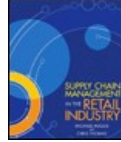


# Chapters *To Go*



## Supply Chain Management in the Retail Industry

by Michael Hugos and Chris Thomas  
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## Chapter 3: Supply Chain Operations: Planning

### Overview

The best retailers are expert jugglers, balancing the many challenges of planning for sales. They plan which product lines they will sell, and how to get these items from their original sources to the stores. They forecast sales figures by week and by month. They plan how to merchandise the items, often with a layout that shows exactly where they'll fit in the store, and how much shelf or rack space will be devoted to them. They plan special promotions and sales. And when things don't go according to plan, they revise their plans to remain on course!

After reading this chapter, you will understand the following concepts as they apply to planning functions in a supply chain:

- Forecasting product demand
- Pros and cons of various forecasting methods
- Importance of aggregate planning
- Cost structures and pricing plans
- Theories of inventory planning

There are also three short company profiles of paper industry distributors, in which their leaders discuss how they deal with their own planning and supply chain issues.

The retail industry has its own unique planning-related challenges. Chain stores must plan for different locations, often with different customer demographics. And today's merchant is likely to sell in multiple channels as well—traditional store locations, online, in catalogs—each requiring its own planning process. But there are common themes in the way supply chain members in any industry must plan, and retailers should become familiar with these processes. This knowledge will allow them to, among other things, be able to discern the well-organized manufacturers from the ones that are going to cause problems sooner or later by their lack of planning.

### Five Links In the Chain

In the first chapter, you became acquainted with the five drivers of supply chain performance. These drivers can be thought of as the design parameters or policy decisions that define the shape and capabilities of any supply chain. Within the context created by these policy decisions, a supply chain goes about doing its job by performing regular, ongoing operations that are the “nuts-andbolts” operations at the core of every supply chain.

To reach a higher-level understanding of these operations and how they relate to each other, we can use the Supply-Chain Operations Reference, or SCOR, model developed by the Supply-Chain Council of Pittsburgh, Pennsylvania ([www.supply-chain.org](http://www.supply-chain.org)). For years, the SCOR model identified four categories of operations, but it has been changed in recent years to include a fifth category. In the next few chapters, we'll examine each of these categories in terms of how supply chains are organized:

- Plan
- Source
- Make Deliver Return

### Plan

This category refers to all the functions that are necessary to plan and organize the operations in the other four categories. We will investigate three functions in this category in some detail: demand forecasting, product pricing, and inventory management.

### Source

Operations in this category include the activities necessary to acquire the raw materials or skills to create products or services. We will look at two operations here. The first is procurement, or the acquisition of materials and services. The second, credit and collections, is not traditionally seen as a sourcing activity, but it can be thought of literally, as the

acquisition of cash. Both these operations have major impacts on the efficiency of a supply chain.

### **Make**

This category includes the operations required to develop and build the products and services that a supply chain provides—product design, production management, and facilities management. The SCOR model does not specifically include the product design and development process, but it is included here because it is integral to the production process.

### **Deliver**

These activities are part of receiving customer orders and delivering products to customers. The two main operations we will review are order entry/order fulfillment and product delivery. These two operations constitute the core connections between companies in a supply chain.

### **Return**

This refers to the service-related functions that take place after the supply chain has achieved its primary mission—and, for retailers, these are critical functions that often make the difference in customer loyalty. They include credit policies and policies for things like returns, repairs, and exchanges of goods. Remember, when something is wrong with a product that has been sold, it “returns” eventually to the supply chain to be dealt with by at least one member of the chain.

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## **Supply Chain Skills—Adaptability**

Paper Enterprises ([www.paperenterprises.com](http://www.paperenterprises.com)) is a distributor of food service and paper disposables and janitorial supplies. Based in the Bronx, it serves the entire New York metropolitan area. Herb Sedler founded the company in 1961; his son Jordan has been working in the business for more than two decades.

Success in a market like New York City requires a combination of efficiency and high customer service levels. “You learn through trial and error but you learn,” Jordan Sedler explains. “This is what adaptability is all about. For instance, in a lot of Manhattan buildings, you have to use a freight elevator manned by a guy who may not really care about your delivery schedule. You learn to bring him a doughnut and coffee!”

“In New York City, there are about 300 competitors for every market segment,” adds Herb Sedler. “There are three or four big, overhead-laden corporations—and then 297 little guys running around with trucks, who buy cheap and sell cheap. Paper Enterprises straddles both worlds. On the one hand, we compete with the big corporations. On the other hand, we didn’t want to compete with the little guys, so we decided to make them our customers. We became a re-distributor who could buy in bulk from manufacturers and resell to all the smaller operators.”

Paper Enterprises encourages a mind-set of customer service in all employees, and then focuses on the day-to-day demands of delivering it.

“I have set the tone that the customer is king,” says Herb. “You have to have a staff who loves the challenge of satisfying the customer. In today’s ABC (activity-based costing) world this drive for customer satisfaction does not always look efficient. But it is the relentless dedication to satisfying the customer that ultimately pays off.”

Logistics are a huge part of this, as well as the biggest challenge in the New York metropolitan area. Jordan says, “There’s always a problem with delivery windows—70 percent of our customers have 2½-hour delivery windows that we have to meet. And the equipment you use has to fit the terrain—in lower Manhattan, you just can’t use trucks over a certain size. Imagine trying to back an 18-wheeler into a loading dock across four lanes of traffic with pedestrians crossing back and forth.”

