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Collaborative Planning, Forecasting and Replenishment: Determinants of Joint Action in Buyer-supplier Relationships

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ABSTRACT

In the past decade, Supply Chain Management (SCM) is considered as an instrument that primarily concentrates on procurement and transformation of material. It has been reported that in SCM it is difficult to make the balance between the necessary customer demand and the sufficient product supply. This paper proposes that collaborative planning, forecasting and replenishment (CPFR) has been used as a force for improving the supply chain management by overcoming the above difficulty. The primary objective of this study is to shed light on the collaborative relationships between buyers and sellers and its impact on supply chain performance. Finally CPFR implications over supply chain are discussed.

Key words: CPFR, Genetic Algorithms (GA), SCM

INTRODUCTION

A buyer-supplier relationship (SCM) is the most powerful process of consumer satisfaction; as a result Supply Chain Management (SCM) has become a vital issue for supply practioners and academicians. Unfortunately, much of the supply chain technology and process improvement projects to date have been focused only on manufacturing and distribution operations. This is why the idea of building demand-driven processes (CPFR) that increase demand visibility across multiple levels of the supply chain is paramount for many executives (Oracle/Demantra, 2006).

This study attempts to lessen the problems associated with SCM and proposed CPFR approach to eliminate demand and supply uncertainty through improved communications between upstream and downstream partners.

CPFR OUTLINE: BASICS OF CPFR

CPFR improved the forecast accuracy while achieving significant reductions in inventory levels. Caridi *et al*. (2006) analyzed that under the CPFR model, the process starts with the retailer agent which gathers data from point of sales and generates demand forecast; then it develops its plans by setting sales, inventory levels and orders to the manufacturer for each product and for each period; finally, it sends the proposal to manufacturer agent Which generates its order forecast (which, in turn, should coincide with retailers orders) and the production and inventory level for each product and each period.

CPFR will force suppliers to innovate, building on strong one-to-one relationships that will drive smarter ways of doing things. Most companies and industries can benefit from CPFR. However, companies that experience variation in demand buy or sell a product on a periodic basis and those deals in highly differentiated or branded products will benefit the most (Attaran and Attaran, 2007). The CPFR initiative has proven very valuable to Wal-Mart. The company has a joint

initiative with P and G where managers from both companies jointly forecast sales of P and G products at Wal-Mart stores and then jointly plan replenishment strategies. This collaboration ensures that there is no gap between what Wal-Mart plans to sell and what P and G plans to produce (Chopra and Meindl, 2001). According to Barratt and Oliveira (2001), the first step the trading partners should take to enable the implementation of the CPFR process is to develop an adequate environment. This environment must be founded on two concepts: trust and technology. CPFR has emerged as a highly sophisticated business practice which aims to ensure that there is always enough quantity to meet consumer demand while maintaining optimum levels of stock across the supply chain. Utilizing the principles of CPFR, a retailer and a consumer goods firm would together jointly to create a single, combined promotion calendar in advance of the selling work period. Both firms create sales and order forecasts, discrepancies or exceptions are identified and appropriate managers are advised (Folinas *et al*., 2004). However, Amaral and Turner (2001) discussed CPFR outline as; in the long-term, a competition pattern between supply chains rather than trading partners belonging to the same supply chain.

Thus, it clear that the specific objectives and scope of CPFR is to build the strong buyer-supplier relationships thereby increasing the efficiency of supply chain.

COLLABORATION: BUYER-SUPPLIER RELATIONSHIPS

In recent years there has been much interest in developing closer supply chain collaboration in many sectors of industry therefore, Simatupang and Sridharan (2005) found that in order to ensure effective collaboration, the chain members are encouraged to clearly define mutual objectives and associated performance measures and link their performance systems with decision synchronization, information sharing and incentive alignment. Clear linkage will encourage the chain members to improve shared supply chain processes that benefit all members. Three types of collaborative relationships were detected from the exploratory interviews; these are termed as, Type I: Collaborative transaction is characterized by high-volume data exchange and task alignment centered on operational issues/tasks, Type II: Collaborative event management is characterized by joint planning activities regarding events (e.g., new product introductions) and items of collaborative focus, such as promotions, Type III: Collaborative process management is characterized by joint problem solving, long-term business planning and more fully integrated supply chain processes. Advanced CPFR Which incorporates order forecasting, is an example of type III collaboration (Whipple and Russell, 2007). Such collaboration requires a great deal of co-ordination and hence Tuominen (2004) presented prior frameworks that assess the value of channel collaboration typically have addressed the issue of customer value from either transactional or relational point of view, but scant attention has been devoted on how these channel-related assets and capabilities appropriate value to firm itself. It is this gap that we hope to address by developing a contingency framework that links the preceding intangible resources to collaboration and fulfillment of firm value proposition. To succeed, mass collaboration needs new solutions to address three key issues other than the issue of how to improve the efficiency of forecasting at the retailer. The first is how to make replenishment more robust. This issue is followed by how to demonstrate to prospective partners the benefits of an order less collaborative business relationship. Finally, the question is how to set up the supporting IT systems, so that the planning processes are truly scalable in a business network consisting of independent organizations (Holmstrom *et al*., 2002). The collaboration helps to eliminate supply chain uncertainty; however Vereecke and Muylle (2006) found that companies are engaged in two different forms of collaboration. Collaboration can

