

# Scheduling to Keep Your Customers Happy

By John R. Dougherty, Senior Partner, Partners for Excellence

## I. Introduction: The 90's — The Era of the Customer

Today every company needs and wants to be demand and customer driven. Everyone wants to get “closer to the customer.” The universal goal is to “delight” the customer. Now more than ever “the customer is always right.” Customers—we must be focused on them, linked to them, constantly communicating with them, more responsive to them, more flexible for them, more open to their requests and inputs, etc., etc., etc.

These are exciting ideas. But how do we measure how well we achieve them? Is it simply a matter of increasing our customer service performance measurements or line item fill rates? That alone wouldn't be particularly hard to accomplish if companies could carry larger inventories, rely on redundant equipment and personnel for ultimate flexibility and scheduling, and absorb costs for last minute product rework, schedule changes and the like.

No company can afford to ignore that the 1990's is also an era of streamlining, restructuring, down-sizing, rightsizing, fine tuning, cost containing, profit improving, etc. Increased customer satisfaction has to come concurrently with improved cost and asset management. ***This means that short-term fixes, the latest program, process or acronym will not be enough to get the job done.*** These dual challenges have forced companies to drastically rethink the way they manage their assets, the flow of materials and their supplier and customer partnerships in a way that produces better long-term value for themselves, their customers and their supply chain partners.

With such a heady challenge, the temptation is strong to seek new approaches, new tools, new initiatives and new programs. However, true breakthrough changes in how we manage things don't

happen very often. In fact, historically we can see that bigger challenges usually motivate companies to find better and more effective ways to take advantage of the tools and technologies that were already there. There are many World Class companies using the tools we already know about in different, better and more rigorous ways to achieve the benefits and goals described above. These approaches and tools include Manufacturing Resource Planning (MRP II), Just-in-Time (JIT) and Customer Linking. It's important to beware of the many consultants, software companies and practitioners that re-name old processes to emphasize or describe their improved use of them. Thus we have Enterprise Resource Planning (ERP) or Supply Chain Management as opposed to MRP II. Thus we have Reengineering, Demand Flow Planning or Continuous Flow Manufacturing as opposed to Just-in-Time. Thus we have Customer Connectivity vs. Customer Linking or Customer Communications. Much of this new terminology is more appealing and attractive because it better describes the tools and how they're used in today's companies. But it's critical not to be blinded by the new name and think that the proven, established principles and approaches are no longer applicable. Rather, they're being expanded, enhanced and in many cases being used in ways that more closely resemble their original intentions.

Given the challenges described above, it is particularly crucial that all three of these areas be addressed concurrently and integratively. For instance, MRP II alone will not produce the desired results. Even Class A MRP II only ensures that supply and demand are balanced and that current processes are managed in an optimal fashion. MRP II helps companies substitute forward-looking ***information*** rather than holding redundant inventory or capacity in

anticipation of dealing with supply and demand changes. Class A MRP II would lead a company to significant decreases in inventory and increases in reliability, flexibility and cost competitiveness. But that simply isn't enough to compete in the 90's.

JIT is a philosophical challenge to how we do things. It doesn't settle for optimizing current processes (as MRP II does) but instills a mindset and methodology in which everyone is always looking at changing and improving processes. Implemented by itself, it would significantly improve company flexibility, significantly lower costs and somewhat lower inventories. However, unless every one of a company's suppliers and every one of its customers had similar systems, it wouldn't provide the optimum supply demand balancing and forward planning that MRP II would. Therefore, most companies have learned the valuable lesson that MRP II and JIT both work best when integrated and used together to very effectively compete on a cost and flexibility basis.

However, the third leg of the stool is Customer Linking. Here we're not talking about just simplistic use of Electronic Data Interchange (EDI) to more quickly and efficiently transmit requested customer delivery changes and rescheduled supplier acknowledgments. Rather, we're talking about truly linking the information, planning and scheduling of the customer with the supplier through every step of the process. This would include customer participation in product design, process development and much more detailed and timely communication of customer long and short-term requirements, inventories and the like. In some cases, companies have found that they have actually eliminated the need for forecasting by using their customers' planned requirements to directly drive their manufacturing schedules! Pursued alone,

this process would help. But its true power comes when done in conjunction with the aforementioned MRP II and JIT processes. In fact, the three should be worked on concurrently. JIT improvements should be prioritized and focused by customer requirements. MRP II planning approaches should match and facilitate the dynamics and choices that the customer demands.