In the years since the September 11 terrorist attacks, delivery hours have been restricted even further, as large trucks are not allowed into Manhattan overnight. Warehouse space is almost nonexistent, or far too pricey.

“Also in this city, there is an interesting situation that you have when it comes to people,” Jordan observes. “We hire people from many different ethnic and cultural backgrounds, and there is a cliquish tendency in the employees from each of these cultures. It is a real trick to keep the cliques from distracting people and undermining the company and teamwork environment.”

When they look at technology, the Sedlers take a very pragmatic approach.” We have two goals for using technology,”

says Jordan. “The first goal is to lower our cost of doing business in a measurable way. How can we use technology to lower costs in inventory control, warehouse management, and order fulfillment? The second goal is to lower our error rate. We don’t want people to manually handle and re-handle data like purchase orders and invoices, because it just increases the error rate. Our motto is ‘Get it right the first time.’ ”

“We also want to bring technology to our customer base,” adds Herb. “The immigrants are the new entrepreneurs. They have no formal training in distribution and they are often one-man shows. I am a mentor in the Baruch College entrepreneurship program. As they succeed, Paper Enterprises will succeed. As we show them technology and practices that help them grow, we become a logistics organization and not just a paper distributor.”

“I learn something every day. Running a business in New York is like working in a microcosm of the whole world. People from every country are here,” said Jordan. “And it’s funny, where you may think that there would be intense and cutthroat competition. Not so! A cooperative spirit has evolved, and that is an important part of how we do business.”

“After 9/11,” Herb recalls, “we called a meeting of distributors in the city and said we would make our trucks available to our competitors who needed to get into lower Manhattan if they would help us in New Jersey.”

And that’s adaptability.

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In this chapter, we begin with further detail in the planning category and an executive-level overview of three main operations that constitute the planning process. We’ll follow in subsequent chapters with the other four major topics.

## Demand Forecasting

Supply chain management decisions are based on forecasts that define which products will be required, in what amounts, and when they will be needed. The demand forecast becomes the basis for companies to plan their internal operations and to cooperate among each other to meet market demand.

All forecasts deal with four major variables that combine to determine what the market conditions are likely to be:

1. Demand
2. Supply
3. Product characteristics
4. Competitive environment

**Demand** refers to the overall market’s perceived need for a group of related products or services. Is the market growing or declining? If so, what is the yearly or quarterly rate of growth or decline, and how is this measured? Perhaps the market is relatively mature and demand is steady at a level that has been predictable for some period of years. Perhaps the product has a seasonal demand pattern—snow skis and heating oil are in greater demand as winter approaches; tennis rackets and sunscreen are more popular in the summer. Perhaps it is a developing market—meaning the products or services are new and there is not much historical data on demand, or the demand varies widely because new customers are just being introduced to the products. Markets where there is little historical data and lots of variability are the most challenging when it comes to demand forecasting.

**Supply** is determined by the number of producers of a product and by the lead times that are associated with a product. The more producers of a product and the shorter the lead times, the more predictable the supply. When there are only a few suppliers or when lead times are longer, there is more potential uncertainty in a market. Like variability in demand, uncertainty in supply makes forecasting more difficult. Also, longer lead times associated with a product require a longer time frame in which to forecast. Supply chain forecasts must cover a time period that includes the combined lead times of all the components that go into the creation of a final product.

**Product characteristics** are the features of a product that influence customer demand for it. Is it in a product category known for fast change and intense competition, like computers and home electronics? Or is the product mature and changing slowly or not at all, as is the case with many commodity products? Forecasts for mature products can cover longer time frames than forecasts for products that are developing quickly. It is also important to determine whether a product will steal demand away from another product—or even from other “members” of its own product line (a phenomenon perhaps unfortunately known as **cannibalizing**). Can it be substituted for another product? Or will the use of a product drive the complementary use of a related product? Demand for products that either compete with or complement each other should be forecast together.

**Competitive environment** refers to the actions of a company and its competitors. What is the market share of a company? Regardless of whether the total size of a market is growing or shrinking, what is the trend in the individual company's market share—growing or declining? How about the market shares of competitors? Market share trends can be influenced by product promotions and price wars, so forecasts should take into account such events that are planned for that time period, both by the company and its competitors.

Forecasting VARIABLES		
1.	<b>Demand</b>	Overall market demand for product
2.	<b>Supply</b>	Amount of product available
3.	<b>Product Characteristics</b>	Product features that influence demand
4.	<b>Competitive Environment</b>	Actions of product suppliers in the market

Forecasting METHODS		
1.	<b>Qualitative</b>	Relies on a person's intuition or opinions
2.	<b>Causal</b>	Assumes that demand is strongly related to certain factors
3.	<b>Time Series</b>	Based on historical demand patterns
4.	<b>Simulation</b>	Combines causal and time series methods

**Figure 3-1. The four forecasting variables and the four forecasting methods.**

### Forecasting Methods

There are four basic methods to use when preparing forecasts, and most forecasts are done using various combinations of these methods. Chopra and Meindl define them as follows:

1. Qualitative
2. Causal
3. Time series
4. Simulation

**Qualitative methods** rely upon a person's intuition or subjective opinions about a market. These methods are most appropriate when there is not much historical data to work with. They are perhaps the most creative types of projections, which does not mean they are the least accurate! When a new line of products is introduced, people can make forecasts based on comparisons to other products or situations that they consider similar, or based on their best estimates about what will happen in the market.

