Chapter 10
On the Analysis of Supplier–Manufacturer Information Sharing Strategies for Production Scheduling

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ABSTRACT

Nowadays, implementing collaboration strategies between the members of the supply chain has been an important research topic to obtain a more reactive and flexible supply chain in the highly competitive markets. However, few studies have been done on the impact of such collaboration strategies at one of the lower short-term decision levels: production scheduling. This paper is devoted to the study of information sharing between the members of a supply chain in a dynamic context. We consider a typical make-to-order direct sell supply chain without finished products inventory, similar to the one implemented by Internet PC sellers. We compare various scheduling algorithms implemented to study different scenarios of information sharing among the members of the chain. We have considered scenarios where no information is shared and scenarios where some or all information is shared. A simulation study is developed in order to get some insights about the impact of information sharing on the performance of the chain. Our results suggest improvement in the performance that shows the importance of collaboration and information sharing between the members of the chain.

INTRODUCTION

According to the dictionary of the *American Production and Inventory Control Society* (APICS), a supply chain encompasses every effort involved in producing and delivering a final product from the supplier to the customer's customer (Paulraj, 2002). The management of the supply chain is concerned with the coordination of material, information and financial flows within and across legally separated organizational units (Stadtler,

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2009). In the last years, it has been recognized that sharing information and coordinating the actions among the supply chain enable the members to make good decisions that can improve the performance of the supply chain (Huang *et al.,* 2003). Several examples of industrial practices show the positive impact of the information sharing in the performance of the supply chain. For example, the vehicles manufacturers use collaboration strategies with their suppliers, so their parts reception and inventory control can be improved (Benyoucef, 2001). Mc Donald's shares information with suppliers in order to achieve the quality standards in his products and assure the clients satisfaction. Dell uses online information sharing to increase its logistic capability and improve its service to customers (Simatupang and Sridharan, 2001). Benetton electronically receives orders and sales information from hundreds of company agents located around the world (Simatupang and Sridharan, 2001). Wall Mart and Procter & Gamble (P&G) share information about sales of P&G products in the Wall Mart stores.

The supply chain performance can be highly influenced by the coordination and information sharing between the members of the chain. According to Sepulveda and Frein (2004a), coordination needs some way of sharing information. Both effective information sharing and effective supply chain practice are critical in achieving good supply chain performance (Rodríguez-Varjan and Montoya-Torres, 2009). According to Simatupang and Sridharan (2001), in a qualitative way, information sharing in the supply chain provides four main sources of benefits: it permits to establish a clear contract, the supply chain can be more reactive and flexible responding to the changing markets, provide a better coordination between the members of the supply chain, and can reduce opportunistic behavior. In a quantitative way, the authors also prove the benefits on inventory costs. More investigations have focused on this subject mainly in the performance of planning in the medium term.

For this reason it is necessary to study the supply chain in a global way (coordinating the decisions) (Simchi-Levi *et al.,* 2000), in order to avoid local optimization of each member which can be detrimental to the global performance of the supply chain (Huang and Lin, 2010). This is because the impacts of management policies do not take into account the requirements of the other members of the supply chain. As suggested by Sepulveda and Frein (2004b), the benefits of information sharing are intuitively clear. Nevertheless, little work has been done about the quantification of this benefits in the different decision levels or in the different main aspects of the supply chain management – inventory control, production, transport, etc. (Lee *et al.,* 2000). It should be apparent that having accurate information throughout the chain should not make the managers of a supply chain less effective than if this information was not available. Unfortunately, using this information effectively does make the management of the supply chain more complex because more issues must be considered (Simchi-Levi *et al.,* 2000). Moreover, information sharing can be detrimental if the shared information is not used intelligently (Hong-Minh *et al.,* 2000).

This paper is focused on the study of the collaboration strategies among a two echelon (manufacturer-supplier) serial supply chain at the operative level. Some aspects of this decision level have been studied in the literature, in particular those about the demand and inventory control. Chen (2001) reported that having centralized the information about the demand could reduce the fluctuation and amplification of orders throughout the supply chain. Some research of Chen *et al.* (2000) aims to quantify the well-known bullwhip effect for each member of the supply chain. He demonstrated that the demand fluctuation throughout the supply chain is an additive function of the lead time when the information is centralized and is a multiplicative function otherwise for each member of the chain. Cachon (2001), and Sepulveda and Frein (2004b) compare several inventory