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Alignment between Supply Chain Management Practices and Maturity: A Framework Proposal

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Abstract: Researches focused on supply chains have gained relevance from 1990's due to the opportunities of adding value to the companies through SCM-Supply Chain Management. The correct understanding of practices applied on this management is very important to obtain higher levels of performance in a supply chain. However is important having the correct understanding between practices and SCM maturity since that the adequate adoption of practices to each level of maturity can lead SCM to higher level of maturity and consequently higher level of performance in the supply chain. Thus, taking into consideration that there is a lack in terms of researches approaching this matter, this study will present the SCM practices which are aligned with SCM maturity dimensions. Aiming to achieve the purpose of this research as a first step a systematic literature review method was adopted in order to identify practices for SCM proposed in the literature. After that a correlation between these practices and SCM maturity was proposed. Future empirical researches are needed in order to get more evidences and validate the findings obtained on this first step of research.

Key words: Supply chain, management, maturity, practices, framework

INTRODUCTION

The potential of researches focused on Supply Chain Management-SCM has become very significant in the last years. Synergies between the members of supply chain, require the development of new theories, frameworks, methods and techniques. Those can help the supply chains managers to overcome the challenge of managing the complexity created by the network of companies (Christopher, 2005, Cooper *et al*., 1997; Lambert and Cooper, 2000; Chan *et al*., 2003; Simchi-Levi *et al*., 2003; Ayers and Malmberg, 2002).

Following this rationale the study of SCM practices can improve the understanding of how all the process are integrated in way to provide products, services and information that add value to the customers. However, only understanding practices is not enough to create a better performance in supply chain since that is important to adopt practices appropriated to the level of capabilities and integration.

This level of capabilities and integration in the supply chain can be identified by the level how mature the supply chain management is in a certain moment. There are some dimensions which is possible to analyze and determine the level of maturity.

Studies about maturity applied in management have been increased in the last years. Areas as project management, product development and continuous improvement have been received focus from researches in the maturity issues. Not differently, some studies have been developed for SCM aiming to understanding the dimensions which drives to maturity of supply chains.

In this way the purpose of this paper is highlighting the practices related to the levels of SCM maturity allowing create a better view and classification on this link. In order to guide this study the research question which needs to be answered as object of this research is:

Which SCM practices are being adopted in terms of SCM maturity dimensions: This study will present the literature review related to de SCM practices and SCM maturity and bring up some findings of this relationship. As structure of this paper, the next topic will present the literature review about SCM maturity and SCM practices. After that, main findings from literature review will be discussed.

Literature review: The literature review process followed a systematic approach proposed by Tranfield *et al*. (2003). Management research is a relatively young field and

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needs more structure and systematic process to allow a better support with regards the research question which is aimed to answer in a management field research (Seuring and Gold, 2012).

Replicability and traceability of the arguments and conclusions using a systematic approach has been being used in the SCM researches (Seuring and Gold, 2012). According to Tranfield *et al*. (2003) systematic review basically follows three steps:

- Planning
- Conduction
- Reporting and dissemination

In the step planning a plan of the literature review is developed having as the result a review protocol which will be used for the next step of the research: conduction (Seuring and Gold, 2011). With regards to conduction step, activities as research identification, selection of studies and assessment of the sources, data extraction and data synthesis are developed (Seuring and Gold, 2012).

This study will focus on the two first steps, 1 and 2 which aim to build a basis for the field research that will be conducted in the future. The research was focused on articles that present studies related to SCM practices and SCM Maturity, aiming understand which practices are being adopted in the supply chains and how they can be classified in terms of SCM maturity dimensions.

MATERIALS AND METHODS

Supply chain management maturity: Maturity is defined as the stage achieved in a process which it is better developed on its more advanced stage.

Maturity frameworks are not new in the management field. Several frameworks for continuous improvement have been proposed in literature (Carina *et al*., 2003) such as project management (Kwak and Ibbs, 2002), virtual organizations (Harter *et al*., 2000) and product development (Kishnan and Salughter, 2000), performance measurement systems (Wettstein and Kueng, 2002; Aken *et al*., 2005).

