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A framework for analysing supply chain performance evaluation models

Dominique Estampe [a,*], Samir Lamouri [b], Jean-Luc Paris [c], Sakina Brahim-Djelloul [d]

[a] BEM Bordeaux Management School, 680 Cours de la Liberation, 33405 Talence Cedex, France
[b] LISMMA, SUPMECA, 3 rue Fernand Hainaut, 93407 Saint-Ouen Cedex, France
[c] IFMA, LIMOS UMR CNRS 6158, BP265, 63175 AUBIERE Cedex, France
[d] Institut National de Commerce, 11, Chemin Doudou Mokhtar, Ben Aknoun, Alger, Algeria

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ABSTRACT

Supply chain management creates value for companies, customers and stakeholders interacting throughout a supply chain. The strategic dimension of supply chains makes it paramount that their performances are measured. In today's performance evaluation processes, companies tend to refer to several models that will differ in terms of corporate organisation, the distribution of responsibilities and supply chain maturity. The present article analyzes various models used to assess supply chains by highlighting their specific characteristics and applicability in different contexts. It also offers an analytical grid breaking these models down into seven layers. This grid will help managers evolve towards a model that is more suitable for their needs.

1. Introduction

With supply chain now comprising a key element in corporate competitiveness, some firms have come to view this function as the cornerstone of their differentiation strategy (Waters and Waters, 2007). Supply chain performance can be measured both in terms of customers' level of satisfaction – since they remain the ultimate judges of how much value is actually being created at a logistics level – and the costs incurred. Evaluating supply chain performance is a complex undertaking, in part because this is a transversal process involving several actors cooperating to achieve given logistical and strategic objectives. Such evaluations become particularly important in situations, where supply chains are considered a key factor of corporate success.

The purpose of the present article is to analyse the characteristics of different supply chain performance evaluation modes, while providing a decision assistance framework that will allow managers to choose the model that offers the kind of analysis they need. As such, it seeks to identify which model is most useful to a company in terms of helping it to raise performance by incorporating analysis that covers a whole range of criteria, one of which is the supply chain maturity.

The article starts with a definition of logistics and supply chains, with a second section specifying different levels of supply chain maturity within companies and considering the estimation of supply chain performance. The two sections seek to analyse ways of evaluating supply chain performance. The third section applies an initial analytical table to identify characteristic criteria, while highlighting the dissimilarities between different models used in supply chain evaluations. The fourth section applies a second analytical grid that we have developed to examine the relevancy of each of these models. The purpose of this double characterisation is to enhance researchers and professionals' understanding of different evaluation models' roles, along with their suitability within particular corporate contexts.

2. Logistics and supply chain

Cooper et al. (1997) have pointed out that in 1986, the Council of Logistics Management (CLM) – since renamed the Council Of Supply Chain Management Professional (CSCMP) – defined logistics management as "the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirement".

This function, whose main mission is the management of physical, and informational flows, interacts closely with many other corporate functions, including management control, human resources, marketing, finance, engineering, IT, etc. Smooth collaboration between logistics and other corporate functions no longer suffices consider that a company is actually performing well. A much broader range of areas come into play nowadays, calling on a variety of additional parties who might be called business

* Corresponding author. Tel.: +33 5 56 84 55 70; fax: +33 5 56 84 55 80.
E-mail addresses: dominique.estampe@bem.edu (D. Estampe), samir.lamouri@supmeca.fr (S. Lamouri), jean-luc.paris@ifma.fr (J.-L. Paris), sakina@brahimdjelloul.com (S. Brahim-Djelloul).

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partners, ranging from suppliers' suppliers to customers'customers. It is in this sense that people no longer talk about "logistics", but instead about "supply chain management" when defining a network of interdependent partners that are working extremely closely together to fulfill a common goal of customer satisfaction (Mentzer et al., 2001). As such, supply chain management involves integrating all key operational processes at any level between the final users and original suppliers of the products, services and bits of information that offer added value to customers and other stakeholders (Christopher and Ryals, 1999; Cooper and Lambert, 2000).

Combining these multiple aspects, supply chain management can be defined as a systemic and strategic coordination of traditional operational functions both within a given company and also between partners working within a chain, with a view towards improving the long-term performance of each company that is part of the chain and of the whole of the chain itself (Mentzer et al., 2001).