This paper will describe how some leading edge companies use specific scheduling approaches or techniques to integrate these three key processes and achieve remarkable results.

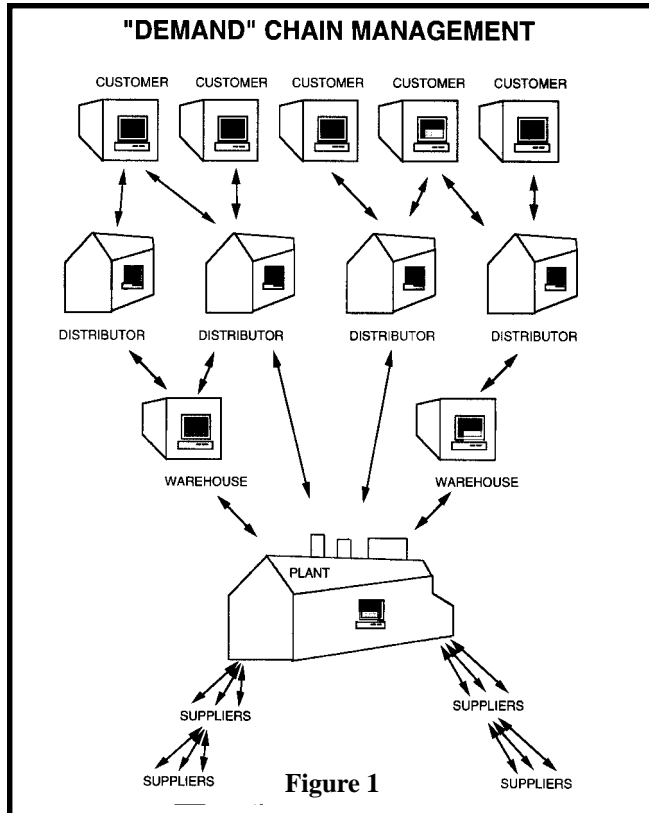


Figure 1

## II. "Demand" Chain Management

Figure 1 shows a relatively deep "supply chain." It shows a plant buying components or raw materials from suppliers who in turn have their own network of suppliers one or more levels deep. It also shows the plant distributing product through both distributors and warehouses. Some of the warehouses then supply smaller distributors. The distributors in turn move the product through a dealer network to the ultimate customer. For purposes of simplicity, we have not added to this diagram cases where the plant may ship direct to large customers or direct to large dealers, but certainly that happens in many cases. Whether a particular company's en-

vironment is similar to this or twice as complex or only half as complex, the issues remain the same. At each step of this process decisions need to be made about purchasing, manufacturing, scheduling, building and holding inventories. In other words, how much "supply" is needed and will be needed to support the demand of the next customer in the chain?

As suggested by the title of this figure, we believe the focus has been on the wrong question. The first question is not "how much to supply;" rather, the first real question is how much will be "demanded."

If as much energy was put into managing demand as we have put into managing supply over the last 30 to 40 years, we'd find that the complexity and costs of our supply processes could have been greatly reduced.

When we think of demand management, we often think of forecasting and customer order management. Why does anyone forecast? The answer is simply because their customers don't give them a long enough horizon of orders, commitments or requirements that allow them to do all the supply planning and execution necessary to have the product ready when the customer wants it. In other words, simplistically, it takes the plant longer to

buy and make than it takes the customer to order.

But is the customer always insensitive to the lead times of their suppliers? Though this often seems to be the case, many businesses have improved their ability to establish, review and maintain longer range plans. In fact, in many cases individual levels within a demand chain operate excellent MRP II, Forecasting, Customer Management and Distribution Resource Planning (DRP) systems. Often what's missing is linking these various systems together over the planning horizon to better share information. However, one of the challenges this presents is handling massive amounts of detailed data from hundreds of

customers on hundreds or thousands of items stretched out over weeks and months of time.

The fact of the matter is that the key to effective demand planning in the 90's is not *mathematical sophistication*, but rather *practical segmentation*. A more refined mathematical formula which seeks to predict the future based on the past will render far less benefit than the ability to manage, combine, sift and summarize the future demand data that customers can provide.

There are various forms of segmentation that will help. For instance, segmenting sales history by *customer* so that you can identify trends for major customers or groups of customers in like industries. Additionally, historical segmentation could be done by *regional areas*, *types of market* or by *particular product features or options* such as color, size, package, label, etc. The key here is to identify major segments of demand so that they can be pursued for more individualized forecasting. For instance, some companies attempt to get forecasts from those customers that represent 80% of the product volume. They then add a factor to those numbers to come up with a total forecast by item.