**Causal methods** of forecasting assume that demand is strongly related to a particular cause, such as environmental or market factors. For instance, demand for commercial loans is often closely correlated to interest rates—so if interest rate cuts are expected in the next period of time, then loan forecasts can be made using a causal relationship with interest rates. Another strong causal relationship exists between price and demand. Generally, if prices are lowered, demand can be expected to increase, and conversely, if prices are raised, demand can be expected to fall.

A forecast that does not take causal factors into account is referred to as a **naïve model**, meaning that it appears to work “on paper” or in principle, but without real-world economic considerations factored in that may impact the true results.

**Time series methods** are the most common forms of forecasting. These naïve models are based on the assumption that

historical patterns of demand are a good indicator of future demand, and that over a period of time, demand can be charted in three different ways: as an underlying trend (flat, up, or down), as a cycle (daily, weekly, seasonally, and so on), and as irregular fluctuations (peaks or valleys) over time.

A time series method is best when there is a reliable body of historical data and the markets being forecast are stable, with demand patterns that do not vary much from one year to the next.

Mathematical techniques, such as moving averages and data smoothing, are used to create forecasts based on performance over certain time periods. These techniques are built right into most computer software forecasting packages, but management students should know something about how they work. A **moving average** is a series of calculations in which a trend is measured and projected, then the numbers are “smoothed” (evened out just enough to measure a curve or cycle).

**Simulation methods** are combinations of causal and time series projections to imitate the behavior of consumers under different circumstances. A simulation may be used to answer questions such as, “What will happen to revenue if we put this entire line of clothing on sale next month?” “What will happen to our market share if our biggest competitor opens a store in this area?” and so on. Simulation models are useful because they are more efficient than, for example, doing actual tests that vary the output of a production facility “to see what will happen.” Technology has made it relatively easy to input different projections into a computer program and let it do the calculating.

In retail settings, simulation is often used to determine what to do about **queuing problems**—that pesky waiting-in-line that annoys customers so much. In a simulation, a store can “try out” different numbers of cash wraps (counters where customers pay for merchandise), different lines for different types of sales (cash, credit card, express lanes), and so on, trying to come to a decent, average wait time without having to test all the various configurations on actual customers.

In most companies, retailers included, several of these methods are combined as a way of looking at a particular business situation from several different angles. This makes sense because different forecasting methods offer different types of insights. Studies have shown that creating forecasts using different methods and then combining the results into a final forecast usually produces greater accuracy than the output of any one method alone.

Regardless of the methods used, when creating and evaluating forecasts, you should keep several things in mind. First of all, short-term forecasts are inherently more accurate than long-term forecasts. The effect of business trends and conditions can be much more accurately calculated over short periods than over longer periods. When Wal-Mart began restocking its stores twice a week instead of twice a month, the store managers were able to significantly increase the accuracy of their forecasts because the time periods involved dropped from two or three weeks to three or four days. Most long-range, multiyear forecasts are highly speculative.

**Aggregate forecasts** are more accurate than forecasts for individual products or for small market segments. For example, annual forecasts for soft drink sales in a given metropolitan area are fairly accurate—but when these forecasts are broken down into sales by districts within the metropolitan area, they become less accurate. Aggregate forecasts are made using a broader base of data, which provides good forecasting accuracy. As a rule, the more narrowly focused or specific a forecast is, the less data is available and the more variability there is within the data, so its accuracy is diminished.

The final, and surely the most frustrating, thing about forecasts is that they are always wrong, to a greater or lesser degree. Quite simply, there is no such thing as a perfect forecast. No matter how scientifically it is prepared, it is still somebody’s best guess, and retailers must therefore assign at least some degree of error to every forecast.

A forecast that is considered “accurate” has a typical degree of error of plus or minus 5 percent. A more speculative forecast may have an error range of plus or minus 20 percent! It is important to know the degree of error because the business must have contingency plans to cover those outcomes. What would a manufacturer do if raw material prices were 5 percent higher than expected? What would a retailer do if demand for the product was 20 percent higher than expected? How quickly could each business in the supply chain respond in these situations?

## Aggregate Planning

Once demand forecasts have been created, the next step is to create a plan that maps out exactly how the company will meet the expected demand for what it makes or sells. This is called **aggregate planning** and its purpose is to satisfy demand in a way that maximizes profit for the company. The planning is done as an overview of the company’s entire offerings (hence the term “aggregate”) and not at the level of individual stock-keeping units (SKUs). It sets the optimum levels of production and inventory that will be followed over the next 3 to 18 months.



## Supply Chain Skills—Meeting Customers' Needs

Service means different things to different customers, and their needs vary depending on their strengths and weaknesses and the business models that they use. Effective supply chain members learn to tailor their service offerings to match the individual customer's needs.

Service Paper Company ([www.servicepaper.com](http://www.servicepaper.com)) distributes retail food and food service products, industrial packaging, health-care disposables, and janitorial supplies. They have been in business since 1937, with locations in Seattle, Portland, and Spokane. Leonard Green is Service Paper's president. See if you can guess who the customer is as Green relates the story:

"We have customers in a number of different market segments and these customers are in different stages of their business growth," Leonard says. "We look at each customer and strive to provide a mix of products and services that will make us a valuable part of their operations. Let me illustrate this with an example of a customer that we have served for some time now and through several stages in their growth. Back in the '80s, we began doing business with a small company that operated a handful of coffee shops in Seattle.