With regards to supply chain management, basically there are seven frameworks proposed in the literature as demonstrated on Table 1. The most complete framework was built by Frederico (2012) who has developed a more comprehensive framework due to consider all set of maturity dimensions together based on dimensions of each other framework proposed. The explanation for each dimension of model proposed by Frederico (2012).

Costs: Thigs dimension is associated to the level of costs and stock in a supply chain.

Customer focus: It is associated to the focus on customer on the supply chain management as is linked to the level of satisfaction of clients.

Processes: Refers to formalization, integration and structure of the process across the supply chain.

Technology and tools: It is associated to the existence of information systems and tools to support the management such as statistics tools and forecasting.

Collaboration: Refers about sharing information, communication, share/repass resources and all kind of joint initiatives through the supply chain as development of new products and production planning.

Table 1: Frameworks for SCM maturity proposed on literature

Authors	Characteristics
Stevens (1989)	Inventory level, organizational boundaries, customer focus, supply chain costs, planning, visibility and on-demand orientation, strategic focus, partnership and collaboration, responsiveness, information technology and control systems, and information share.
Ayers and Malmberg	Supply chain costs, planning, strategic focus, partnership and collaboration, supply chain management philosophy, project (2012) management, formalization and structuration of processes, integration of processes, information technology and control systems, information share and gains share
PMG	Organizational boundaries, planning, strategic focus, partnership and collaboration, responsiveness, formalization and structuration of processes, integration of processes, information technology and control systems, and performance measurement.
Lockamy and McCormack (2004)	Organizational boundaries, customer focus, customer satisfaction, supply chain costs, planning, strategic focus, partnership and collaboration, structured processes, integration of processes, information technology and control systems, information and gains share and performance measurement and competitiveness as a differentiation.
Daozhi	Supply chain costs, partnership and collaboration, responsiveness, risk management, information share, resources share, (2006) regulation and incentives in the chain, and resources used in the chain
Oliveira (2009)	Customer focus, customer satisfaction, planning, visibility and on-demand orientation, strategic focus, partnership and collaboration, responsiveness, formalization and structuration of processes, integration of processes, information technology and control systems, information share and performance measurement
Reyes and Giaghetti (2010)(2010)	Customer relationship management, performance measurement systems, inventory management, collaboration, process management, information systems and technology, integration of processes, risk and project management, human resources management
Frederico (2012)	customer focus and satisfaction, collaboration in terms of resources, information, gains, initiatives, cost management and wastes, resources, environment issues, risk and project management, lean management, awareness in terms of SCM, processes standartization, structuration and formalization, responsiveness, technology and tools, strategic focus and performance Measurement

Management: It is associated to the experience level on projects management through supply chain, methods used for project management, systematic management of risks, lean management and also the management of awareness in terms of supply chain management by the members.

Performance measurement: Associated to the extension of measurement performance, set of indicators, performance measurement systems for SCM.

Strategic focus: Refers to strategic intention gives to supply chain by the company focus of the supply chain and their members.

Responsiveness: Associated to velocity which the supply respond to environment changes, requiring a service in terms of volume and mix of product.

Resources: Refers to all kind of resources used on supply chain, combined in two category: commons (necessary to execution of the process) and competitive (generates competitive advantage and it is hard to be copy by other companies due their differential.

Environment: Consider regulatory issues and credit incentives wich can facilitate and improve the supply chain performance. Frederico (2012) has considered these eleven dimensions in three levels of maturity: Initial, Intermediate and Advanced. According to this author as more mature is the SCM more integrated the supply chain is. The characteristics for each level of maturity is.

Initial: Prevalence of high costs, lower customer satisfaction, disintegrated and unstructured processes, lack of collaboration between members, lack of technologies and tools for forecasting demand and other activities, lack of strategic focus in the chain, poor management of supply chain projects, absence of risk management, lack of performance measurement in the entire supply the chain, lack of regulation and lines of credit as supporting elements and use of basic resources.

