CHAPTER 29
Industrial Engineering Applications in Retailing

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1. HOW BOB GOT HIS BOOK

Bob decides that he needs a copy of Gordon MacKenzie's *Orbiting the Giant Hairball,* published in 1996 by Penguin Books. He gets in his car and drives to the local book superstore. After unsuccessfully searching in the superstore for the book, then someone to ask about the book, Bob gets a Starbucks and goes to the smaller chain bookstore in the nearby mall. As it turns out, this store does not have the book either, but the employee says he thinks they can get it for him—but cannot tell him for sure when. Frustrated with both stores, yet very satisfied with the Starbucks, he drives home.

At home, Bob decides that he will check Amazon.com. Within two clicks, he finds that *Orbiting* can be sent within 24 hours and at 30% off the price at the superstore. Bob also sees that it has a five-star rating and is one of the most popular purchases at Nike and Ernst & Young (not bad company, he thinks). Finally, he reads a review from a reader that says the following, "Here is the passage that was on his funeral leaflet (it seems that Mr. McKenzie has recently died): 'You have a masterpiece inside you, too, you know. One unlike any that has ever been created, or ever will be. And remember: If you go to your grave without painting your masterpiece, it will not get painted. No one else can paint it. Only you.' " Taken by this statement, Bob decides the book may be better than he heard and orders five copies (one to keep and four to give away). He clicks and within 30 minutes receives an e-mail notification that the order was received. The next day he receives an e-mail notification that the order was shipped. In three days, he receives the package from Amazon. That night he reads the book, finds it to be a great book on leadership, and orders 20 more from Amazon to give out as Christmas gifts. Thinking about the experience, Bob concludes that there may be no reason to ever go to a book store again (except for the Starbucks).

Superstore bookstores stock many single copies of books that sell infrequently and multiple copies of books that sell quickly. They have a sophisticated sales/inventory system so books can be replaced rather quickly from regional distribution centers. Each of the superstores has 130,000 different books, about 10 checkout lines, and a staff of about 20 working in the stores at any one time. When Bob went to purchase *Orbiting* and it was not there, there was no system or person who was able to tell Bob if they could get it to him in a reasonable amount of time. It seems that this superstore doesn't care that Bob did not get his book. These stores are profitable carrying a large inventory with many popular books. The lifetime value of Bob's business does not seem to be important to them.

When Bob goes to Amazon.com, he is welcomed as a regular client and asked if he wants to see some recommendations. (Most of the time he clicks "yes" and purchases a book or two he had not heard of, maybe a new book from an author he likes, and maybe a CD that he did not know about.) This time he simply typed in the name of the book he wanted and clicked on a button at the bottom of the page that tells Amazon.com how Bob wants to pay for the book and where to ship it based upon his previous orders. Amazon then assigned the order to one of its seven U.S. distribution centers (five have opened in 1999—Amazon has 3 million square feet of floor space) that had the book. A red light on a shelf where the book was stored automatically goes off. Workers move from bulb to bulb, retrieving the items ordered then pressing a button to turn off the light. Computers determine which rows the workers go to. Bob's order is placed in a moving crate that contains any number of orders. The crate moves along at 2.9 ft per sec through 10 miles of conveyor. Machines and workers (all of whom get Amazon stock options by the way) scan the bar codes on the items at least 15 times. At the end of the trail, the bar-coded books get matched with the orders. Bob's book goes down a three-foot chute to a box with a bar code that identifies the order. The box is packed, weighed, and labeled before leaving the warehouse in a truck. One of Amazon's newest facilities, in McDonough, Georgia, can ship as many as 200,000 boxes a day. One to seven days later, Bob is another one of over 13 million customers satisfied with Amazon.

The moral of the story—Bob really didn't care if the companies cared or what they had to go through to get the book to him. HE JUST WANTED THE BOOK.

2. INTRODUCTION TO RETAIL LOGISTICS

If your business has all the time in the world, no sales or profit pressures, and a strong competitive advantage in the marketplace, then you do not have to be concerned about the efficiency and effectiveness of your supply chain management. This is not the world of retailing, where margins are thin and competition plentiful (and aggressive).

2.1. The Retail Supply Chain

By and large, consumers don't know (or really care) how the product made it to the retail shelf (or to their door). They do care that retailers have the right products, in the right sizes, in the right colors, at the right prices, where and when they want it. The business challenge for retailers is to manage the thousands of paths that exist between raw material to putting the product on the shelf, from the small one-store operation to the 2600+ store chain Wal-Mart.

The retailer's role is to manage these complex relationships and make it possible for the consumer to make a choice easily among the many thousands of vendors and manufacturers creating products that consumers would want. By reducing the complexity of finding and acquiring the right merchandise, retailers help deliver something of value to the consumer. The goal of the retail supply chain should be to minimize expense and time between the manufacturer and the consumer so that consumers find what they want at a competitive price. Customer relationships are only developed by designing product paths that deliver what the customer wants, when they want it, at the price they want it. This is what shareholders pay the executives to do. Executives who do not marshal the supply chain well will have a business that will underperform (see Figure 1).

