# EVALUATING COLLABORATIVE SUPPLY CHAIN MANAGEMENT STRATEGIES: A COST-BENEFIT ANALYSIS

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## Abstract

Increasing competition and demandchanges/requirementsforce businesses to collaborate in a supply chain that allows them to gain mutual benefits. Collaboration is a recent trend in supply chain management (SCM) that focuses on joint planning, coordination, and process integration between suppliers, customers, and other partners in a supply chain. However, collaborative SCM implies some considerable technology investments and other costs that companies would need to balance out relative to its promised benefits such as cost reductions and increased demand responsiveness. In this vein, this paper proposes and analyses a cost-benefit framework that can be used for evaluating collaborative SCM strategies and so, assisting companies' decision whether to participate and engage in collaborative SCM practices.

**Keywords**
collaboration; supply chain management; costs; benefits;

## 1. Introduction

There are increasing changes and competition in the modern business environment, which features more customized products and services, globalization of markets and cost efficient production. Firms strive to achieve competitive advantage through satisfying customers effectively and efficiently. Effectiveness requires that firms be equipped with customer-focused common goals among all the related suppliers and partners, while business success now depends largely on the capability of quick response to customer requirements. Both suppliers and producers need to cooperate and coordinate in sharing the common goal of strategy of improving product quality and customer service level. Efficiency demands firms to meet customer requirements economically, which also calls for collaboration between suppliers and producers. Addressing these considerations, supply chain management (SCM) is encountering increased interest in both the academic and professional communities. SCM is a well-established discipline that involves the coordination of an organization's internal planning, manufacturing / production, procurement and distribution efforts with those of its external partners (i.e. suppliers, retailers etc). To reduce inefficiencies in the supply chain, firms are increasingly exploiting Information and Communication Technology (ICT) tools (Serve et al, 2002) to integrate systems and processes throughout their supply chain, as integration and synchronization among partners can eliminate excess inventory, reduce lead times, increase sales and improve customer service (Anderson and Lee, 1999). However, mere coordination amongst trading partners today is no longer enough to maintain a competitive advantage. Instead, companies are moving towards collaborative SCM in an effort to reduce the information imbalances that result in the dreaded "bullwhip effect" (Lee et al, 1997) and increase their responsiveness to market demands and customer service (Mentzer et al, 2000). Collaborative SCM is continually being recognized as an effective tool of survival and maintenance of long-term advantages in global and heavily competitive market (Rudberg et al, 2002; Folinas et al, 2004; McLaren

et al, 2002). Indeed, much earlier, Christopher (1992) had advocated that leading-edge companies have realized that the real competition is not company against company, but rather supply chain against supply chain.

Despite the huge literature on the concept, determinant factors and benefits of collaborative SCM, limited research is currently found on evaluating the costs of SCM. However, companies need a consolidated and analytical cost-benefit framework of collaborative SCM strategies based on which to decide whether to engage and invest resources in supply chain networks and joint activities. In this vein, this paper proposes and analyses a cost-benefit framework that can be used for evaluating collaborative SCM strategies. The practical and theoretical implications of this framework are also discussed.

## 2. Collaborative SCM: a cost-benefit framework

### 2.1 The concept of collaborative SCM

SCM often refers either to a process-oriented management approach to sourcing, producing and delivering goods and services to end consumers or in a broader meaning to the co-ordination of the various actors belonging to the same supply chain (Harald, 1996). SCM offers the opportunity to capture the synergy of intra- and inter-company integration and management. Thus, SCM entails firms to co-operate with the common goal to increase the overall chain performance and end consumer satisfaction, rather than competing for a bigger share of the fixed profit. In that sense, SCM deals with total business-process excellence and represents a new way of managing the business and relationships with other members of the supply chain. Nowadays firms are seeking to extend their scope of integration beyond their organizational boundaries to include suppliers and customers with the aim to create network of firms based on long-lasting relationships.