Intermediate: Existence of cost savings in the chain, good customer satisfaction, documented and defined beginning of a cross-functional way of the processes in the entire chain, spirit of cooperation between the functions related to supply chain management in the focal company, use of technologies and statistical tools for forecasting demand and other activities, strategic focus, awareness, collaborator's vision and competence in supply chain management, good project management practices, limited use of risk management, evidence of performance measurement, existence of regulations and credit lines to support the supply chain and use of adequate resources.

Advanced: Supply chain with cost excellence, total focus on customer satisfaction, fully integrated and structured processes in the entire chain, extensive use of information systems, profit and information sharing between the supply chain members, project and risk management excellence, comprehensive performance measurement, supply chain a source of competitiveness, supply chain responsiveness dealing with variations of customers demand, extensive regulation and credit lines to support the supply chain.

Supply chain management practices: Koh *et al*. (2007) states that SCM's practices involve a set of activities undertaken by organization to promote effective management of their supply chain. Tutuncu and Kucukusta (2008) go beyond that and states that SCM lead to changes in the structure of the organization by integrating internal functions and linking these with the external operation of suppliers, customers and others stakeholders of the supply chain. The study presents that there is an extensive range of practices to be explored. Since the practices about forecasting, inventory, collaboration, development of warehouses, hub, site factories and besides that there is not a recent research treating all those dimensions of management.

Talib *et al*. (2011) research on a project to link the TQM-Total Quality Management-practices to SCM. A set of 12 practices applicable to different organization were identify above 50 TQM practices and 90 SCM practices. Authors indicate that implementation of these TQM and SCM practices in the organization will result in many desirable outcomes and benefits such as customer satisfaction; JIT delivery and reduced cycle time.

Regarding innovation on supply chain, Ageron *et al*. (2013) defended a model in which the practices are separated by 3 levels. On the top of the pyramid, the managerial process, under that, information sharing and information technologies and for the base the Operational process. Almost 70 practices were found out using a sample of 68 supply chains.

Jabbour *et al*. (2011) applied a survey with 107 Brazilian companies and statistics techniques were employed to build four new dimensions by mapping 22 practices for four constructs of SCM namely:

- Supply Chain (SC) integration for Production Planning and Control (PPC) support
- Information sharing about products and targeting strategies
- Strategic relationship with customer and supplier
- Support customer order

A more complex study of practices is presented by Prajogo and Olhager (2011). Due the globalization and

specialization of the firms supply chain integration has become one of the most important fields of study as the performance. Integration has at least two strands: the logistics integration, refers to specific logistics practices and operational activities that coordinate the flow of materials from suppliers to customers throughout the value stream and the information integration which refers to the sharing of key information along the supply chain network which is enabled by Information Technology (IT). Prajogo and Olhager (2011) capture the three principal elements of an integrated supply chain suggested by Handfield and Nichols (1999) as seen below:

- Information flow
- Product and material flows
- Long term relationships between supply chain partners

Zhou and Benton (2007) research on 6 practices to study the impact on supply chain dynamism and delivery performance. The practices are listed below:

- Plan
- JIT Production
- Delivery practice
- Information sharing support technology
- Information content
- Information quality

With regards to Lean practices and supply chain performance, Zaman and Ahsan (2014) states that Lean is applicable in many supply chains, particularly those seeking to improve performance by reducing waste. Cost competitive supply chains can benefit from utilizing lean to remove waste and reduce costs. The lean supply chain can mitigate the lack of co-ordination between performance measures and lean tools and techniques.

RESULTS AND DISCUSSION

The study provides a selection from literature review of 188 practices. The practices are classified using the eleven dimensions of Frederico (2012) model. It is also presented a framework with the frequency of each dimension in this literature review, bringing to the light the fields that can be more studied yet.