2.2. Strategic Advantages through Retail Supply Chain Management

Today an executive whose goal is not lowering costs is not shepherding the resources of the company well. Procurement, distribution, and storing accounts for about 55% of all costs. By contrast, labor
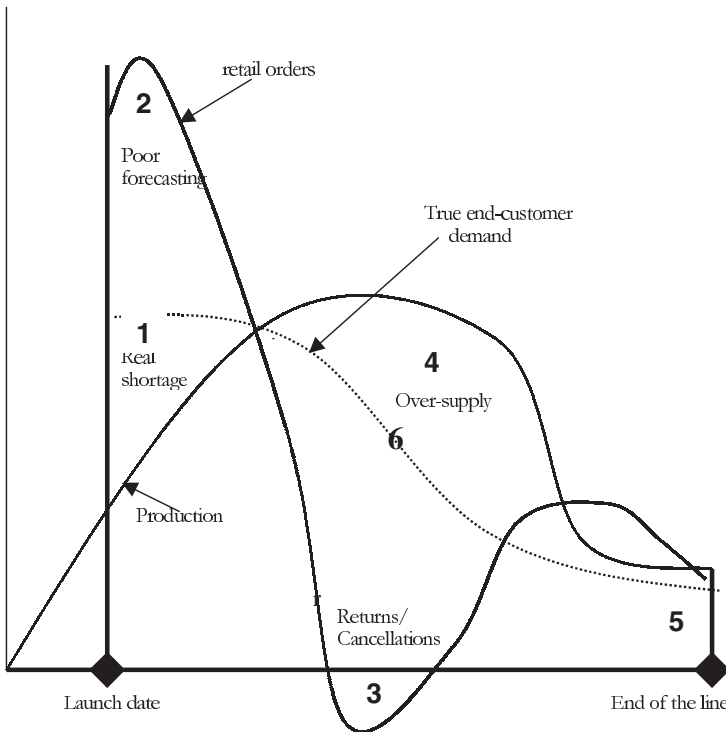
1. Production cannot meet initial projected demand, resulting in real shortages. Retailers frustrated because they cannot get the merchandise they want. Consumers dissatisfied because they cannot find what they want.
2. Retailers overorder in an attempt to meet demand and stock their shelves. Retailers are angry at manufacturer and lose confidence.
3. As supply catches up with demand, orders are cancelled or returned. Retailers lose money and lose customers.
4. Financial and production planning are not aligned with real demand; therefore production continues. Overproduction means manufacturers lose money.
5. As demand declines, all parties attempt to drain inventory to prevent writedown
6. Supply and demand match closely. Everyone maximizes profit.

Figure 1 Supply–Demand Misalignment. (From J. Gattorna, Ed., *Strategic Supply Chain Alignment: Best Practice in Supply Chain Management.* Reprinted by permission of the publisher, Gower Publishing, UK.)

accounts for 6%. Thus, leveraging cost savings on supply chain issues creates a greater return than almost any other single category. A 5% savings in supply chain expense adds almost 3% to net profits (a 5% labor savings adds less than 0.3%). To achieve the bottom-line impact of a 5% supply chain saving, you would have to cut personnel costs by 46%. According to a study by Computer Sciences Corporation and *Consumer Goods Manufacturer Magazine,* almost 75% of executives responding to their survey said that reducing supply chain costs was one of the most significant market forces driving their companies and that integrating systems with their customers (e.g., retailers) was a top information system concern (57%) (see Figure 2).

How could such a large area be almost invisible? Quite simply, lack of interest, knowledge, and the clear priorities of sales and marketing drive it into invisibility. The issues in the supply chain seem almost coincidental to the business. It is clear that many senior executives don't quite understand the nature, scope, and bottom-line impact of their supply chain.

But the issue is not simply cost savings. The real benefits of supply chain management come when the retailer develops relationships with suppliers that add value for customers. Wal-Mart is the number one retailer in the world—$160 billion in sales in 1999. Its advantage in the marketplace is based on its ability to give customers what they want at the lowest price every day. The reason for its success is not really its outstanding customer service (although customer service doesn't hurt). The reason is that it manages it supply chain better than any other retailer does. Wal-Mart dictates to vendors the manner and costs by which goods will be delivered to its distribution centers and stores. Wal-Mart's ability to track and know what consumers buy, and its control over the process, result in over 50% of all Wal-Mart products on the shelves and out the door before it has to pay for them. Its efforts to increase this to 100% of all products sold will lead Wal-Mart's dominance into the 21st century. Wal-Mart's ability to manage its supply chain allows it to have the lowest cost structure in the industry, allowing lower prices and maximizing profitability.

2.3. What Is Supply Chain Management?

Supply chain management goes beyond mere transportation, logistics, warehousing, and distribution. It is a relationship among manufacturers, suppliers, vendors, retailers, and customers working together to provide a product that the customer wants at a price that the customer is willing to pay. The "extended enterprise" makes optimal use of shared resources to achieve greater operating efficiency than any could achieve alone. The resulting product is the highest quality, lowest cost, fastest delivery, and maximal customer satisfaction.

The best retailers are focusing on the complete supply chain, developing and maximizing whatever partnerships can exist to get what customers want, before they know they want it (Kuglin 1998). The new terms going into the 2000s are *quick response, category management, continuous replenishment,*

Stage 1: Supplier consolidation — 1 — 7-20% savings

Stage 2: Incremental improvements in existing process — 2 — 21-40% savings

Stage 3: Real Retailer/ vendor partnership — 3 — Major improvements in revenue, market share, total cost, customer relationships
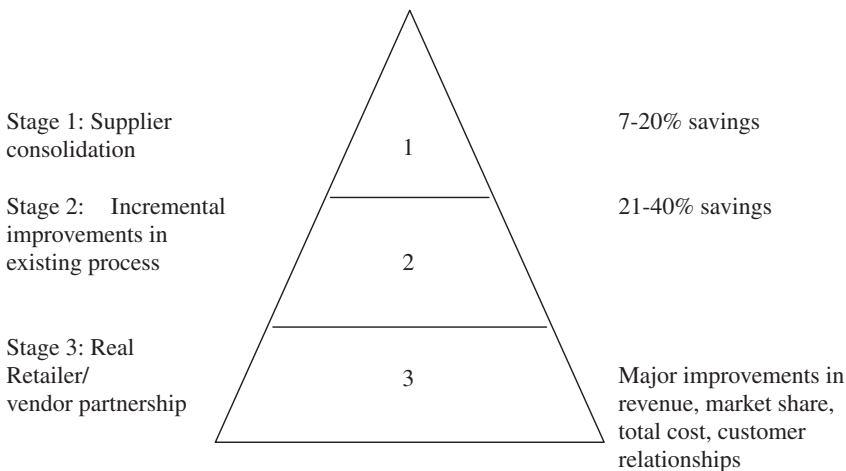
Figure 2 Supply Management Benefits. (Adapted from *The Executive's Guide to Supply Chain Management Strategies,* Copyright © 1998 David Riggs and Sharon Robbins. Used with permission of the publisher, AMACOM, a division of American Management Association International, New York, NY. All rights reserved. http://www.amacombooks.com)

supply chain partnerships, efficient consumer response, flow-through merchandising (cross-docking), and *enterprise resource planning.*

