# Electronic Technology: New Opportunities and New Demands for Retail Food Stores

## Jean Kinsey

*The "currency" of the next millennium is information.*
*Competitive advantage hinges on harnessing it and figuring out how to use it.* (Rapp, 1998)

If information is the currency, then electronic technology—the hardware and software that allows high-speed information transfer between firms or divisions of the same firm—is the banking system. It stores, creates, transfers, and destroys the currency called information. The rapid adoption, even infusion, of electronic technology allows organizations to consolidate management functions. Decision-makers who are geographically dispersed can increase their span of control and coordinate their activities in real time. From a single keyboard, prices can be set for a variety of retail stores and/or individual products that meet the sales objectives of individual stores and of the overall company. Everything from floor plans, to work schedules, to delivery routes can be supported from a central computer.

For the most part, the biggest advantage of this type of consolidation is the ability to save costs—labor costs, redundant capacity costs, excess inventory costs. By coordinating the ordering of supplies and services, firms acquire bargaining power in purchase negotiations. Buyers can achieve lower purchase prices, higher-quality products, and better service from their vendors. This ability and strategy has led to the belief that power in the retail supply chain has shifted from manufacturers and national brands to retailers.

Electronic and information technology not only allows consolidation, it demands consolidation. In order to take advantage of the power of information technologies and to realize the economies of size and scope that become available once one has invested in the appropriate hardware, software, and human capital, horizontal and vertical integrations are inevitable. Electronic technology demands bigger institutions, better trained personnel, and processes that are better organized, more precise in their language, and more consistent in their communications.

Green, Lanini, and Schaller (1996) point out that technical innovations have always been accompanied by organizational innovations of equal, if not greater, importance. Across the food industry, innovations have historically centered on industrial procedures and operations involving product development and design, presentation, packaging, and handling. Quality control has been hit-and-miss though HACCP programs have been developed at several levels of the supply chain. Logistics, inventory control, and strategic management practices received little attention until the advent of Wal-Mart. By the late 1980s, Wal-Mart had demonstrated to the retail world just how efficiently a business could operate if attention is given to the information provided by sales data and then used to coordinate supplies and negotiate with suppliers. Wal-Mart continues to demonstrate the power of well-organized information systems. By now, organizational innovations in the rest of the food retail world are rampant. These organizational changes, particularly the horizontal mergers and the coordinated and integrated distribution chains, are indeed of greater magnitude and importance than the adoption of information technology would have predicted. Still, the industry appears to lag behind other retail leaders.

## New Opportunities

The opportunities presented to and utilized by retail food establishments and their suppliers started with the advent of the bar code. The UPC code, developed in 1972, was first put to use with scanning equipment in 1974 at a Marsh's Supermarket in Troy, Ohio. When stores began to scan groceries and other merchandise, they also had to install some type of computerized equipment that matched the bar code to a price.

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Prices could be entered, changed, and stored on a computer, and shelf tags could be printed for consumers' information. This negated the need to mark prices on individual items. Hailed as a major innovation at the time, it saved labor costs and helped lower food prices. Consumers protested the lack of item pricing but this protest faded in all but a few locations when detailed sales receipts showed consumers exactly what they were purchasing at what price.

The same computers used to change prices and scan purchases also gather incredible amounts of sales data. Referring to frequent shopper data, Zimmerman (1999) wrote that sifting through all the data gathered at the point of sale is like trying to take a sip out of a fire hose. No wonder this data was initially ignored by retail grocers. Meanwhile, however, other retail sectors—such as clothing—began to utilize point-of-sale data to develop a "quick response" system. With this system, merchandise that flowed to stores was synchronized with its sale by using scanner-generated sales data for continuous replenishment. Tracking customers' buying behavior helped stores target their advertising and promotions. Wal-Mart, for example, has two years of sales data for each of its stores. Internet sellers can track the "click-stream" of buyers in order to find out tendencies and attributes of shoppers.

Initially, scanner data was touted as being useful for inventory control. Store managers could look at the data and know how low they were on ketchup and when a new order should be placed. But it took years before many retail food stores used this data to reorder supplies. The eyeball method, annual history of seasonal sales, and experience were considered to be more reliable for keeping the shelves stocked than any forecasting models that might emanate from computer data.

Early on, analysis of the data was relegated to third-party analysts, such as *Nielson* or *IRI*. They would analyze the data for manufacturers to help them decide which products were the best-sellers and when the sales of various products waxed and waned. Food manufacturers' marketing and promotion programs were built with this data. Slow-moving items might even be dropped. But in that system, information still reached manufacturers with a considerable time lag.

