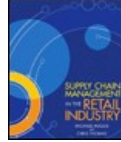


# Chapters *To Go*



## Supply Chain Management in the Retail Industry

by Michael Hugos and Chris Thomas  
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## Chapter 4: Supply Chain Operations—Sourcing Materials And Making Products

### Overview

In this chapter, we examine the parts of retail supply chains that only senior managers and buyers are privy to—how the “production end” of a supply chain works to create the products eventually sold at retail. All too often, retail employees view this portion of the supply chain like preschoolers may view the supermarket meat counter when shopping with a parent—that is, they assume the meat comes “from the store,” not from cows, pigs, or chickens, let alone the farms where these critters are raised to end up on a dinner table.

After reading this chapter, you will have a better understanding of what it takes to fill those store shelves. The topics include several cooperative functions between supply chain members:

- Procurement and consumption management
- Selecting and negotiating with suppliers
- Setting credit terms
- Collaborative product design
- Determining plant capacity and scheduling production

Many companies and supply chains in which they participate serve customers who are growing more sophisticated every year and demanding higher levels of service. Continuous improvements to the operations described in this chapter are needed to deliver the efficiency and responsiveness that evolving supply chains require.

### Procurement

Purchasing the raw materials for making new products is serious business. In 2002, the 100 largest U.S. manufacturers spent 48 cents of every dollar in sales to buy materials—up from 43 cents in 1996.<sup>[1]</sup>

Traditionally, the aim of a good purchasing manager was to “beat up” potential suppliers on price—that is, threaten or induce enough guilt to get them to drop their prices—and then simply buy products from whomever turned out to be the lowest-cost supplier. Today, successful companies take a different approach that can best be described as embarking on partnerships. They rely on suppliers to improve quality, reduce costs, and assist with product design and development—and they learn to trust their suppliers. So other, related activities have become just as important as purchasing.

Because of this, the purchasing activity is now seen as part of a broader function called **procurement**. The procurement function can be broken into five main activities or categories:

1. Purchasing
2. Consumption management
3. Vendor selection
4. Contract negotiation
5. Contract management

### Purchasing

Purchasing comprises the routine activities related to issuing purchase orders for needed products, and there are generally two types of products that a company buys:

- Direct materials are the supplies needed to produce whatever products the company sells to its customers. They may be known as raw materials or, in some companies, strategic materials.
- Indirect or **MRO** (maintenance, repair, and operations) products are things that a company consumes as part of its own daily operations.

The mechanics of purchasing both types of products are largely the same. Purchasing decisions are made, purchase

orders are issued, vendors are contacted, and orders are placed. There is a lot of data communicated in this process between the buyer and the supplier—items and quantities ordered, prices, delivery dates, delivery addresses, billing addresses, and payment terms. Much of this activity is very predictable and follows well-defined routines, but the greatest challenge of the purchasing activity is to see to it that this data communication happens in a timely manner and without error.

The hottest trend in the business world today is **e-procurement**, the ability to handle purchasing functions online using software applications that are Internet-based. Vendors put their product catalogs, order forms, and other data on a Web site where others can access the site and place orders. In business-to-business applications, the transactions are secure, available only to selected buyers and suppliers, and can be tracked.

## Consumption Management

Effective procurement begins with an understanding of how much of what categories of products are being bought across the entire company, as well as by each operating unit. Even in companies where different departments exercise a lot of autonomy, the procurement staff must keep track of who is buying what, and at what prices. This is necessary for several reasons, including theft prevention, waste management, and the ability to combine multiple, smaller purchases of the same goods to get better deals on them. Most major purchases made by a company are based on the terms of a sales contract, and companies discourage so-called **maverick spending**, or purchases made off-contract.

Expected levels of consumption for each product at the various locations of a company should be set and then compared against actual consumption on a regular basis. When consumption is significantly above or below expectations, it signals a possible problem that must be investigated. Consumption above expectations might be the result of pilfering, poor manufacturing practices, or outright wasting of materials, or it reflects inaccurate expectations that need to be reset. Consumption below expectations may point to an opportunity that should be exploited, but it also may simply reflect inaccurate planning or forecasting to begin with.

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### E-Procurement Is Paying Off

147 companies, most of them in North America, participated in a 2004 benchmark survey about e-procurement by Aberdeen Group, a market research firm in Boston, Massachusetts. Respondents said their e-procurement capabilities have allowed them to:

- Reduce off-contract “maverick spending” by 64 percent.
- Cut costs by 7.3 percent for spending that was brought back onto contract.
- Accelerate the cycle of requisition-to-order by 66 percent.
- Slash costs in requisition-to-order cycles by 58 percent.

The report also found that in 2001, companies did e-procurement business with an average of about 30 suppliers; by 2004, that number had increased to 250. The companies that have been successful with e-procurement have used some common tactics:

- They have the support of their senior management, which has made it easier to gain wide acceptance of the systems among users.
- They have made the use of e-procurement part of their strategic initiatives.
- They take time and effort to clearly define the costs, processes, and performance metrics. They measure things like adoption and usage rates, requisitions issued each month, and requests for off-catalog or off-contract items.

Like any relatively new technology, there are some downsides to e-procurement. So far, they seem to be as follows:

- Getting suppliers on the system can be challenging, especially if they are small and/or not technologically sophisticated.
- Most systems are being underutilized. Companies are using them to order goods, but not to make payments or reconcile invoices.
- The software developers have consolidated and/or gone out of business.