"This small company insisted on using specially made products featuring their logo. Their original supplier was not willing to stock 'special print' inventory. At Service Paper, we viewed the request as a customer requirement rather than an inconvenience. We began taking large shipments of their logoed special-print items from various manufacturers and distributed these products to their coffee shops several times a week.

"They were growing rapidly and we were able to work with their staff to facilitate the procurement of their food service disposables. We knew the products and the manufacturers in the food service industry, so we were able to help in educating their purchasing people and in suggesting the products they needed. We also helped them with sourcing and even helped schedule production runs with manufacturers for products they needed.

"Early on, the company CEO was very hands-on in all of these areas. He knew what he wanted the company to be and was intent on finding the products they needed. We steered him to the maker of a new coffee cup lid called a 'Traveler Lid.' It allowed a person to sip hot coffee while they walked or drove, without getting too much in their mouth all at once. When he saw the lid, he liked it so much that he insisted the manufacturer give them an exclusive on the product. The manufacturer wasn't willing to do that and was ready to walk away from the business because of that demand.

"Since I knew both parties, I was able to act as a referee. I encouraged the CEO to see that he had a strong potential partner there and perhaps he could reconsider his position. I helped them start a business relationship that has been very beneficial to both companies ever since."

As the company expanded out of the Seattle area, Service Paper introduced them to a national cooperative of distribution companies, of which Service Paper is both a member and an owner. "We got Network Services involved when the company told us they were going to expand into Chicago.

I became their advocate within Network. We had lots of business in Seattle, but at first, there were only a few stores in Chicago. The Network member in Chicago was reluctant to stock the specially printed products and do the many small deliveries to the coffee shops. Then they expanded into San Francisco, and I had to work hard to explain to our member there why it was a good deal.

"We had to change our operating policies to meet the customer's needs. We had to carry a substantial inventory of proprietary items, and we had to accept orders that were often much smaller than our usual minimum orders. But, over time, they established credibility with us because they met their new store rollout plans and the promised volume did materialize."

Today, numerous Network members support the Starbucks locations nationwide—and no doubt, they're glad they took the risk! And it all started with one distributor's willingness to meet some unique customer demands.

Depending on the type of company, its aggregate plan becomes the framework for its short-term decisions about production, inventory, and distribution:

- Production decisions include the rate of production (how fast or slow) and the amount of production capacity to use, the size of the workforce, and how much overtime to pay versus hiring subcontractors.
- Inventory decisions include how much demand will be met immediately by inventory on hand, and how much demand can be satisfied later with back orders.

- Distribution decisions define how and when product will be moved from the place of production to the place where it will be used or purchased by customers.

There are three basic approaches to take in creating the aggregate plan, and they involve trade-offs among three variables:

1. Amount of production capacity
2. Percentage or level of production capacity being used
3. Amount of inventory to carry

We will look briefly at each of these three approaches. Not all of them relate directly to retail management, so imagine instead the manufacturers that supply the product lines for retail stores, which will help you to envision the process. In practice, even the smallest manufacturing companies create aggregate plans that are combinations of the following three approaches:

1. **Use production capacity to match demand.** In this approach, the total amount of production capacity is matched to the level of demand. The objective here is to be working at 100 percent of capacity at all times. This is achieved by adding or eliminating plant capacity as needed, and hiring and laying off employees as needed. This approach results in low levels of inventory, but it can be very expensive to implement if the cost of modifying the plant capacity is high. It is also disruptive and demoralizing to the workforce if people are constantly being hired, then laid off as demand rises and falls. So this approach works best when the cost of carrying inventory is high and the cost of changing capacity—both of the plant and the workforce—is low.
2. **Use varying levels of total capacity to match demand.** This approach works well, but only if there is excess production capacity available. If existing plants are not used 24 hours a day, 7 days a week, then there is an opportunity to meet changing demand by increasing or decreasing the way the plants' capacity is used. The size of the workforce can be maintained at a steady rate, with overtime and flexible work scheduling used to match production rates. The result is low levels of inventory and also lower average levels of capacity utilization. The approach makes sense when the cost of carrying inventory is high and the cost of excess capacity is relatively low.
3. **Use inventory and backlogs to match demand.** This approach provides for stability in the plant capacity and workforce, and enables a constant rate of output. Production is not matched with demand—instead, inventory is either built up during periods of low demand (in anticipation of future demand) or inventory is allowed to run low and backlogs are built up in one period, to be filled in a following period. This approach results in higher capacity utilization and lower costs of changing capacity. However, it does generate large inventories and backlogs over time as demand fluctuates. It should be used when the cost of capacity and changing capacity is high, and the cost of carrying (storing) inventory and backlogs is relatively low.