*With the dawn of the computer age,*
*we are witnessing the birth of an industry.*
*It is as fundamental as, for example,*
*the printing press, and the changes*
*it facilitates are way beyond any*
*originally envisioned.* (Pittman, 1999)

By the early 1990s, Wal-Mart and some of their suppliers had figured it out. They designed an information logistics system to harness the power of this data. With compatible computer systems and the willingness to share data with suppliers, the information about what was moving over a scanner in a particular store could be transmitted directly to suppliers (a warehouse/distribution center) and/or a manufacturer. Suppliers could adjust their supplies (or production lines) according to consumer demand. The food industries version of just-in-time delivery, already popular in the manufacturing sector, was born. By tracking the movement of products at the retail store and making this information available, in real time, to both the retailer and their suppliers simultaneously, a continuous loop was created whereby information about sales flowed in one direction and product flowed out in the other, just in time to match the retail demand. To grasp the magnitude of this operation just at Wal-Mart, it is useful to know that its information technology system is second only to that of the Pentagon. It tracks all products purchased over the previous 65 weeks. The information is held in a product by store matrix, which results in a data warehouse approaching 101 terabytes. Wal-Mart transmits 8.4 million updates a minute to its distribution centers, and it has electron data interchange (EDI) with 17,700, or 20 percent, of its U.S. vendors. About 200 key vendors have direct access to the data warehouse. They use it to replenish the stock in the distribution centers and to plan store layouts and product placement and promotions (IGD, 1999).

**Efficient Consumer Response**

The concept of sharing information about sales with vendors and developing a continuous and coordinated flow of product was introduced to the rest of the retail food industry and institutionalized by a coalition of trade associations (that is, Food Marketing Institute, Grocery Manufacturers of America) and food

manufacturers and suppliers (that is, Proctor and Gamble and a few big grocery chains like Kroger) under the name of efficient consumer response (ECR) in 1992. It had little to do with the consumer except that it tracked consumer purchases and tried to tailor the delivery of goods to match the volume being sold. The goal of ECR was to have each food store/company behave like Wal-Mart; to implement EDI to order goods and slim down the offerings in each category in order to streamline delivery and costs associated therewith. This led to "category management," which has mainly limited success since it conflicts with a goal of providing variety and service to consumers. EDI requires compatible computer systems, is expensive to set up and operate, and most importantly, demands a willingness to share information. Having computers at all stores that could communicate with the computers of all suppliers was asking a lot of an industry made up of 130,000 disparate stores, all operating on thin margins and accustomed to treating their suppliers as adversaries. Problems of technical incompatability and a cultural resistance to sharing store level data with suppliers resulted in a slow adoption of the ECR agenda, though many of its goals have been slowly adopted or merged into newer programs.

A newer version of ECR bypasses the technical problem of compatible computer systems by using the Internet to transmit information. It still involves mutual commitment and trust by partners in the supply chain. Again, Wal-Mart launched this new system. In 1996, it joined Warner Lambert in testing a "Collaborative Planning, Forecasting, and Replenishment" (CPFR) system and studied the effects on the sale of Listerine. This system involves the manufacturer and the retailer each forecasting sales for some future period of time, sharing their forecasts, revising them if necessary, and then committing to delivering and receiving merchandise on a prearranged schedule. In this system, scanner data is transmitted in real time to suppliers via an Internet interface, and the supplier is responsible for keeping the shelves stocked. "The whole intent of CPFR is to establish trust between retailers and manufacturers" (Robinson, 1999). Each party faces less risk of excess inventory or stock-out in this system, and sales

tend to increase (Margulis, 1999). This should help the business-to-business E-commerce take off and flourish in the rest of the food industry. In 1998, only 9 percent of retailers and 26 percent of wholesalers were trying CPFR programs. In 1999, 26 percent of retailers and 43.5 percent of wholesalers were planning to try it (Blair, 1999). By now, Wal-Mart is using CPFR with more than 7,000 (8 percent) of its suppliers (IGD, 1999).

The industry is again working with the Uniform Product Code Council to develop the Internet protocol and standards so that virtually any store and supplier can exchange information (Amato-McCoy, 1999). Those who are developing software to allow CPRF processes agree on the following trends in supply chain technology: (1) integration of the optimization process to increase profits; (2) collaboration with trading partners to enhance efficiencies, to reduce inventories, and to better understand the consumer; (3) real-time data communication; (4) shift from enterprise integration to advanced planning and scheduling; and (5) co-management of inventories (*Food Logistics*, 1999). These trends will transform the dysfunctional supply chain from a supplier-push system to a demand-driven system.