- Most companies still choose to spend their limited dollars updating other types of computer software with which they are more familiar.

Source: Adapted from Beth Stackpole, “E-procurement Systems Finally Paying Dividends,” *Managing Automation* magazine (online), January 26, 2005. © Thomas Publishing Company, LLC, New York and reprinted with permission of Managing Automation.

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## Vendor Selection

The first decision a manufacturing company makes about where to get any part or raw ingredient is “Do we need to find a supplier, or can we make (or do, or grow) this ourselves?” If an item is absolutely critical to the design of a product, or if the company wants complete control over the quality and production of a highly technical component, the result may be keeping it in-house. This is also true for specific supply chain functions (like customer service or deliveries of finished goods)—some companies outsource them; others do it themselves. When a company looks for outside vendors, it has three basic choices:

- **Multiple sourcing** means there is more than one supplier of the item or service, and the company chooses to use several. Multiple sourcing is important if the company absolutely never wants to run out of the product—multiple suppliers ensure there is always inventory on hand. Many companies refer to the suppliers that make the cut as their “preferred vendors.” In theory, the competition among suppliers should result in a better deal for the company, in terms of price, payment terms, service, product quality, and so on, as each supplier works to impress the procurement team and gain a larger share of the business. In practice, though, multiple-sourcing relationships can be somewhat adversarial.
- **Single sourcing** means there are several sources of the item or service, but the company chooses to use only one. These “exclusive” arrangements typically involve long-term contracts and true partnerships. They put a lot of responsibility on the supplier to meet the demands of the client company, but the mutual loyalty allows both companies to lower their costs a bit.
- **Sole sourcing** is just what its name indicates—an item that is so specialized, it is available from only one company. It may be a complex or highly technical product, or one that is trademarked or patented to prevent competition. Companies also enter into partnerships with a sole source to develop a specific product, only for them.

The downsides of both sole and single sourcing are, of course, the problems that may arise from shortages caused by any number of factors—strikes, shipping delays, natural (or financial) disasters, or poorly planned production that results in too few items being produced. And then what? A company needs to ask questions like this before making contractually binding, single-source agreements.

In addition to the price of a vendor’s product, the vendor’s other capabilities must be considered. How important are they? The values of attributes like product quality, service levels, just-in-time delivery, and technical support can only be estimated in terms of what they mean to the company that is interested in doing business with them—its business plan, its operating model, the sizes and frequency of its potential orders, and its willingness to fine-tune a relationship with a new vendor.

As a general rule, a company seeks to narrow the number of suppliers it does business with. This way it can leverage its purchasing power with a few suppliers and get better prices in return for purchasing higher volumes of product.

## Contract Negotiation

As particular business needs arise, contracts must be negotiated with individual vendors on the preferred-vendor list. This is where the specifics—items, prices, deadlines, and service levels—are worked out. The simplest contract negotiations are for the purchase of indirect products where suppliers are selected on the basis of lowest price. The most complex negotiations are for contracts to purchase direct materials that must meet exacting quality requirements, and where high service levels and technical support are needed.

Increasingly, though, even negotiations for the purchase of indirect items such as office supplies and janitorial products are becoming more complicated, because companies have learned to pay attention to these items in pursuit of their overall business plan. They want to use every opportunity to gain greater efficiencies in purchasing and inventory management.

Suppliers of both direct and indirect products need a common set of capabilities. Nowadays, maximizing purchasing efficiencies requires that suppliers have Electronic Data Interchange (EDI) capability—the systems and technical knowhow

to receive orders, send delivery notifications and invoices, receive payments, and so on—by computer. Better inventory management requires that inventory levels be reduced, which often means suppliers need to make smaller, more frequent deliveries and orders must be filled accurately and completely.

Anything that the “customer” company considers necessary is open to negotiation as part of the contract terms with the supplier. The negotiations often involve trade-offs between the unit price of a product and all the other value-added services that are desired. These other services might be paid for by a higher margin in the unit price, by separate payments, or by some combination of the two. Performance targets must be specified, and penalties and other fees must also be defined in the contract if performance targets are not met.

## Contract Management

Once contracts are in place, vendor performance against these contracts must be measured and managed. Supplier performance is important, and suppliers should be willing to, and even enthusiastic about, participating in this process. A particular supplier may be the only source of a whole category of products that a company needs, and if it is not meeting its contractual obligations, the activities that depend on those products will suffer.

Therefore, a company must have the ability to track the performance of its suppliers and hold them accountable to meet the service levels they agreed to in their contract. Just as with consumption management, people in the company need to routinely collect data about suppliers’ performance, both bad and good. Any supplier that consistently falls below requirements should be made aware of the shortcomings and asked to correct them, with a deadline stated in the request.

In many retail situations, the suppliers can be given responsibility for tracking their own performance, and should then be proactive about keeping their performance up to contracted levels. One example of this is the concept of vendor-managed inventory (VMI), which allows a vendor to monitor the inventory levels of its product within a customer’s business. The vendor is responsible for watching usage rates and calculating economic order quantities (EOQs). The vendor proactively ships products to the customer locations that need them, and invoices the customer for those shipments under terms defined in the contract.

