Reducing Lead-Time, the Key To Make-To-Order Success

by Dave Turbide, CFPIM, CMfgE, CIRM

Success in the “to-order” market often depends on reducing lead-time— to nimbly respond to changing demand and to be able to deliver more quickly to your customer.

Most manufacturers would agree that lead time can be an effective competitive weapon—or competitive handicap—as customers become less patient and less willing to wait for delivery of what they order. Whether the product is a consumable supply item or expensive capital equipment, the ability to deliver sooner than your competitors can make the difference between a successful sale and declining market share.

The same holds true for the introduction of new products. The first to market enjoys a temporary margin advantage and often a market exclusive. This advantage is fleeting, however, as competitors will quickly enter any market segment with high margins or little competition. The sooner a new product can be brought to market, the longer this period of exclusivity and high margins.

These considerations are especially important in make-to-order (MTO) and engineer-to-order (ETO) situations. With product cycles shrinking, especially in technology-driven industries, reducing lead-time can be the key to survival.

The elements of lead time
Most of us tend to think of lead-time within a rather narrow viewpoint. Production lead-time, made up of material handling and non-production (wait or queue) time as well as real production activities, is what comes to mind, especially in light of the recent focus on advanced scheduling techniques. Many APS (Advanced Planning & Scheduling) systems are aimed at the efficient movement of work through the plant, and that’s appropriate and important, but there are other aspects of lead-time that can be just as critical, although not always as easy to identify.

Think about the complete cycle of a customer order:
- Receipt and handling of the order including review (customer service, engineering, credit, sales/marketing), and entry into the system
- Possible design or engineering activities
- Scheduling, allocation/acquisition of materials and parts
- Production, including the aforementioned non-active portions of lead-time
- Testing, packaging, handling, and shipment preparation
- Transportation/delivery to the customer’s location
- Invoicing and collection

Production lead-time may not be the largest element on this list. In many cases, the order handling on the front end and/or shipment and transportation at the other end may exceed actual production time significantly. In these situations, it is important to identify where the opportunity is and focus any improvement efforts where they are most likely to deliver real results.

One client company I worked with a few years ago produced a component part for the computer industry. Each item produced was customer-specific and none were stocked by the supplier (true make-to-order). Because of the competitive nature of their industry, they were forced to promise (and deliver) very short lead-times—their standard was 10 days from receipt of order to delivery of the product.

Their production lead-time was about three days. Yet, they consistently missed ship dates or struggled mightily to make the ones that they did meet. The problem was that all customer orders had to pass through a multi-step review and approval process. The credit checking step alone usually consumed up to five or six days. By the time the order got to production, the promised ship date was at hand.

This company suffered from two major impediments: outdated and inappropriate procedures, and multiple systems that were not integrated. Since a majority of their orders came from established customers with a history of buying and payment pat-
terns, manual credit checking/approval should have been on an exception basis only; most of the orders could have passed right through that step untouched. Integration of systems (customer orders were on one computer, production schedules on another) would have saved another day or two. Once the order made it through the approval processes, it had to be manually entered into the production system. Only then did manufacturing become (officially) aware of the requirement. Of course, an informal “system” evolved to provide manufacturing with some advance notice. Otherwise, they probably would not have been able to meet ANY of the customer promise dates.

In many cases, there are inefficiencies like this built into existing procedures—procedures that have evolved over many years and were designed around old organizational or system limitations that may no longer apply. The essence of reengineering is identifying the best way to accomplish a task in today’s environment, unencumbered by the limitations of the past.

Post-production
When looking for lead-time reduction opportunities, don’t ignore the other end of the time line. After production is complete, there may also be convoluted processes for completing the paperwork, inspection and movement of goods to stock, picking, packing, and shipping. Follow an order or a product through its complete cycle. You may be amazed at how far it travels and how little real production time is involved.

And remember that Supply Chain Management is a burgeoning technology area where many new tools (and extensions of existing systems) are being introduced to help manage not only supplier and customer relations, but also the transportation links in between.