## Product Pricing

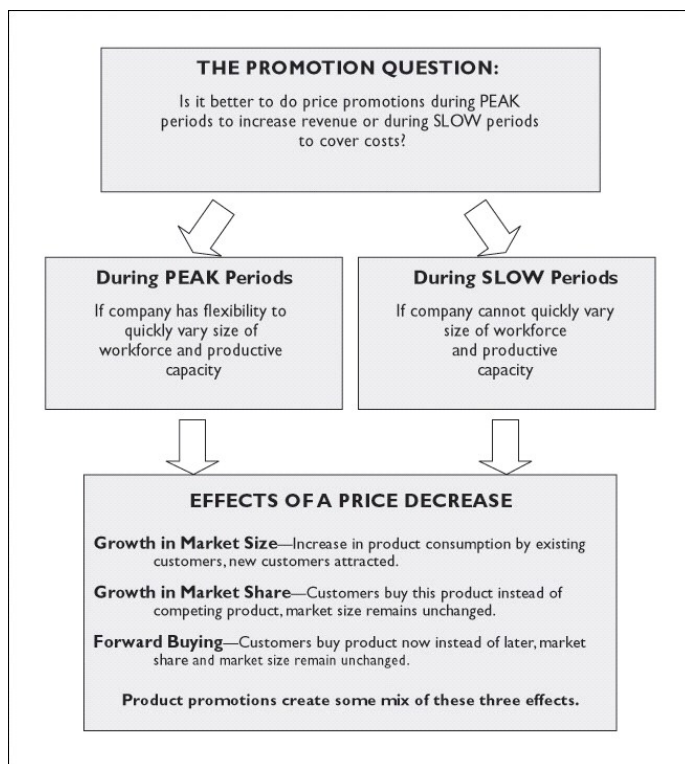
Companies and entire supply chains can influence demand by using price— and in a supply chain, we're not just talking about the retail prices of finished goods, but the prices of each and every ingredient or service that goes into manufacturing, storing, and transporting them before they arrive at the store.

Depending on how price is used, it will tend to maximize either revenue or gross profit. Typically, marketing and sales people want to make pricing decisions that will stimulate demand during peak seasons, with the obvious aim of maximizing total revenue. Financial or manufacturing people are more likely to favor pricing decisions that stimulate demand during slow periods, to even out the peaks and valleys. The latter goal is to maximize gross profit in peak demand periods, which then generates enough revenue to cover costs during periods of low demand for the product or service.

## Relationship of Cost Structure to Pricing

So who's right? Is it better to do price promotion during peak periods to increase revenue—or during slow periods to cover costs? The answer depends on the company's cost structure. If a company has flexibility to vary the size of its workforce and productive capacity and the cost of carrying inventory is high, then it is best to create more demand in peak seasons. If there is less flexibility to vary workforce and capacity and if cost to carry inventory is low, it is best to create demand in low periods.





**Figure 3-2. Product promotion and company cost structure.**

An example of a company that can quickly ramp up production would be an electronics components manufacturer. This type of company has typically invested in equipment and facilities that can be quickly reconfigured to produce different final products from an inventory of standard component parts. And this company doesn't want to carry a lot of product in inventory, because it soon becomes obsolete and must be written off.

Therefore, the electronic part supplier is generally motivated to run promotions in peak periods, to stimulate demand even further. Since it can quickly increase production levels, it can make up for a reduction in the profit margin with an increase in total sales—as long as it is able to sell all the product that is manufactured.

Conversely, a paper mill is an example of a type of manufacturing plant that cannot quickly ramp up production levels. The plant and equipment involved in making paper is very expensive and requires a long lead time to build. Once in place, a paper mill operates most efficiently if it is able to run at a steady rate, all year long. The cost of carrying an inventory of paper products is less expensive than carrying an inventory of electronic components because paper products are commodity items that will not become obsolete. These products also can be stored in less expensive warehouse facilities, and they are also less likely to be stolen.

A paper mill is motivated to do price promotions in periods of low demand. In periods of high demand, the focus is on maintaining a good profit margin. Since production levels cannot be increased anyway, there is no way to respond to—or profit from—an increase in demand. In periods where demand is below the available production level, then there is value in increased demand. The fixed cost of the plant and equipment is constant, so it is best to try to balance demand with available production capacity. This way, the plant can run steadily at full capacity.

Why do the details of suppliers' pricing policies matter to retailers? As senior partners Will Ander and Neil Stern of the prestigious retail consulting firm McMillan|Doolittle write in their book *Winning at Retail*: "Having low prices on the front end—the shelves—demands low costs on the back end." [1]

### Supply Chain Skills—Building A Brand Continued

Waxie Sanitary Supply ([www.waxie.com](http://www.waxie.com)) is a distributor with locations throughout California, Nevada, Utah, Colorado, and Arizona. Over the last 20 years, they have been very successful in developing and promoting their own, Waxie brand-name products.

CEO Charles Wax recounts the company history: "It was founded in 1945 by my uncle Harry Wax, and then my father Morris joined him. The company started under the name of San Diego Janitorial Supply. We grew and in 1962 bought

another company in southern California named Kleenline. We kept both names, because each had a loyal customer base. In the 1980s we expanded out of the southern California area and we felt the need for a new company name that would convey who we were as we entered new markets.

“Uncle Harry was a Seabee in the navy during World War II. That’s where he got the nickname ‘Waxie,’ and the logo he chose when he started the company was a bee operating a floor-waxing machine. So it seemed natural for us to adopt the name Waxie and to use a bee as our logo.

“We wanted to develop our own brand name because a lot of companies buy product and then forget where they bought it,” Wax explains.” If we put our name on the product, they would remember where they got it—and if they like the product, then they have to come to us to buy it. We redesigned and standardized our logo and the company slogan and put them on products, forms, trucks, brochures, everything.”