2.4.   A Short History of Supply Chain Management

In the beginning, it was sufficient for the owner/proprietor simply to order the products he or she thought the customer would want, and these would be delivered to the store. As business got more complex (and larger), the need arose for a division of labor in which a separate expert department/ function was born for the major areas of the business. One part of the organization and set of people was empowered to order, track, plan, negotiate, and develop contacts. The greater the size of the retailer, the greater the number of buying functions—accessories, socks, underwear, coats sportswear, petites, men's wear, furnishings. Each department worthy of its name had an ''expert'' buyer and assistant buyer. Each buyer reported to a divisional merchandise manager (DMM). Each DMM reported to a general merchandise manager (GMM), and the GMM reported to a senior vice president.

Small retailers have direct store deliveries from the manufacturer or middleman. Larger retailers have centralization of storing, transporting, and distributing from regional distribution facilities (distribution). Technology development over the past 15 years has focused on more efficient and faster ways to get ''stuff'' into the regional distribution facilities and out to the stores or end user. Success was measured in the number of days or hours it took merchandise to hit the distribution center from the manufacturer or supplier and go out the distribution door. The end result of these developments is the situation today (Fernie 1990; Riggs and Robbins 1998):

• Many small transactions and high transaction costs
• Multiple suppliers delivering similar goods with the same specification but little price competition
• Very low levels of leveraging purchasing or achieving economies of scale
• Too many experts and executives focusing time and effort on very narrow areas that frequently have nothing to do with the core competency of the business, essentially wasting time that could be otherwise be devoted to improving the business's competitive advantage
• Little time for strategy because the experts are involved in daily transactions

2.5.   The Current State of Supply Chain Management

We have seen what was. Now here is what some retailers have achieved. Expected demand for a product is forecasted (forecasts can be updated as changes in demand reflect change is needed). Stock levels are constantly monitored. The frequency of production and shipment is based on the difference between demand and on-hand goods. When stock falls below some number, the product is ordered by electronic data interchange (EDI). There is immediate electronic acknowledgment with a promised delivery date and mode of shipping. The mode will be automatically selected by comparing the current level of inventory and demand. When the product is shipped, it is bar coded and a packing skip is EDIed to the company. When the products arrive, bar codes are matched to the order. Any discrepancies are handled electronically. The product is cross-shipped, inventoried, picked, and entered into the purchaser's inventory electronically and is immediately available. Store shipment goes out according to store inventory levels and cost considerations.

There are a number of state-of-the-art processes and technologies at work here. Forecasting and monitoring is used to minimize inventory levels while maintaining very high levels of in-stock positions for the consumer. Money is saved by reducing the inventory at each distribution center. Inventory can be assessed at any of the distribution centers. Almost all handling and clerical labor is eliminated and greater accuracy is achieved. Lower handling costs per unit translate into savings and efficiency. Finally, if you don't have excessive inventory in the stores, it may be possible to raise the percentage of goods sold prior to the need to pay for them. This reduction of cash to cash cycle time is a major benefit of supply chain management.

3.   RETAIL SUPPLY CHAIN COMPONENTS

Retail supply chains are different than other industry models. Many of the components of the supply chain are the same: product sourcing, inbound transportation, processing, location and storage of inventory, outbound transportation, company operations, and information. However, retailers are at the end of the chain, just before the products touch the consumer. As a result, the retailer is at the end of the cumulative efficiencies and deficiencies of all the chain partners. It may be that retail supply chains are just a bit more complex. Imagine the thousands of vendors, each with their own ideas and operations, all moving with a thousand different retailers' set of unique requirements and multiply this by the 90,000+ different stock keeping units (SKUs) in the typical large discount store.

3.1. Product Selection and Sourcing

Retailers must establish competence in selecting products that consumers want. The retailer must discern the needs and wants of its consumers and translate that into category assortments. Sourcing describes the manner in which the retailer forms relationships with manufacturers or vendors in order to deliver the products at the right time. Guess wrong and the retailer suffers a season of lower sales and profitability (e.g., short skirts when long is in). Guess right and the retailer becomes a hero.

Retailers have two broad choices as they strategize sourcing. With branded merchandise, the retailer selects manufacturers who have established some image equity with the consumer. The supply chain is simplified for the retailer, for all it has to do is inform the manufacturer how much and when it wants to get the ''stuff'' to the store. With private-label merchandise, the retailer must manage the whole process, from design to material to manufacturing to shipping, all the way to selling, and advertising the brand equity. Retailers choose to develop private-label merchandise because of the market advantage that this strategy allows. First, there is added profit margin. Retailers can make greater profit margins, even though private label goods are generally priced lower than manufacturer brands. Second, with private labels, retailers have the ability to develop products that are unique in the marketplace because the consumer can get the private label only at that retailer.

3.2. Inbound Transportation

The issues here revolve around getting the merchandise to the retailer's warehouse and distribution centers in the quickest time, minimizing the handling. The faster goods can be at the distribution center, the faster the speed to market.

3.3. Processing of Retail Goods

All products require some type of value-added service to make it ready for the shelf. Ten years ago, retailers received the merchandise in centralized warehouses and the warehouses tagged and priced the products before the products left for the stores. Today, retailers are forcing manufacturers to deliver the items already tagged and priced. Indeed, the greater the ability of the manufacturer to create shelf-ready merchandise, the greater the retailer's ability to develop just-in-time strategies for merchandise replenishment. Manufacturers with the ability to meet country-specific requirements for labeling and presentation will have a better chance of biting off a piece of the global marketplace.

3.4. Warehouse Management Technologies

Warehousing is a critical part of retail success and can add value as a crucial link between supply and demand. The key issues in warehousing are efficient handling, inventory management, product flow, transportation, and delivery.

