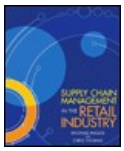

Supply Chain Management in the Retail Industry

by Michael Hugos and Chris Thomas

Chapter 1: An Introduction to Supply Chain Management

Overview

When a retailer sells a new suit to a satisfied customer, the supply chain has done its job. A **supply chain** encompasses every step that was taken to get that suit into the hands of that customer—a combination of the companies and the business activities needed to design, make, deliver, and use a product or service. In some types of retail, the supply chain also includes follow-up services: the purchase of that suit, for instance, may include tailoring services, or credit services from the bank or store credit department responsible for accepting the customer's monthly payments.

Businesses depend on their supply chains to provide them with what they need to survive and thrive. For retailers, of course, this means their very lifeblood—the goods that they sell to consumers—but every business fits into one or more supply chains and has a role to play in each of them.

After reading this chapter, you will be able to

- Explain and appreciate what a supply chain is, and what it does
- Define the different organizations that participate in any supply chain.
- Discuss ways that companies align their supply chains with their business strategy.
- Recognize supply chain management issues in retail businesses.

The pace of change and the uncertainty about how markets will evolve has made it increasingly important for companies to be aware of the supply chains they participate in and to understand the roles that they play. Companies that learn how to build and participate in strong supply chains do so to create a substantial competitive advantage in their markets.

The Evolution of the Supply Chain

The practice of supply chain management is guided by some basic underlying concepts that have not changed much over the centuries. Several hundred years ago, Napoleon made the remark, "An army marches on its stomach." Napoleon was a master strategist and a skillful general, and this remark shows his clear understanding of the importance of what we would now call an efficient supply chain—that is, unless the soldiers are fed, the army cannot move. Getting them fed required a supply chain in the late 1700s . . . and would still require one today.

Another pertinent saying is, "Amateurs talk strategy; professionals talk logistics." People can discuss all sorts of impressive maneuvers and grand victories, but none of that will be possible without first figuring out how to meet the day-to-day demands of providing an army with fuel, spare parts, food, shelter, and ammunition. It is the seemingly mundane (but not always simple) activities of the quartermaster and the supply sergeants that often determine an army's success.

What Made Alexander So Great? Supply Chain Management!

Alexander the Great based his strategies and campaigns on his army's unique capabilities—and he was a master of effective supply chain management.

In the spirit of the saying, "Amateurs talk strategy and professionals talk logistics," let's look at the campaigns of Alexander the Great. For those who think his greatness was due to his ability to dream up bold moves and cut a dashing figure in the saddle, think again.

The authors from Greek and Roman times who recorded his deeds had little to say about something so apparently unglamorous as how he secured supplies for his army. Yet, from these same sources, many little details can be pieced together to show the overall supply chain picture and how Alexander managed it.

A modern historian, Donald Engels, investigated this topic in *Alexander the Great and the Logistics of the Macedonian Army* (University of California Press, Los Angeles, California, 1978). Engels observes that, given the conditions of Alexander's time, his strategy and tactics had to be very closely tied to his ability to get supplies and to run a lean, efficient organization. The only way to transport large amounts of material over long distances was by ocean-going ships or by barges on rivers and canals. Away from rivers and sea coasts, an army had to be able to live off the land as it traveled. Diminishing returns set in quickly using pack animals and carts to haul supplies—the animals themselves had to eat, and would soon consume all the food and water they were hauling unless they could graze along the way.

In the typical military arrangement of the day, the number of support people and camp followers was often as large as the number of actual fighting soldiers, because armies traveled with huge numbers of carts and pack animals to carry their equipment and provisions, as well as the people needed to tend them. These ancillary workers and pack animals significantly reduced the army's speed and mobility.

In Alexander's Macedonian army, however, the use of carts was severely restricted. Soldiers were trained to carry their own equipment and provisions. The result of this logistical decision was the fastest, lightest, and most mobile army of its time. As its leader, Alexander could use this capability to devise strategies and employ tactics that allowed him to surprise and overwhelm enemies that were numerically much larger.

The picture that emerges of how Alexander managed his supply chain is an interesting one. For instance, time and again the historical sources mention that before he entered a new territory, he would receive the surrender of its ruler and arrange in advance with local officials for the supplies his army would need. If a region did not surrender to him in advance, Alexander would not commit his entire army to a campaign in that land. He would not risk putting his army in a situation where it could be crippled or destroyed by a lack of provisions. Instead, he would gather intelligence about the routes, the resources, and the climate of the region and then set off with a small, light force to surprise his opponent. The main army would remain behind at a well-stocked base until Alexander secured adequate supplies for it to follow.

Whenever the army set up a new base camp, it looked for an area that provided easy access to a navigable river or a seaport. Then ships would arrive from other parts of Alexander's empire, bringing in large amounts of supplies. The army always stayed in its winter camp until the first spring harvest of the new year, so that food supplies would be available. When it marched, it avoided dry or uninhabited areas and moved through river valleys and populated regions whenever possible, so the horses could graze and the army could requisition supplies along the route.

Alexander had a deep understanding of the capabilities and limitations of his supply chain. He formulated strategies and tactics based on the unique strengths of his supply chain, and he wisely took measures to compensate for whatever limitations it had as well. His opponents often outnumbered him and were usually fighting on their own home turf—but they were undermined by clumsy and inefficient supply chains that restricted their ability to act, and limited their options for opposing Alexander's moves.

The idea has many analogies in business. The term "supply chain management" arose in the late 1980s and came into widespread use in the 1990s. Prior to that time, businesses used terms such as "logistics" and "operations management" instead. Following are some definitions of a supply chain:

- A supply chain is the alignment of firms that bring products or services to market.[1]
- A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. [2]
- A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers.[3]
- The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.[4]

In short, supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served. We can further define supply chain management as the things we do to influence the behavior of the supply chain and get the results we want.

What does all this have to do with retail? Consider all the decisions—from the individuals who are responsible for making them to the products and services required to carry them out—that a retail buyer makes when purchasing a single line of clothing. In Figure 1-1, you see four distinct systems or "streams" set into effect by the buyer's decisions. Each of these systems requires a supply chain and, of course, responsive and efficient management of that chain.