The first step is to create a brand name; the next step is to sell its benefits to customers.” We sell a lot of value-added services,” says Wax.” We educate the customer to use the best product for their specific needs. We show them how to use dilution control to optimize usage rates for chemicals. We show them how to use floor machines to cut labor costs. We train the customer’s people in how to use our products.

“It is easy for a competitor of ours to say, ‘We have the same item and at a lower price.’ We respond to this by educating customers to the fact that 10 percent of their cost is product and the other 90 percent is labor. We can show them how to use our products to cut their labor costs, and that’s where they’ll see the big savings.

“We are always looking for ways to solve our customers’ problems and customize our service offerings for them. For instance, we did a lot of work at the Winter Olympics in Salt Lake City. To meet their delivery schedules, we got security clearance for our drivers, and worked closely with people running the event to bring our trucks in at night, where and when they wanted them.”

Waxie has also welcomed technology to help deliver services. Director of Information Technology Cliff Robbins says they’ve computerized the customer survey process, and field sales and service people carry laptops.

“They have the same access to information as they would if they were in the office—complete customer profiles, credit status, open issues, and sales history,” Robbins explains.” There is a Web-based order entry system that lets customers view their own customized product catalogs and prices, and we’ve worked with the sales people to train our customers to use this system.”

Wax adds,” There is great benefit to the customers. They can order 24/7, they can make up their own order guides, they can see product pictures, and they can see usage information. As customers start using the system, it cuts our cost to handle the orders and we are also seeing an increase in the average order size from these customers.”

Delivering the value to the Waxie customers requires a coordinated effort from everyone in the company. The company tracks a few simple performance measures and has a bonus program for the non-sales employees, called “All Sell, All Grow.”

“We post branch and overall company gross margin growth every month throughout the company, so all employees know how we are doing and how they stand on their yearly bonus,” Wax explains.

“Having our own brand helps us manage our margins. It insulates us somewhat from the actions of the national brand-name manufacturers. We wanted to create a brand that stands for who we are—to remind us why we are here and to remind customers of our value.”

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[1] Willard N. Ander and Neil Z. Stern, *Winning at Retail* (New York: John Wiley & Sons, 2004).

## Inventory Management

The demand forecasts and pricing policies discussed in this chapter should give each company in the supply chain the data it needs to decide how to manage its inventory. The term **inventory management** means using a set of techniques to manage the inventory levels within different companies in a supply chain. This task is an ongoing balancing act—making sure there is enough inventory to meet the demands while exploiting economies of scale to get the best prices for the products when they are sold; and reducing the costs associated with the inventory as much as possible while still maintaining the service levels that customers require.

Technology and computerization have had incredible impact in this part of the industry, allowing supply chain members to share data instantly. The term for increased efficiency in meeting the consumer's needs for a product is called efficient consumer response, or ECR. You'll learn more about the technology used to achieve ECR in Chapter 5.

As mentioned in Chapter 1, there are three kinds of inventory. Both *cycle inventory* and *seasonal inventory* are influenced by economy-of-scale considerations—that is, the cost structure of the companies in any supply chain will suggest certain levels of inventory based on how much it costs to produce and store the products. *Safety inventory* is influenced by product demand: The less predictable the demand for the product, the higher the level of safety inventory is required—more “backup” in storage, just in case of a demand swing.

The inventory management operation in a company (or an entire supply chain) is composed of a blend of activities related to managing the three different types of inventory. Each type of inventory has its own specific challenges, and the mix of these challenges will vary from one company to another and from one supply chain to another.

## Cycle Inventory

Generally, in retail a **cycle** refers to the time period between orders of product—that is, enough goods must be ordered to keep the store stocked well enough during the cycle until the next order is placed. So cycle inventory is the inventory required to meet product demand between orders.

The whole reason cycle inventory exists is because economies of scale favor placing fewer, larger orders of just about any product, rather than continuous orders of small quantities. Of course, some perishable products and gourmet foods would be exceptions in the supermarket trade, but for the most part, supply chains “think” just like consumers—we can probably get a better deal buying in bulk.

The end user of the product may actually use or sell it in continuous small amounts throughout the year, but the distributor and manufacturer of the product often find it more cost-efficient to produce and sell it in large quantities that do not match the typical usage pattern. So cycle inventory might be described as the buildup of inventory in a supply chain, because production and stocking of inventory is done in quantities that are much larger than the ongoing demand for the product.

For example, a distributor may experience an ongoing demand for Item A of 100 units per week. However, the distributor finds that it is most cost-effective to order in batches of 650 units. Every six weeks or so, the distributor places a new order, which causes the cycle inventory to build up in the distributor's warehouse at the beginning of the order period.

Observing the rest of the supply chain, let's say the manufacturer of Item A sells to a number of distributors in different states and has found that production is most cost-effective when it manufactures in batches of 14,000 units at a time. This also results in the buildup of cycle inventory at the manufacturer's location.