The advent and adoption of CPFR is largely responsible for some saying that ECR is dead, but the momentum and far-reaching goals and activities set in motion by ECR have led to much reorganization and coordination in the industry. It encouraged, facilitated, allowed, and even demanded that trading partners talk with each other and explore the usefulness of the information held by retailers and needed by suppliers.

Data collected from 100 stores in the *Supermarket Panel Report to the Board of Advisors*, The Retail Food Industry Center, University of Minnesota (RFI, 1999) shows that those stores that had implemented more of the data management and coordination activities associated with ECR are indeed larger and have greater productivity and more sales. With one year of data, one cannot say which came first, the ECR practices or a well-organized and progressive organization, but they are highly correlated. As reflected in Table 1, those who had adopted a high number of ECR practices were more productive by every measure.

**Table 1. The Adoption of ECR Practices by Retail Stores and Corresponding Productivity.**

| ECR Readiness | Level of Adoption | Weekly Sales/Sq. Ft. | Annual Sales Growth | Inventory Turns/Year | Sales per Labor Hour |
|---|---|---|---|---|---|
| | High | $6.88 | 11.9% | 20.0 | $98 |
| | Middle | $6.15 | 2.6% | 18.6 | $87 |
| | Low | $5.27 | 2.7% | 14.4 | $89 |
| | Relationship | Positive | Positive | Positive | Positive |

Source: RFI (1999).

The ECR index, developed by researchers at The Retail Food Industry Center, has two components (RFI, 1999). These components reflect the adoption of technology and the development of relationships with suppliers, two major problems in the implementation of the ECR index. The results shown in Table 2 reveal that the single-store retailers (SSR—independents) adopted the fewest technological practices and the self-distributing retailers (SDR) adopted the most. These stores were only slightly ahead of the multi-store non-self distributing (MSR) chains in the building of relationships. The results reinforce the point that the use of information technology allows and demands larger organizations.

**Table 2. Percent of ECR-Related Management Practices Adopted by Type of Store: Single-Store Retailer, Multi-Store Retailer, Self-Distributing Retailer.**

| | SSR | MSR | SDR |
|---|---|---|---|
| ECR Index Score | 32 | 56 | 63 |
| Technology Component | 37 | 51 | 63 |
| Relationship Component | 26 | 60 | 63 |

Source: RFI (1999).

**Scan-Based Trading**

Finding ways to streamline the supply chain and to reduce inventory in the system has led to experiments in "scan-based trading." Participants include many Direct-Store-Delivery (DSD) manufacturers and many of the larger retailers (Weinstein, 1999). Under this system, the store does not pay for its inventory until after it is sold—that is, until after it is scanned. The manufacturer learns what is moving off the shelf in real time and replenishes it, often stocking the shelves themselves. This step saves labor costs to the retailer and helps to alleviate stock-outs. The store receives a bill for merchandise in its store that is due in 30 days, but the product moves out in 8 or 10 days. The store can use the revenue from the sale for the rest of the 30-day period. In effect, the manufacturer lends the store an interest-free loan. The store does not take a risk on buying inventory that will not sell or might sell slowly. It improves cash flow and reduces the retailer's need for capital, improving the return on assets. It saves time when product is delivered because it does not have to be checked in at the back door, and it can, therefore, be delivered almost any time of the day or night. It does have some demands, however. It depends on mutual trust and 100 percent accurate scanning. Since the manufacturer owns the product until it is sold out of the store, s/he is not keen on losing any of it due to sloppy scanning.

Most of the products being sold in a scan-based trading system are delivered directly (DSD) to retailers by manufacturers. Applying "activity-based costing" (ABC) to store deliveries reveals that it is less expensive for stores to receive products through DSD than from wholesalers, especially if the DSD deliverers were using SBT (Wellman, 1999). In 1998, 39 percent of retailers and 9 percent of wholesalers were involved in SBT tests; by 1999, 59 percent of retailers and 16 percent of wholesalers reported plans to test an SBT system (Blair, 1999). DSD products tend to be beverages and sweet or salty snacks. Sales increase up to 12 percent, primarily because the shelves are kept full by the manufacturers (Wellman, 1999). Also, in-store promotions of these products seem to induce a permanent increase in their sales. Wellman (1999) calls this "consumption elasticity," which can now be known and tracked due to direct sharing of sales information between retailer to supplier.