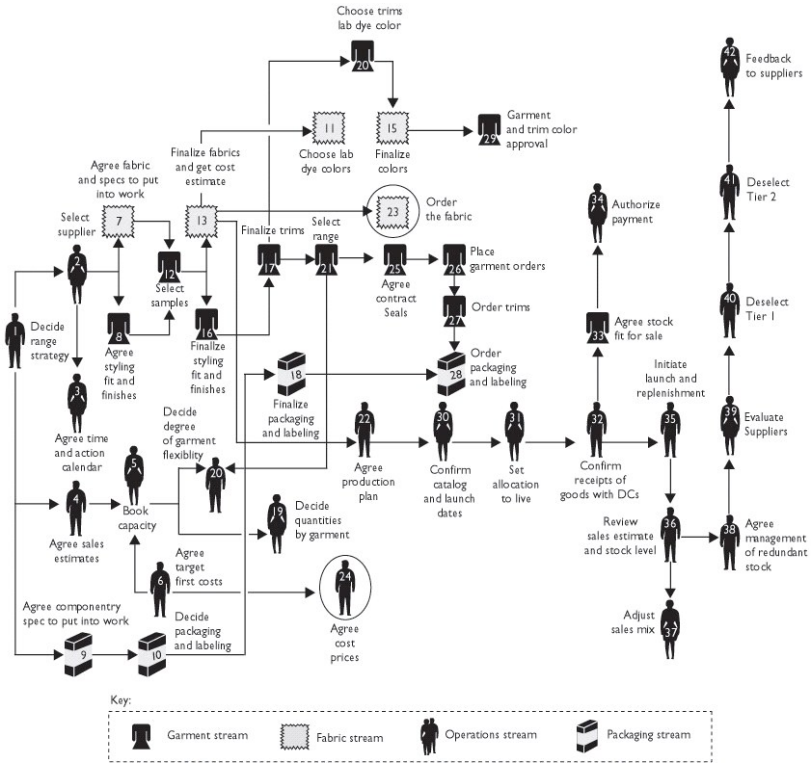

Figure 1-1. Critical decisions in the retail buying process. (A retail buyer's choices set into motion four different streams of goods and services, all of which are parts of a supply chain.) From the report "11 Ways to Make a Difference—For Retailers," © A.T. Kearney, an EDS Company, Chicago, Illinois, 2002. All rights reserved. Reprinted with permission.

Isn't That . . . Logistics?

There are distinct differences between the concepts of supply chain management and traditional logistics. Logistics typically refers to activities that occur within the boundaries of a single organization. Supply chains refer to networks of companies that coordinate their actions to deliver a product to market. Also, traditional logistics focus attention on activities such as procurement, distribution, maintenance, and inventory management. Supply chain management acknowledges all of the traditional logistics, but adds activities such as marketing, new product development, finance, and customer service.

In the wider view of supply chain thinking, these additional activities are now seen as part of the "big picture" of tasks required to fulfill customer requests. Supply chain management views the supply chain and the organizations in it as a single entity. It brings a "systems approach" to understanding and managing the different activities needed to coordinate the flow of products and services to best serve the ultimate customer. The systems approach provides the framework in which to best respond to business requirements that otherwise would seem to be in conflict with each other.

When examined individually, different supply chain requirements often seem to have conflicting needs. For instance, the requirement of maintaining high levels of customer service would probably call for maintaining high levels of inventory, but the requirement to operate efficiently would suggest reducing inventory levels. It is only when these requirements are seen together—as parts of a larger picture—that ways can be found to effectively balance their various demands.

Effective supply chain management requires simultaneous improvements in both customer service levels and the internal operating efficiencies of the companies that make up the supply chain. Customer service at its most basic level means consistently high order fill rates, high on-time delivery rates, and a very low rate of products returned by customers for whatever reason. Internal efficiency means that the organizations in the supply chain get an attractive rate of return on their investments in inventory and other assets, and that they find ways to lower their operating and sales expenses.

There is an underlying pattern to the practice of supply chain management. Each supply chain has its own unique set of market demands and operating challenges, and yet the issues remain essentially the same in every case. Companies in any supply chain must make decisions individually and collectively regarding their actions in five areas, as shown in Figure 1-2 and described here:

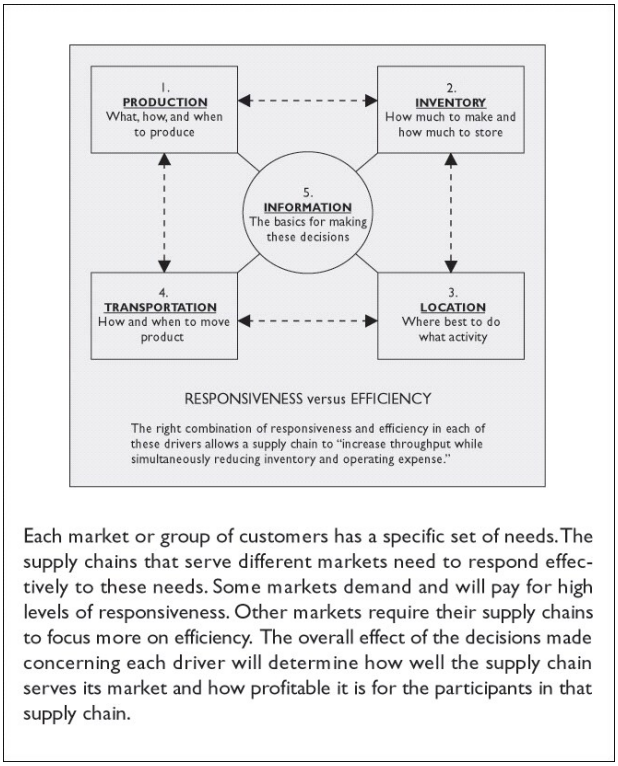

Figure 1-2. The five major supply chain drivers.

1. **Production.** What products does the market want? How much of which products should be produced and by when? This activity includes the creation of master production schedules that take into account plant capacities, workload balancing, quality control, and equipment maintenance.

2. **Inventory.** What inventory should be stocked at each stage in a supply chain? How much inventory should be held as raw materials, partially finished goods, or finished goods? The primary purpose of inventory is to act as a buffer against uncertainty in the supply chain. However, holding inventory can be expensive, so what are the optimal inventory levels and reorder points?

3. **Location.** Where should facilities for production and inventory storage be located? Where are the most cost-efficient locations for production and for storage of inventory? Should existing facilities be used or new ones built? Once these decisions are made, they determine the possible paths available for product to flow through for delivery to the final consumer.