be focused on the exchange of information on forecast, planning, inventory and delivery. It may also be geared toward setting up more structural collaboration, such as installing Kanban systems, initiating VMI or even co-locating plants. The business environment changes rapidly. Generally speaking, in an environment where the competition is increasingly based on supply chain efficiency, firms need to take advantage of the Internet and Web technology to achieve higher quality and lower cost collaboration with trading partners (Chou *et al*., 2004). The collaborative environment must be founded on two concepts: trust and technology. Leger *et al.* (2006) studied that business managers need to consider the benefits of e-collaboration tools when trying to safeguard their important business relationships. Furthermore, in order to benefit from the network externalities of explicit knowledge, firms seem to link upstream and downstream electronic collaborative initiatives, particularly in network-dependent contexts. Rudberg *et al.* (2002) suggested that by integrating collaborative supply chain services through an electronic marketplace, companies can collaborate and share information with each other, without having to implement expensive Electronic Data Interchange (EDI) networks. Computer integrated supply chain is one of the primary business strategies to improve supply chain performance. This has led to the emergence of the term Collaborative computing which refers to product and services that foster collaboration. The products in this category perform a wide variety of tasks ranging from e-mail, conferencing, task delegation, project management, data sharing, data storage/retrieval and time billing (Attaran and Attaran, 2002). Firms often need to break down their business boundaries. However, Bititci *et al.* (2004) found that intense competition forces companies to become involved in supply chain collaboration with their upstream and downstream partners. However, collaboration for collaboration sake is not enough, if businesses are to maintain their competitive and continue to sustain their performance collaboration should result in creation of new and unique value propositions based on a unified approach to value creation. The benchmarking scheme can be used to examine the current status of supply chain collaboration among the participating members, identify performance gaps and systematize improvement initiatives (Simatupang and Sridharan, 2004).

It is also observed that the collaborative relationships greatly depend on the trust, desires and intentions of the trading partners.

Information sharing: The next important step is that the trading partners must overcome reservations about sharing business information. Jagdev and Thoben (2001) observed that the traditional form of business exchange has been based on transactional relations focusing on the single product transaction with limited information sharing. Since (1995), have seen new forms of collaboration taking regular information sharing relations and their concepts one step further. A collection of new business practices that leverage the internet and electronic data interchange in order to radically reduce inventories and expenses while improving customer service (Skjoett-Larsen *et al*., 2003). Information visibility is often seen as a critical element in maintaining an efficient supply chain, but only way to obtain visibility is to plan and execute collaborative actions with both upstream and downstream partners (Cassivi, 2006). Information is made available to trading partners for constant updating and management of inventory. Taylor (2006) found that, on the one hand there are operational matters including the need to streamline information handling systems, the need to define relevant data requirements, the need to systematically and accurately record the required data and the need for timely transmission of data between supply chain partners. On the other hand, there are issues related to managing the nature

and characteristics of demand once this is clearly understood. In recent years, from a supply chain perspective, companies have touted the benefits of radio frequency identification (RFID), particularly its ability to create a seamless flow of information through all layers of the supply chain in near real time and to provide such detailed customer information that suppliers can tailor products and services to an individual more accurately than ever before. At the same time many are realizing cost savings by deploying RFID technology internally to monitor production processes (Spekman and SweeneyII, 2006). Birtwistle *et al.* (2006) studied how Quick Response (QR) strategies are dependent on building long term relationships, sharing information and investment in technology and facilities with suppliers. Rahman (2004) discusses how the internet is being used in the management of various areas of supply chain by Indian companies. The study revealed that the most frequent rate of usage of the internet in order processing was in the handling of return goods (3.67%) followed by out-of-stock notification of the customer (3.33%). The research showed that 70.4% of the firms indicated that they use an internet and 30.1% indicating that they also use an extranet.

