Chapter 12

DUE DATE MANAGEMENT POLICIES

Pinar Keskinocak*
School of Industrial and Systems Engineering
Georgia Institute of Technology, Atlanta, GA 30332
pinar@isye.gatech.edu

Sridhar Tayur
Graduate School of Industrial Administration
Carnegie Mellon University, Pittsburgh, PA 15213
stayur@cyrus.andrew.cmu.edu

Introduction

To gain an edge over competitors in an increasingly global and competitive marketplace, companies today need to differentiate themselves not only in cost, but in the overall “value” of the products and the services they offer. As customers demand more and more variety of products, better, cheaper, and faster, an essential value feature for customer acquisition and retention is the ability to quote short and reliable lead times. Reliability is important for customers especially in a business-to-business setting, because it allows them to plan their own operations with more reliability and confidence [67].

We define the lead time as the difference between the promised due date of an order (or job) and its arrival time\(^1\). Hence, quoting a lead time is equivalent to quoting a due date. The importance of lead time quotation becomes even more prevalent as many companies move from mass production to mass customization, or from a make-to-stock (MTS) to a make-to-order (MTO) model to satisfy their customers’ unique needs. Hence, companies need to determine in real time if and when an order can be fulfilled profitably. The Internet as a new sales channel further increases the importance of effective lead time

* Pinar Keskinocak is supported by NSF Career Award DMII-0093844.
quotation strategies, as customers who place orders online expect to receive reliable lead time as well as price quotes. For example, many customers were extremely dissatisfied with their online purchasing experience during the 1999 holiday season, mainly due to unreliable delivery date quotes, lack of order status updates, and significant order delays [48].

Quoting unreliable lead times not only leads to potential loss of future business, but may also result in monetary penalties. Seven e-tailers, including Toys R Us and Macy’s had to pay a total of $1.5 million to settle a Federal Trade Commission (FTC) action over late deliveries made during the 1999 holiday season [40]. According to the FTC, the e-tailers promised delivery dates when fulfillment was not possible and failed to notify customers when shipments would be late. Sometimes a company may self-impose a penalty for missed due-dates. For example, due to the increasing insistence of many steel users on consistent reliable deliveries, Austin Trumann’s Steel started to offer a program called Touchdown Guarantee in 1986. Under the program, if the company agrees to a requested delivery date at the time an order is placed, it has to deliver on time or pays the customer 10% of the invoice value of each item not delivered on time [52].

A common approach to lead time quotation is to promise a constant lead time to all customers, regardless of the characteristics of the order and the current status of the system [66] [112]. Despite its popularity, there are serious shortcomings of fixed lead times [63]. When the demand is high, these lead times will be understated leading to missed due dates and disappointed customers, or to higher costs due to expediting. When the demand is low, they will be overstated and some customers may choose to go elsewhere.

The fundamental tradeoff in lead time quotation is between quoting short lead times and attaining them. In case of multiple customer classes with different capacity requirements or margins, this tradeoff also includes capacity allocation decisions. In particular, one needs to decide whether to allocate future capacity to a low-margin order now, or whether to reserve capacity for potential future arrivals of high-margin orders.

Lead-time related research has developed in multiple directions, including lead time reduction [54] [100], predicting manufacturing lead times, the relationship between lead times and other elements of manufacturing such as lot sizes and inventory [42] [62] [69], and due date management (DDM) policies. Our focus in this survey is on DDM, where a DDM policy consists of a due date setting policy and a sequencing policy. In contrast to most of the scheduling literature [49] [79] [89], where due dates are either ignored or assumed to be set exogenously (e.g., by the sales department, without knowing the actual production schedule), we focus on the case where due dates are set endogenously. Most of the research reviewed here does not consider inventory decisions and