

# Chaos in Manufacturing

*Don't mistake activity for accomplishment.*

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*The Place:* A typical North American manufacturing company

*The Time:* 10:00 A.M.

*The Date:* Friday, the last day of the month

What had been a quiet and sporadically busy area three weeks ago has turned into a three-ring circus. Lift trucks careen through the stockrooms at full tilt, barely avoiding head-on collisions. Every inch of the shipping department is piled with partially completed products waiting for missing components. Normally neat and orderly work areas now resemble obstacle courses as excess materials clog the aisles.

Outside the supervisor's office an angry manager berates an expeditor, demanding to know why the night shift ran the wrong size product. The expeditor shifts his weight from foot to foot as he explains that the required product had been at the top of the hot list—and maybe the night supervisor did not get that revision of this week's list (of which there had been three).

Over in one of the assembly areas a worker complains that she has gone as far as she can without the next skid from the processing department. A supervisor moves from worker to worker, asking people

to sign up for weekend overtime. A chart on the wall shows that 30% of the month's shipments still need to be made.

The cost variance reports that were the burning issue of the manufacturing meetings just two short weeks ago are now buried under a stack of quality control reject reports. Management has temporarily waived the rejects so that needed materials can be used to meet this month's numbers.

Off in a corner by the coffee machine, a gray-haired foreman shakes his head and mumbles: "So this is the manufacturing of the future that the guys in corporate promised. It looks like the manufacturing of the past to me."

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This scene plays itself out in many manufacturing companies today. Worse, like a recurring nightmare it returns to haunt companies month after month. It happens, in part, because many companies still operate in a reactive mode, in which all decisions, priorities, and schedules are driven by the day-to-day fluctuations of the marketplace, momentary changes in the plant, and the performance of individual suppliers. It is a cycle of action and reaction, and until companies break the cycle, they will never rid themselves of the end-of-the-month crunch and nightmare.

Breaking the cycle entails four steps:

1. Admitting that serious problems exist, and that the current situation is not healthy for the company or the people who work in it
2. Identifying the specific problems—not just the symptoms
3. Determining the cause of the problems
4. Creating and acting on effective solutions

## Problems in Manufacturing

Consider the scenario again, this time through the eyes of the plant manager, who sees that although everyone is attempting to do a conscientious job, the efforts are often misdirected. The use of hot lists to set priorities in getting products out the door causes major disruptions and confusion in manufacturing. Schedule changes prompted by these hot lists satisfy some short-term requirements but throw a monkey wrench into others. Shipment dates are missed, the customers complain to the sales force, and the sales manager vents his anger onto the production manager.

Although there appears to be much work in process, the reality is that most of the work is sitting in queues. In addition, staggering amounts of unplanned overtime and quality problems are mounting. After inventorying the problems, the plant manager begins to look for their underlying causes. The hot lists, he finds, are used because of frequent part shortages, some of which result from late deliveries from engineering (specifications) and suppliers (materials), late ordering by the company, and the poor quality of materials actually delivered by

### Symptoms of Master Scheduling Problems

Uncontrollable costs	Hot lists
Disruptions on the shop floor	Frequent schedule changes
Late deliveries to customers	Many full-time expeditors
Late deliveries from suppliers	Customer complaints
Unplanned overtime/off-loading	High "past dues"
High work-in-process	Long queues
Mismatched inventories	End-of-month crunch
Over-/under-utilized resources	Finger pointing/low morale

manufacturing (inside supplier) or outside suppliers in general. Other part shortages result from inaccurate bills-of-material and inventory record inaccuracies that report materials as being in stock when they are not.

Schedule change problems often stem from the lack of a priority mechanism, or from following the wrong priorities—such as keeping a machine busy rather than satisfying a customer. (It is not unusual for a company that has just purchased a new piece of expensive equipment to believe that its first priority is to keep the machine running, even if there are no customer orders for the machine's output.)

Missed shipment dates may result from part shortages or problems with capacity. Some companies are not ever sure what their capacity is, nor do they have a process in place to measure it. In other companies, measuring processes may be available, but they may not be accurate.

Additionally, material can sit in queues on the manufacturing floor because of material shortages, because of the capacity issues just described, or because plant priorities and work flows are driven by an overly optimistic sales forecast that is used to communicate priorities to people on the manufacturing floor.

Still other problems on the manufacturing floor have their source in inaccurate forecasts of demand—forecasts that instruct the plant to build either too much or too little.

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## THE INACCURATE FORECAST

It seems to happen all the time. Marketing forecasts customer demand at one level, while actual demand turns out to be something different—sometimes more, sometimes less.