[1]Thomas Y. Choi and Jeffrey K. Liker, “Building Deep Supplier Relationships,” *Harvard Business Review*, December 2004.

## Credit and Collections

Procurement is the sourcing process a company uses to get the goods and services it needs. Credit and collections is the sourcing process that a company uses to get its money. The credit operation screens potential customers to make sure the company only does business with customers who will be able to pay their bills. The collections operation is what actually brings in the money that the company has earned.

Approving a sale is like making a loan for the sale amount, for a length of time defined by the payment terms. The goal of good credit management is to fulfill customer demand for products while also minimizing the amount of money tied up in receivables. This is analogous to the way good inventory management strives to meet customer demand and minimize the amount of money tied up in inventory.

The supply chains that a company participates in are often selected on the basis of credit decisions. Much of the trust and cooperation that is possible between companies who do business together is based upon good credit ratings and timely payments of invoices. Credit decisions affect who a company will sell to and also the terms of the sale. The credit and collections function can be broken into three main categories of activity:

1. Setting a credit policy
2. Implementing credit and collections practices
3. Managing credit risks

## Setting Credit Policy

Credit policy is decided on by senior managers in a company—the controller, chief financial officer, treasurer, and chief executive officer. The first step in this process is to review the performance of the company’s receivables. Every company has defined a set of measurements that is used to analyze receivables, such as:

- Days of sales outstanding (DSO)

- Percent of receivables that are past their customer payment terms
- The company's bad-debt write-off amount as a percentage of sales

Most of the number-crunching involves looking for trends and/or problems. Once management has an understanding of the company's receivables situation and the related trends, they can take the next step: to set or change risk acceptance criteria to respond to the receivables situation. These criteria should change over time, as economic and market conditions evolve, to define the kinds of credit risks that the company will take with different kinds of customers, and the payment terms that will be offered.

### **Implementing Credit and Collections Practices**

These activities involve putting in place and operating the procedures to carry out and enforce the credit policies of the company. The first major activity in this category is to work with the company salespeople to approve sales to specific customers. As noted earlier, making a sale is like making a loan for the amount of the sale. Customers often buy from a company that extends them larger lines of credit and longer payment terms than its competitors. Credit analysis is necessary to ensure that this loan is only made to customers who will pay it off promptly, and according to the terms of the sale.

After a sale is made, people in the credit department work with customers to provide various kinds of service. They process product returns and issue credit memos for returned products. They resolve disputes and clear up questions by providing copies of contracts, purchase orders, and invoices.

The third major activity is collections, a process that begins with the ongoing maintenance of each customer's accounts payable status. Customers that have past-due accounts are contacted and payments are politely requested. Sometimes, new payment terms and schedules are negotiated.

The collections activity also includes the receiving and processing of customer payments, which can come in a variety of different forms. Some customers will pay by electronic funds transfer (EFT); others will use bank drafts, revolving lines of credit, or credit cards. If customers are in other countries, there are still other ways that payment can be made, such as international letters of credit from foreign banks.

### **Managing Credit Risk**

The credit function works to help the company take intelligent risks that support its business plan. What may be a bad credit decision from one perspective may be a good business decision from another perspective. If a company wants to gain market share in a certain area, it may make credit decisions that help accomplish this. Credit department employees can work with other lenders to find innovative ways to lower the risk of selling to new kinds of customers. (Why do you think so many major retailers offer a "sponsored" Visa or MasterCard, sometimes in lieu of their own credit cards?)

Among members of a supply chain, offering and accepting credit is a business necessity. The inherent financial risk of offering credit can be managed by creating credit programs that are tailored to the needs of customers in certain market segments. Some credit grantors specialize in working with high-tech firms, start-up companies, construction contractors, or customers in foreign countries, devising payment terms that are attractive to customers in these market segments. Credit risks can be lowered by the use of credit insurance, liens on customer assets, and government loan guarantees for exports.

For important customers and particularly with large individual sales, people in the credit area work with others in the company to structure special deals just for a single customer. This increases the value that the company can provide to such a customer and can be a significant part of securing important new business.

### **Product Design**

We've found the suppliers, negotiated the contracts, and determined the credit-worthiness of the supply chain members. Now let's shift our focus to the next phase of the manufacturing process.

The design of a product—which determines the components needed to make or build it—is based on the technology available and the specific product performance requirements. Until recently, relatively little thought was given to how the design of a product and the selection of its components affect the supply chain; and yet these costs can account for 50 percent or more of the product's final cost. Smart company managers have learned to scrutinize them.

From a supply chain perspective, the goal of product design is fewer parts, fairly simple designs, and modular construction



from generic subassemblies, so that the parts can be obtained from a small group of preferred suppliers. The fewer the parts, the less that can go wrong with the finished product. Inventory can be kept (in the form of the generic subassemblies) at appropriate locations in the supply chain. There will be no need to hold large inventories of finished goods, because customer demand can be met quickly. Some of the parts are already prepared and stored—they simply have to be fully assembled as customer orders arrive. This technique, called **variability pooling** or **postponement**, was pioneered by high-tech manufacturers like Hewlett-Packard because it allows them to keep large inventories of parts without the risk of holding finished inventory that might quickly become obsolete. The method requires the companies in the supply chain to collaborate on the design process, in order to shorten the time to market for the products that are assembled for sale.