Let us follow merchandise as it comes into the warehouse. Systems are needed to plan the breakdown of merchandise into manageable orders. Weight, size, and shipping dates need to be scheduled. Dock area management facilitates the loading and unloading of product. There is a need to make certain that products coming in match what was ordered. Discrepancies with merchandise not caught here will cause problems as the merchandise flows through the retail organization. The second significant function of the warehouse system is ''put away'' and replenishment. Inventory that will not be cross-docked has to be stored and available for retrieval. Merchandise that has been stored will need to be found and shipped out to stores that need it. In modern warehouses, this function is highly computerized, with automated picking tools and belts. In less sophisticated facilities, a lot is still done slowly and by hand. Finally, the warehouse system must pack the items and make certain accurate paperwork and order consolidation occur.

Given the complexity of the warehouse, it is easy to see how systems and technologies can be of considerable benefit. An effective warehouse-management system saves labor costs, improves inventory management by reducing inaccuracies, speeds delivery of merchandise to store or consumer, and enhances cross-docking management.

3.5. Distribution

Distribution is the set of activities involved in storing and transporting goods and services. The goal has been to achieve the fastest throughput of merchandise at a distribution center with minimal cost. These efforts are measured by internal standards with very little involvement by manufacturers / vendors and consumers. The service standards are typically set by pursuing efficiencies, not necessarily making sure that consumers have what they want, when and how they want it.

3.6. Outbound Transportation

Moving the correct quantity and type of merchandise to stores or direct to the consumer can create great economies, flexibility, and control. Inefficient transportation can be disastrous. Systems that do

not get the correct merchandise to the proper stores during a selling season or when an advertising campaign is scheduled (e.g., winter goods three weeks after the consumer starts shopping for winter clothing) face very poor sales. The effect is more than simply the store not selling a particular piece of merchandise. Each time the consumer does not find what he or she wants, the customer's chance of shopping at a competitor increases.

The diversity of merchandise and the number of stores create several important challenges for retailers. How do you transport merchandise to reach all the stores efficiently at the lowest cost and time? How do you fill the trucks to maximize space in the trucks? Differences in demand and geographic concerns make empty trucks very expensive.

Every day, merchandise moves into the city from a variety of vendors to a variety of stores. Yet for most stores, full truckloads have not been purchased. Third-party distributors that combine loads from different vendors to different merchants allow economies of scale to develop but nothing like the advantage of a large store that receives and buys full truckloads many times a week. The delivery expense to cost is a significant one for retailers. It cuts into the profit and makes prices for the smaller retailer less competitive.

Getting the goods from point A to point B is neither simple nor pedestrian. Tomorrow's business leaders will see this as part of the seamless experience leading to short lead times and reliable service at the lowest price. It has recently been estimated that the cost of transporting goods is 50% of the total supply chain costs. Significant improvements in the movement of goods have been advanced by improvements in software that aid in planning transportation, vehicle routing and scheduling, delivering tracking and execution, and managing the enterprise.

Cross-docking of merchandise occurs when the delivery of product to the distribution center is put directly into the trucks heading for the stores. For cross-docking to work well, suppliers and retailers must have fully integrated information systems. For example, Federal Express manages the complex task of getting all the component parts to Dell at the same time so that a particular Dell Computer order can be manufactured without Dell having to have inventories on hand.

3.7. Outsourcing

Many retailers make use of third-party logistics in the form of warehouse management, shipment consolidation, information systems, and fleet management. Outsourcing allows a retail management to focus on core competencies of purchasing, merchandising, and selling.

3.8. Storage

Consumers buy merchandise that is available—on the shelf—not merchandise in some backroom storage area. Storage costs money (which must be added to the price that consumers pay). Not every retailer is Wal-Mart, which claims to be able to restock products in any of its 2600+ stores within 24 hours. As a result, Wal-Mart stores can have minimal storage areas and maximal selling areas with shelves that always have the merchandise. Just-in-time, quick response, and vendor-managed inventory hold the promise that less merchandise will have to be stored at the local level because systems will dictate that manufacturers or central storage facilities will fill shelves with product as the product starts to decline. Most retailers must still carry inventory so that they may achieve a responsible level of service for the consumer. As a result, compared to Wal-Mart, they have fewer products to sell, more out-of-stock positions, greater consumer frustration, and greater cost structure because they have more nonproductive space used for storing inventory.

The Internet is increasing the pressure on retailers to have better in-stock positions. The only real sustainable competitive advantage that retailers have right now over the Internet is their ability to get product in consumers' hands immediately. If the consumer cannot find what he or she wants in the stores, and its takes just as long for the store to order the merchandise and get it to the customer, the customer might just take advantage of the Internet. Because information and pricing are more transparent on the Internet, if stores do not have the product, the competitive advantage goes to the Internet. This is assuming that the Internet has the same product available at a lower price. The consumer can use a shopping agent like My Simon (www.mysimon.com) to compare all the prices for a particular product on the Internet and choose the lowest price.

As this chapter was being written (December 1999), Toys "R" Us reported very significant problems in getting Internet orders delivered to consumers. Not only will this impact their bottom line in cancelled orders (all customers who were promised delivery that now could not be met were offered cancellation), but all affected customers received a certificate worth $100 on their next Toys "R" Us purchase. This will cost Toys "R" Us millions of dollars which would have gone directly toward their bottom line. More importantly, we cannot estimate the number of customers who will never go to a Toys "R" Us website again.

Internet retailers understand this, and independent or third-party businesses are offering almost immediate delivery in major metropolitan areas. If this is successful, Internet retailers will be removing one of the only barriers and will be competing head-on with store retailers. This suggests

large multibrand/manufacturer warehousing in central urban locations with technology and systems to support it.

Storage is also a major issue for Internet retailers. While Internet retailers have a competitive financial advantage because they do not have to support stores on their balance sheets, they still have to maintain extensive storage and distribution facilities. Their efficiency in building and maintaining and efficiently running these massive facilities will actually determine their success to a greater extent than any other single factor.