Hence, in order to optimize the entire supply network and not just create local optima in one or two partners, the organizations must jointly make supply chain and demand

decisions that create sustainable value for all involved. In this vein, collaborative SCM goes beyond mere exchanging and integrating information between suppliers and their customers, and involves tactical decision making amongst the partners in the areas of collaborative planning, forecasting, distribution and product design (Kumar, 2001). Collaboration also involves strategic joint decision making about partnership and network design (Sigala, 2004a). Overall, collaborative SCM systems allow organizations to progress beyond mere operational-level information exchange and optimization and can transform a business and its partners into more competitive supply networks.

**2.2. Collaborative SCM requirements and related costs**

Despite the huge literature in SCM, the theory has failed to propose any specific implementation path and requirements to SCM. To feel in this gap, Cigolini et al (2004) have recently developed and tested a SCM model that was also adopted for identifying and classifying the costs and requirements of collaborative SCM. That was because the model represents an operational definition of SCM, while it identifies the constructs for SCM successful implementation. In this vein, the contribution of Cigoloni et al' s (2004) model in this study is the recognition of the SCM building blocks and requirements whose costs are later recognized and incorporated into the cost-benefit framework.

According to Cigolini et al's (2004) SCM model, SCM-related actions are classified into two categories namely SC techniques and SC tools. SC techniques are the main building blocks through which managers define their SC's main hard framework and control system, shaping its configuration, its management rules, and ultimately determining its performance. Different SC techniques would imply and require different organizational investments, commitments and costs which Cigolini et al (2004) recognized in their second block of the SC model namely the SC tools. SC tools are relation-specific assets or investments (e.g. an information system) through which the implementation of one or more SC technique(s) can be supported or enabled. Cigolini et al (2004) identified three SC tools namely information tools,

co-ordination and control tools, and organization tools, but they (2004) highlighted that this list should not be considered as a comprehensive and complete reference.

Information tools (e.g. online connections, automated identification systems such as barcodes, shared databases) are utilized to gather, analyze, transmit and share data, regarding customer data, end-to-end inventory status and locations, order status, costs related data and performance status. Data sharing ensures that participating members will be able to make use of shared information to help design and deliver products that fulfill customer requirements more quickly and effectively. Visibility and sharing of performance metrics also enables members to address production and quality issues more quickly permitting more agile demand planning to take place. Overall, collaborative SCM systems are designed to support enhanced information sharing and collaborative planning amongst partners in an effort to reduce information asymmetries in the supply chain, which contribute to the bullwhip effect and result in excess inventories (Lee et al, 1997). Hence, investments in information and communication technologies (ICT) support collaboration primarily through three mechanisms: 1) information integration and sharing; process and resource coordination; and 3) reporting of performance measures to ensure accountability.

Based on the above analysis, information tools imply that organizations should engage in the following costs and investments: ICT investments costs; costs for integrating their technological systems internally and externally with their network partners; costs for data translation and integration; financial and organizational costs for reengineering, coordinating and integrating their processes. On the other hand, investments in certain ICT in order to comply with network systems and enable network integration entail a degree of technological and so organizational dependence on the network and its more powerful members. Sigala (2003) revealed and analyzed how airline alliances and their respective Global Distribution Systems (GDS, i.e. the technological platform supporting the integration of the airline supply chain) gained control and power over the other

partners of the airline SC such as travel agents, corporate travel bureaus, smaller and regional airlines, and web travel intermediaries. Specifically, the ownership that GDS owner airlines had over this technological platform gave them the advantage to gather, analyze and control the exploitation of market intelligence and information for their own purposes. Based on this knowledge exploitation, particular airlines are able to influence the behavior of downstream distribution supply chain members establishing market hierarchies rather open marketplaces. In other words, ICT investments in proprietary systems as well as open ICT systems (as was the case of internet based system sin the airline SC) may lead to lock-in effects and costs resulting from the opportunistic behavior of certain network members.