The more flexible, responsive, and cost-efficient the supply chain, the more likely the product will succeed in its market. To illustrate this point, consider the following fictitious situation:

Fantastic Company designs a fantastic new home entertainment system with wide-screen TV, surround sound, the whole works! It performs to demanding specifications and delivers impressive results. But the electronics that power the entertainment center are built with components from 12 different suppliers.

Demand takes off and the company ramps up production, but soon finds that managing quality control and delivery schedules for 12 suppliers is a challenge. More procurement managers and staff are hired. Assembly of the components is complex, and delays in the delivery of components from any of the suppliers can slow down production rates. So buffer stocks of finished goods are kept to compensate for this.

Several new suppliers are required to provide the specified product components. One of them has quality control problems and has to be replaced. Another supplier decides after several months to cease production of the component it supplies to Fantastic Company. They bring out a new component with similar features, but it is not an exact replacement.

Fantastic Company has to suspend production of the home entertainment system while a team of engineers redesigns the part of the system that used the discontinued component so that it can use the new component. During this time, buffer stocks run out in some locations, and sales are lost when customers go elsewhere.

A competitor called Nimble Company is intrigued by the success of Fantastic Company and introduces a competing product. Its design is simpler, with fewer parts and components from only four suppliers. The cost of procurement is much lower, since only 4 suppliers must be coordinated instead of 12. There are no production delays due to lack of component parts, and product assembly is easier.

While Fantastic Company, who pioneered the market, struggles with a cumbersome supply chain, Nimble Company provides the market with a lower-cost and more reliable supply of the product. Nimble Company—with a more responsive and less costly supply chain—takes market share away from Fantastic Company.

What can be learned here? Product design defines the shape of the supply chain, and this has a great impact on the cost and availability of the product. If product design, procurement, and manufacturing people can work together in the initial design phase, there is tremendous opportunity to create products that will be successful and profitable.

The problem is that there is a natural tendency for design, procurement, and manufacturing people to have different agendas unless their actions are coordinated. Design people are concerned with meeting the customer requirements. Procurement people are interested in getting the best prices from a group of prescreened preferred suppliers. Folks in manufacturing are looking for simple fabrication and assembly methods and long production runs. You can't blame any of them for looking out for their own interests. They're all doing exactly what they are supposed to do.

Cross-functional product design teams with representatives from these three groups have the opportunity to blend the best insights from each group. At the same time they are designing the product, they should envision any accessories or services that can be bundled with it to add value, and discuss the relevant issues: Can the current suppliers provide the necessary components? How many new suppliers are needed? What opportunities are there to simplify the design and reduce the number of suppliers? What happens if a supplier stops producing a certain component? How can the assembly of the product be made easier?

At the same time they are reviewing product designs, a cross-functional team can evaluate existing preferred suppliers and manufacturing facilities. What components can existing suppliers provide? What are their service levels and technical support capabilities? How large a workforce and what kinds of skills are needed to make the product? How much capacity is needed, and which facilities should be used?

A product design that does a good job of coordinating the three perspectives—design, procurement, and manufacturing—

will result in a product that can be supported by an efficient supply chain. This will give the product a faster time to market as well as a competitive cost.

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### Supply Chain Skills—Building Strong Partnerships

Two professors—Jeffrey K. Liker of the University of Michigan in Ann Arbor and Thomas Choi of Arizona State University's W.P. Carey School of Business in Tempe—have studied the American and Japanese automotive industry for more than 20 years. Between 1999 and 2002, their goal was to learn how Toyota and Honda managed to attain such solid relationships with their suppliers when American automakers seem unable to accomplish this. Their findings, published in the *Harvard Business Review* in December 2004, make for fascinating reading. Here are just a few of their conclusions and suggestions:

When we compared the elements of Toyota's partnering model with those of Honda's, we found that although the two companies used different tools, they had created strikingly similar scaffoldings. Experts usually emphasize the use of devices like target pricing, but we believe Toyota and Honda have built great supplier relationships by following six distinct steps:

First, they understand how their suppliers work.

- Learn about suppliers' businesses.
- Go see how suppliers work.
- • Respect suppliers' capabilities.
- Commit to co-prosperity.

Second, they turn supplier rivalry into opportunity.

- Source each component from two or three vendors.
- Create compatible production philosophies and systems.
- Set up joint ventures with existing suppliers to transfer knowledge and maintain control.

Third, they supervise their vendors.

- Send monthly report cards to core suppliers.
- Provide immediate and constant feedback.
- Get senior managers involved in solving problems.

Fourth, they develop their suppliers' technical capabilities.

- Build suppliers' problem-solving skills.
- Develop a common lexicon.
- Hone core suppliers' innovation capabilities.

Fifth, they share information intensively but selectively.

- Set specific times, places, and agendas for meetings.
- Use rigid formats and have a structure for sharing information.
- Insist on accurate data collection.

Sixth, they conduct joint improvement activities.

- Exchange best practices with suppliers.
- Initiate kaizen projects at suppliers' facilities.



- Set up supplier study groups.

Toyota and Honda have succeeded not because they use one or two of these elements, but because they use all six together as a system.

Most vendors believe that Toyota and Honda are their best—and toughest—customers. The two companies set high standards and expect their partners to meet them. However, the carmakers help suppliers fulfill their expectations. Clearly, Toyota and Honda want to maximize profits, but not at the expense of their suppliers.