3. Supply chain maturity

Maturity models first appeared in early quality management studies, which tended to identify a number of different levels (Crosby, 1979). Identifying such levels has been one corollary of corporate performance improvement approaches. This vision considers that organising a company on a silo basis (i.e. at the lowest possible level) leads to lesser performance than taking a broad, cross-departmental view.

The best known maturity model derived from these approaches is the Capability Maturity Model Integration (CMMI). This model has been developed by Software Engineering Institute (SEI) (SEI, 2004) since the 1990s to improve the efficiency and effectiveness of product and service development and maintenance activities, while incorporating practices associated with a product or service's total lifecycle, ranging from design to maintenance. This model is mainly used for engineering activities. The maturity model is based on the description of processes that must be implemented to achieve the level of excellence corresponding to the maximum level of maturity. Achieving each level of maturity enables an incremental and lasting improvement in performance. In the CMMI model, there are five maturity levels:

Level 1: initial: the processes are neither defined nor standardized and the performance is not evaluated regularly.
Level 2: managed**:** the processes being implemented are planned, executed, supervised, controlled, reviewed and assessed. The resources associated with the use of these processes are effective and possess the wherewithal that will allow them to realise the processes in question.
Level 3: defined: the processes are standardised and improved and used by the whole of the organisation—whose own objectives will also be defined.
Level 4: quantitatively managed**:** the organisation sets performance objectives for the processes. The objectives are linked to organisational, but also customer demands. Outcomes are measured quantitatively.
Level 5: optimizing**:** the processes are continually improved through an analysis of the causes for any variations in performance.

These quality management-based maturity models are geared toward process implementation and the introduction of good practices enabling an improvement in an organisational performance. Many authors in the field of supply chain management have demonstrated the existence of links between maturity levels and supply chain performance (Simatupang and Sridharan, 2004; Lockamy and McCormack, 2004; Cohen and Roussel, 2004; Trkman et al., 2007) with others contesting this same linkage (Lapide, 2006) insofar as they consider that supply chain performance derives from an evolutive process involving the implementation of "customised" practices grounded in an understanding of the principles of value creation that actually lead to an improvement in performance. Note that this shift from one level of maturity towards another higher one is usually associated with the implementation of best practices.

The ability to integrate best supply chain management practices is one way of defining maturity levels (Paché and Spalanzani, 2007). Many authors have worked to define supply chain performance-related maturity classifications that are not exclusively tied to the proper implementation of intra-organisational processes (in the same way as quality approaches are), but also rely on a company's ability to integrate such practices into an inter-organisational vision.

The maturity classification proposed in the Supply Chain Operations Reference (SCOR) model relates to companies' ability to manage the full scope of a supply chain (Cohen and Roussel, 2004).

*Level 1: functional integration:*The goal is to respond to improvements in the performance of a company's internal processes without seeking an optimum with other, ancillary processes.
*Level 2: internal integration:*The goal is to devise tools to measure transversal performance within the company, thereby validating overall performance by seeking an optimum between the demand for (and the management of) resources.
*Level 3: external integration:*The goal is to extend performance measurement to the company's key external actors, while associating them with the search for shared performance.
*Level 4: inter-company collaboration:*Sharing a joint organisational strategy (design, management modes, shared risks, etc.) enables the choice of common performance objectives.

Paché and Spalanzani (2007) have proposed five levels of maturity built around inter-organisational supply chain relationships, including any relevant societal aspects.

Level 1: intra-organisational maturity: the goal is to manage performance by bringing together different corporate functions (design, marketing, production, etc.).
Level 2: inter-organisational maturity: performance is managed at a more global level through the integration of any and all actors operating in proximity to the company (suppliers, service providers, direct customers, etc.).
Level 3: extended inter-organisational maturity: with all of the actors in a chain being involved in the search for better performance, this extended chain approach corresponds to the aforementioned supply chain definitions.
Level 4: multi-chain maturity: the company is integrated into a complex network of relationships, where each member company can be the "pilot" or "fulcrum" of a relationship. The "multi-firm" level enables each company to progress by offering a number of inter-sectorial performance approaches (ECR, 2010).
Level 5: societal maturity: companies belonging to a global network incorporate sustainability-associated performance dimensions (environment, society) and seek a kind of performance that will be valuable in a broader societal context. A prime example is the work done in France by the Déméter club (Déméter, 2010), which has brought together a variety of