Figure 1 shows the frequency of practices considered on the literature according to each maturity dimension. Based on Fig. 1, process (270.1%), strategic focus (14.9%)

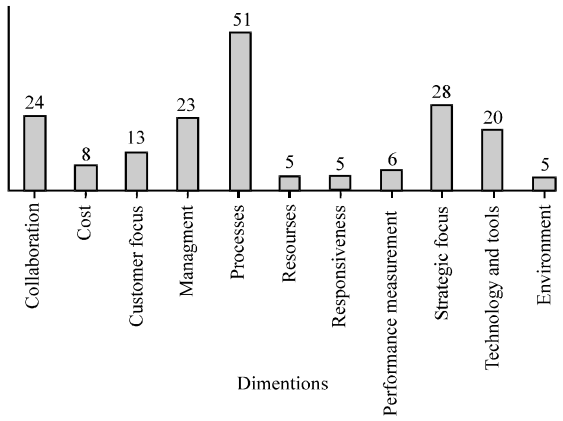

Fig. 1: Frequency of practices found out from literature review for each SCM dimensions

research, corresponding to 54.8% of the practices found. One of the reasons for that can be explained by Chandra and Kumar (2000) which states that supply chain integration, optimization and excellence have become the goal and focus of many organizations worldwide and depending on how and why the supply chain has been developed companies must follow one of these directions:

- A network for efficient management of demand and flow of products and services
- A philosophy of conducting business
- A strategy to gain competitive advantage through co- ordination and synchronization of actions of its members

As showed on Table 2, Ageron *et al*. (2013), Zaman and Ahsan (2014) and Kuei *et al*. (2001) have the most complete set of practices in terms of SCM dimensions. Ageron *et al*. (2013) propose practices involving eight dimensions and Zaman and Ashsan (2014) and Kuey *et al*. (2001) seven dimensions each one.

The main practices related to the Processes dimension are linked to JIT practices and lean manufacturing such as 5S, standardized research, implementation of panel for visual management, cellular manufacturing, kanban system of supply and creation of multifunctional teams. Collaboration practices are the second most present in the study and the reason for it could be the nature of relationship between suppliers and customers in every level. Some practices like development and harmonization of a supplier base, sharing information about planning schedules forecasting and integrated and collaboration (12.8%) are the most studied dimensions on supply chain management according to

Table 2: Presence of dimensions on the papers researched

Authors	Collaboration	Costs	Customer focus	Mangement	Processes	Resources	Responsiveness	Performance measurement	Strategic focus	Technology and tools	Envio-rnment
Ageron *et al.* (2013)	×			×	×	×	×		×	×	×
Zaman and Ahsan (2014)	×	×		×	×		×	×		×	
Jabbour *et al.* (2011)		×	×								
Koh *et al.* (2007)	×		×		×		×		×		
Kuei *et al.* (2001)	×		×		×	×		×	×		
Zhou and Benton (2007)	×			×	×	×		×	×	×	
Jabour *et al.* (2014)				×	×						
Rexhausen *et al.* (2012)	×	×		×					×		
Dyer and Nobeoka	×			×	×						
Talib *et al.* (2011)	×		×		×	×					
Chin *et al.*	×			×	×					×	×
Laosirihongthong *et al.* (2013)					×				×		
Chen and Paulraj	×			×					×		
Flynn and Flynn (2005)				×				×	×		