Source: Thomas Y. Choi and Jeffrey K. Liker, “Building Deep Supplier Relationships,” *Harvard Business Review*, Boston, Massachusetts, December 2004.

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## Production Scheduling

Production scheduling assigns the available capacity to the work that needs to be done. First, of course, the capacity has to be determined. American companies are known for a preoccupation with numbers—that is, they think in terms of how many garments they can manufacture in a day on a production line, or how many customers they can serve in an hour at a fast-food counter. This type of measurement may be accurate, but it is only a small part of a far more complex concept that involves what have been nicknamed “The Four M’s of Manufacturing”—machinery, manpower, materials, and money.<sup>[2]</sup> (For the most part, these apply to businesses other than manufacturers as well.) Seen in these terms, capacity says as much about what a company *cannot* do as what it can do. It is a measurement of the limits, or “Here’s the maximum of what we are capable of.”

So the goal is to use available capacity in the most efficient and profitable manner. The production scheduling operation is a process of finding the right balance between several competing objectives:

- **High utilization rates.** This often means long production runs and centralized manufacturing and distribution centers. The idea is to generate (and benefit from) economies of scale.
- **Low inventory levels.** This usually means short production runs and just-in-time delivery of raw materials. The idea is to minimize the assets and cash tied up in inventory.
- **High levels of customer service.** This often requires high levels of inventory or many short production runs. The aim is to provide the customer with quick delivery of products and not to run out of stock in any product.

There are also three different types of scheduling:

**Aggregate scheduling.** The long-term view of what a plant is going to be doing and making over a time period of a year or more, this schedule is created as part of the aggregate planning process.

**Master scheduling.** This is what is typically thought of as “the schedule,” the assignments of work to meet specific deadlines over one month, three months, six months, and so forth.

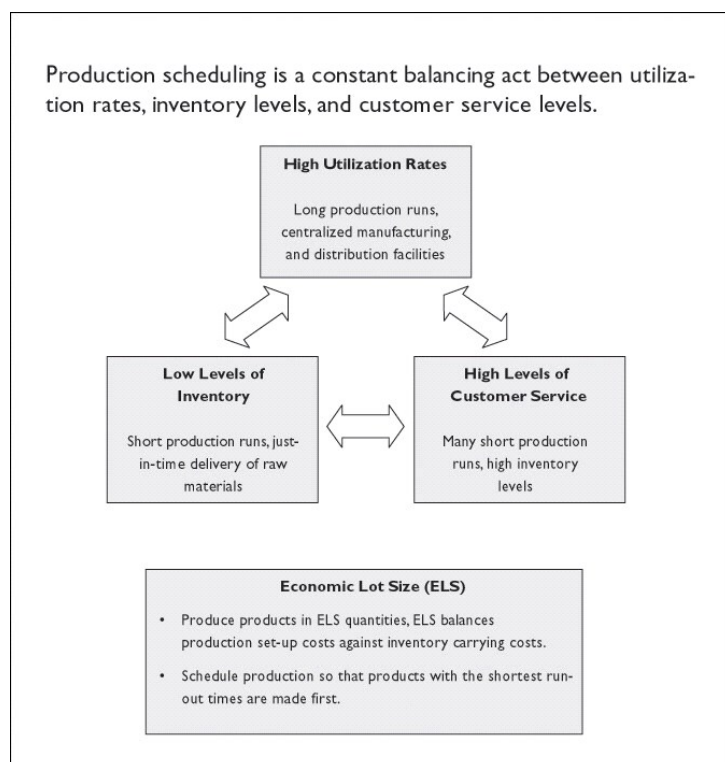
**Dispatching.** This involves day-to-day tweaks in the schedule at the point of production to match up supply and demand.<sup>[3]</sup>

Most of today’s manufacturing for the retail market is known as **mass customization**—yes, it does sound like a contradiction in terms—or **build-to-order**. Manufacturers can no longer afford to produce thousands of items, warehouse them, and hope that they will remain in style or in demand over a long time period, so they wait until orders are placed and make enough to fill those orders—perhaps with a little overage just to be safe, but not much. Plants are designed for flexibility so they can adapt to retailers’ needs, which depend in turn on consumers’ changing tastes.

When a single product is to be made in a dedicated facility, scheduling means organizing the operations as efficiently as possible and running the facility at the level required to meet demand for the product. When several different products are to be made in a single facility or on a single assembly line, this becomes instantly more complex. Each product will need to be produced for some period of time, and then more time will be needed to switch over to production of the next product.

The first step in scheduling a multiproduct production facility is to determine the economic lot size (ELS) for the production runs of each product. This is a calculation much like the EOQ calculation used in the inventory control process. The calculation of economic lot size involves balancing the production setup costs for a product with the cost of carrying that product in inventory. If setups are done frequently and production runs are done in small batches, the result will be low

levels of inventory but the production costs will be higher due to increased setup activity. If production costs are minimized by doing long production runs, then inventory levels will be higher and product inventory carrying costs will be higher.