4. **Transportation.** How should inventory be moved from one location to another in the chain? Air freight and truck delivery are generally fast and reliable, but they are expensive. Shipping by sea or rail is much less expensive but usually involves longer transit times and more uncertainty. This uncertainty must be compensated for by stocking higher levels of inventory. When is it better to use which mode of transportation?

5. **Information.** How much data should be collected, and how much information should be shared? Timely and accurate information holds the promise of better coordination and better decision making. With good information, people can make effective decisions about what to produce and how much, about where to locate inventory and how best to transport it.

The sum of these decisions will define the capabilities and effectiveness of any company's supply chain. The things a company can do, and how competitively it can do them, are all very much dependent on the effectiveness of its supply chain. If a company's strategy is to serve a mass market and compete on the basis of price, it had better have a supply chain that is optimized for low cost. If a company's strategy is to serve a market segment and compete on the basis of customer service and convenience, it had better have a supply chain optimized for responsiveness. In short, what a retailer is and what it can do is shaped in large measure by its supply chain and by the markets it serves.

[1]Lisa M. Ellram, Douglas M. Lambert, and James R. Stock, *Fundamentals of Logistics Management* (Boston: Irwin/McGraw-Hill, 1998).

[2]Sunil Chopra and Peter Meindl, *Supply Chain Management: Strategy, Planning, and Operation* (Upper Saddle River, NJ: Prentice Hall, 2001).

[3]Ram Ganeshan and Terry P. Harrison, *An Introduction to Supply Chain Management,* Department of Management Sciences and Information Systems (University Park, PA: Penn State University, 1995).

[4]John T. Menzer, William DeWitt, et al., "Defining Supply Chain Management," *Journal of Business Logistics*, (Oak Brook, IL: Center for Supply Chain Research, Vol. 22, No. 2, 2001).

How the Supply Chain Works

Great business leaders don't operate in a vacuum, and so it is with the gurus of supply chain management, or "SCM" for short. A couple of the earliest and most influential books that defined the principles and practice of supply chain management are still in use, in updated versions, today:

- *The Goal* was first published in 1984 and is now in its third edition by North River Press (2004). Its author, Dr. Eliyahu ("Eli") M. Goldratt, captured the attention of the business world by describing workplace challenges in the form of a novel. His character, Alex Rogo, is the new manager of a fictitious manufacturing plant who must make some big adjustments or watch the company go under—at the same time Rogo's marriage is faltering. These universal lessons can be applied to almost any business system and, of course, to life in general.
- *Supply Chain Management: Strategy, Planning, and Operation* by Northwestern University professor Sunil Chopra and alumnus Peter Meindl, both of Northwestern's Kellogg School of Management. A second edition was released in 2003 by Prentice Hall. The book began as Kellogg's second-year MBA course text and focuses on solving supply chain problems with analytical tools.

If more depth is desired on any of the topics covered in this book, especially in the first three chapters, we'll recommend those two to augment our introductory discussions.

According to Dr. Goldratt, the goal or mission of supply chain management can be defined quite simply: "Increase throughput while simultaneously reducing both inventory and operating expense."

Throughput refers to the rate at which sales to the end customer occur. Depending on the market being served, sales or throughput occur for different reasons—in some markets, customers value and will pay for high levels of service; in other markets, they are motivated by the lowest price, and price alone.

As mentioned previously, there are five key areas in which companies can make decisions that will define their supply chain capabilities: production, inventory, location, transportation, and information. Chopra and Meindl define these areas as "performance drivers" that can be managed to produce the capabilities needed for a given supply chain. So the first step in effective supply chain management is to understand each driver and how it operates, because each has the ability to directly affect the supply chain and enable certain capabilities.

The next step is to develop an appreciation for the results that can be obtained by mixing different combinations of drivers. But one thing at a time! Let's start by looking at the drivers individually.

Production

Production refers to the capacity of a supply chain to make and store products. The facilities of production—and retailers are no exception—are factories and warehouses. The fundamental decision that managers face when making production decisions is how to resolve the trade-off between responsiveness and efficiency. If factories and warehouses are built with a lot of excess capacity, they can be very flexible and respond quickly to wide swings in product demand. Facilities where all or almost all capacity is being used are not capable of responding easily to fluctuations in demand. On the other hand, capacity costs money—and excess capacity is idle capacity, since it's not in use and not generating revenue. So the more excess capacity that exists, the less efficient the operation becomes.

Factories can be built to accommodate one of two approaches to manufacturing:

1. **Product focus.** A factory that takes a product focus performs the whole range of different operations that is required to make a given product line. This may include everything from fabrication of the various parts of the product to the assembly of these parts.
2. **Functional focus.** A functional approach concentrates on performing just a few operations, perhaps only making a

select group of parts, or only doing assembly. These functions can be applied to making many different kinds of products.

Why does this matter? Because a product approach tends to result in developing expertise about a given set of products at the expense of expertise about any particular function. A functional approach results in expertise about particular functions instead of expertise in a given product. Companies need to decide which approach (or what mix of these two approaches) will give them the capability and expertise they need to best respond to customer demands.

As with factories, warehouses can also be built to accommodate different approaches. There are three main approaches to use in warehousing:

1. **Stock-keeping unit (SKU) storage.** In this traditional approach, all of a given type of product is stored together. This is an efficient and easy-tounderstand way to store products.

2. **Job lot storage.** In this approach, all the different products related to the needs of a certain type of customer or related to the needs of a particular job are stored together. This allows for an efficient picking and packing operation but usually requires more storage space than the traditional SKU storage approach.

3. **Cross-docking.** Pioneered by Wal-Mart in its drive to increase efficiencies in its supply chain, in this approach, product is not actually warehoused in the facility. Instead, the facility is used to house a process, in which trucks from suppliers arrive and unload large quantities of different products. These large lots are then broken down into smaller lots. Then, smaller lots of different products are recombined according to the needs of the day and quickly loaded onto outbound trucks that deliver the products to their final destinations—in this case, Wal-Mart stores.

Inventory

Inventory is spread throughout the supply chain and includes everything from raw material, to work in process, to finished goods that are held by the manufacturers, distributors, and retailers in the supply chain. Again, managers must decide where they want to position themselves in the trade-off between responsiveness and efficiency. Holding large amounts of inventory allows a company or an entire supply chain to be very responsive to fluctuations in customer demand. However, the creation and storage of inventory is a cost, and to achieve high levels of efficiency, the cost of inventory should be kept as low as possible.