3.8.1. Inventory Management

The goal of managing inventory is to have what customers want in the right styles, colors, and prices, while holding costs down. The cost of maintaining inventory is from 25% to 40% of the value of the inventory. Too much inventory and you are not profitable. Not enough inventory and you miss sales and increase the likelihood that consumers will shop in other places. Money tied up in inventory that is not selling takes up money that could be profitably invested in inventory that would be selling. Because of inefficiencies in the supply chain, retailers often have more products in inventory than required by demand.

Vendor-managed inventory (VMI) means that the retailer shifts to the manufacturer the role of counting and replenishing dwindling stocks. Many vendors believe that this is simply an effort by retailers to reduce retailer costs by making the vendor pick up the tab for work the retailer used to do. VMI is most common in large mass merchandisers and in grocery stores. VMI helps reduce stock outs, a benefit to the vendor because when the item is out, consumers may try and switch to a competing brand.

3.8.2. Store Operations

Merchandise is not cost neutral when it arrives in the stores. The expense associated with unloading, unpacking, and storing the merchandise is considerable. Retailers have aggressively tried to minimize the amount of effort required once the merchandise enters the back room. Five years ago, it was common for central distribution facilities to receive the merchandise, unpack it, tag or bar code it, repack it, and ship to stores. Larger retailers have tried to shift many of these functions back up the supply chain to the manufacturer and demand that merchandise be priced, tagged, and packed for individual stores. However, not all suppliers are advanced enough to accomplish these simple tasks. For example, 20% of Saks' 12,000 suppliers are unable to accomplish these back room functions. In about 25% of these cases, the ability of Saks' to process products is hindered.

Retailers also have costs and problems of matching supply to demand across the chain. Adherence to a customer-satisfaction goal may require retailers to ship merchandise from store to store to meet different demands. This reshipping is quite expensive and inefficient. Systems and technologies that better predict what is needed, when, in what size and color, and in what quantity is essential for progress on this issue.

3.8.3 Customer Support Logistics

This refers to the support of customer service operations. Services that require logistical foundations include service parts management (parts shipment and inventories), service management (equipment, technology, scheduling involved in servicing and repairing products), and customer contact management (problem resolution, contact management, training). For example, a large Japanese consumer electronics company believed its products to be of superior quality. As a result, they saw no need to inventory parts in the United States. When product repairs were needed, they had to ship the required parts to the United States. Not only was this expensive, but consumer satisfaction was low with the repair process and the electronics manufacturer. The low satisfaction had an impact on repurchase of the product in that product category and other product categories carrying that brand name.

4. STRATEGIC OBJECTIVES FOR RETAIL SUPPLY CHAIN MANAGEMENT

4.1. Improved Forecasting Ability

Collaborative forecasting and replenishment is the term used to represent the joint partnership between retailers and vendors/manufacturers to exchange information and synchronize the demand and supply. With improved forecasting, the amount of material and inventory that vendors, manufacturers, and retailers have to have in hand is reduced. Most forecasting, if it is done (much more likely in larger retails), is done separately. It is only within the past five years that retailers have discovered the value or implemented any joint forecasting partnerships (e.g., Procter & Gamble and Wal-Mart. P&G maintains an office in Bentonville, Arkansas, where Wal-Mart world headquarters is located, to serve this important partnership).

Supply chain management advances rest firmly on the flow of information. Overwhelming paper flow, separate computer systems and databases, and nonnetworked computer systems are unacceptable in the supply chain era. Linking computers on a single platform of information with fast access to all information needed to make decisions fosters enterprise-wide solutions that make up supply chain management.

The success of the Procter & Gamble/Wal-Mart relationship has been looked to as the model for what will be happening in retailing over the next 10 years. It has also served as the model that P&G will be using with its business partners to grow and prosper. Since supply chain management procedures were implemented, market share for P&G went from 24.5% in 1992 to 28% in 1997, while net margin increased from 6.4% to 9.5% (Drayer 1999).

Typically it is the retailer that develops a forecast and hands it to the vendor/manufacturer. Trusting mutually beneficial relationships are not the operational reality between retailers and vendors/ manufacturers (see Figure 3). Even greater efficiency will be achieved when multiple retailers in a geographic region combine their information seamlessly with multiple vendors/manufacturers to allow the most efficient delivery and manufacturing of product. Why should Procter & Gamble plan and ship with Wal-Mart, then do it again with Target, with K-Mart, and with the hundreds of smaller retailers in the area, when if they did it together, the costs would be lower for all?

4.2. Faster and More Accurate Replenishment

Direct product replenishment offers to increase the efficiency and effectiveness of retail operations. According to a Coopers & Lybrand study (1996), direct replenishment improves retail operations by allowing:

- Integration of suppliers with mission and function of store
- More reliable operations
- Synchronized production with need
- Cross-docking and associated savings and efficiencies
- Continuous replenishment and fewer out-of-stock positions
- Automated store ordering and more attention and money available for more important areas of the business

Retailers would need fewer people to be experts in a product area. Fewer mistakes would be made. Markdowns (need to sell inventory that did not or would not sell) would be minimized making margin enhancement possible. Goods would reach the consumer faster. Less inventory storage would be needed. There would be lower distribution expenses since much of the inventory would be stored at the manufacturer until needed.