**Figure 4-1. Production scheduling.**

Once production quantities have been determined, the second step is to set the right sequence of production runs for each product. The basic rule is that if inventory for a certain product is low relative to its expected demand, then production of this product should be scheduled ahead of other products that have higher levels of inventory relative to their expected demand. A common technique is to schedule production runs based on the concept of a product's **run-out time**. The run-out time is the number of days or weeks it would take to deplete the product inventory on hand given its expected demand. The runout time calculation for a product is expressed as:

$$R = P \div D$$

$R = P \div D$  where:

$R$  = run-out time

$P$  = number of units of product on hand

$D$  = product demand (in units) for a day or week

The master scheduling process is a repetitive process that begins by calculating all the run-out times for all of the products—their “ $R$  values.” The first production run is then scheduled for the product with the lowest  $R$  value. The production scheduler assumes that the economic lot size for that product has been produced, and then recalculates all product  $R$  values. Again, the one with the lowest  $R$  value is selected, and its production is next on the schedule . . . and so forth. This scheduling process can be repeated as often as necessary to create a production schedule going as far into the future as needed.

After scheduling is done, the resulting inventory should be continuously checked against actual demand. Is inventory building up too fast? Should the demand number be changed in the calculation of run-out time? Reality rarely happens as planned, so production schedules are constantly being monitored and adjusted.

<sup>[2]</sup>Eliza G.C. Collins and Mary Anne Devanna, *The Portable MBA* (New York: John Wiley & Sons, 1990).

[3] *Ibid.*

## Facility Management

Location is one of the five supply chain drivers discussed in Chapter 1. It is usually quite expensive to shut down a facility or to build a new one, so companies live with the consequences of decisions they make about where to locate their facilities. Ongoing facility management takes location as a given and focuses on how best to use the capacity available. This involves making decisions in three areas:

*The role each facility will play* involves decisions that determine what activities will be performed in which facilities. These decisions have a huge impact on the flexibility of the supply chain. They largely define the ways that the supply chain can change its operations to meet changing market demand. If a facility is designated to perform only a single function or serve only a single market, it usually cannot easily be shifted to perform a different function or serve a different market if supply chain needs change.

*How capacity is allocated in each facility* is dictated by the role that the facility plays. Capacity allocation decisions determine how much labor and what types of equipment are part of the facility. It is easier to change capacity allocation decisions than it is to change locations—but still it is not cost-effective to make frequent changes in allocation. So, once decided, capacity allocation strongly influences supply chain performance and profitability. As with so many other supply chain considerations, it is a balancing act for manufacturers with multiple locations. Allocating too little capacity to a facility creates inability to meet demand and loss of sales. Saddling a facility with having to carry too much capacity results in low utilization rates and higher supply chain costs.

*The allocation of suppliers and markets to each facility* is influenced by the first two decisions. Depending on the role that a facility plays and the capacity allocated to it, the facility will require certain kinds of suppliers, and the products and volumes that it can handle mean that it can support certain types of markets. Decisions about the suppliers and markets a facility will serve affect transportation costs, both for getting supplies to the facility and transporting the finished goods to the customers. In turn, these decisions also affect the overall supply chain's ability to meet market demands.

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### Supply Chain Skills—Working With Global Partners Continued

Faced with shrinking margins and intense competitive pressure, officials at Hunt Corp. (in Philadelphia, Pennsylvania) knew something had to change. So, in 2002, the privately owned maker of office and graphics supplies decided to outsource manufacturing of its high-volume products to contractors in China and to use other lower-cost offshore suppliers.

The good news: Hunt, a supplier of office supplies used worldwide by businesses, consumers, educational institutions, and professional photographers and framers, got the lower manufacturing costs it was after. The bad news: The switch to offshore sourcing and manufacturing put new strains on the company's supply chain. Lead times—the time it took for Hunt orders to arrive at its shipping dock—grew from days or weeks when manufacturing was done in-house to an average of 95 days, for example. Inventory costs and overnight shipping charges also rose.

As a result, says Bill Bracey, Hunt's materials manager, the company has been forced to “undergo a model change.” This means Hunt had to switch from being a company that could respond quickly to customer requests for supplies such as paper clips, pens, and X-ACTO brand items by depending on its manufacturing prowess to one that has to rely on its partners.

“Our role in the market is changing from [one centered on] our strength as a manufacturer to [one in which] our strength [is] our distribution and supply chain prowess,” adds Bracey.

To get the most out of this changing business model, Hunt began designing and implementing new supply chain processes intended to improve communication and collaboration with suppliers. So far it's working. Hunt has been able to reduce its lead times from 95 to 65 days, cut airfreight charges and reduce inventory levels on imported items by 10 percent.

Hunt isn't the only company that, having outsourced some manufacturing offshore, will be forced to revamp its supply chain. With many companies turning to overseas suppliers to lower unit prices, Bracey says, manufacturers that focus only on lowering manufacturing costs will eventually lag behind.

“Companies can afford to acquire a lot of inventory while the cost of money is low, but that won't always be the case,” he says.” As companies begin to pay the same amount for goods, that cost benefit also goes away. The only way to

create sustainable advantage is through a well-run supply chain.”

As Hunt has learned, there are challenges to doing business overseas. Outsourcing production can significantly reduce the cost of goods. But it also typically means working around long lead times and accepting large lot sizes. Long lead times lead to less accurate forecasts and make it difficult to manage unplanned spikes in demand, while large lot sizes can mean carrying excess inventory. It soon became clear to Hunt officials that a 95-day lead-time was “unacceptably long,” according to Tony Stafford, Hunt’s purchasing manager. The long lead time was not only driving up inventories, it was also making it difficult for Hunt to service customers quickly and to efficiently manage returns, a significant issue as retailers increasingly move to a consignment model where they return any unsold inventory to Hunt.