1. **Cycle inventory.** This is the amount of inventory needed to satisfy demand for the product in the period between purchases of the product. Companies tend to produce and to purchase in large lots in order to gain the advantages that economies of scale can bring. However, large lots also mean greater **carrying costs**, the term for what it costs at various places along the chain to store, handle, and insure the inventory. Managers face the trade-off between the reduced cost of ordering and better prices offered by purchasing product in large lots, versus the increased carrying cost of the cycle inventory that comes with purchasing in large lots.

2. **Safety inventory.** Inventory that is held as a buffer against uncertainty. If demand forecasting could be done with perfect accuracy, then the only inventory that would be needed would be cycle inventory. But since every forecast has some degree of uncertainty in it, we cover that uncertainty to a greater or lesser degree by holding additional inventory in case demand is suddenly greater than anticipated. The trade-off here is to weigh the costs of carrying the extra inventory against the costs of losing sales due to insufficient inventory.

3. **Seasonal inventory.** This is inventory built up in anticipation of predictable increases in demand that occur at certain times of the year. For example, it is predictable that demand for antifreeze will increase in the winter. If a company that makes antifreeze has a fixed production rate that is expensive to change, then it will try to manufacture product at a steady rate all year long and build up inventory during periods of low demand to cover for periods of high demand that will exceed its production rate. The alternative to building up seasonal inventory is to invest in flexible manufacturing facilities that can quickly change their rate of production of different products to respond to increases in demand. In this case, the trade-off is between the cost of carrying seasonal inventory and the cost of having more flexible production capabilities.

Location

Location refers to the geographical sites of supply chain facilities. It also includes the decisions related to which activities should be performed in each facility. The responsiveness versus efficiency trade-off here is the decision whether to centralize activities in fewer locations to gain economies of scale (and therefore efficiency), or to decentralize activities in many locations close to customers and suppliers in order for operations to be more responsive—a system that creates a different kind of efficiency.

When making location decisions, managers must consider a range of factors that relate to a given location. These include the cost of facilities, the cost of labor, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers. Location decisions tend to be very strategic decisions because they commit large amounts of money to long-term plans.

Location decisions have strong impacts on the cost and performance characteristics of a supply chain. Once the size, numbers, and locations of facilities are determined, that also defines the number of possible paths through which products can flow on the way to the final customer. Location decisions reflect a company's basic strategy for building and delivering its products to market.

Transportation

Transportation refers to the movement of everything from raw materials to finished goods between different facilities in a supply chain. In transportation the trade-off between responsiveness and efficiency is manifested in the choice of transport mode. The fastest modes of transport are very responsive but also more costly. Slower modes are cost-efficient but not as responsive. Since transportation costs can be as much as one-third of the operating cost of a supply chain, decisions made here are very important.

There are six basic modes of transport from which a company can choose:

1. *Cargo ships* are very cost-efficient but are also the slowest mode of transport. Of course, shipping by water is also limited to locations situated near to navigable waterways and facilities such as harbors and canals.
2. *Rail* is also very cost-efficient but can be slow. This mode is also restricted to use between locations that are served by rail lines.
3. *Pipelines* can be very efficient but are restricted to liquid and gas commodities, such as water, oil, and natural gas.
4. *Trucks* are a relatively quick and very flexible mode of transport. Trucks can go almost anywhere. The cost of this mode is prone to fluctuations though, as the cost of fuel fluctuates and road and weather conditions vary.
5. *Airplanes* are a fast and responsive mode of transport; however, they are also the most expensive option and are somewhat limited in rural areas by the availability of appropriate airport facilities.
6. *Electronic transport* is the fastest mode, both flexible and cost-efficient, but it can only be used for movement of certain types of products such as electric energy, data, and products composed of data—music, pictures, and text. Someday technology that allows us to convert matter to energy and back to matter again may completely rewrite the theory and practice of supply chain management ("Beam me up, Scotty . . ."). But for now, hard goods can't be transmitted!

Given these different modes of transportation and the locations of the facilities in a supply chain, managers must design routes and networks for moving products. A **route** is the path through which products move, and **networks** are composed of the collection of the paths and facilities connected by those paths. As a general rule, the higher the value of a product—electronic components or pharmaceuticals, for example—the more its transport network should emphasize responsiveness and the lower the value of a product (say, bulk commodities like grain or lumber), the more its network should emphasize efficiency.

Information

Information is the basis upon which to make decisions regarding the other four supply chain drivers. It is the connection between all the activities and operations in a supply chain. To the extent that this connection is a strong one, (i.e., the data is accurate, timely, and complete), the companies in a supply chain will each be able to make good decisions for their own operations. This will also tend to maximize the profitability of the supply chain as a whole. That is the way that stock markets or other free markets work, and supply chains have many of the same dynamics as markets.

Information is used for two purposes in any supply chain:

1. *Coordinating daily activities* related to the functioning of the other four supply chain drivers: production, inventory, location, and transportation. The members of the supply chain use available data on product supply and demand to decide on weekly production schedules, inventory levels, transportation routes, and stocking locations.
2. *Forecasting and planning* to anticipate and meet future demands. Available information is used to make tactical forecasts to guide the setting of monthly and quarterly production schedules and timetables. Information is also used

for strategic forecasts to guide decisions about whether to build new facilities, enter a new market, or exit an existing market.

Within an individual company, the trade-off between responsiveness and efficiency involves weighing the benefits that good information can provide against the cost of acquiring that information. Abundant, accurate information can enable very efficient operating decisions and better forecasts, but the cost of building and installing systems to deliver this information can be very high.

Within the supply chain as a whole, the responsiveness versus efficiency trade-off that companies make is one of deciding how much information to share with the other companies and how much information to keep private. The more information about product supply, customer demand, market forecasts, and production schedules that companies share with each other, the more responsive everyone can be. Balancing this openness, however, are the concerns that each company has about revealing information that could be used against it by a competitor. The potential costs associated with increased competition can hurt the profitability of a company.

The participants in a supply chain are continuously making decisions that affect how they manage the five supply chain drivers. Each organization tries to maximize its performance in terms of these drivers, through a combination of outsourcing, partnering, and in-house expertise. In the fast-moving markets of our present economy, a company usually will focus on what it considers to be its “core competencies” in supply chain management—and outsource the rest.