The difficulty of scheduling production in the face of forecast inaccuracies should be obvious: Materials and capacities are planned for one level of demand, but the demand that actually finds its way to the production facility is something different. Consider the simple case

Periods	April	May	June	Quarterly Total
Forecast	100	100	100	300
Demand	140	65	120	325
Variance	+40	-35	+20	+25

shown in the graph. This company's quarterly forecast was off the mark by 25 units (about 8%). Not bad. Its forecast for individual monthly periods, however, was greatly off target. This is typical, as forecasting aggregate demand (such as quarterly) is always easier and tends to be more accurate than forecasting more detailed demand (such as monthly or even shorter periods).

Unfortunately, most production is scheduled in these shortened (or even smaller) periods, where grousing about inaccurate forecasts is commonplace but does little to alter the fact that forecasting the future will never have the precision of rocket science. Forecasts may be improved, but never guaranteed. Besides, any forecaster who could really see the future clearly would be in the next limo headed toward Wall Street or Las Vegas, where rewards for accurate forecasting are mind-boggling!

## Management Issues

People in the day-to-day business of manufacturing must learn to live with the variances between anticipated (forecasted) and actual customer demand, and with the problems they create. For company leaders and managers, forecast inaccuracies create a number of important issues. First among these is the fact that when someone creates a forecast, real things happen: Materials and components are ordered or canceled. If current capacity isn't up to the forecast, people start thinking about increasing it with new equipment and new personnel. If current capacity is greater than the forecast, people start thinking about decreasing it by shutting down production centers, laying off employees, or even closing entire manufacturing operations. In other

words, forecasting demand is not an intellectual exercise done for its own sake, but an activity that triggers a number of other costly actions within the company.

Unfortunately, forecasts are not always taken seriously. Salespeople may be tempted to overstate the forecast as insurance against possible stockouts. The forecast itself is generally uncritical of the estimates submitted by each salesperson and contains no rewards for accuracy or penalties for inaccuracy. The task of management is getting all parties involved in the forecasting process to work together and take accountability for its accuracy. Production and finance need to understand the concern of sales personnel about stockouts and lost commissions. Sales and marketing need to understand the cost of excess inventory to the profitability and survival of the company.

There is now a large body of knowledge and experience indicating the heights of customer satisfaction and profitability that result when teamwork replaces hostility among engineering, production, finance, marketing, and sales personnel. Management can and should act as the catalyst in team-building efforts.

While the team-building activity may be the greatest contribution of the executive team, other issues merit its concern:

- *What about inventory?* If a plant is scheduled to build 100 units and orders for 140 appear, is there enough inventory to satisfy the unexpected demand? In the reverse case, when demand fails to appear, should the plant keep running and building inventory?
- *What alternatives exist on the manufacturing floor?* When forecasted orders fail to appear, equipment and trained people are idled—unless alternative work is found. Moving up an order might keep some hands busy; maintenance or training might occupy others. When demand exceeds scheduled supply, can more supply be created through overtime or outsourcing of part of the workload?
- *What are some of the real costs of forecast inaccuracy?* An overloaded schedule creates overtime expenses. The production floor and its personnel are stressed and, perhaps, made less productive. Overforecasted demand creates idle hands and capacity, and inventories of unused materials.

- *How are customers affected?* When actual demand is underestimated, management becomes a traffic cop, directing the company's limited output to certain customers and withholding it from others. This is known in the industry as placing the customer on allocation (such a nasty word). If allocation of product is necessary, how should it be allocated when there isn't enough to go around? Which customers have priority? Remember, all customers are equal; it's just that some are more equal than others.

As management ponders these issues, the fallout of forecast inaccuracies has other minds working. Marketing observes the discrepancies between its forecasts and actual demand and wonders if these indicate a trend. If the forecast is usually on the high side, manufacturing thinks about discounting the forecast as a matter of policy. The corporate controller jokes about just tossing the manufacturing budget out the window. Out in the field, the individual salesperson grows apprehensive about guaranteeing delivery on firm orders; when push comes to shove, another sales representative's customer may have priority.

Knowing that forecasts will never match actual demand, except on rare occasions, experienced master schedulers understand that they must be flexible in shifting capacity and materials from one period to another. They must know whom to call about splitting a customer's delivery over two or more periods. And they must have the courage to look beyond the forecasted numbers as they plan production. Indeed, many top managers would be stunned to know that the solution to many of their production headaches is in the hands of the master scheduler, who either solves them with skill and ingenuity or allows them to fester due to inexperience or indifference.

