the literature systematization and the definitions of constructs presented above it is possible to make some considerations and to propose some recommendations for future researches, as found in the next topic.

4. Final considerations

As the SCM is a contemporary area of great importance in business and academic areas, it is still lacking some systematization in its terminology The analyzed studies use a large number of variables in order to compose their constructs. These variables are not usually the same in different studies. Thus, a systematization of terminology and variables of SCM practices constructs is necessary in order to improve the measurement of constructs. Therefore, the present work aims to contribute to the clarification of concepts used in SCM area, in both academic and business fields.

From the analysis of these studies it is possible to present suggestions for future researches. A more criterial evaluation of explanatory factorial analysis results is recommended in order to identify whether the variables can be grouped in organizations

practice in the same or distinct latent factors. For example, Krause *et al.* (2007) separated variables that could compose a sole latent construct in explanatory factorial analysis. From the result of the factorial analysis in this study, it is believed that the constructs named as *value integration* and *supplier commitment* could compose a sole construct. Moreover, the referred authors grouped performance quality, flexibility and delivery variables in a sole construct. In organizations practice and previous studies that are considered classic (SKINNER, 1969; FERDOWS e DE MEYER, 1990; WARD, MCCREERY e RITZMAN, 1998), such performances are measured in different ways.

Sanchez and Perez (2005), on the other hand, presented a conceptual model in three flexibility dimensions in SCM: (a) shop floor basic flexibility, including product mix, volume and production sequence flexibility dimensions; (b) level or system flexibility of the company, including delivery flexibility (lead time reduction and reliability/precision), transportation flexibility (physical distance between supply and factory) and postponement flexibility; and (c) supplier-client relationship flexibility, including supply, market response, product launching, wide distribution or product access flexibility. It is important to highlight that the flexibility dimensions or concepts in this study are a little confusing, as both overlap the systematization of *delivery/reliability* performance, as already mentioned in the present work.

Two other performance concepts considered relevant for organizations practices are: (a) delivery reliability related to precision (quantity) while attending the client's order, as many studies consider delivery reliability only in relation to the promised deadline; and (b) reduction of delivery lead time, including reduction on the production lead time variable in order to make the delivery faster. On that account, future works could consider such variables as indicators of delivery performance constructs.

Future works could complement the present study performing a statistical meta-analysis

aiming to investigate which SCM practices influence the most the performance indicators evaluated by the analyzed studies in this theoretical referential. As an example, Nair (2006) and Gerwin and Barrowman (2002) respectively performed a statistical meta-analysis correlating the TQM and products development practices with performance. However, in the SCM area, studies on these perspectives were not found yet.

Researches that evaluate the indirect effects of SCM practices on business performance through operational performance improvement would also be interesting. Martin and Patterson (2009) identified that product cycle time (inventory turnover and order fulfillment) and inventory indicators are easy measures for the organizations, as information could be shared with no restrictions with members of the whole supply chain, the opposite of the financial performance measures. Besides, the inventory and cycle time cause an impact on the operations and may not affect directly the financial performance. For example, the financial invoicing is related to indicators of sales and profit margin on sales. Li, Ragu-Nathanb *et al*. (2006) confirm this supposition when they argue that SCM practices directly affect operational performance and might indirectly affect financial performance when improving operational performance. The same point of view appears in Vickery *et al.* (2003), as they discuss that managers always expect a direct effect or impact of action programs on market or financial performances and if the effect is not enough, they conclude the action was not successful. However, such conclusion might be cursory, as the practices might indirectly affect business performance through its impact on operational results.

Finally, another potential research effort would be to evaluate the strategic adjust on the supply chain, evaluating the level of competitive priorities alignment, SCM practices and companies performance. Vachon *et al.* (2009) highlight that studies which analyze gaps reduction between what the customers request and what is imposed to suppliers would be interesting, observing the performance results of contractor companies.

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