This was not always the case, though. In the slower-moving mass markets of the industrial age, it was common for successful companies to attempt to own much of their supply chain, a theory known as **vertical integration**. The aim of vertical integration was to gain maximum efficiency through economies of scale (see Figure 1-3).

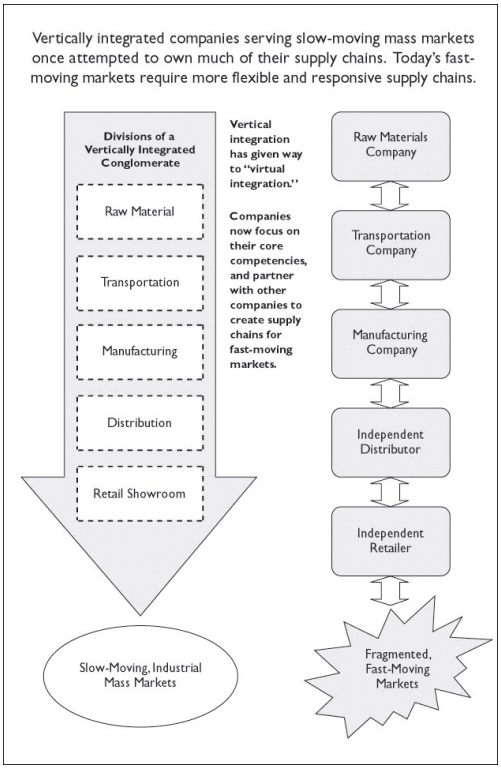

Figure 1-3. Old supply chain versus new.

In the first half of the 1900s, Ford Motor Company owned much of what it needed to feed its car factories. It owned and operated iron mines that extracted iron ore, steel mills that turned the ore into steel products, plants that made component car parts, and assembly plants that turned out the finished cars.

In addition, they owned farms where they grew flax to make into linen car tops, and forests that they logged and sawmills where they produced the lumber for making wooden car parts. Ford’s famous River Rouge Plant was a monument to vertical integration—iron ore went in at one end and cars came out at the other end. In his 1926 autobiography, Henry Ford boasted that his company could take in iron ore from the mine and put out a car 81 hours later.[5]

This was a profitable way of doing business in the more predictable, one-size-fits-all industrial economy that existed in the

early 1900s. Ford and other businesses churned out mass amounts of basic products. But as the markets grew and customers became more particular about the kinds of products and features they wanted, this model began to break down. It could not be responsive enough or produce the variety of products that were being demanded. For instance, when Henry Ford was asked about the number of different colors a customer could request, he is famous for saying, "They can have any color they want—as long as it's black." [6] In the 1920s, Ford's market share was more than 50 percent, but by the 1940s, it had fallen to below 20 percent. Henry Ford's factories still put out dependable vehicles; it's just that focusing on efficiency at the expense of being responsive to customer desires was no longer a successful business model.

[5]Henry Ford, *Today and Tomorrow* (Portland, OR; Productivity Press, Inc., originally published 1926; reissued 1988).

[6]*Ibid.*

The Evolving Structure Of Supply Chains

Globalization, highly competitive markets, and the rapid pace of technological change have driven the modern-day supply chain in which multiple companies work together, with each focusing on the activities that it does best.

Supply Chain Management in Action: How Wal-Mart Works

Wal-Mart is a company shaped by its supply chain, and the efficiency of its supply chain has made it a world leader in the markets it serves.

Sam Walton decided to build a company that would serve a mass market and compete on the basis of price by creating one of the world's most efficient supply chains. The entire structure and company operations have been defined by the need to lower costs and increase productivity in order to pass these savings on to its customers in the form of lower prices. In so doing, Wal-Mart introduced concepts that are now industry standards. There are four in particular that relate to its supply chain.

The strategy of expanding around DCs (distribution centers) is central to the way Wal-Mart enters a new geographical market. The company looks for areas that can support a group of new stores, not just a single new store. It then builds a new DC at a central location in the area and opens its first store at the same time. The DC is the supply chain bridgehead into the new territory. It supports the opening of more new stores in the area at a very low additional cost. Those savings are passed along to the customers.

The use of EDI (Electronic Data Interface) with suppliers provides the company two substantial benefits. First, it cuts the transaction costs associated with well-defined, routine processes like ordering products and paying invoices—everything is done electronically, by computer. Second, these electronic links with suppliers allow Wal-Mart a high degree of control and coordination in scheduling and receiving product deliveries. This helps to ensure a steady flow of the right products at the right time, delivered to the right DCs, by all Wal-Mart suppliers.

The "big box" store format allows Wal-Mart to, in effect, combine a store and a warehouse in a single facility and get great operating efficiencies from doing so. The big box is big enough to hold large amounts of inventory like a warehouse. And since this inventory is being held at the same location where the customer buys it, there is no delay or cost that would otherwise be associated with moving products from warehouse to store. Again, these savings are passed along to the customer.

"Everyday low prices" are a way of doing two things—first, telling price-conscious customers that they will always get the best price. They need not look elsewhere or wait for special sales. Second, the effect of this message to customers helps Wal-Mart to accurately forecast product sales. By eliminating special sales and assuring customers of low prices, it smoothes out demand swings for certain products, making demand more steady and predictable. This way, stores are also more likely to have what customers want, when they want it.

Taken individually, these four concepts are each useful—but their real power comes from being used in connection with each other. They combine to form a supply chain that drives a self-reinforcing business process. Each concept builds on the strengths of the others to create a powerful business model for a company that has grown to become the dominant player in the world of retail.

Mining companies focus on mining, timber companies focus on logging and making lumber, and manufacturing companies

focus on different types of manufacturing, from making component parts to doing final assembly. This way, people in each company can keep up with rapid rates of change and keep learning the new skills needed to compete in their particular business.

Where companies once routinely ran their own warehouses or operated their own fleets of trucks, they now have to consider whether those operations are really a core competency—or whether it is more cost-effective to outsource those operations to other companies that make logistics the center of their business. To achieve high levels of operating efficiency and to keep up with continuing changes in technology, companies need to focus on their core competencies. It requires this kind of focus to stay competitive.