*Time segmentation* is also significant. Here you're asking questions such as why does demand change over time? Are there promotional activities instigated by you, your customers or other levels of the demand chain? Are there price changes that are announced at typical times of year that affect demand? Do price changes necessarily have to cause a spike in demand? Could price changes be announced but the supplier reserve the right to ship under the old price 30, 60 or 90 days after the order was received to smooth the flow of material and, in effect, not deliver it any sooner than the customer wanted it anyway?

Should the *level of detail* be segmented? Does the final packaging or labeling of the product need to be known 12 months in the future? Is it just enough to know the total volume of base product that will be required? This could lead to asking customers, for instance, for a detailed line item forecast for the next 13 weeks by product size, package, label, etc., then just a monthly demand forecast by type of product for the following six months and then just a quarterly forecast for the next five quarters for an entire product family.

In all cases this segmentation of data has to be done in light of the *availability of data* and its *significance*. For instance, if you had a highly flexible manufacturing process where it's very easy to change product mix within the month, less detail would be needed, even if it was available. Conversely, in situations where you need a lot of detailed data but it simply is not available, either through historical records or through customer information, the choice there may be to begin to collect and segment the data now for use in a year or two.

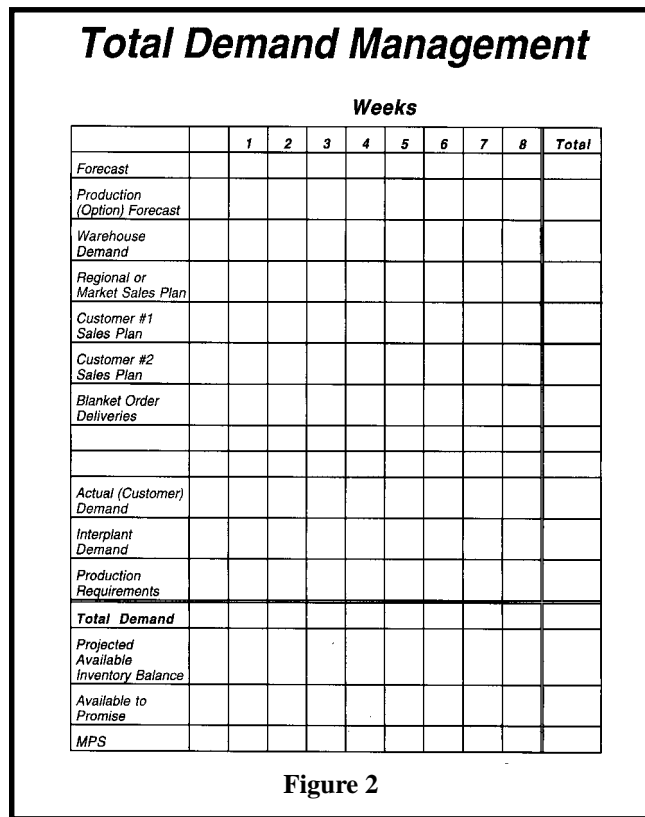
Finally, segmenting the effect of *new product introduction, product design changes, product label changes* and the like is also important. Making all this information easily identifiable in an attempt to analyze past historical trends by market, customer, segment, etc. and to use it for validation and evaluation of future planning data can be critical.

Probably none of the ideas expressed in the previous paragraphs would totally surprise the reader. However, how many standard, off-the-shelf forecasting or demand management packages provide for this kind of segmentation and organization of information? How easy is it to inquire a pre-existing database to get this information and analysis? Certainly the power of the computer is not what stands in the way, but the design of databases and software programs may be a hindrance. This challenge is being overcome by leading edge companies by the upgrade of both their own and their customers demand management systems.

### **Type of Customer Input**

The segmentation should lead a company to determine what type of detailed information is desirable from customers. In some cases the customer can simply download the output of their planning system and feed it direct into the supplier company's database in the form of individual, line item forecasts. This would represent the actual output of their MRP II or DRP systems which take into account their forecasts, plans, current inventories and hedge factors.

Where this is not available or too voluminous, different approaches need to be taken. For instance, the customer could forecast total volumes by month, by major product group and highlight only those cases where product mix changes within a



**Figure 2**

group are anticipated. Or the customer could simply express future demand as a percentage of past demand, showing increases or decreases by month over time and showing any variation in cyclical or seasonal demand patterns or promotion or pricing impacts. The farther into the future, the less detail the supplier companies should need since they're generally only planning broad levels of internal and supplier resources required, not the detailed, weekly product mix.