The message here is that production lead-time, though it may be significant, is not the only place to look when trying to reduce lead-time to the customer. That’s why, in fact, you will find this Make-To-Order issue of Midrange ERP filled with information about configurators and PDM systems; tools for reducing lead time in the front office and in the engineering release area.

Production lead-time
While there is little or no discussion of manufacturing lead-time reduction among these other articles, it can be an important factor, but not just in make-to-order. Even make-to-stock companies can benefit. Shorter lead-times:

- reduce the time it takes to respond to a shift in customer demand
- reduce the interval over which a forecast is used to commit to purchase and production plans, making the forecast more accurate and increasing the ability to respond to detected forecast errors
- reduce material and work-in-process inventory investments which are proportional to lead time
- reduce obsolescence and rework risk; being caught with large investments in

![Components of Production Lead Time](image)

Figure 1: “Touch time” is a small part of total production lead-time.
Without going all the way to flow manufacturing, there is still significant potential for lead-time reduction in a batch environment.

It is a fact that the majority of the time that elapses between the start of a manufacturing order and its completion is not consumed by "active" production—time on the machines or in the hands of workers—often called "touch time". Note that the word "order" is used in that sentence. Work orders signify traditional "batch" or discontinuous production wherein an order for a specified quantity of a product is initiated, the materials are issued to the order, it all moves to the first work center, then waits its turn. After the entire lot is completed at this first operation, it moves as a unit to the next work center where it again waits its turn. This "batch" situation is typical in a traditional production environment.

The way we schedule and manage traditional batch production assumes that there is movement time and waiting time (queue) which, it turns out, makes up about 80% of total production time in a typical plant. In addition, even the "active" time is not really active for most individual parts. If the order size is 100 units and a work center can accommodate only one unit at a time, the other 99 are waiting even during the active portion of lead time. (Figure 1)

Conceptually, if all non-active time could be removed from production lead-time, a product could be produced in a very small fraction of the time currently required. This is the idea behind flow manufacturing which is the focus of a special supplement that will ship with the upcoming September 1998 issue of Midrange ERP.

Without going all the way to flow manufacturing, there is still significant potential for lead-time reduction in a batch environment. The obvious opportunities are to reduce batch sizes and/or reduce queue time. Smaller lot quantities mean that a given item will be produced more often, increasing the handling and paperwork burden. It also means that any fixed costs (primarily set-up or change-over) will be spread across a smaller population of produced product, raising unit costs. The solution to these concerns is to reduce fixed costs and handling/overhead to the point where smaller lot sizes are affordable.

Work flow management (scheduling and dispatching) and queue reduction are at the heart of traditional work-in-process management and input/output analysis. The philosophy is that queue time exists and can be exploited as a tool for responding to priorities and managing the flow of work through the plant.

Some of today’s chief proponents of Advanced Planning and Scheduling (APS) systems contend that queue is not necessary and that some of the basic assumptions of work scheduling and management simply perpetuate this myth. Whichever side of this discussion you favor, it is obvious that queue is a significant portion of lead-time today and any tools or theories that can be applied to its reduction are beneficial.

Reducing non-active time directly reduces manufacturing lead-time without adding cost to the product. As a bonus, the flow manufacturing experience has taught us that shorter lead times contribute to higher quality and lower costs-of-quality.

In production, then, the challenge is to reduce lot size and/or manage or eliminate non-active (queue) time. Lot size reduction often entails set-up or change-over reduction. Outside of production, the solution is often to streamline procedures, eliminate non-valuable activities, coordinate departments more closely, and overlap activities for parallel completion wherever possible. Fortunately, information systems can help in many of these pursuits. Additional good fortune results from the development and emergence on the market of a veritable flood of new and improved tools under the umbrellas of PDM/PIM, CM, SFA, ISS, and other acronyms. Once again, the software industry has identified needs and responded with tools to address them. As these products evolve, tighter integration among these newer tools and between these tools and ERP will bring even more benefit to manufacturers, whether make-to-order or otherwise.

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PDM = Product Data Management
PIM = Product Information Management
CM = Configuration Management
SFA = Sales Force Automation
ISS = Interactive Selling Systems