Chapter 26
Collaboration Planning Among Supply Chain Partners Using an ANP and Game Theory-Based Approach

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ABSTRACT

In response to current economic downturn coupled with intense global competition, the concept of supply chain collaboration has emerged as a possible solution for firms aiming to gain competitive advantage through cost reduction, increased asset utilization and improving service levels. In this chapter, the authors address the problem of collaboration planning between multiple retailers and/or suppliers in a supply chain network. Three problems are considered, namely partner selection, collaboration strategy selection, and profit allocation, among the partners entering into a collaboration. Three techniques, namely cluster analysis, analytical network process (ANP), and game theory, are used for this purpose. Partner selection for collaboration is done using cluster analysis and analytical network process (ANP) while collaboration strategy selection is made through the application of game theory. The profit allocation among collaborating partners is performed using Shapley method. A numerical application is provided.

INTRODUCTION

Supply chain collaboration, as defined by Simatupang & Sridharan (2002), is an interaction between "two or more chain members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying

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end customer needs than acting alone." Current economic downturn, intense global competition and fast changing customer demands have made it difficult for organizations to stay competitive in the current market place. Recession scarred customers are constantly looking for better quality and innovative products at a relatively low price. In the nutshell, organizations that are capable of selling products, or services that satisfy the above-mentioned specifications will be able to dominate the market.

In response to this challenge, the concept of supply chain collaboration has emerged as a new approach to attaining competitive advantage through cost reduction, increased asset utilization, reduced inventories, and shared business risk that arises because of the coordination of actual customer demand with supplier production plans. Effective supply chain collaboration can help organizations reduce excess inventory, shorten lead times and increase sales and customer service level. Furthermore, supply chain collaboration has allowed organizations to enhance flexibility and capabilities by fostering relationships that improve skills and knowledge, facilitate easier product development, offer access to new technologies and reduce time to market.

While supply chain collaboration amongst independent firms can often provide them with competitive advantage, however, lack of awareness regarding the presence of barriers of collaboration might impede the benefits of collaboration (Ramesh et al., 2010). A number of factors such as the level of trust between collaborating partners (Delbufalo, 2012), willingness to share information (Barratt, 2004), mistrust regarding the fairness of benefit, costs and risk sharing (Cruijssen, 2012) and availability of adequate measurement systems to support the efficiency and flexibility requirements of the supply chain (Reddy, 2001a; Karahannas & Jones, 1999) can influence the level of benefits that can be realized as a result of collaboration.

The purpose of this study is to provide a framework for facilitating collaboration amongst different supply chain partners. This involves:

1. Identification of potential partners for collaboration.
2. Determining best partner(s) for collaboration among the potential partner(s)
3. Identifying strategies for collaboration among the selected partners
4. Profit allocation among the partners' post collaboration.

The rest of the chapter is organized as follows. The next section is the literature review. This is followed by the solution approach and numerical application. The final section draws the conclusion.

LITERATURE

Partner selection is the first critical step in collaboration formation. Partner selection is a procedure of identifying ideal partners that can provide the right quality products and services at the right place, at the right quantities and at the right time (Sonmez, 2006). Proper identification of potential partners is of utmost importance for achieving successful supply chain management (Lasch & Janker, 2005). Adequate identification of partner selection decreases the purchasing costs and enhances corporate competitiveness (Ghodsypour & Brien, 2001). In the partner selection process for collaboration, identification of suitable decision-making criteria for choosing the right partner is of utmost importance. The decision-making criteria to be used for partner selection will vary across a variety of industries. For example,

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