## And the Solutions

The search for solutions to these problems should begin with a fundamental question: Why is this company in business? And the answer

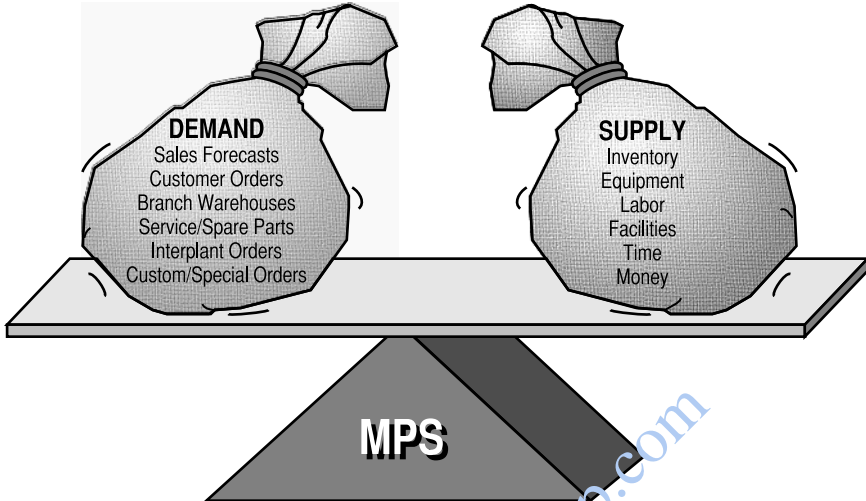
should be this: To safely make a profit and satisfy customers. This answer entails ensuring an adequate product supply to meet the demand for the company's products. If a product is not in inventory to satisfy demand, the company must have the material, labor, equipment, capital, and time to produce it. This is where Master Scheduling (MPS), Enterprise Resource Planning (ERP), and Supply Chain Management (SCM) play such a critical role in the purpose of the business.

Supply Chain Management and Enterprise Resource Planning are integrated demand-driven supply planning processes. This demand can consist of a forecast, customer orders (which may or may not be part of that forecast), contracts or long-term agreements, engineering prototypes, branch warehouse requirements (e.g., replenishing a distribution center), or orders from another division within the company if the product in question is, in turn, a component of that division's products. Demand can also originate in the need for specials (industry shows, samples), service parts or spares, increase in safety stock requirements, or lot sizes.

To satisfy these demands, the master scheduler needs to consider the availability of materials and capacity resources. These materials include those being produced internally as well as those being procured from outside sources. Besides the item itself, quantities, dates, and lead times must be taken into account. Capacity involves people and equipment—both of one's own company and of its suppliers. Time, space, and money are also important considerations.

As mentioned in the introduction, the challenge the master scheduler faces is to effectively balance product supply with product demand. One way to envision the situation is to imagine a seesaw like the one shown in Figure 1.1. In a perfect world, the seesaw is parallel with the ground; supply is always an equal counterweight to demand. When demand changes, supply instantly adjusts in a way that keeps the system in perfect balance. In the real world, however, demand rises or falls in unpredictable ways, and imbalances occur. These occasions require a master scheduler to make adjustments to the system in order to get the demand and supply back into balance.

When a company has more demand for its products than it has supply, it has two options for returning to a balanced condition:



**Figure 1.1 Balancing Supply and Demand**

1. Increase the supply of product—get more material and resources.
2. Decrease the demand—turn away or reschedule some demand orders.

The situation in which there is more supply of the product than demand also creates two choices:

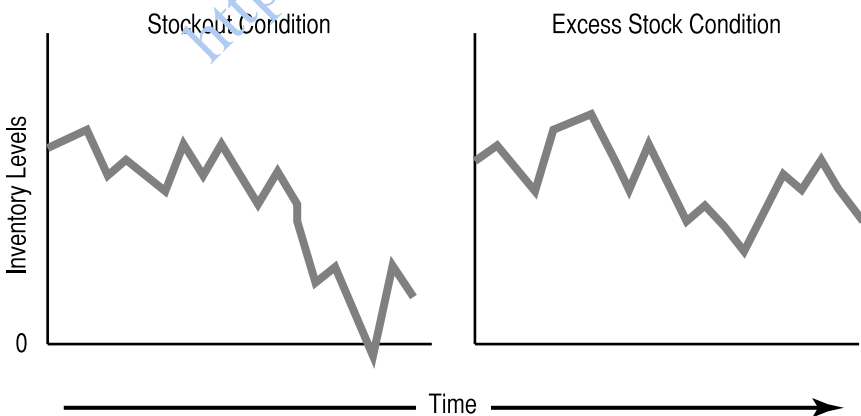
1. Increase demand—energize the sales force, run a promotion, discount the price, and so on.
2. Decrease the supply of the product or the material/capacity needed to produce it—cut back on production, people, and equipment.