## Economic Order Quantity

For every company and every product, there is an order quantity that makes the most financial sense to purchase at a time. This “most cost-effective amount” for a single order is called the **economic order quantity (EOQ)**. The mathematical formula to calculate EOQ consists of very basic knowledge of square roots:

$$EOQ = \sqrt{2UO / hC}$$

where: U = annual usage rate

O = ordering cost

C = cost per unit

h = holding cost per year as a percentage of unit cost

For instance, let's say that Item Z has an annual usage rate (U) of 240, a fixed cost per order (O) of \$5, a unit cost (C) of \$7, and an annual holding cost (h) of 30 percent per unit. Let's do the math:

$$EOQ = \sqrt{\frac{2 \times 240 \times 5.00}{.30 \times 7.00}}$$

$$EOQ = \sqrt{\frac{2400}{2.1}}$$

$$EOQ = \sqrt{1142.86}$$

$$EOQ = 33.81 \text{ (or rounded to the nearest whole unit, 34)}$$

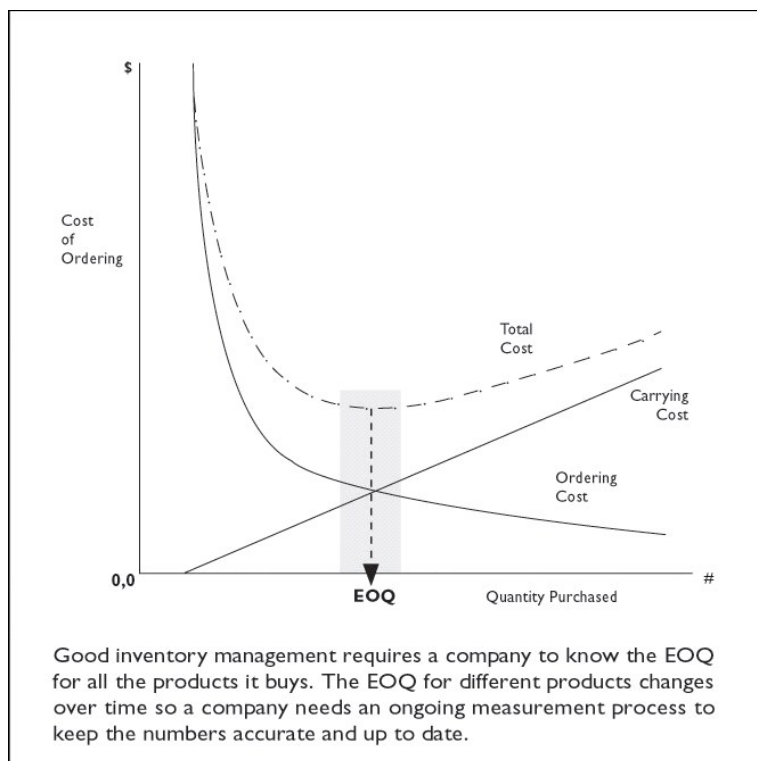
If the annual usage rate for Item Z is 240, then the monthly usage rate is 20. An EOQ of 34 represents about 1 and 3/4 months supply. This may not be a convenient order size. Small changes in the EOQ don't have a major impact on total ordering and holding costs, so it is usually best to round off the EOQ quantity to the nearest standard ordering size. In the case of Item Z, there may be 30 units in a case, so it would make sense to adjust the EOQ for that item to 30.

The EOQ formula works to calculate an order quantity that results in the most efficient investment of money in inventory. Efficiency here is defined as the lowest total unit cost for each inventory item. If a certain inventory item has a high usage rate and it is expensive, the EOQ formula recommends a low order quantity—that is, more orders per year, but less money invested in each order.

If an inventory item has a low usage rate and is inexpensive, the EOQ formula recommends a high order quantity. This means fewer orders per year, but maximum efficiency when investing money to stock that item, since the unit cost is low.

### Seasonal Inventory

Seasonal inventory happens when a company or a supply chain with a fixed amount of production capacity decides to stockpile products in anticipation of future demand. This is common when a manufacturing facility uses its slow periods to plan and get a head start on making fashions for an upcoming high-demand season, rather than be swamped with work it would not have the production capacity to do when demand is high. For the manufacturer's employees, it also means steady work—instead of a seasonal rush and then a layoff when things slow down.

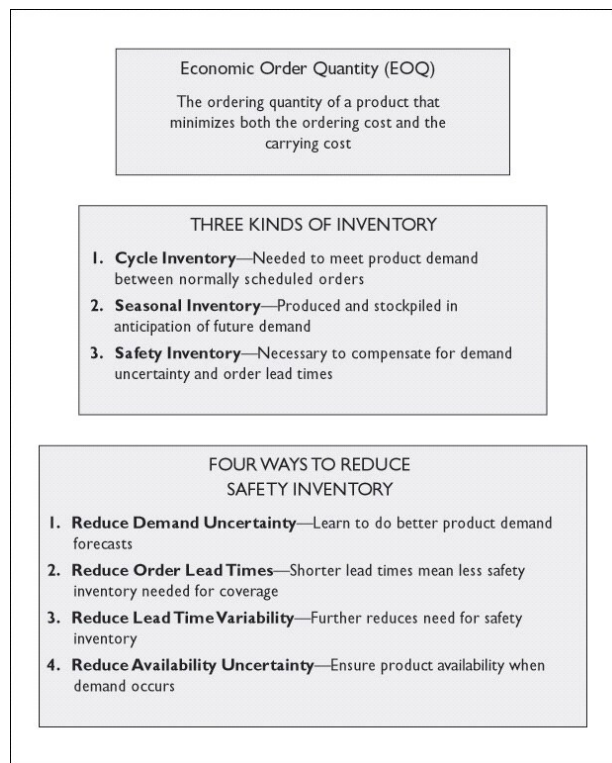


**Figure 3-3. Understanding the economic ordering quantity (EOQ).**

Decisions about seasonal inventory are driven by a desire to get the best economies of scale given the capacity and cost structure of each company in the supply chain. If it is expensive for a manufacturer to increase productive capacity, then its capacity can be considered as fixed. Once the annual demand for the manufacturer's products is determined, the most

efficient schedule can be calculated to put that fixed capacity to its best use.