E-business systems and processes that use ubiquitous platforms such as web browser and internet have a profound impact on the management of inter-organizational processes (Croom, 2005). In this sense, e-business is not restricted to buying and selling activity but also related with trading partners' collaboration. Kwon and Suh (2005) observed that effective supply chain planning based on shared information and trust between and among partners is an essential element for successful supply chain implementation. Trading partners must overcome reservations about sharing information. Supply chain visibility does not mean sharing all information with all partners in the supply chain but rather that the shared information should be relevant and meaningful. The future of visibility development is linked to other development activities, especially collaborative practices (Kaipia and Hartiala, 2006). The feedback information facilitates decision making and performance improvement in CPFR. A complex performance management system includes many management processes, such as identifying measures, defining targets, planning, communication, monitoring, reporting and feedback. These processes have been embedded in most information system solutions, such as i2, SAP, Oracle, EPM etc. These system solutions measure and monitor Key Performance Indicators (KPIs) which are crucial for optimizing supply chain performance (Cai *et al.*, 2009). Thus CPFR emphasized on managing the interface between buyer and supplier through effective information sharing.

Demand forecasting and bullwhip effect: CPFR aims to ensure a well integrated supply chain, so that there is always sufficient quantity to satisfy consumer demand while maintaining optimum levels of inventory across the supply chain. Stank *et al.* (1999) evaluated CPFR attempts to lessen the problem associated with traditional anticipatory demand forecasts by co-operating with trading partners to better match supply and demand. Thus, it makes firms better prepared and ready to respond to market signals. Most of the traditional forecasting methods require a large amount of data or assumptions to be normal. Therefore, with a small amount of data, how the industry will still be able to get an accurate prediction has become an important objective. Therefore, an improved nonlinear grey Bernoulli model by using Genetic Algorithms (GA) to solve the optimal parameter estimation problem of small amount of data used in the forecast is proposed (Hsu, 2010). GA works with a population of points instead of single point. Basic GA is created to work with a predetermined constant size of population and to use continuous search space for individual's presentation. It also provides opportunity to be adjusted to concrete problems by fitting

of its global and local parameters (Shopova and Vaklieva-Bancheva, 2006). GA is very different from most of the traditional methods. Radhakrishnan *et al.* (2009) proposed approach of GA to predict the optimum stock levels of the future by considering the stock levels of the past years such that the total supply chain cost will be maintained as minimum. The objective of GA application is to improve the precision of demand forecasts so as to reduce inventory losses and cost of management. The next important issue is why firms should manage the volatility of demand. The primary source of environmental uncertainty facing manufacturers is volatile demand, as this volatility tends to be distorted and amplified along a supply chain. This phenomenon, commonly called the bullwhip effect (Lee *et al.*, 1997). Moon and Kim (2005) defines bullwhip effect as an individual systems thinking ability of supply chain participants impacted on the dynamics of the total supply chain. CPFR attempts to better match supply and demand. Cyclic planning in multi-echelon environment has more practical benefits, because it provides easy control, reduced administrative cost and safety stocks and elimination of bullwhip effect (Merkuryeva and Napalkova, 2008). Two sources (the Houlihan and Burbidge effect) of the bullwhip effect may be completely eliminated by the adoption of vendor managed inventory in a supply chain (Disney and Towill, 2003).

The inventory and supply chain managers are mainly concerned about bullwhip effect. CPFR provide accurate, detailed and timely demand information thereby eliminating the bullwhip effect completely.

CONCLUSION

Companies have multiple objectives like to gain and sustain competitiveness, improving performance and increased profitability etc. In this context companies have used different performance management tools. Often these tools focus on any one operational area of company, but the tool (CPFR) which we have discussed covers most of the areas of company. It is centered on forecast collaboration to predict sales based on information provided by trading partners and these live sales data allow for constant updating and management of inventory on a real-time basis.

In this study we have suggested that joint action in buyer-supplier relationships is vital for supply chain management. We discussed the concept of CPFR from companies' point of view. The purpose of this is to explore the domain of CPFR for optimizing supply chain performance. It is expected that in future all companies will have to adopt partnership initiative with suppliers. Therefore, elimination of demand and supply uncertainty through improved communications between supply chain partners is vital for CPFR practice and development of suitable model for the same would be the most challenging task for researchers and users.

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