What does the supplier company do with this information: how is it stored, displayed and utilized to make detailed planning decisions? In some cases customer demand information is converted into long-term contracts or blanket delivery agreements. These may take the form of guaranteed annual amounts in annual, quarterly or monthly detail. Various agreements could exist as to the amount and frequency of change to these delivery amounts. Obviously the dynamics of these numbers will vary depending on the marketplace and planning skill of the customer in question. What's important for the manufacturer to understand is that the quality of this data will vary and it should be used and monitored in light of that quality. In other words, segment the data into parts which have varying reliability.

Figure 2 shows an expanded version of a traditional planning spreadsheet often used by master schedulers or planners. On the bottom are the traditional MPS, projected inventory and available-to-promise lines. Please note that the segmented demands are displayed and then summed in the line marked "Total Demand." In this way, a demand manager or scheduler could actually look at the detailed demand information, item by item, and determine where the total demand is coming from in making decisions on how to best cover it in the master schedule.

The Production (Option) Forecast would be the

system calculated prediction of the amount of this product to be sold as a percentage of a family or product group forecast.

The warehouse (DRP generated), regional customer and blanket demands represent segments planned separately from the overall forecast. That forecast line should be "consumed" or lowered by these segment demands and then combined with interplant and production requirements to dynamically maintain total demand.

There may be very few items that would have demand tracked in every one of these segments. But tracking whatever different sources of demand that do exist would facilitate supply demand problem resolution by enabling selective communications with different segments to validate their reliability or make suggested changes.

This simple diagram shows only eight weeks of information. The database would certainly hold much more than this and should be able to store and display it in monthly or quarterly totals as time goes out in the future.

### **"Inventory" Chain Relationships**

There are some cases when the finished product inventory is held at various steps in the "demand chain." For instance, a dealer is holding inventory as well as a

## CUSTOMER CONNECTIVITY (MULTIPLE LEVEL LINKING)

ITEM: 949  
PARTNER: DEALER "A"  
SUPPLY SOURCE: WAREHOUSE X

	NOW	10-07	10/14	10/21	10/28	11/04	11/11	11/18	11/25
FORECAST	0	271	262	262	262	262	262	262	262
IN TRANSIT	0	0	0	0	0	0	0	0	0
PAB	1155	884	922	810	848	886	924	812	850
SCHEDULE	0	0	300	150	300	300	300	150	300

### PARTNER (DRP) PLACED ORDERS FOR ITEM #949

WEEK	1	2	3	4	26	27	28
PARTNERS	10-07	10-14	10-21	10-28	3-31	4-7	4-14
DEALER "A"	300	150	300	300			
DEALER "B"	150	—	300	—			
DEALER "C"	200	100	200	100			
DEALER "D"	—	200	—	200			
DEALER "E"	50	100	—	100			
DEALER "F"	100	—	100	50			
<b>TOTAL</b>	<b>3500</b>	<b>2950</b>	<b>3200</b>	<b>3460</b>			

### WAREHOUSE X SUPPLY / DEMAND FOR ITEM #949

	PAST DUE	10-07	10-14	10-21	10-28	3-31	4-7	4-14
PTNR DMD	-	3500	2950	3200	3460	3150	3400	2550
CUST ORD	-	11500	7500	0	0	-	-	-
FORECAST	-	13050	11490	11700	12200	12700	12400	1190
<b>TOTAL DMD</b>	-	<b>16550</b>	<b>14440</b>	<b>14900</b>	<b>15660</b>	<b>15850</b>	<b>15800</b>	<b>14450</b>
IN TRANSIT	-	-	-	-	-	-	-	-
PROJ AV BAL	47550	31000	16560	1660	21000			
SCHEDULE (DUE)					35000			

### SUPPLIER SCHEDULE

Figure 3

distributor, a warehouse and the supplier. In these cases, the forecasted demand should be that over and above what is already held in inventory at each location and should be reflective of the lead times and lot size rules being followed at each. But perhaps just as important would be the need to be able to communicate and summarize the total inventory in the system, so that in times of supply demand imbalance, a planner knows what opportunities there are for translocation of the inventories or suggested changes in safety stock levels or lot sizing policies. Figure 3 shows an example of this kind of linkage. Dealer A holds Item 949 in stock and sells it to the ultimate customer. The detailed line item forecast by week for the months of October and November represent how much Dealer A expects to sell. Dealer A currently has 1155 units in inventory and based on a weekly demand delivery pattern, Dealer A is passing requirements down to Warehouse X of