Since inventory is a retailer's number one asset, making that asset more productive feeds the bottom line directly. Continuous and time-minimal replenishment schemes are easier with basic everyday items that move through the store quickly. Grocery stores have widely implemented electronic data system techniques to maximize the efficient replenishment of fast-moving merchandise.
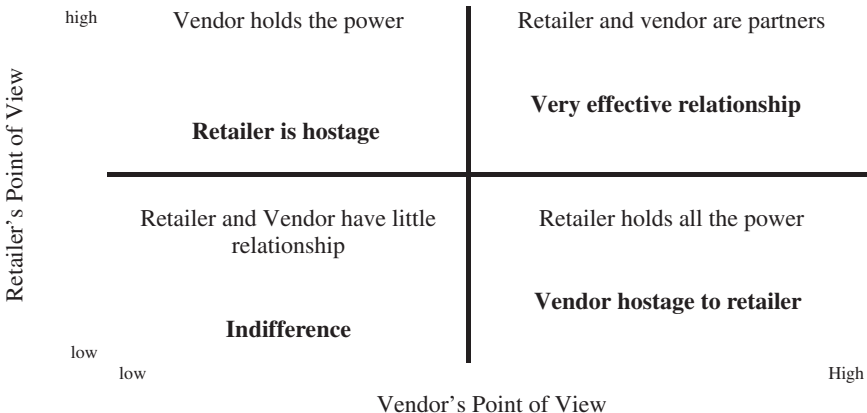

Figure 3 Retailer/Vendor Affairs in the Retail Supply Chain.

Other retailers are just beginning to learn how to use point-of-sale information to minimize quantities of merchandise stored (needed to buffer poor forecasting and slow replenishment). Ernst & Young estimates that savings in inventory management would give the economy a $35 billion boost.

4.3. Flexible Channel Capability

The emerging e-commerce pressures are forcing retailers to build supply chain flexibility. Getting merchandise to the consumer outside of the store chain while maintaining the stores (frequently called a clicks-and-mortar strategy) forces retailers to understand how to deliver items directly to the consumer as well as to the consumer from the stores. Federated Department Stores (parent company of such retailers as Macy's and Bloomingdales) realized the different nature of e-commerce and purchased one of the better mail-order fulfillment houses (Fingerhut) to build the expertise for their emerging e-commerce initiatives. Retailers who have the flexibility to provide multiple access points (stores, catalog, Internet) will be better positioned for success than solely store-based or Internet-based retailers. Petsmart will deliver Internet-ordered goods from their local stores. They have an Internet distribution system built into their already vast network of stores.

5. THE EMERGING PARADIGM FOR RETAIL SUPPLY CHAINS

Up to this point, retail supply chains have largely generated greater profit margins through driving out inefficiencies. For example, retailers have pushed the function of maintaining an inventory back onto the vendor or middleman. Vendors, in turn, have required lower prices and faster deliveries from their suppliers. This type of approach has been effective, but for many supply chains there is precious little fat still left to cut out of the system. To reach the next level of efficiency, productivity, and profitability, a new perspective on what retail competition means will have to be adopted.

5.1. Relationships/Alliances/Partnerships

Perhaps the factor that will have the greatest impact on supply chain management issues is not a technology or a system but a way of thinking. The gap between winning and losing retail organizations in the last decade was defined by their ability to manage the supply chain better than the competition: squeaking out margins and profits from cost savings and efficiencies in the supply chain. The winners in the 21st century will be those retailers who structure, organize, coordinate, and manage partnerships between manufacturers and stores to meet better, faster, and more closely the needs of the consumer. A survey of U.S. companies by Forrester Research shows that 50% of companies share inventory data with supply chain partners. Only 30% share demand histories and forecasts. It is this latter category that holds the greatest promise for all chain partners . . . and U.S. business has a long way to go.

The commoditization of products and services dictates that the real competition will come from organizations that will compete as configurations of partnerships. These partnerships allow greater probabilities of stores having the right item, at the right price, in the right size, in the right color, JUST before the customer wants it. Moreover, supply chain partnerships mean that retailers can spend less of their time and effort in accomplishing this portion of their operation, freeing time, energy, people, and financial resources for developing and maintaining customer relationships. According to Lewis (1995), these partnerships allow:

- Ongoing cost reductions
- Quality improvements
- Faster design cycle times
- Increased operating flexibility
- More value to the customer's customer
- More powerful competitive strategies

A partnership starts with a discussion based on "You are important to us and we are important to you. Now how can we do this better so we can both make more money." To be successful in this new paradigm will require skills that have not been well developed as yet.

5.2. Integrated Forecasting, Planning, and Execution

Multiple forecasts for the same line of business within the organization are common (if any planning is even done). The gap between what is planned and what actually happens represents lost profits and lost opportunities. The new paradigm for retail supply chain management begins with an accurate view of customer demand. That demand drives planning for inventory, production, and distribution within some understood error parameters. Consumers will never be completely predictable. At the same time, prediction is bounded by limitations in our statistical and modeling sciences. We can

predict only as well as our tools allow us. Computer advances will allow easier and affordable management of millions of data points so that demand can be measured. Effective demand management represents an untapped and significant opportunity for most if not all retailers. Effective demand modeling allows greater forecast accuracy, increases supply chain effectiveness, reduces costs, and improves service levels, and all reflect greater profit. The result—lower inventories, higher service levels, better product availability, reduced costs, satisfied customers, and more time available to respond to other areas of the organization.

5.3. Statistical Techniques

Understandable, usable, and affordable software to accommodate millions and millions of individual consumer purchases has only recently become available. But that is only part of the equation. It is still unusual to find company executives who understand the capability and use of these sophisticated software packages. Of equal importance is the need to have a uniform database representing the forecasting target. Typically, different data needed to accomplish accurate forecasting resides in isolated silos of databases that cannot talk to each other.

In addition to decisions regarding the supply chain, these tools would:

- Provide the CEO with an important strategic view of the business
- Provide opportunities for cost savings
- Aid in developing long-range strategic plans
- Assist in resource allocation
- Identify inadequate areas in existing management and operations

5.4. The Role of Senior Management

Logistic, warehouse, and other supply chain management efficiency can result from a piecemeal decision-making process. But true partnerships must flow from a strategic alignment with the mission and values of the organization. Wal-Mart's industry-leading supply chain operation did not result from chance but from Sam Walton's understanding of the business and a strategic view that saw that investments in state-of-the-art technology and systems will pay off handsomely in the future. For most companies, the appointment of a supply chain czar is needed to push supply chain management through the organization.

5.5. Information Technology

No advances in supply chain management can occur without a layer of middleware. Information and its collection, management, availability, and use serve as the foundation for all advances in supply chain management. Sustained success of retailers comes from an understanding of how information technology (IT) creates competitive advantage. Prepackaged enterprise-wide IT solutions are available, but they make it difficult to be different. Unique and strategic IT enterprise-wide solutions are difficult to integrate and implement.