Managing seasonal inventory requires that the demand forecasts be as accurate as possible. Large amounts of inventory can be built up this way, with the risk that they will become obsolete—or at the least, expensive to store—if they don't sell as well as anticipated. Managing seasonal inventory also calls for manufacturers to offer price incentives to persuade distributors to purchase it and put it in their own warehouses, well before demand for it occurs.



**Figure 3-4. Key points to remember about inventory management.**

## Safety Inventory

Safety inventory is necessary to compensate for the uncertainty that exists in a supply chain. Retailers and distributors certainly don't want to run out of product if the demand is hot or their replenishment order is delayed, so they keep "safety stock" on hand. As a rule, the higher the level of uncertainty, the higher the level of safety stock required.

For any given item, its "safety inventory" can be defined as the amount of the item that is on hand at the time the next replenishment EOQ order arrives. Technically, this means that a store's safety stock is inventory that does not turn over. Inventory that is carried in this way—the backroom merchandise—becomes a fixed asset, in effect. It is always "around," and it must be stored and secured, which automatically adds to the store's overall cost of carrying inventory.

Retailers need to find a balance between their desire to carry a wide range of products and offer high availability on all of them, and their conflicting desire to keep these inventory costs as low as possible. That balance is reflected, quite literally, in the amount of safety stock that the company carries.

## Chapter Summary

The business operations that drive the supply chain can be grouped into five major categories: plan, source, make, deliver, and return. The functions that make up these categories are the day-to-day operations that determine how well the supply chain works, so companies must continually coordinate their plans and communicate their expectations in order to make improvements in these areas.

Planning refers to all the operations needed to organize the operations in the other four categories. Creating solid plans requires a combination of mathematics, competitive knowledge, and the ability to spot trends. It is also critical to know the strengths, weaknesses, and capacities of the other supply chain members—how flexible they are, how quickly they can work, and how much inventory they are willing to carry.



Planning begins with demand forecasting, and there are several reliable ways of looking at the past to determine possible future demands for products. Ironically, the more highly targeted and specific a forecast is, the less accurate it may be because the sample size is small. Aggregate plans are combinations of several types of forecasts, combined to get a clearer overall picture of a market or a business strategy.

A company's pricing policies for the goods they sell depend on how flexible the company is in terms of being able to hire or lay off people as needed, to produce and store a lot or a little of an item, also as needed. Highly flexible companies can offer special sales promotions to create more demand in peak seasons; companies that cannot be especially flexible should try to create demand in low periods to maintain steady production (and a steady stream of revenue) year-round.

The chapter ended with an explanation of the three basic types of inventory, as well as what drives a company to carry each type of inventory and what factors must be considered in managing that type of inventory.

Increasingly, it is these planning operations—demand forecasting, product pricing policies, and inventory management—that determine the potential efficiency of the supply chain.

### Discussion Questions

1. This chapter asserts that, "The more producers of a product and the shorter the lead times, the more predictable the supply." But wouldn't supply be easier to predict if only a few companies produced the product instead of many? What do you think?
2. What makes data "historical"? With market conditions changing all the time, how far back should a retailer be able to look in order to make accurate forecasts about the future?
3. If you were a retailer in the process of selecting major suppliers, which type of aggregate planning would you expect to see from a large manufacturing company?
4. What types of planning would you assume each of the three paper products companies profiled in this chapter undertake? Briefly explain your answers.
5. Pick a store you admire that is not a "superstore" but might be a national or regional chain. How much safety inventory do you think they keep on hand, on-site? If something you want is not "in stock," how quickly can they get it? If they don't have it, where is it stored—that is, who maintains the costs associated with their safety inventory?

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### The Incredible Journey Continues

#### AUGUST 25—SWEETENING THE DEAL

SPI Polyols, Inc., a manufacturer of ingredients for the confectionery, pharmaceutical, and oral-care industries, buys corn syrup from one of several corn-wet millers that purchases corn from farmers in the Midwest. SPI converts the corn syrup into sorbitol solution, which sweetens and adds bulk to the Cool Mint Listerine. The syrup is shipped to SPI's New Castle, Delaware facility for processing and then delivered on a tank wagon to Lititz. The whole process, from the time the corn is harvested to when it's converted to sorbitol, takes about a month.

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#### How does WL determine the right quantity of raw materials to buy from its suppliers?

The sales and marketing group in Morris Plains forecasts demand with the help of Manugistics Inc.'s Demand Planning system. Used with other products in the Manugistic's Supply Chain Planning suite, the system analyzes manufacturing, distribution, and sales data against expected demand and business climate information to help WL decide how much product to make and distribute and how much of each raw ingredient is needed. For example, it can anticipate the impact of a seasonal promotion or of a production line being down. The sales and marketing group also meets monthly with folks in finance, procurement, and operations to project demand over the next several months. The procurement group enters the expected demand for mouthwash into a Marcom Corp. Prism Capacity Planning system, which schedules the production of Listerine in the amounts needed and generates electronic purchase orders for WL's suppliers.

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