300 in the week of October 14th, 150 in the week of October 21st, etc. This planning into the future would be done by DRP. The total demands placed on Warehouse X by Dealers A through F and all other dealers totally 3500 in the first week of October, 2950 in the second, etc. This total "partner demand," (coming from a linked "partner" DRP system) is then added to other individual "customer orders" and a "forecast" of those orders, where the warehouse is shipping directly to customers, not through the dealer network. Thus the total demand for Warehouse X of 16,550 in the first week of October (or any other week) can be analyzed by its segments if problems occur. Inventories, lead times, lot sizes and safety stocks for each dealer can also be accessed where appropriate.

## Capacity Booking

As shown in Figure 2, an "available-to-promise" (ATP) calculation can always be kept up-to-date for a given item at a supply point. The traditional calculation is beginning inventory plus schedule minus any booked demands. In other words, it's that portion of the on-hand and on-order which has not been committed to customers. Its use becomes much more sophisticated when you segment the demand, as we have done in Figure 2. For instance, would future blanket requirements and future warehouse demands lower ATP? There's no right answer to this question, but each company must decide for itself what it wants to treat as "firm commitments" (those which lower ATP) vs. what would be used for planning purposes only. The resulting ATP can be used for making commitments to customer or warehouse requests when they occur. In companies with relatively few products, this can be done by item number, as Figure 2 implies.

However, in some environments there are many, many items to be promised and many of them have similarities in that they are made from common subassemblies or intermediate manufactured products and utilize common capacities or resources. In such businesses (which often are primarily make-to-order or finish-to-order), it often makes more sense to summarize the ATP for a given family of items and relate it to its impact on available capacity. Figure 4 shows such a summary where the current total committed demands for a family of products is summarized by the amount of the critical capacity required to produce them. In this example, a fixed capacity of 240 per week is available. Currently customer commitments have been made that

## Capacity Booking

	WEEKS					
	1	2	3	4	5	6
<b>Actual Demand (Scheduled)</b>	240	254	182	140	70	
<b>Available to Promise</b>	0	-14	58	140	210	280
<b>MPS (Capacity)</b>	240	240	240	280	280	280

Figure 4

totally sell out Week 1 and actually oversell Week 2. Weeks 3 through 5 are partially sold out and the ATP indicates how many units of capacity are left to promise to the next customer that wishes to order. This order promising technique slots demand by capacity limitations and ensures that promises are made to customers in a reliable fashion. However, it presumes that a forecasting and planning process is used to set the original schedule and ensure that all proper materials and resources are available.

done after the customer order is received. The longer the customer lead time, the more things can be put off until the order is received; and similarly, the shorter the lead times for the various supply functions, the more that can be put off until the customer order is received.

Of course, customer lead times in and of themselves are dangerous. A long customer lead time generally means that the customer also has more time to change their mind before final shipment. Customers would generally believe, with a long lead time, that the supplier should be able to accommodate changes inside that lead time.

The changes could be in quantity or ship date, but sometimes could also be on the actual design of the product. So fighting for a longer customer lead time or bigger customer contract period in and of itself doesn't eliminate all potential short-term changes.

The better solution is to work on shortening the lead times for all the supply side functions. This is where Just-in-Time or Continuous Flow Manufacturing techniques come in. Eliminating set-up or changeover times, simplifying processes, shortening cycle times, eliminating queue and move times represent

customers where it would make no difference to them whether the lead time is one day or two weeks. Thus the Customer Linking is not just sharing planning data, but also getting to better understand how the customer uses your product and what dynamic forces are at work that would change their requirements for that product over time. By shortening supply cycle times and also redefining customer expectations, in some cases the customer can be better served and the supplier can do it more productively and profitably in a longer lead time..

Some companies redefine the make-to-order (or package-to-order) vs. the make-to-stock rules by time of year. For instance, with a very seasonal product, it might be planned such that it will always be in stock during the heavy season but be handled on a make-to-order basis (at least beyond a certain quantity) out of the season. This could be true for products such as toys (Christmas), agricultural chemicals (planting or growing seasons) and the like.

Think of your local McDonalds. The Fillet of Fish sandwich is make-to-order at 10:00 in the morning, but it's make-to-stock at noontime. They set their schedule and inventory policies that way and it becomes part of the routine.