Instead of vertical integration, companies now practice what some call **virtual integration**. Companies find other companies with whom they can work to perform the activities called for in their supply chains. How a company defines its core competencies—and how it positions itself in the supply chains it serves—are perhaps the most important decisions it can make.

Participants in the Supply Chain

In its simplest form, a supply chain is composed of a company and the suppliers and customers of that company. This is the basic group of participants that creates a simple supply chain. Extended supply chains contain three additional types of participants:

- First there is the supplier's supplier or the ultimate supplier at the beginning of an extended supply chain.
- Then there is the customer's customer or ultimate customer at the end of an extended supply chain.
- Finally there is a whole category of companies that are service providers to other companies in the supply chain. These are companies that supply services in logistics, finance, marketing, and information technology.

In any given supply chain, there is some combination of companies that perform different functions. There are companies that are producers, distributors or wholesalers, retailers, and companies or individuals who are the customers, the final consumers of a product. Still other firms support these companies as providers of a range of services related to the product lines.

Producers

Producers or manufacturers are organizations that make a product—perhaps raw materials, perhaps finished goods. Producers of raw materials are organizations that mine for minerals, drill for oil and gas, and cut timber. It also includes organizations that farm, raise animals, or catch seafood. Producers of finished goods use the raw materials and subassemblies made by other producers to create their products. Some types of retailers deal with raw materials producers more often than others—supermarkets, for example, in creating private label brands.

Producers can create products that are intangible items such as music, entertainment, software, or designs. A product can also be a service such as mowing a lawn, cleaning an office, performing surgery, or teaching a skill. In many instances, the producers of tangible, industrial products are moving to areas of the world where labor is less costly. Producers who remain in the developed world of North America, Europe, and parts of Asia are increasingly producers of intangible items and services.

Distributors

Distributors are companies that take inventory in bulk from producers and deliver a bundle of related product lines to customers. Distributors are also known as wholesalers. They typically sell to other businesses, and they sell products in larger quantities than an individual consumer would usually buy. Distributors buffer the producers from fluctuations in product demand by stocking inventory and doing much of the sales work to find and service customers. For the customer, distributors fulfill the "time and place" function; they deliver products when and where the customer wants them.

In addition to product promotion and sales, other functions the distributor performs are inventory management, warehouse operations, and product transportation, as well as customer support and post-sales service. Distributors can either buy their wares outright from producers or can simply broker them between the producer and the customer and never take ownership of the products. In both of these cases, as the needs of customers evolve and the range of available products changes, the distributor is the agent that continually tracks customer needs and matches them with products available.

Retailers

Retailers stock inventory and sell in smaller quantities to the general public. Retailers also closely track the preferences and demands of their customers. They place advertising to attract these customers and use some combination of price, product selection, service, and convenience as the primary draws to attract customers for the products they sell. Discount department stores attract customers using price and wide product selection, upscale specialty stores offer a unique line of products and high levels of service, quick-service food restaurants use convenience and low prices as their draw, and so on.

Customers

Customers or consumers are the groups or individuals who purchase the product. Of course, a customer organization may buy the product in order to incorporate it into another product that they, in turn, sell to other customers. Or the customer may be the final end user of a product, buying it in order to consume, wear, or otherwise use it.

Service Providers

These are organizations that provide services to producers, distributors, retailers, and customers. Service providers have developed special expertise or skills that focus on a particular activity needed by a supply chain. Because of this, they are able to perform these services more effectively and probably at better prices than any of the other groups (producers, retailers, and so forth) could do on their own.

Some common service providers in any supply chain are the companies that handle transportation and warehousing services, otherwise known as logistics providers. Another category of service providers delivers financial services—making loans, doing credit analysis, and collecting past-due amounts. This group includes banks, credit rating companies, and collection agencies, to name a few. Still other service providers deliver market research and advertising, product design, engineering services, legal services, management advice, and more. The newest and fastest-growing field in the past decade has been information technology, as companies hire external service providers to choose, program, install, align, and/or service their computer systems—even if they also have their own IT people in-house.

To summarize, supply chains are composed of repeating sets of participants that fall into one or more of these categories. Over time, the needs of the supply chain as a whole remain fairly stable. What is more likely to change is the mix of participants in the chain, or the roles that each participant plays. For example, in some supply chains, there are few service providers—because the other participants perform these services on their own. In other supply chains, very efficient providers of specialized services have evolved and the other participants outsource work to them, instead of doing it themselves. Examples of supply chain structure are shown in Figure 1-4.

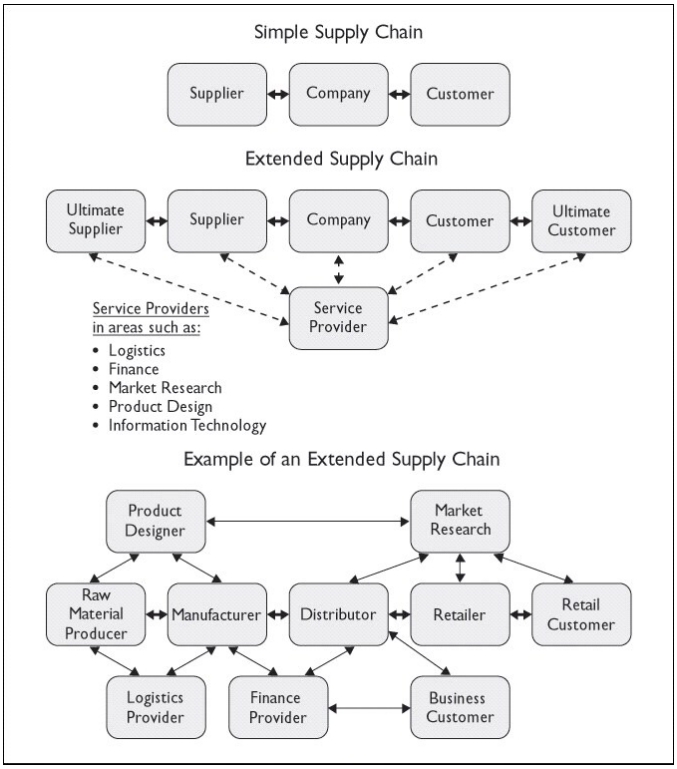

Figure 1-4. Supply chain structure.