In order to cut lead times, Hunt officials realized they had to work much more efficiently with suppliers. “We had to schedule capacity and get [suppliers] to operate as an extension of our organization,” says Bracey.

Hunt set its sights on developing supply chain processes that would provide “a more continuous flow of product so when price is less of a factor, we still have competitive advantage in being able to service our customers without carrying excess inventory,” Bracey explains. That means continuing to improve communication and collaboration with its suppliers to shorten the order-to-delivery cycle.

To help suppliers plan capacity, Hunt first modified its forecasting process. Rather than giving suppliers just one level of commitment—a discrete order—Hunt established what Bracey calls “firm, slushy, and free time zones in our forecasts.” In the firm zone, the company is committed to buying the finished goods in the amount specified. In the slushy zone, the company is committed to purchasing the raw materials and standard components so the supplier can plan its purchases and production. In the free zone, Hunt has no commitment to buy.

“The free zone is typically three to five months out and is strictly for reference information to help them manage capacity,” says Bracey.

At the same time, Hunt worked to give suppliers better visibility into its forecasts and inventory levels. Hunt uses the full suite of QAD Inc. (based in Carpinteria, California) MFG/PRO enterprise resource planning (ERP) applications to run its internal business, so it was natural for the company to use QAD’s hosted Supply Visualization application. The application, hosted by QAD on its MFGx.net site, is designed to provide suppliers with visibility into a manufacturer’s forecasts and inventory levels. Using a hosted version of the application, says Bracey, helped Hunt get a quick return on its investment.

Supply Visualization helped Hunt communicate effectively with suppliers and, ultimately, drive lead times down to 60 days. The Supply Visualization application is integrated with the company’s MFG/PRO software applications. Inventory and forecast data from MFG/PRO are published to partners over standard Internet browsers, which means suppliers can access inventory and forecast information as soon as it’s updated rather than waiting for a fax or e-mail from Hunt when the data is rolled up monthly or quarterly. So now, even if suppliers can only meet part of Hunt’s demand, they can more quickly and easily communicate that, and Hunt can make contingency plans.

Hunt updates its forecasts monthly and can update a forecast on individual products or by group as needed. To develop its forecasts, Hunt uses the Demand Solutions forecast applications from Demand Management Inc. (based in St. Louis, Missouri) and imports/exports that data into its MFG/PRO ERP system. In the new process, Hunt meets with suppliers once a month (or more frequently if necessary) via conference call to discuss the forecast and plans and how they compare to Hunt’s actual needs.

“In the past, we didn’t have a tool that would force us to get together and work out the details,” says Bracey. Sharing forecast data and improving communication with suppliers also means all members always have the same data from which to work. Stafford says Hunt’s partners look at the Web site for changes or new information “daily, if not more often.” One advantage of the browser based system is that supplier browsers can be set up in Chinese so the information appears in their native language. That way Hunt doesn’t have to depend on just a few people who are fluent in English.

Shorter lead times have delivered several benefits to Hunt. For one thing, they’ve made for more accurate forecasts because, with 35 fewer days between order and delivery, there is less data to try to analyze and less time for surprises to hit the process.” The further out you look, the less accurate your forecasts are and the more you have to hedge on that forecast. Having a 50 percent longer lead time more than doubles the work with far less certain results,” says Stafford.

Shorter lead times also let Hunt cut off product pipelines more efficiently when it sees the end of an item’s selling period. That’s important as product life cycles shorten. Shorter lead times also reduce the need for safety inventory. That’s

important to Hunt because “if that inventory goes obsolete, it’s a real struggle to get rid of it without contaminating your market,” says Stafford.

Hunt also found that by moving its manufacturing processes to suppliers, it moved its work-in-progress (WIP) and raw materials inventory to those suppliers. It’s then the suppliers that have to improve the way they manage that inventory. To do that, suppliers need more accurate and timely demand and forecast data from Hunt.

Besides cutting lead times and inventory levels, Hunt has been able to reduce its airfreight costs for items it couldn’t wait 35 travel days to receive. Under the previous process, when it needed product in less than 95 days, the company would have to airfreight product from China to its distribution center. The new process let the company cut \$200,000 in airfreight charges in the first half of 2003.

But Bracey says Hunt isn’t stopping there. The next step in improving its supply chain is for the company to use the Supply Visualization tool to move away from creating a discrete purchase order for each item and toward generating a firm release of the forecast so suppliers can simply package product and send it to Hunt efficiently.

“Letting our schedule float could shorten lead times to 45 days,” says Bracey.” With a floating schedule, when our customer orders change, we don’t have purchase orders clouding the picture of what we really need. At the latest possible moment, our suppliers could take the latest requirements, load the container, and let us know what’s coming.”

To make the supply chain even more efficient, Bracey is also beginning to discuss with Hunt’s product-engineering group the standardization of parts. That would mean, rather than carrying a finished goods inventory, Hunt’s suppliers could carry a parts/materials inventory. That could allow the company to carry less total inventory and possibly reduce the company’s risk and need for safety stock.

Already, though, Hunt has increased its level of service and reduced cost by improving its supply chain.” If you don’t have the right processes in place when the cost of money rises and the price of goods levels out for everyone, you won’t be competitive,” Bracey says.” We assume that day will come, and we’re developing processes that will put us ahead of the curve.”