The approach to this entire question can also affect how products are designed. For instance, a new product can be designed in a way that makes it easy to alter its final packaging, form, strength, color, size, etc. at the very end of the manufacturing process. In other words, design a product and a process to make it easy to finish, assemble or package to order. Then offer it to the customer, with the lead time needed to do this and sell them on the benefit of their ability to specify more product choices.

The terms make-to-order vs. make-to-stock can be very misleading. The fact of the matter is that most companies stock something. It may be raw material or may even be "capacity or resources." It could be semi-finished material, subassemblies, finished goods or some of all of the above. Figure 6 (next page) shows some of the many factors that contribute to a company's choice as to where they should stock. The factors, starting with "unique customer design" and ending in "transportation costs" are arranged on the page to

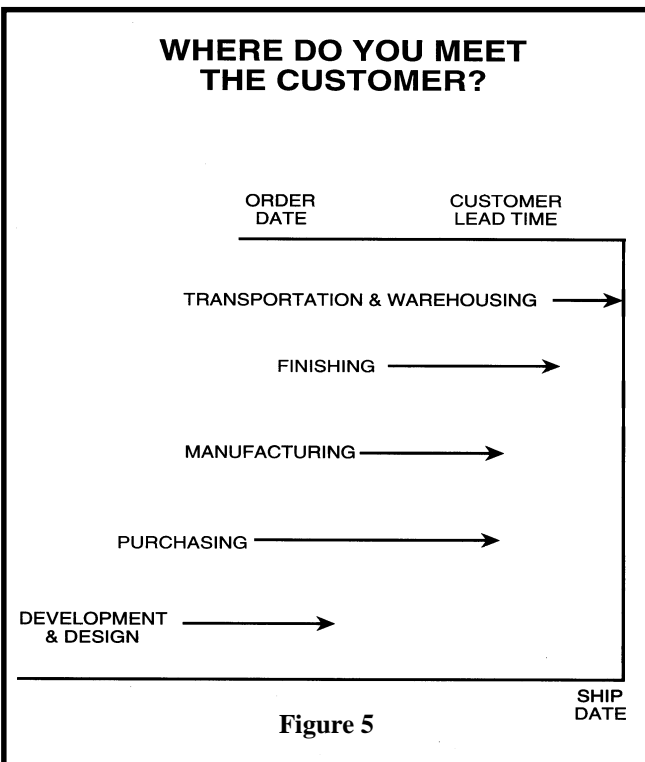


Figure 5

### III. Redefining Where Supply Meets Demand

Figure 5 displays major activities that occur for a product to be designed, produced and shipped to a customer. The answer to the question, "Where do you meet the customer?" is a function of the lead time the customer gives vs. the amount of time it takes to do all of these supply functions. If you drew a vertical line down this chart at an order date that represents a typical customer lead time, where it intersects each of the other lines describes "where in the supply process you meet the customer." Anything to the left of that vertical line indicates things that need to be done in advance of receiving a customer order and therefore based on a forecast or customer contract or commitment. Anything to the right of the line indicates things that could be

true, permanent improvements in flexibility, regardless of changes that the customer asks for.

World Class companies are finding it productive to challenge their assumptions about where they meet the customer. For instance, some are developing multi-tier supply approaches. For certain items for certain prices they guarantee delivery within one or two days. But for certain other items, and for cheaper prices (and in many cases with a lot of different options available to the customer) they tell the customer that they'll deliver within several weeks. Thus, in this case some items in a product family are make-to-stock and some of them become make-, finish- or package-to-order. It may sound like heresy, suggesting that customers be asked if they're willing to wait longer, but there may be some products supplied to

## WHERE YOU STOCK IS A (DYNAMIC) STRATEGIC DECISION DEPENDING ON:

UNIQUE CUSTOMER DESIGN  
 HIGH COST OF OBSOLESCENCE  
 HIGH COST OF INVENTORY  
 LONG PROCUREMENT LEAD TIME  
 FORECAST VARIABILITY  
 MANY CUSTOMER OPTIONS  
 CAPACITY LIMITATIONS  
 PROCESS CONSTRAINTS  
 MANUFACTURING EFFICIENCY

SEASONAL DEMAND  
 EXPENSIVE TO VARY CAPACITY  
 COMPETITIVE LEAD TIME  
 CUSTOMER LEAD TIME  
 TRANSPORTATION COST

DESIGN-TO-ORDER	MAKE-TO-ORDER	FINISH-TO-ORDER	STOCK-IN-PLANT	STOCK-IN-DISTRIBUTION CENTER
-----------------	---------------	-----------------	----------------	------------------------------