Even though these situations can be solved only by one or both of the choices described here, some companies nevertheless believe that if they ignore the situation it will go away—an approach to problem solving called *ostrich management*.

The periodic imbalances between demand and supply are repre-

sented in Figure 1.2, which shows inventory's constant fluctuations over time between high, medium, and low demand as well as high, medium, and low supply, resulting in a sawtooth curve. In profitable manufacturing companies, the goal is generally to stabilize production by level-loading the plant while smoothing out the demand. The situation shown—stockouts as well as excess inventory—is certainly not the objective; the objective is to have just enough inventory to satisfy demand, thereby satisfying customers and making a profit.

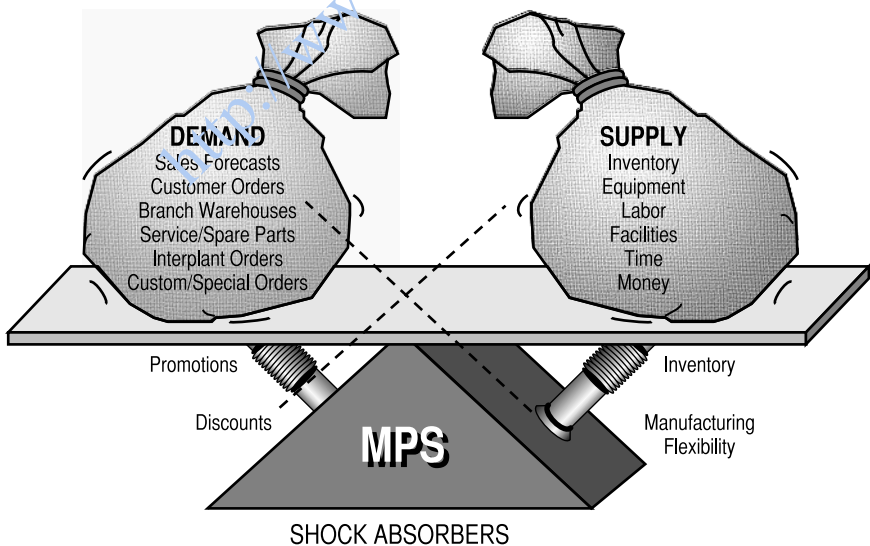
In the presence of sawtooth demand, manufacturing will be a seesaw in constant motion, with all the stockouts, hot lists, and confusion that characterize the company profiled at the beginning of this chapter. If the company is not experiencing stockouts, it is experiencing excess inventories. What is known for sure about this environment is that it continually goes back and forth. Companies that try to smooth out sawtooth demand through artificial contrivances usually fail. Tactics like enforcing schedule freezes and placing limits on the volume of orders salespeople can take cause more problems than they solve. Telling a sales force to limit its sales for a particular period, for example, is a sure way to torpedo the important relationship that must exist between sales and manufacturing if a company is to grow and prosper. Using these types of approaches is like installing welded struts onto the bottom of the seesaw: nothing moves. A better approach may be to



**Figure 1.2** The Sawtooth Curves

install shock absorbers under the seesaw, to dampen expected fluctuations in supply and demand (see Figure 1.3).

Inventory in the form of finished goods, for example, is one traditional type of shock absorber. Inventory helps the company to accommodate changes in both supply and demand. Another type of shock absorber is flexibility in the supply chain, which allows the company to alter the activity rate on the plant floor in order to satisfy demand fluctuations without severe disruption. Flexibility can also be extended to sales and marketing. If the customer orders a red item, will a blue one work? If the customer requests the product for a next-month delivery, would that delivery better suit the customer's business purpose if it arrives in this month or in two months? If the customer cannot be so swayed, discounts or other sales inducements may give the customer reasons to cooperate with your demand and supply balancing problem. The point is, don't be afraid to ask. In any case, the company should identify whether it wants its greater flexibility in demand (sales and marketing) or supply (manufacturing and engineering). It should decide whether it wants to "sell the products manufacturing makes" or "build the products that sales sells" (further discussion regarding these



**Figure 1.3 Dampening Supply and Demand Fluctuations**

choices appears in Chapter 4, “Managing with the Master Schedule”). Once that decision is made, the company can move on to the task of balancing product supply with market demand. This effort takes place in demand management, sales and operations planning, supply management, and master scheduling.

