Chapter 1

Modeling Accuracy of Promised Ship Date and IT Costs in a Supply Chain

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ABSTRACT

In the current dynamic, competitive business environment, customers expect to see products they purchase to be shipped on the date it is promised. However, accurate calculation of promised ship date by suppliers can only be obtained at expense of corporate IT systems that provide accurate availability data. Our study indicates that refresh frequency of availability data in IT system substantially impacts accuracy of the ship date that is promised to customer. The value of customer service level corresponding to accuracy of promised ship date needs to be estimated against the costs of having necessary IT system. The estimation requires a simulation model of availability management process. In this paper, we describe how to model and simulate the availability management process, and quantify the customer service level resulting from various availability refresh rate.

INTRODUCTION

Being able to promise customers the desirable shipment (or delivery) date and fulfilling the orders as promised are important aspects of customer service in a supply chain. With the recent surge and widespread use of e-commerce, shoppers can now easily assess and compare customer service quality in addition to quality of goods and price among different vendors. This creates a very competitive business environment, thus making customer service a critical factor for success and survival of many companies. Competitive pressures are forcing companies to constantly look for ways to improve customer services by evaluating and redesigning supply chain processes. The Availability Management Process (AMP), also called Available-to-Promise (ATP) process, is a key supply chain process that impacts customer service since it determines customer promised ship (or delivery) dates, the accuracy of the promised ship date, order scheduling delay and order fulfillment rate as well as inventory level.
It is possible for suppliers to have accurate promised ship date; however, it may require a high IT expense. In an ideal e-business environment, when a customer order is scheduled and a ship date is computed and promised to the customer, the availability of the product should exist when it is time to fulfill the order. However, in reality the availability data that are used for the scheduling the orders are not real time availability (physical availability), but they are availability information stored in an IT system (system availability). The availability data in the IT system (static view of availability) are typically refreshed (synchronized with real time availability) only periodically since it is very expensive to update the database in real time. Due to this potentially inaccurate view of the availability, some orders can’t be shipped on the promised ship date. Therefore, for certain customer orders, products are shipped later than the promised ship date resulting in customer dissatisfaction. The accuracy of promised ship date can improve with high capacity computer hardware and software and improve the customer service; however, it would also cost substantially high IT expense. Therefore, one of key decisions in order fulfillment process is to properly balance IT system (e.g., IT expense) and accuracy of promised ship date. In this work, we study how availability fresh rate (IT system) impacts customer service level. The simulation model we develop helps making critical business decision on refresh rate of availability, and adequate investment in IT system.

Availability management involves generating an availability outlook, scheduling customer orders against the availability outlook, and fulfilling the orders. The generation of *availability outlook* is the push-side of the availability management process, and it allocates availability into ATP (Available-to-Promise) quantities based on various product and demand characteristics and planning time periods. *Order Scheduling* is the pull-side of the availability management process, and it matches the customer orders against the availability outlook, determines when customer orders can be shipped, and communicates the promised ship date to customers. *Order fulfillment* is executing the shipment of the order at the time of promised ship date. Even if an order is scheduled for shipment for a certain date based on the outlook of availability, the resources that are required to ship the product on the promised ship date may not be actually available when the ship date comes. A key role for effective availability management process is to coordinate and balance the push-side and pull-side of ATP, and to have adequate Information System (IS) capabilities so that a desirable and accurate ship date is promised to customers, and products are actually shipped on the promised date.

AMP or ATP process has been described in several research papers. Ball et al. (2004) gave an overview of the push-side (Availability Planning) and pull-side (Availability Promising) of ATP with examples from Toshiba, Dell and Maxtor Corporation. They stressed the importance of coordinating the push and pull-side of availability management for supply chain performance by making good use of available resources. Although ATP functions have been available in several commercial ERP and supply chain software solutions such as SAP’s APO, i2’s Rhythm, Oracle’s ATP Server and Manugistics’ SCPO modules etc. for several years (see Ball et al. 2004 for details), those ATP tools are mostly fast database search engines that schedule customer orders without any sophisticated quantitative methods. Research on the quantitative side of ATP is still at an early stage, and there are only a limited number of analytic models developed in supporting ATP.

For the push-side of ATP, Ervolina and Dietrich (2000) developed an optimization model as the resource allocation tool, and described how the model is used for a complex Configured-to-Order (CTO) environment of the IBM Server business. They also stress how the push-side (Availability Promising) and pull-side (Availability Planning)