LONG LEAD TIME MATERIAL	SEMI-FINISHED INTERMEDIATES	FINISHED GOODS
-------------------------	-----------------------------	----------------

- STRATEGY CAN VARY
- OVER TIME
- BETWEEN ITEMS IN A FAMILY
- DURING SEASONAL CYCLES
- AS DEMAND VARIES
- AS SUPPLY VARIES

Figure 6

represent their impact on lead time. The ones listed to the left and top of the page tend to push suppliers to a design or make-to-order approach. Those on the bottom right tend to move companies to a make-to-stock or finish-to-order strategy. For instance, on the fourth line it says "Long procurement time." Below it would intersect with make-to-order. In an environment with long procurement times but with a lot of "forecast variability," "many customer options" and some "capacity limitations" as listed, generally companies can't afford to build all the variations or products and hold them all in finished goods stock. Therefore, the combination of these factors would move them toward the make-to-order approach, where long lead time materials are stocked along with a few semi-finished items.

It is most important to consider that this is a decision that an individual company can make differently for different items and product lines. It's a trade-off of the various factors vs. the costs and risks of carrying inventory at various levels. That strategic decision can vary, over time, between items in the family, between times in the year and as demand or supply reliability or variations begin to change. For instance, as the demand stability or

forecastability of items becomes much firmer, it is affordable to commit to finished goods but, in fact, keep less of them because there's less demand variation to cover. Or, as a process begins to exhibit variability with increasing scrap rates and unpredictable cycle times, additional stocks, before and/or after that step in the process may be needed to hedge against that variability.

In environments where many different options or choices are offered to the customer, the use of planning bills, common parts "kits," option bills or option "kits" and two-level master scheduling should be utilized. The complexity of these techniques are such

that they can't be covered in this paper, but they are documented in many other articles. It should be noted that the use of such approaches for planning will grow as customers are offered more choices and as the lead times shorten, thus allowing companies to make more and more products in a finish- or assemble-to-order fashion.

### IV. Supply Side Improvements

Having a Class A MRP II system operating as a starting point adds reliability, balance and inventory and cost optimization to any business.

Then aggressively pursuing Just-in-Time and Continuous Improvement activities that attack set-up times, cycle times, inventories, levels in the bill of material, process complexity, distances that materials travel throughout the manufacturing cycle, etc. will further optimize a company's ability to adjust supply to match demand when that is necessary. Below are described some techniques that leading edge companies have used to further enhance their supply management capabilities.

#### Underloading

Ironically, maintaining a schedule that represents less than 100% of full capacity

can be a way of building flexibility into a process to allow for last minute changes to accommodate supply or demand variation. It is much easier to move a product in and increase quantities when the schedule is underloaded and other products don't have to be moved out. The key here is to assure that you are planning for enough of any long lead time or upstream purchased or manufactured materials so that they will be available to support the last minute schedule increase. This can be accommodated through the use of planning bills where a master schedule of a planning bill drives down dependent demand requirements on the materials and in the mix specified. Then when the actual item is moved into the schedule, the amount of the overplanning in the master schedule for the planning bill is reduced by a similar amount.

### V. Improving Supply Management Upside Planning

Some companies have developed some clever approaches to using the system to help them simulate the impact of a "range of outcomes" or a "high and low plan." First they pick a base forecast and a base plan against which to establish their live planning system. These forecasts and master schedules are used to then drive the execution of the day-to-day purchasing and manufacturing activities. However, in parallel (again often using planning bills of materials), they will plug in a forecast and a schedule that would represent a potential upside or incremental amount of business that they're not yet sure of getting. These schedules are run through the MRP II system in a simulation mode to calculate how much more of key materials or capacity would be necessary to support them and when.

The planning bills would include only those key materials that have traditionally been a bottleneck and only those key resources that traditionally have been capacity bottlenecks. This high side plan and what it would cost is then analyzed and sometimes leads companies to make decisions such as to strategically order more of given materials, find subcontract sources for upside capacity, build inventories up to a particular level in the upstream processes in anticipation of them, etc. Typically firm planned orders are used at the appropriate level to schedule the additional amounts to cover this simulated, upside potential. Only

when Sales and Marketing are willing to fully commit to the upside potential is the actual live forecast and full master schedule then updated. But when it is, many of the materials and capacity needed to support the increases will already be built into the plan as a result of this upside planning.