The IT system should allow new and better customer–vendor relations, provide new insights into a company's consumers and markets, maximally exploit efficiencies in the supply chain, transform product development and delivery, increase the capability to make real-time decisions, increase planning ability, manage increasingly complex national and global markets, and eliminate traditional and costly processes.

6. RETAILER OPPORTUNITIES ON THE HORIZON

6.1. The Global Marketplace

The globalization of retailing presents a host of problems and opportunities for retailing. The ability of companies to meet cultural needs, transport goods and services across boundaries (sometimes oceans), while controlling costs and maintaining efficiencies is not clear . . . yet. Some companies may have already met this challenge. Dell Computers' direct-to-customer model is a global reality. Since a Dell computer is manufactured only when it is ordered, it does not matter to Dell if the computer is selected by a consumer sitting in Peoria, Illinois, or Kuala Lumpur, Malaysia. The computers are built and the appropriate shipping is arranged from the closest facility. Trained technicians answer technical and support questions over the phone and can be anywhere in the world (questions are also answered from a central website).

6.2. E-commerce: The Virtual Retailer

Fifty years ago, catalog shopping was deemed the beginning of the end of store retailing, in much the same way that e-commerce is proclaimed to spell the beginning of the end for store retailing

today. Offering products and services directly to the consumer who has money but little time is nothing new. The e-commerce alternative is simply another way for consumers to get what they want, when they want it. The e-commerce alternative is not a threat to the existence of retailing but is a challenge to supply chain management of the store-based retailer.

The promise of direct to consumer retailing is clear—fast, individualized, convenient delivery of what the customer wants. The reality is less clear. Few if any direct to consumer e-commerce initiatives have proven successful . . . yet. The reason is simple. The Internet is an easy way to sell but a lousy way to distribute. Everything purchased on the Internet has a price to which a shipping charge must be added as well as the time to deliver it. The Internet's ability to provide immediate purchase gratification is limited.

It is interesting to note when we review e-commerce discussions that it is as if home delivery were a new concept discovered by these Internet pioneers. In fact, home delivery has been a burgeoning trend in many industries—furniture, appliances, video, Chinese food, pizza, and now the grocery business. A study by Anderson Consulting predicted that delivery can capture 12% of the U.S. grocery business, about $85 billion. But even in this area of e-commerce there is plenty of need for, and money for, the store-based retailer. And it is still not clear whether grocery e-retailers will be able to make a profit in the near future. Peapod is the most successful example of this business model in groceries. The company started in 1989 in a suburb of Chicago, went online in 1990, and now has over 40,000 products available for delivery in eight metropolitan areas. The company delivers what is ordered at a prearranged time. Revenues for 1999 were estimated to be $70 million. However, Peapod has yet to show a profit.

6.2.1. Scope of E-commerce

Toyota is considering a direct electronic channel where customers submit their specifications, as well as financing information, via the Internet (or 800 number). Toyota would respond within the first 24 hours after researching their supply chain and retail distribution with the closest matches and estimated delivery time.

Cisco, Autodesk, Intel, Dell, and Gateway all allow their customers to access inventory and order information from the Internet. They can place and track orders without any human intervention (hence lower costs).

Anderson Windows has supplied point-of-sale kiosks to its retailers. Consumer and retailers design the windows, get order quotes, and place orders at the same time. The system shows customers what they have designed and links the retailers to the supply chain and distributors.

Levi's stores have a minimal inventory, but with a computer model, they measure the consumer at the key design points of their personal fit jeans. The measurements are transmitted to the production facility and a personal pair of jeans is mailed to the consumer within nine days. Consumers are willing to pay slightly more for the perfect pair of jeans. The customer simply cannot buy jeans that fit as well at any other retailer. The customer can now call Levi's from any place in the world and a custom-fit pair of jeans will be shipped.

Grainger is not the business you might think of when you think of an e-business. Since 1927, Grainger has sold industrial supplies (motors, cleaners, lightbulbs) through a 7-lb thick read catalog and 500 stores. It has made a spectacular transition to the Web. Its advertising says it all: "The Red Book [its catalog] has .com of age." They further say, "Our award winning web site (www.grainger.com) carries over 560,000 products online, 24 hours a day, 7 days a week. Our powerful search engine finds exactly what you want. Fast. And you can take advantage of your company's specific pricing." In 1998, its Internet sales were $13.5 million. In 1999, they were $100 million. Only Cisco, Dell, Amazon, and IBM have a larger sales volume. Grainger builds online customized catalogs for the many businesses that negotiate selling prices. When the customer write his or her own order, there are fewer errors made than with placing the order by calling the 800 number. The site tells customers whether the product is in stock at a local store that will deliver it the same day (or overnight) without the overnight shipping fee. The cost of selling a product is a fraction of what the costs are in other areas of Grainger's business, allowing greater discounts and greater profits. To encourage sales, account managers encourage their accounts to order on the Internet, and the salespeople will still get commission on their accounts, even when products are ordered from the website.

One of the biggest problems that retailers face in Internet retailing is the ability of manufacturers to go directly to the consumer. Why pay for a GE microwave from an appliance store on the Web when you can buy it from GEs website (probably for less money). What is particularly interesting about Grainger is that by selling a wide variety of manufactured products, it gives the customer a side-by-side comparison of all available brands when the customer is searching. The customer can buy all the brands he or she wants conveniently and easily instead of having to go to each manufacturer's website and buy separately.

6.2.2. *The Internet Mindset*

Yes, the Internet will spur many direct-to-consumer businesses. Yes, the Internet will allow existing retailers to expand their markets and provide a new channel for their existing companies. And yes, the Internet will allow retailers to develop efficiencies of time and money with their vendors and manufacturers. But more importantly, the Internet will force retail leaders to develop an Internet frame of mind that will allow challenges to the way business is being done at all levels in all ways. The advances that will come from this change of mindset cannot be predicted but can be expected.