It's this effort to balance supply and demand that drives a company to improve its master scheduling process and capability. The job ahead certainly is not an easy one. However, Class A and world-class companies face uncertain demand and supply in a controlled and managed way. The next chapter addresses the issue of why companies that wish to formally establish Class A planning and control processes elect to tackle the master scheduling function right from the start. Most Class A and world-class companies believe it's never too early to start to improve their master scheduling processes. However, before we move on, consider the following situation, which is all too typical of today's manufacturers.

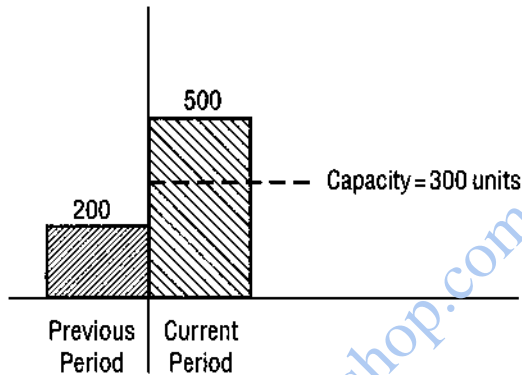
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## THE CASE OF THE OVERLOADED MASTER SCHEDULE

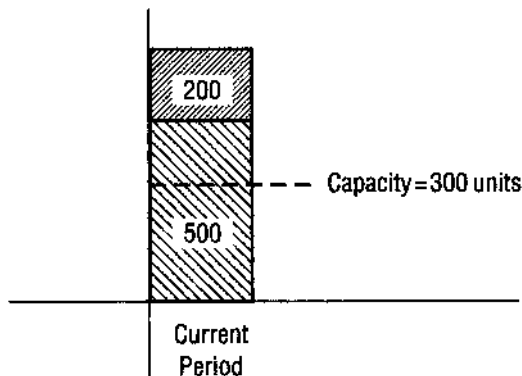
Some companies are always behind schedule on production and shipment. If Friday afternoons are a hellish race to whittle down the mountain of late manufacturing orders, Monday mornings are even worse. On Monday morning, the manufacturing manager and master scheduler face the dismal prospect of starting the new week under a load of past-due orders. It is tough enough to run a smooth operation when each week begins with a clean slate; but when you are faced with the normal scheduled orders *plus* all the work that failed to get done the previous week, the outlook is far from rosy. Yet this is how some companies operate—many on a continuing basis. Like a football or soccer team that starts the second half three touchdowns or goals behind its opponent, the manufacturer that carries past-due orders into the next period plays a desperate game of catch-up.

Here is a typical scenario. Spectrumatic Paint Company, which has a

weekly capacity of 300 units, begins the current week with 500 units to produce—the result of inept scheduling, arm twisting by salespeople to accept orders, and so forth. To compound its current problem, Spectromatic ended the previous week sitting on past-due orders totaling 200 units.



There is one unfortunate principle about past work periods, however, and this is *inalterable*: Time that passes is gone forever. Once a current production period expires, there is no retrieving it, and any orders left undone must either be done in a future period or be dropped entirely. Many companies simply move them into the current period. In the case of Spectromatic Paint Company, its inexperienced scheduler simply piled the 200 past-due units on top of the 500 units currently scheduled, resulting in a total burden of 700 units in a period with 300 units of capacity. As the next figure shows, this is what the company was faced with on Monday morning.



This is like packing your family station wagon to the rain gutters for a summer vacation, only to find that—*oops!*—you forgot the bicycles, fishing gear, and canoe. Chances are that with all this new stuff loading down the wagon, you and your passengers are destined for an uncomfortable ride. Therefore, this scenario suggests an ironclad law for master schedulers to obey: The master schedule cannot be past due.

## Management Issues

Past-due MPS orders and overscheduled current work periods are two major sources of the overloaded master schedules that plague so many companies. And these overloaded schedules create a host of *internal* problems for management.

- *Production efficiency decreases.* “Drop what you’re doing and start order 247. We have to get this customer taken care of or we’ll lose their whole account!” Poorly timed line changeovers, downtime due to material shortages, and stress take a toll on efficiency in the manufacturing facility. Production supervisors and cell leaders also get mixed signals as to real priorities.

- *Products do not get shipped.* An overloaded master schedule results in material stockouts; partially built products are taken off line, where they sit as work-in-process until missing materials are received. Products built but not shipped increase inventories while reducing current revenues, thereby creating financing problems for the entire company.

- *Costs go up or out of control.* As production efficiency decreases, financial managers see costs rising. Dependence on overtime, expedited material purchases, air freight charges on late orders, concessions to irate customers, and other compensations drive up unit costs and cause havoc in cost planning and budgets.

- *Widespread confusion makes it difficult for management to identify the real problems.* Why are products not being shipped? Lack of coordination of materials and production scheduling? Capacity problems? Credit holds? Engineering specifications not available?