This is a particularly useful technique in seasonal or cyclical businesses where the opportunity of capturing a significant amount of extra business is very time sensitive and occurs only on an occasional basis. During the off season, the upside planning can be done to anticipate what will be needed to support the high plan and also to set milestones or time targets when final decisions need to be made to commit to procuring or hiring or acquiring additional resources. A multi-level planning bill could give warnings based on lead time offsets of when extra materials and resources need to be ordered. These milestones and decisions should be tracked and reviewed in monthly Sales & Operations Planning (Production Planning) meetings.

#### ***Master Scheduling Approaches***

Some companies are able to shorten the planning horizon for their detailed master schedule. They are able to do this (especially once their cycle times and lead times have been reduced) by making a lot of the longer term material and capacity planning decisions from the Sales & Operations Planning production plan or from of a master schedule at the family level utilizing a planning bill. This is a particularly good approach if there are a lot of minor variations within a family. There may be only four to thirteen weeks of detailed master schedules by line item. The balance of the cumulative lead time planning horizon may be by family or product groupings (again using planning bills) that explode down dependent demands only for materials and capacity with lead times greater than the four to thirteen week horizon or ones that have potential bottlenecks and need to be constantly monitored.

#### ***Option Overplanning***

This term is normally used in conjunction with two-level master scheduling and the use of planning bills. It refers to the idea that the plan will accommodate mix variation. For instance, if there were two customer options and the typical ordering pattern is about 50/50, the plan would sup-

port 60% of either option. This option overplanning would use firm planned orders with increased quantities scheduled at the typical customer lead time. Extra optional material would then be ordered as a result.

The idea of overplanning options, though, can be applied even without two-level master scheduling (for instance, on make-to-stock items). Planning bills can be constructed whose sole purpose is to generate additional demands for optional components. For instance, a company that provides the same product with many different labels in many different languages due to regulatory requirements, may master schedule the end products based on the forecast. But a planning bill encompassing all the different labels and packaging variations with the typical product mix specified could then be scheduled to drive down extra requirements for the packaging materials. Thus, if customer order demand shifts and a master schedule change needs to be made in the short term, the additional packaging materials will already be on order or in inventory as a result of the overplanning done through the option planning bill of material.

#### **VI. Summary**

Manufacturing and distribution is similar to the construction industry. The basic type of materials, tools and people hasn't changed much over the years. However, the level of automation and the approach to doing the job have. Therefore, the end results are different.

For instance, today's buildings and homes look much different than they did years ago. The construction materials are similar: wood, stone, brick, etc. The quality, strength and form of these materials has improved, thus enabling and fueling the change in customer preference for the style of buildings. The shapes and the sizes of what is possible has grown as well. The types of tools used to turn these materials into buildings are also quite similar: mixers, saws, hammers, screwdrivers, etc. The tools are now more automated and powerful, but they do basically the same work.

Obviously what's changed most is the vision of the customer and the ability of the workers. That analogy also holds true in our manufacturing and distribution industries.

Most of the techniques talked about in

this paper have been used by companies over the last 30 years. They've been refined, automated and improved, but the approaches are basically the same. Even in the area of Just-in-Time we could arguably say that it represents a broad scale formalization of techniques that formerly were used to expedite a given order through a plant (streamlining changeovers, cutting cycle times, making lot sizes matching the demand quantities, etc.).

The moral of the story is this. As customers become more demanding, suppliers must become more creative. But the first line of creativity is to ensure that everyone working in the business understands and optimally applies the use of approaches, tools and techniques that already exist in the body of knowledge. A trained, thinking, empowered worker making the best use of the tools available is the true formula to Class A or World Class benefits. True breakthroughs are rare and infrequent. World Class companies don't pursue them at the expense of ensuring that they're getting the most from what is already available.

#### **About the Author John R. Dougherty**

John has, since 1977, provided direction for manufacturers seeking to improve their management controls and productivity levels. John, with the Partners for Excellence, instructs private, company-focused education sessions on the following topics: Supply Chain Management / MRP II Top Management Overview, Supply Chain Management / MRP II Functional Detail, Sales and Operations Planning, Master Production Scheduling, and Inventory Record Accuracy.

John has guided companies to successful improvements in their planning and control systems and approaches. Many of them have reached the coveted World Class or "Class A" level of achievement. His experience spans the electronics, consumer goods, capital goods, pharmaceutical and chemical industries.

John is certified at the fellow level (CFPIM) by the American Production and Inventory Control Society (APICS). John is co-editor of the Sixth Edition of the APICS Dictionary. He was a six-year member of the Master Planning Committee of the APICS Curricula & Certification Council.