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More companies are facing the reality that at least some of their supply chain partners—notably suppliers, manufacturers, and customer service functions—are located in foreign countries. The information in this book about procurement, inventory levels, credit terms, manufacturing schedules, and so on applies just as surely to them as to any United States-based company. The article about Hunt Corp. (see *sidebar*) has been included in this chapter as an introduction to the shifts in supply chain operation that become necessary when its member companies span the globe.

## Chapter Summary

Manufacturing is a critical part of the supply chain. Without it, there would be little for retailers to sell.

This chapter began with a look at the *sourcing* or *procurement* process—terms for how companies purchase everything they need to do business, from paper clips to fleet vehicles to the products that they resell to their own customers. They make decisions about whether to use multiple or single sources of each product, and the chapter included information about what to look for in a reliable supplier. Once trusted suppliers are in place, routine procurement is often done nowadays on secure Internet Web sites, which saves time and money.

Credit and collections are considered part of sourcing, since they are the ways companies “procure” the money for what they have sold to customers.

Sourcing of supplies and the actual manufacturing of products go hand in hand—and the design or development process should include input from cross-functional teams to ensure real-world considerations: Can we get the parts we need to do this? Is the design more complex (and therefore, more expensive) than it needs to be? Can we design services to bundle with the product for added value?

When the design is complete and the raw materials have been procured, the manufacturing process cannot begin without scheduling the production of the item. Plant capacity must be determined and a certain portion of that capacity must be allocated to each product the plant produces. The processes of scheduling and facility management sound simple and



logical, but they are a constant juggling act in order to balance the workloads of people and machinery with desired inventory levels and customers' orders.

The chapter ended with a look at how one U.S.-based supplier, Hunt Corp., has modified its business operations in order to work with supply chain partners in China.

### Discussion Questions

1. Find out more about e-procurement and compare the benefits and sales claims of three different e-procurement software systems based on their Web sites. As a purchasing manager for a multiplant manufacturer, which would you choose and why?
2. As a retailer, what would *you* expect from a good supplier, in terms of added services and perks?
3. As a retail executive, you are at the mercy of the credit policies of your suppliers. How generous do you think they should be if your store is having financial difficulties and has fallen behind on some payments?
4. Why should designers of a product have to be constrained by the limitations of a supply chain? Explain the theory here. If you were designing the product, how would you try to work around ineffective or unresponsive supply chain partners?
5. How are the "Four M's of Manufacturing" impacted by mass customization? How are they impacted by the use of foreign suppliers?

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### The Incredible Journey Continues

#### AUGUST 31—WARNER-LAMBERT MIXES IT UP

By now the ethanol, eucalyptol, and sorbitol solutions have all arrived at WL's plant in Lititz, where employees test them—along with the menthol, citric acid, and other ingredients that make up Listerine—for quality assurance before authorizing storage in tanks. To mix the ingredients, flow meters turn on valves at each tank and measure out the right proportion, according to the Cool Mint formula developed by WL R&D (Research & Development) in 1990. (The original amber mouthwash was developed in 1879.) This blending process is constant; as ingredients are added to the several-thousand-gallon vat, the properly blended liquid is continuously transferred to a separate holding tank. Next the Listerine flows through a pipe to fillers along the packaging line. The fillers dispense the product into bottles delivered continuously from a nearby plastics company for just-in-time manufacturing.

The bottles are capped, labeled, and fitted with tamper-resistant safety bands, then placed in corrugated shipping boxes (known as "shippers") that each hold a dozen 500-milliliter bottles. During this process, machines automatically check for skewed labels, missing safety bands, and other problems. The entire production cycle, from the delivery via pipe of the Listerine liquid to the point where the bottles are boxed and ready to go, takes a matter of minutes. The line can produce about 300 bottles per minute—a far cry from the 80 to 100 bottles that the line produced per minute prior to 1994. In that year, WL switched from glass bottles to sturdy plastic bottles, modernized its production line with high-speed equipment, and went from mixing batches of mouthwash one tank at a time to the continuous mixing process.

Each shipper travels on a conveyor belt to the palletizer, which organizes and shrinkwraps shippers into 100-case pallets. Stickers with identifying bar codes are affixed to the pallets. Drivers forklift the pallets to the distribution center located in the same Lititz facility and store them in a designated spot where they will sit for two to four weeks.

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### What sets Warner-Lambert's supply chain apart?

WL's supply chain excellence stems from its innovative Collaborative Planning, Forecasting and Replenishment (CPFR) program, says Hau L. Lee, CIO-100 judge and Stanford University professor. WL launched CPFR a few years ago when it started sharing strategic plans, performance data, and market insight with Wal-Mart Stores Inc. over the Internet. The company realized that it could benefit from Wal-Mart's market knowledge, just as Wal-Mart could benefit from its product knowledge.

During the CPFR pilot, WL increased its products' shelf-fill rate—the extent to which a store's shelves are fully stocked—from 87 percent to 98 percent, earning the company about \$8 million in additional sales, or the equivalent of a new product launch, says Jay Nearnberg, director of global demand management for WL. Every major supply chain vendor now offers CPFR software. Eventually, WL hopes to use the Internet to expand the CPFR program to

all its suppliers and retail partners, says Nearnberg.

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