- *Product quality suffers.* Production is pressured to work faster and faster to complete work in less than planned lead time, possibly causing quality to drop.

Given all of these negatives, we have to ask: Why would anyone allow the master schedule to be overloaded? Very often, the answer comes down to some basic human behaviors in situations where trust and confidence are absent.

Consider the sales representative who must ensure delivery of 100 units of Model 5B3 refrigerators to an appliance distributor on October 15. If the company's history is such that production is *always* late, or *always* short, or the stockroom *never* has enough components to complete an order, this sales representative has every incentive to inflate the size of the order and to ask that the order be moved up in the schedule. "One hundred twenty units delivered to the customer on the first of October" becomes his entry in the order book. Discounting production's capabilities is a natural response to past lack of performance, and deliberately overloading the schedule is often seen as a way of ensuring that enough materials will be on hand and that enough units will be built. Naturally, production schedulers learn to play this game and begin discounting orders as they appear. In no time at all, no one can trust anyone else's numbers.

The unfortunate part of this dysfunctional charade is that all the players are motivated by a desire to do the right thing: for the sales representative, to fill the customer order with the right quantity at the right time; for the purchasing department, to have just enough materials on hand; for the production facility, to meet *real* demand in an efficient and timely manner.

The net result of all these fine intentions in an atmosphere of distrust, however, is an overloaded master schedule and profit- and energy-sapping people problems, the most deadly being the blame game. Sales blames manufacturing for lost orders due to shipment delays. Manufacturing points the finger at the sales representatives, who "promise anything to get an order." Everything is a crisis. Finance yells that "costs are out of control" because of overtime and air freight. In this atmosphere, the refusal to recognize the seriousness of the problem naturally becomes a survival trait. Why admit that there *is* a prob-

lem? You can only be blamed for it and, maybe, fired (“If you can’t get the job done, we’ll find someone who can!”). Avoidance or denial of the problem becomes the course of least resistance. Sweep it under the rug. Park it at someone else’s door.

Ultimately, all the people problems come to rest at the doorstep of the management team. Management must create an environment in which all concerned can be honest about their numbers. Sales and production must be motivated to be frank with one another and to operate in a mutually beneficial partnership. Very often, the key to developing this environment of cooperation is, as W. Edwards Deming noted, to “drive out fear.”<sup>1</sup> Management must end the blame game and create a climate in which people can admit to problems and past mistakes without fear of blame or retribution. Lacking this climate, problems will simply continue being swept under the carpet.

Once fear is driven from the workplace, the next step toward dealing with an overloaded master schedule is a top-down analysis that does the following:

- Lists sales and production priorities
- Seeks practical remedies to production constraints
- Prioritizes and allocates production to customer demands
- Establishes a strategy to get out of—and stay out of—the over-scheduled condition
- Implements and communicates the chosen strategy
- Monitors and measures the strategy’s success

The ultimate goal of this analysis, or course, is to give management the knowledge and the tools to shake off the oppressive burden of the overloaded master schedule and to reschedule production with completion dates that are realistic and that satisfy customer needs to the company’s best ability.

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<sup>1</sup> W. Edwards Deming, “Fourteen Points,” in *Out of Crisis* (Cambridge: Massachusetts Institute of Technology Center for Advanced Engineering Study, 1982), 23.

## Getting Out of the Overloaded Master Schedule

One of the primary responsibilities of the master scheduler is to create a valid master schedule. A valid master schedule is one in which the material due dates equal the material need dates, and the planned capacity equals the required capacity. Look at Figure 1.4. As you can see, a master schedule item has gone past due. This item is used to drive the material requirements for all lower-level items as well as the capacity requirements for all manufacturing and engineering resources. If the master scheduled item is past due, what does that say about all the material that still needs to become part of the scheduled item? All this material is also past due. If we start with a past-due master schedule date, all the material and capacity still required, by definition, is past due. And how valid is a past-due date? How do you answer manufacturing, suppliers, or engineering when they ask, “Which past due do you want me to work on today?”