6.3. One to One Marketing

A company's success at individualized product offerings means greater market penetration, greater market share, greater share of the consumer's wallet, and improved satisfaction as customers get exactly what they want instead of settling for what the retailer has. Mass customization/one to one marketing is the real final frontier for retailers. Responsive manufacturing, IT, and efficient replenishment systems allow Levi's to offer the consumer a pair of jeans made to his or her exact specifications.

Here we have a vision of the ultimate supply chain management. Customers have exactly what they want. A long-term relationship is established so that the customer has no reason to desert to a competitor. Because a customer is getting a unique product made just for him or her, a competitor cannot steal that customer simply by offering price inducement. The jeans are not manufactured until they are needed, and a third party delivers the product. The very issues that supply chain management has been concerned with are reduced and eliminated by one to one marketing.

6.4. The Product Comes Back: Reverse Logistics

If the supply chain is relatively invisible, the reverse supply chain (getting back to the manufacturer products that need repair or replacement) is practically ethereal. However, the costs of getting products back through these reverse channels makes process and management issues extremely important to retailers. According to the National Retail Federation, the average return rate from products bought in specialty stores is 10%, and in department stores, 12%. Catalogs have a return rate three times higher. Early indications are that Internet purchases are twice that. Reverse logistics is maximizing the value from returned products and materials.

Frequently, the products/material put into the reverse supply chain can be refurbished or remanufactured. Xerox reports that recovering and remanufacturing saves over $200 million annually, which can then be passed along to customers in lower prices or shareholders in higher earnings and profits. A product returned for repair can either be replaced (and the product broken down and its parts used in other manufacturing) or repaired. Repaired or returned products that cannot be sold as new can be resold, frequently as refurbished, using parts from other returned products. Unfortunately, retailers and manufacturers have made poor use of the strategic information available in returned products to change and improve design. Mostly the repairs are made or the broken product sits in a warehouse. The information about your product and the company sits useless.

A growing area of concern is how to conscientiously dispose of products or their components. Black & Decker avoided significant landfill costs and made money by selling recyclable commodities. When there are no alternatives except disposal, the product or material needs to be appropriately scrapped. In an era of environmental concern (which will continue to grow and drive marketplace decisions), companies should take proactive action to develop environmentally sound landfill or incineration programs. Not only will this allow favorable consumer reactions, but it may forestall government regulation and control.

7. THE FUTURE FOR SUPPLY CHAIN MANAGEMENT

The logic of supply chain management is compelling. Its benefits are well understood. The trend toward supply chain management is clear. Companies are excelling in parts of the equation.

As retailing moves into the 21st century, more retailers will be adopting the following lessons from supply chain management as we see it today:

- Advances in and use of IT to drive supply chain decisions. Large integrated stock-replenishment systems will control the storage and movement of large numbers of different goods into the stores.
- A restructuring of existing distribution facilities and strategic placement and development of new distribution facilities to reduce inventory and move the inventory more efficiently.
- Greater and more effective adoption of quick response. More frequent delivery of less. Greater use of cross-docking so that merchandise hits the docks of the distribution centers and is immediately loaded into destination trucks. EDI and POS electronics will track what is selling and transmit directly to distribution center to plan shipment.

- Greater diffusion of efficient consumer response, defining a process of close collaboration of retailer and manufacturer / supplier to coordinate activities to achieve maximal efficiency and better service levels for the ultimate customer.

7.1.   Conclusions

It is easy to see how retailing will need to improve the front-end selling and merchandising function through stores, catalogs, television, and the Internet. What is not so clear to an outsider is that the real difference to retail success and bottom-line earnings and profits will not be in the store or on the Internet but in the middle. The invisible chain between manufacturer and consumer will be where the most significant competitive advantages will take place.

According to Gattorna (1998), the major improvements in the supply chain, over the next 10 years will include:

- Whole industries will rethink their sales and marketing channels, and these new channels to customers will require newly reengineered processes and technologies, in turn demanding significant changes at all levels.
- Leading companies will recognize the close relationship between customer relationship management and the supply chain; taken together, these two will open up new avenues for shaping trading terms from both supplier and reseller / customer perspectives.
- A much more aggressive search for additional organization design options for supply chains in particular industries will eliminate polarized thinking in terms of insourcing or outsourcing, opening the way to new solutions and combinations along this continuum.
- The best supply chains will have fully integrated enterprise systems and indeed will go beyond transactional information and decision-support systems to knowledge management. In turn, this will affect organization design and lead to improved coordination (rather than "control").
- Companies looking to embrace supply chain regimes at the global level will require a much better understanding of country cultures as a necessary ingredient for success.
- Strategic sourcing approaches at the supply end, and mass customization approaches at the consumption end, are likely to be fertile areas for relatively quick large-scale benefits.
- Reverse logistics will loom large on the agenda, with issues such as extending product usage life cycles, product-recovery processes, and bidirectional logistics channels coming to the fore in the search for new competitive dimensions.
- Organizations other than product companies will begin to recognize the huge untapped potential that the application of logistics and supply chain principles to their businesses will release, such as telecommunications, utilities, health care, education, entertainment, and financial services.

On the one hand, supply chain management is not hard. Any business can get anything to stores. Any store or e-retailer can get merchandise to consumers. What is hard is achieving an efficiency and effectiveness that maximizes a retailer's competitive advantage in the marketplace. Until we develop the *Star Trek* process of transportation, where we can dematerialize and materialize objects at command (now that's a one to one deliver system of the future), supply chain issues will be a leading-edge practice for the company and the driver for corporate strategy. Collaborative planning forecasting replenishing (CPFR) will be the strategy of the next decade in retailing. The bottom line is, of course, profits and shareholder value (Anderson and Lee 1999; Quinn 1999). Incremental improvements in the supply chain have a greater impact on profits than incremental improvements in other areas. Technology and the Web will be driving the most innovative changes and applications in retail supply chain management in the next 10 years, and this will drive retail performance and excellence.

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