Aligning the Supply Chain With Business Strategy

A company's supply chain is an integral part of its approach to the markets it serves. The supply chain needs to respond to market requirements and do so in a way that supports the company's business strategy. The business strategy a company employs starts with the needs of the customers that the company serves or will serve. Depending on the needs of its customers, a company's supply chain must deliver the appropriate mix of responsiveness and efficiency. A company whose supply chain allows it to more efficiently meet the needs of its customers will gain market share at the expense of other companies in that market and also will be more profitable.

For example, let's consider two retail companies and the requirements they place on their supply chains—7-Eleven and Sam's Club, which is a part of Wal-Mart. The customers who shop at convenience stores like 7-Eleven have a different set of needs and preferences than those who shop at a discount warehouse like Sam's Club. The 7-Eleven customer is looking for convenience and wants the store to be close by and have enough variety of products so that they can pick up small amounts of common household or food items, often needed immediately. Clearly, the supply chain for 7-Eleven needs to emphasize responsiveness, since its customers expect convenience and will pay for it.

Sam's Club customers, on the other hand, are looking for the lowest price. They are not in a hurry and are willing to drive some distance and buy large quantities of limited numbers of items in order to get bargains by purchasing in bulk. The Sam's Club supply chain needs to focus tightly on efficiency, finding every opportunity to reduce costs so that these savings can be passed on to the customers.

Both of these companies' supply chains are well aligned with their business strategies, and because of this, they are each successful in their markets.

There are three steps to use in aligning any retailer's supply chain with its business strategy. The first step is to understand the markets that the retailer serves. The second step is to define the strengths or core competencies of the retailer, and the role it can play in serving its markets. The last step is to develop the needed supply chain capabilities to support the roles the retailer has chosen.

Understanding the Markets a Company Serves

If you were a retail executive, you'd begin by asking questions about your customers. What kind of customer does your company serve? To whom do you sell products? What kind of supply chain is your company a part of? The answers to these questions will tell you whether your supply chain needs to emphasize responsiveness or efficiency. Chopra and Meindl have defined the following attributes that help to clarify requirements for different types of customers:

- **The quantity of the product needed in each lot.** Do your customers want small amounts of products, or will they buy large quantities? A pharmacy customer will no doubt buy in smaller quantities than the customer of a discount store.
- **The response time that customers are willing to tolerate.** Do your customers buy on short notice and expect quick service, or is a longer lead time acceptable? Customers on their lunch hours expect speedy service from a fast-food chain; but customers buying custom machinery would plan the purchase in advance and expect some lead time before the product could be delivered.
- **The variety of products needed.** Are customers looking for a narrow and well-defined bundle of products or a wide selection of different kinds of products? Customers of a fashion boutique expect a narrowly defined group of designer items, while people who buy from a "big box" discount store expect a wider variety.
- **The service level required.** Do customers expect all products to be available for immediate delivery, or will they accept partial deliveries of products and longer lead times? Customers of a music store expect to get the newest CD they want to hear immediately, or they will probably go elsewhere; other types of stores may be able to special-order merchandise for which customers don't mind waiting.
- **The desired rate of innovation in the product.** How fast are new products introduced, and how long before the existing products become obsolete? In fields such as electronics and computers, customers expect a high rate of innovation. But in hardware or house paint, innovations happen— just not with incredible frequency.
- **The price of the product.** How much are customers willing to pay? We've already discussed the all-important "price or convenience" trade-off.

Defining Core Competencies

The next step is to define the role that your company plays (or wants to play) in these supply chains. Yes, retailers are retailers—but some may also be producers, distributors, or service providers, too. What does your company do to enable the supply chains that it is part of? What are the core competencies of the company? How does it make money? The answers to these questions tell you what roles in a supply chain will be the best fit.

Be aware that any company can serve multiple markets and participate in multiple supply chains—in fact, the smartest ones do just that. A company like W.W. Grainger serves several different markets. It sells maintenance, repair, and operating (MRO) supplies to large national customers such as Ford and Boeing, and it also sells these supplies to small businesses and building contractors. Its two very different markets have different requirements.

When you are serving multiple market segments, your company should always be looking for ways to leverage its core competencies. Parts of these supply chains may be unique to the market segment they serve, while other parts can be combined to achieve economies of scale. For example, if manufacturing is a core competency for a company, it can build a whole range of different products in the same production facility. Then, different inventory and transportation options can be used to deliver the products to customers in different market segments. This situation is rare for retailers, but it's worth knowing about as you select suppliers as partners in your supply chain. Who can be the most flexible? Who is "best" at what skills?

Developing Supply Chain Capabilities

Once you know what kind of markets your company serves and the role your company plays in the supply chains of these markets, the last step is to develop the supply chain capabilities needed to support the roles your company plays. This development is guided by the decisions made about the five supply chain drivers. Each of these drivers can be developed and managed to emphasize responsiveness or efficiency, depending on the business requirements. Remember, not all of these examples apply to retail—or do they? See what you think.

1. **Production.** This driver can be made very responsive by building factories that have a lot of excess capacity and that use flexible manufacturing techniques to produce a wide range of items. To be even more responsive, a company could split its production into many, smaller plants that are close to major groups of customers so that delivery times would be shorter. If efficiency is the goal, a company might build factories with very little excess capacity, which produce only a limited range of items—but do it quickly and expertly. Further efficiency could be gained by centralizing production in large central plants to get better economies of scale.

2. **Inventory.** Responsiveness here might mean stocking high levels of inventory for a wide range of products. Additional responsiveness can be gained by stocking products at many locations, so the inventory is close to customers and available to them almost immediately. Efficiency might mean reducing inventory levels of all items, especially those items that do not sell as frequently. Also, inventory could be stocked in only a few central locations to reduce costs.

3. **Location.** Responsiveness means opening many locations, to be physically close to the customer base. McDonald's is a great example of responsive use of location. Efficiency, on the other hand, can be achieved by operating from only a few locations and centralizing activities in common locations. An example of this is the way computer manufacturer/retailer Dell serves large geographical markets from only a few locations that perform a wide range of activities.

4. **Transportation.** Responsiveness in transportation means "fast and flexible." Many companies that sell products by mail-order catalogs or over the Internet are able to offer high levels of responsiveness by using "rush" forms of transportation (like Federal Express) to deliver their products, often within 24 hours, if customers are willing to pay for it. Efficiency means transporting products in larger batches, and doing it less often, using ship or rail transport. It can be even more efficient if the transportation originates from a central hub facility instead of from many branch locations.