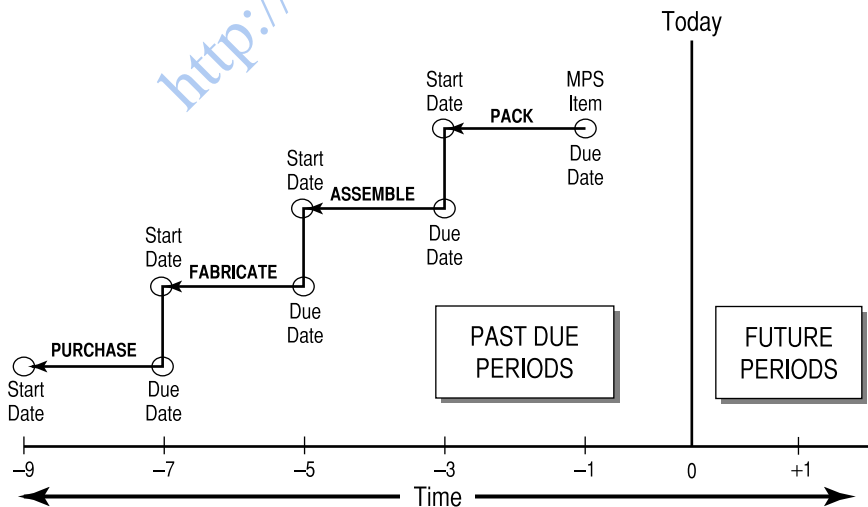


Figure 1.4 Past-Due Master Schedule

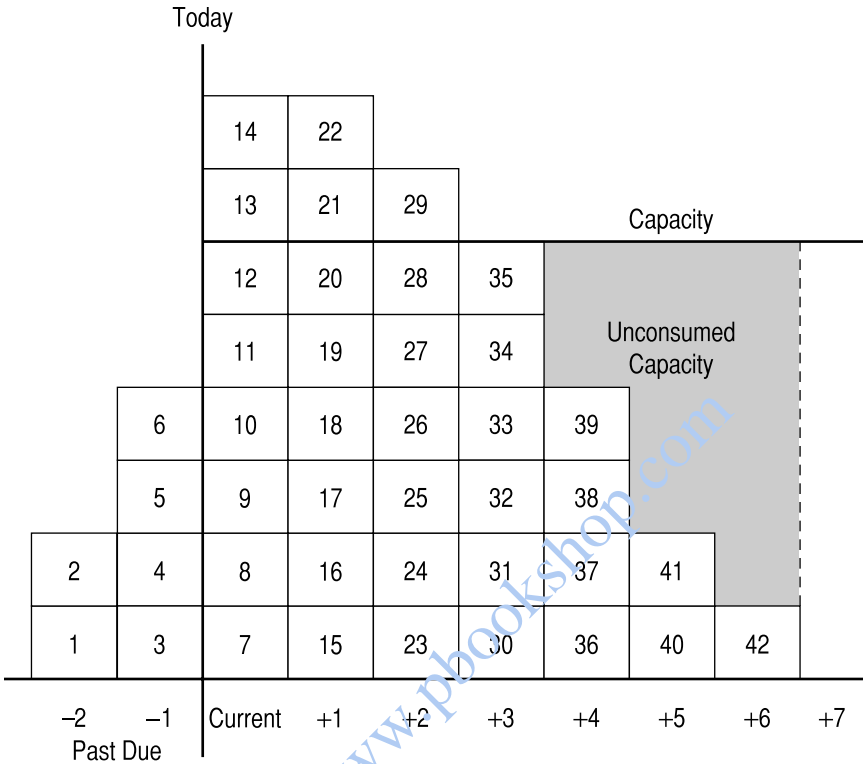


Figure 1.5 Overloaded Master Schedule

The job of creating a *valid* master schedule is not an easy one. It certainly is harder to do than to create an *invalid* schedule. In fact, it is not difficult at all to create an *invalid* schedule. Just about anyone can do that! The real challenge is to create a schedule that balances supply of resources and materials with the demand for those resources and materials. So, when in an overloaded condition, how does a master scheduler successfully orchestrate getting out of this inevitable situation?

The first step is to admit that the master schedule is overloaded. With this acknowledged, an assessment of the situation and identifying the constraints facing the company become necessary. Can overtime be used? Can work be subcontracted? Can more people be hired? Can material be expedited? Can premium air or ground freight be used? With these opportunities and constraints in mind, the master

		Capacity							
		6	12	18	24	30	36	42	
Past Due	Today	5	11	17	23	29	35	41	First New Order Placed Here ★
		4	10	16	22	28	34	40	
		3	9	15	21	27	33	39	
		2	8	14	20	26	32	38	
		1	7	13	19	25	31	37	
		Current	+1	+2	+3	+4	+5	+6	

**Figure 1.6 Correcting the Overloaded Master Schedule by Freezing Incoming Orders**

scheduler needs to identify a rescheduling strategy. Other approaches to the rescheduling strategy have been tried, most of which have been unsuccessful. Look at the example presented in Figure 1.5, which illustrates a situation where 42 orders have been scheduled over a seven-period (current plus six periods) horizon. As the figure shows, 6 of these scheduled orders are past due, while 5 others have been committed over the planned capacity. Clearly, this represents an overloaded master schedule.