To avoid and eliminate opportunistic behavior, network members should establish and operate co-ordination and control tools in order to monitor and influence the joint decision-making process, by measuring performances and setting rewards based on achievement of certain results. Cigolini et al (2004) found the existence of a supply chain performance metric system as a SC necessity. This system should include a set of parameters that fully describe the performance metrics of both the whole supply system, as perceived by end customers, and of each actor of the chain. This is because the main concern in developing SC metrics is to design appropriate metrics that ensure trustworthiness and accountability (Golbratt et al, 2000). Hence, instead of functional-cost-oriented metrics that are often achieved at the expense of another member, integrated metrics are required. However, performance metrics found in the literature are focused internally. Lambert & Pohlen (2001) argued that there is little evidence about the existence of metrics spanning across multiple members along the SC. Van Hoek (1998) also lamented the lack of aligned performance metrics that direct participating managers to pay attention to areas requiring improvements. Performance metrics should be continually shared to identify SC bottlenecks in time and enable continuous and accelerating SC performance improvements that contribute to both individual and mutual benefits. Indeed, members' commitment to improvement

is a critical SC issue that is dependent on shared performance metrics (Caplice & Sheffi, 1995; Gunasekaran et al, 2001; Holmberg, 2000). In this vein, the co-ordination and control costs required in collaborative Scare clustered into three categories as follows: 1) the development of SC integrated metrics; 2) trade-offs between integrated SC and organizational performance; 3) operational costs for functioning an integrated SC performance system.

SCM also requires inter-company co-operation and process alignment and so, organization tools are needed to support cross-firm communication and co-ordination. Cigolini et al (2004) considered "interface managers" as an indispensable organizational tool that facilitates data transmission, helps to manage established processes, and is useful whenever a new project is initiated and it needs tight co-ordination. Interface units should be cross-functional, since horizontal communication among neighboring departments is essential to exploit the full potential of SC integration, as well as at all managerial levels (i.e. senior, middle and operational level). However, since the SC environment dynamically changes, SC members should continually assess their decisions and co-ordination practices. Simatupang & Sridharan (2004) stressed the need to engage in continuous learning and improvement process and illustrated how an inter-firm performance benchmarking scheme systematizes and manages improvement initiatives.

A number of several other authors have also identified similar SC tools. Lee & Kindale (2003) identified six major dimensions of SCM: partnership, operational flexibility, IT, performance measurement, management commitment, demand characterization. Simatupang & Sridharan (2002) referred to and identified three SC enablers that dictate the amount of mutual actions used to drive SC performance: information sharing, decision synchronization, incentive alignment. Information sharing refers to the ability to see private data in partners' systems and monitor the progress of products as they pass through each process in the supply chain (Simatupang & Sridharan, 2002). Information exchange has been widely accepted as an indispensable SC tool (e.g. Stank et al, 1999; Lambert & Cooper, 2000; Lau &

Lee, 2000). In assessing members' information sharing capabilities, Shore & Venkatachalam (2003) revealed that such competencies require both hard (i.e. technology systems) and soft (i.e. trust, openness, mutual benefits) factors. Thus, in extension of Cigolini et al's (2004) arguments, other authors have identified soft factors as necessary SC tools.

Indeed, trust can significantly contribute to the long term stability of a network (Heide & John, 1990), while Lee & Billington (1992) expanded this argument by suggesting that effective coordination of the supply chain is built on a foundation of trust and commitment. Decision synchronization is the ability to orchestrate decisions at different managerial levels and time horizons for pursuing the common goals of optimizing the SC performance (Simatupang et al, 2002). This activity covers aligning strategic objectives, policies and metrics amongst the SC members (operational decisions), synchronizing mutual improvements (tactical decisions) and synchronizing supply chain planning and execution (strategic decisions regarding the adoption of certain SC techniques). Incentive alignment refers to the process of sharing costs, risks and benefits amongst the participating members (Simatupang & Sridharan, 2004), and it can be considered as one of the aims of a SC performance system argued by Cigolini et al (2004). This scheme motivates the members to act in a manner consistent with the mutual strategic objectives such as making decisions that are optimal for the overall supply chain and revealing truthful private information. To enhance collaboration and avoid opportunism activities and costs within collaborative networks, Sigala (2004b) argued that SC members should invest in developing and maintaining quality in their collaboration relations which in turn requires resource commitment in the following activities: conflicts resolution; understanding of business and network goals; sharing of risks and costs; costs for cross functions and network processes alignment; and commitment.

