

Chapter 2.18

Balancing Accuracy of Promised Ship Date and IT Costs

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ABSTRACT

In an ideal e-business environment, when a customer order is scheduled and a ship date is computed, the availability should immediately be reserved and not be available for future orders. 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) is 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 cannot 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. 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 avoiding expensive IT investment.

INTRODUCTION

Being able to promise customers the desirable delivery date and fulfilling the orders as promised are an important aspects of customer services. 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. 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.

The availability management involves generating availability outlook, scheduling customer orders against the availability outlook, and fulfilling the orders. Generation of Availability Outlook is a 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 a pull-side of availability management process, and it matches the customer orders against the Availability Outlook, determines when customer order 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 actually be 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) capability so that desirable and accurate ship date is promised to customer and product is shipped on the promised date.

AMP or ATP process has been described in several research papers. Ball, Chen, and Zhao (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 such as SAP's APO, i2's Rhythm, Oracle's ATP Server and Manugistics' SCPO

modules, and so forth for several years (see Ball et al. (2004) for details), those ATP tools are mostly fast search engines for availability database, and they 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) have to work together for the overall availability management performance.

For the pull-side of ATP, Chen, Zhao, and Ball (2002) developed a Mixed-Integer Programming (MIP) optimization model for a process where order promising and fulfillment are handled in a predefined batching interval. Their model determines the committed order quantity for customer orders that arrive with requested delivery dates by simultaneously considering material availability, production capacity as well as material compatibility constraints. They also studied how the batching interval affects supply chain performance with different degrees of resource availability. Moses, Grand, Gruenwald, and Pulat (2004) also developed a model that computes optimal promised ship date considering not only availability but also other order-specific characteristics and existing commitments to the previous scheduled orders. Pan and Shi (2004) also developed a heuristics-based order promising model but with E-commerce environment in mind. They modeled a process where customer orders arrive via Internet and as earliest possible shipment dates are computed in real-time and is promised to customers.

All the previous work described above deal with either push-side of ATP or pull-side of ATP with an assumption that accurate inventory data

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