## Scanning

Scanning technology itself is evolving in ways that could save labor costs in a store and time costs to consumers. Whole basket scanning is experimental. It will require new and upgraded bar-code technology. We are creating systems that make the old bar codes obsolete, even before they have been perfected for all food products. For example, they are still being designed for variable weight products. For whole-cart scanning, a bar code must be easy to place on any and every package and easy to read through any package, at any angle, and with 100 percent accuracy.

Self-scanning today, at the regular check-out counters, is mostly a way to pass store labor off on consumers. Corbin (1999) reports that it is not actually any faster but some customers think it is faster because they have more control over the process. Those stores that have installed it have not experienced overwhelmingly favorable response. On the other hand, self-scanning by consumers as they put product into a shopping cart would save time and labor, but it demands more sophisticated equipment. It is also in the experimental phase. All of these new scanning methods will require the adoption of computer and radio-wave technology. They will potentially save labor costs and reduce consumer shopping time. Since these are two very high priorities for both retailers and consumers, useful adoptions will surely be found.

## New Demands

The full use of information technology demands larger networks of business partners, partners that are willing to share information to their mutual benefit. This requires a culture change in most industries, certainly in the food industry. Rapp (1999) points out that successful business and information strategies have rarely led to a change in corporate culture. Rather, they have been used to codify and institutionalize existing cultures, core competencies, and organizational structures. And these strategies and cultures have been designed to use technology to improve products or service, or delivery. Many have tried to used proprietary software in vertical organization to control competitive advantage. This may be what we are witnessing in the behavior of the large wholesalers who are incorporating more retail operations into their companies and expanding

their span of control and their assured customer base. These wholesalers are beginning to look a lot like self-distributing chains. Also, large self-distributing chains, using the power of computer information, are doing their job better. They are merging, becoming larger, and beginning to behave more like the acknowledged retail leader—Wal-Mart.

On the other hand, the push by retail leaders and the Uniform Code Council to develop a low-cost Internet system, which all can use to connect with their trading partners, represents a serious attempt to change the culture of the industry. Only if the new system is convenient, secure, and cheap will stores give up their old practices, such as buying inventory on a forward contract, keeping their data secret, and making ordering decisions by the eyeball method.

Having, and even using, information technology alone does not correspond with improved performance. It must be integrated with human motivations and organizations. Customers impose limits on the system's complexity. They are unwilling to reveal some data for customer loyalty programs, and they are unwilling to substitute their labor for that of store personnel. And, employees' ability to understand and manage data is limited, requiring intensive and continual training.

The use of information technology requires accuracy and precision that many do not have. In the computer, numbers add up the same way every time. Careless rounding errors or guesstimates by those who enter data are multiplied in a computer, and in the end, one can get very misleading information. Computers are unforgiving, and they cannot correct human errors or give out information that is not requested. In a way, the plethora of data sitting in retailers' computer data banks is like hard, dark diamonds buried in a large mountain. At first glance, they are ugly, hard to extract, and the value of the raw product is uncertain. Consequently, much of it has been ignored, thrown away or examined by scratching on the surface. So far, only a few have invested in profitable mining operations, but when they do, unlimited opportunities spring forth.

And when these diamonds are mined and put to their highest and best uses, we will observe some paradoxes. One paradox is that there will be more vertical coordination in the food system. Decisions about what is stocked and sold and what prices are charged will be both more cen-

tralized and subject to negotiation. Business practices and processes will be more homogeneous and rigid day-to-day but will evolve faster over time. At the same time, consumer choice will increase, with firms using their knowledge about consumer segments to tailor products and services to consumer niches. The market will be even more driven by consumer preferences. Will this lead to fewer or more competitive firms, or higher or lower food prices? It may be difficult to even answer these questions in the future. For example, the estimation of consumer demand equations could become very difficult if every consumer faces a different (unknown) price for heterogeneous products that they have custom-ordered.

In thinking about the opportunities and demands of information technology in the food industry another quote comes to mind: *"Where is the wisdom we lost in knowledge? Where is the knowledge we lost in information?"* (Eliot, 1934). To paraphrase in this context, I would say: "Where is the information in the data? Where is the knowledge in the information? Where is the wisdom in the knowledge?" The food industry and its analysts are working on the answer in an attempt to better serve consumers and to stay profitable at the same time.

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