### 2.3 Benefits of Collaborative SCM

The benefits of collaborative SCM is not only the reduction of waste in the supply chain through reduced process

costs, inventory levels and product costs that result from the coordination of actual demand with supplier production plans, but also the increased responsiveness, improved customer service and satisfaction, better understanding of end-customer needs throughout the entire chain (market intelligence) and competitiveness amongst all members of the partnership (Mentzer et al, 2000; Sigala, 2004a). Thus, collaborative SCM systems allow organizations to progress beyond mere operational-level information exchange and optimization and can transform a business and its partners into more competitive organizations. In summary, as Folinas et al (2004) illustrated firms can experience a greater level of benefits by exploiting ICT advances in order to evolve their supply chains from internally logistics focused optimization efforts to more collaborative and whole network optimization practices.

## 3. A cost – benefit framework for collaborative SCM

Based on the above analysis, the cost and benefits of collaborative SCM were summarized and integrated into Table 1 that can be used as a cost-benefit framework based on which companies can assess their collaborative SCM practices as well as decide whether to engage in such strategies and particular networks. The value of the framework is twofold. First, it identifies the areas and fields in which organizations should expect to have costs and benefits. Second, it breaks down the cost/benefits fields into specific performance metrics in which organizations should aim to continually gather information and benchmark their performance.

**Table 1.** Cost – benefit framework for collaborative SCM.

| | Costs & Benefits | Performance fields | Results |
|---|---|---|---|
| Costs | ICT investments | Costs of ICT | Net benefits of collaborative SCM |
| | ICT implementation costs | | |
| | | | |
| | Data translation & Integration costs | | |
| | | | |
| | Process ICT & Organizational integration costs | Coordination costs | |
| | Process coordination and relationship quality costs | | |
| | Sharing of operational risks | | |
| | | | |
| | Network performance system costs | Control costs | |
| | Trade-offs in network and organizational performance optimization | | |
| | | | |
| | Partners opportunistic behavior costs | Partnership costs | |
| | SC loc-in and switching costs | | |
| | | | |
| Benefits | Cycle time reduction | Market responsiveness benefits | |
| | Service level gains | | |
| | Market intelligence gains | | |
| | | | |
| | Process cost reduction | SC cost reductions | |
| | Inventory cost reduction | | |
| | Product development and design cost reduction | | |

## 4. Conclusions and implication for future research

The aim of this paper was to develop a consolidated cost-benefit framework of collaborative SCM strategies. To achieve that, findings in previous studies and arguments in the literature were critically reviewed and summarized in an integrated cost-benefit framework that companies can use in order to continually assess their collaborative SCM practices and / or assist them in deciding whether to engage in a specific SC network. Specific cost and benefit metrics are suggested in order to operationalize the practical implications of the framework, however, the framework also identifies several areas in which future research is required. Specifically, further studies could aim at investigating the impact of open ICT architectures in the costs and benefits of companies in joining SC networks. Open ICT architectures imply a "plug and play" approach to developing and participating in SC network as lock-in effects are reduced to zero. However, such an approach may involve lower commitment, trust and cooperation benefits which may need to be balanced out to the lower ICT and partnership costs. In addition, open SC architecture may require new coordination mechanisms, probably through a third company and/ or marketplace, which may involve additional and new SC costs and benefits. Finally, continuous ICT advances further perplex SC relationships and collaboration practices meaning that continuous research studies are required to investigate their implications.

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