Over the years, three approaches have been tried to correct this situation. The first might be ostrich management—ignore the situation and it will simply go away. History has shown that this approach has never worked and probably never will.

The second approach is to freeze the schedule: No more orders are taken until a period well into the horizon. This will allow the company to work its way out of the overloaded condition. Refer to Figure 1.6

for a visual of this approach. What management or the master scheduler has done in this example is to inform everyone that no orders can be committed for delivery inside of seven periods. By doing this, the master scheduler expects to use the unconsumed capacity in periods current plus four through current plus six (see Figures 1.5 and 1.6) to work off the overload. In other words, the orders keep their same priority and just shift to the right, as seen in Figure 1.6.

How long do you think this directive will last? Maybe about 17 seconds—or until the next customer order that must be committed within the seven-period freeze zone! Another drawback of this approach is that it fails to recognize that these orders are not shipping because of some problem; this could be material, capacity, quality, credit hold, missing engineering specification, and so on. This approach ignores the fact that these problems may exist, and the product cannot be completed as scheduled, or cannot be completed even in the first or second periods, no matter how much pressure is put on the people or the facility.

A better approach, although it requires more work initially, is to reschedule. Using the reschedule strategy requires that the right mix of people—people who have the authority to make decisions—participate in an exercise to put achievable and realistic dates on all orders needing rescheduling. This process may require properly scheduled products to be moved out (or in some cases in) due to another product's being rescheduled into its committed time slot. Using Figures 1.5 and 1.7, let's review how this rescheduling process takes place.

Caution! Before beginning the actual rescheduling process, the company should be sure to identify a more realistic approach to booking customer orders in the future. This is important so that when the rescheduling exercise is complete, the company will not find itself right back in the same overloaded condition. Not only does the company need to identify how it will book orders in the future (using available-to-promise and realistic lead times), it must also implement the changes necessary to ensure that this more realistic approach is followed.

To start the rescheduling effort, a few key people must be available. The first and probably most important players are sales and marketing.

		Capacity						
		13	22	29	35	38	41	40
Past Due	Today	9	17	25	34	28	19	42
		7	14	24	33	36	11	20
		6	5	23	30	32	39	37
		2	8	21	18	31	27	16
		1	4	15	12	5	26	10
		Current	+1	+2	+3	+4	+5	+6

**Figure 1.7 Correcting the Overloaded Master Schedule by Rescheduling Commitments**

In fact, when it comes to determining customer priorities, sales and marketing, working with the facts known as well as within the identified constraints, should have the final say. Manufacturing and materials management also should be included in the session to answer questions on capacities, capabilities, and materials. Other requested functions may include finance, quality, engineering, and general management. For obvious reasons the president, general manager, or managing director should speak last: It's called *people empowerment* and getting the people close to the situation to solve the problem. Of course, general management always has the right to make the final call. General management is also responsible for breaking ties when sales, marketing, manufacturing, engineering, and finance cannot agree.

Figure 1.5 on page 18 identifies an overloaded condition. Before starting the exercise, the status of each order (why it is past due or

scheduled beyond the capacity limits) needs to be known. Once this information is on the table, the painful process of deciding a realistic and valid promise date begins. Looking at order number 1 and reviewing the problems associated with it, the group determines the new, realistic date. In the example, order numbers 1 and 2 remain as the highest priorities. Order number 3 has been rescheduled into the current period plus four, while orders number 4 and 5 have been rescheduled for a period 2 (current plus one) delivery. Order number 6 is designated as the number-three priority and rescheduled into the current period. This process continues until all orders have new expected delivery dates.

The next step in the process is to secure approval for the new plan from sales, marketing, materials, manufacturing, engineering, finance, and general management. Once this is done, it is time to implement the reschedule and make it happen. This is when the sales and marketing people really earn their money. Someone with sales and marketing responsibility must tactfully notify the customer of the anticipated delay and reschedule. It's generally not a pleasant task. Remember, many of these orders are already late and the customer is now being told that the expected delivery has been pushed out even further. No, it's not a pleasant task, but someone needs to do it. The challenge now is to ensure that the new delivery dates are met. Although implementing a rescheduling strategy is difficult, when coupled with the implementation of the promising new strategy, it works—and the benefits are many.

As you can see from the scenario, guarding against an overloaded master schedule is one reason why companies need to pay attention to how they master schedule. The next chapter discusses the whys of master scheduling and the framework into which this master scheduling process must fit.