5. **Information.** The power of this driver grows stronger by the minute as computer technology becomes more sophisticated, but easier to use and less expensive. Like money, information is a useful commodity because it can be applied directly, to enhance the performance of the other four supply chain drivers. High levels of responsiveness are achieved when companies collect and share accurate and timely data generated by the operations of the other four drivers. Where efficiency is the focus, less information about fewer activities can be collected—too much data that isn't especially useful isn't really necessary. Companies may also elect to share less information among themselves so as not to risk having that information used against them.

Two Companies, Two Types of Supply Chain: Wal-Mart and Dell

Sunil Chopra is the IBM Distinguished Professor of Operations Management at Northwestern University's Kellogg School of Management, and a director of the Masters of Management in Manufacturing program. He is also coauthor of *Supply Chain Management: Strategy, Planning, and Operation,* a widely recognized source book in the field.

Professor Chopra agreed to share his thoughts here about two companies that both have risen to prominence by offering low prices as key selling points to customers. This strategy requires a highly efficient supply chain in order to generate cost savings while still making a profit. Professor Chopra offers his analysis of how each company has aligned its supply chain to support its business strategies.

WAL-MART: To begin with, Wal-Mart's competitors opened stores in ones and twos and used demographic data to select store sites. Wal-Mart took a supply chain approach and would not even open a store in an area unless it determined that the area could support a distribution center (DC) and a sufficient number of stores to gain scale economies at the DC. Then they targeted specific business operations from which to get efficiencies.

"Wal-Mart said, 'We are going to replenish our stores much more efficiently,' Chopra explains. "They began to replenish stores two times a week, where their competition was replenishing two times a month. What this meant was that a Wal-Mart manager only had to forecast for half a week, and an equally capable store manager elsewhere had to forecast sales and inventory needs for half a month—they couldn't do as well.

"Since they were replenishing more often, they pioneered the cross-docking technique, in order to reduce the cost of small lot replenishment. They also said that they would own and control their own trucks and their computer systems, because these were the two assets that they used to make their supply chain so efficient. They invested heavily in information technology and trucks— they bought a fleet of trucks. They made these into core competencies of the company."

DELL: "When I look at Dell," says Chopra, "I see a company that was able to live through and learn from a big mistake they made early on. Their roots were as a direct sales company—but then in the early 90s, they tried to sell through retail stores and almost went broke.That drove them back to the direct model and they have not strayed since.

"PCs are now much like cars; it is more of a replacement market than a growth market. Customers know what they want and they also want a good price. Dell's message to the market is customization and great prices. They can support this strategy because they enjoy economies of scale and postpone assembly. They use a few large facilities to assemble PCs, and they assemble to order and not to stock, so inventory is kept very low. In a high-change technology market, they do not get stuck with obsolete inventory. Their shipping costs are high but there is enough profit margin to cover that."

But what would happen if the PC market suddenly changed? "Dell and its competitors all use many of the same components to build their machines. If the market no longer values customization and simply wants the best price on a standard machine, then the Dell model doesn't work as well. [In that case,] build to stock and position inventory close to the customers via retail stores becomes a better model."

In short, there is no one "right model" for a supply chain. Markets change, and as they do, retailers must reevaluate their business model and their strategy. As Professor Chopra puts it," Since a company's supply chain has a great impact on its ability to execute its business model successfully, that supply chain must always be adjusted as the business strategy changes."

Please note, however, that these information efficiencies are *only* efficiencies in the short term. They become less efficient over time, because the cost of information continues to drop, while the costs of the other four drivers usually continue to rise. Over the longer term, those companies and supply chains that learn how to maximize the use of information to get optimal performance from the other drivers will gain the most market share and be the most profitable.

Every retailer is part of at least one supply chain, and often many different supply chains. A supply chain is composed of all the companies involved in the design, production, and delivery of a product to market.

Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served. The goal of supply chain management is to increase sales of goods and services to the final end user or customer, while at the same time reducing both inventory and operating expenses.

Chapter Summary

The business model of vertical integration that came out of the industrial economy of the last century has given way to today's "virtual integration" of companies in a supply chain with technological capabilities like Electronic Data Interface (EDI). Each company now focuses on its core competencies and partners with other companies that have complementary capabilities for the design and delivery of products to market—and they are linked by computer to be able to share and transmit information instantly. Even so, every company in the chain must focus on improving its core competencies, to keep up with the fast pace of its markets and with technological change, as well as to satisfy its supply chain partners.

Retailers are no exception. To succeed in this competitive world, companies must learn to align their supply chains with the demands of the markets they serve. Supply chain performance is now a distinct competitive advantage for companies who excel in this area. The world's largest retailer, Wal-Mart, is a testament to the power of effective supply chain management. Much, if not most, of its success is directly related to its evolving capabilities to continually improve its supply chain.

Discussion Questions

1. What is the difference between supply chain management and logistics?
2. What did you learn from the story of Alexander the Great that might be useful in a retail business? Do you see similarities between the business profiles in this chapter of Wal-Mart and Alexander the Great?
3. Find a supply chain service provider and write a report on the services it provides to retailers and how it fits into the retailers' total supply chain.
4. Why do you think the cost of information continues to drop, while costs associated with the other four supply chain drivers continue to rise?
5. Briefly describe the differences between the supply chains of Wal-Mart and Dell.

The Incredible Journey

Coauthor's Note: In doing the research for this book, I came across a fun and fascinating article—which is, to be honest, somewhat rare in the field of supply chain management! "The Incredible Journey" follows a single bottle of mouthwash on its trek through an actual supply chain. The publisher was kind enough to allow me to split the "journey" into multiple parts to use between chapters. The original article can be found in the August 15, 1998, issue of *CIO Enterprise* (now *CIO*) magazine. Many thanks to the original writer, Jennifer Bresnahan, and publisher Andrew Burrell of CXO Media, Inc. for permitting its use.

Please note that the speed at which supply chain technology moves automatically dates this article, at least somewhat. Wherever possible, I have updated the basic financial figures used in the original article. However, the 1998 copy mentioned several specific brands of SCM-related software, described various types of automated technology, and quoted individuals at some companies. Today, I cannot vouch for the continued use of those particular systems or brands by the supply chain partners in the article, or confirm that the people mentioned are still working in those positions at the same companies.

In this book, "The Incredible Journey" begins on page 43 and continues between each chapter and the next.

Chris Thomas