Table 3: SCM Dimensions and practices framework

SCM dimensions	SCM practices
Costs	Practices related to inventory management, cost systems management, waste management, cost reduction policies, productivity clauses on the contracts, supplier competitive analysis, quality costs management, activity based cost analysis, total cost of ownership
Performance	Performance measures for each processes in supply chain (inventory, transportation, cash flow of supply chain, measurement manufacturing, handing and storage, quality measures, financial measures, environmental measures, performance measurement systems (balanced scorecard, performance prism, for supply chain management), performance measurement systematic review, customer relationship measures
Collaboration	Supplier development, joint initiatives with suppliers and customers (product development, management policies, SCM projects), share of information, share of productivity increases, share of resources employed into supply chain, collaborative forecasting, integration with suppliers and dealers
Processes	Lean manufacturing practices as Kanban, value stream mapping, 5S, visual management, poka yoke system, quality tools, kaizen, processes standatization, processes integration with members in the supply chain, logistics reverse processes development, milk run in transportation, total productivity maintenance, cross docking processes, balanced production, supplier pull system, material management, SCOR model for SCM processes, six sigma
Strategic focus	Global sourcing decisions, strategic projects in supply chain, product segmentation in supply chain, make or buy decisions, outsourcing decisions, supplier matrix definition, manufacturing format definition, merge and acquisitions decisions in SCM, facilities place definition, new business in supply chain definition
Customer focus	Customer's requirements information, tackt time manufacturing flows, customized logistics for representative customers, oriented demand forecasting, post sales supply chain operations and reverse solutions
Management	Leadership implementation in SCM, adoption of PMBOK practices for SCM projects, adoption, programs for SCM awareness and training, systematic risk management practices, lean philosophy
Technology and tools	EDI adoption with suppliers and dealers, ERP Enterprise Resources Planning systems adoption, routing software, transportation management systems, warehouse management systems, voice picking, RFID-radio frequency identification, global position systems in transportation, automated warehouses, statistic tools for demand forecasting, advanced manufacturing systems
Environment	Adoption of green practices in supply chain, compliance processes and policies, social responsibility initiatives in supply chain community, governmental and non-governmental entities involvement
Resources	P&D for supply chain resources development, use of differential resources in the supply chain, supply chain capabilities adequacy, human resources development practices for SCM, partnerships for resource use
Responsiveness	Inventory availability,operations subcontracting, dealers location nearest customers, contingency plans, components matrix flexibility, lean distribution channels

quality programs. These initiatives to integrate the tiers on supply chain can be interpreted as a need for relationship management that should result in more effective use of the combined resource base together with better integrated information and material flow (Childerhouse *et al*., 2011).

Lastly, the practices related to strategic focus contemplates decisions about location of the site factories, hubs decision, warehouses location, safety stock adoption, outsourcing decisions, reverse logistics adoption, supplier matrix decision and global sourcing.

In terms of practices approached by the authors the most cited are related to collaboration, management, processes and strategic focus. The link between strategy, collaboration and processes is very important in terms to achieve a higher integration in a supply chain. In terms of maturity this can be linked to a higher level of maturity achieved by adoption of practices correlated to these three main SCM maturity dimensions. Table 3 presents the main practices found out from the research for each SCM maturity dimension.

CONSLUSION

This study is the first step towards a comprehension about practices on supply chain and the relation with the management maturity. A systematic literature review was used as a method to obtain findings related to practices and maturity dimensions. It was possible identify that the recent researches about practices are more focused on three dimensions of eleven SCM maturity dimensions: process, strategic focus and collaboration. In total 188 practices of SCM were found out and more than a half of this are related to the three dimensions referred.

Next steps of the research are necessary to try understanding better the relationship between practices and maturity dimensions on supply chain management. It is necessary to identify practices aligned to each level of maturity in SCM. Also, understanding factors to implement these practices and possible practices adopted by practitioners and not approached by literature. A deep study involving a field research needs to be taken in place in order to understand deeply the SCM practices phenomenon.

Important to emphasize that study about practices is not something solved and established. This is because new practices has continuously coming up in supply chains. That is triggered by the quick technologies development which implicates in higher stages of maturity for SCM. New movements like IoT-Intenet of Things and 4.0 Industry can change this scenario of practices for SCM and consequently the impacts will need to be discovered and understood.

RECOMMENDATIONS

Then, some research questions which can be deployed from this study are needed to be answered in the future:

- What are the practices adequate for each level of SCM maturity
- What are the relevant practices and its priorities to achieve higher level of maturity in SCM
- How companies are adopting practices to improve their SCM maturity
- Which are the critical factors to implement each category of SCM practices
- How new movements in SCM like IoT and industry 4.0 can change practices and influence on SCM maturity dimensions

Irrespective of this new research directions this study, brings an important contribution SCM knowledge related to maturity and practices. It can be a reference for new researches deployed as well as for practitioners who needs to have more clarity with regards practices adoptions and maturity of supply chain management.

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