

## A Study of Supermarket Industry and Integral Role of Enhanced Logistics Systems

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### Abstract

The study analyzes and reports commonalities and differences between supermarket industry in developed economies of North America and European Union and also the emerging Asian economy of India. Multi-economy market considerations enable generalized outcomes from industry analysis. The results of analysis show that the supermarket industry is customizing operating strategies. Efficient Consumer Response (ECR) standards are becoming a common method used to increase the supermarket supply chain efficiencies that are driving logistics trends in the industry. The trends include expanded service requirements, mass customization, customer loyalty and private labeling, delivery options and increased challenges in diverse markets. Reverse logistics, electronic point of sale data collection and management of supply chain by third (3PL) and fourth party logistics (4PL) providers are also becoming increasingly important for the supermarket industry. Advancements in transportation and storage technologies, including breakthrough technologies, are increasingly used to significantly enhance efficiencies and effectiveness of supermarket operation.

### Keywords

Supermarket Industry; Supermarket Logistics; Efficient Consumer Response (ECR).

### 1. Introduction

Intense competition and market saturation are forcing supermarkets to access new revenue streams. Supermarkets are expanding their array of products through mass customization, developing private label lines, embracing Internet and home delivery services, and increasing focus on customer loyalty programs. (Agnese, 2003; Blisard, Lin, Cromartie and Ballenger, 2002) All of these trends create new challenges for logistics systems operations. Despite the critical need for improvements in these systems, the supermarket industry has a long way to go before achieving the efficiencies enjoyed by other industries. Increased use of technology in all areas of logistics will be key to growth and improvement of this industry.

The exploratory study tests following three research hypotheses. It does so by identifying commonalities and differences in the supermarket industry in two contrasting developed economies, North America and European Union, along with emerging Asian economy of India. This multi-economy market perspective provides generalized outcomes when analyzing the industry.

H1. Diverse markets in supermarket industry create a need to customize operating strategies.

H2. To respond to market and operational challenges, supermarket chains around the globe are implementing Efficient Consumer Response (ECR) standards to increase efficiency and reduce costs throughout the supermarket supply chain.

H3. ECR implementation is becoming central to shaping logistics trends in the supermarket industry.

The study begins with an overview of the state of supermarket industry followed by exploring major industry trends. Trends include: expanded service requirements; mass customization; customer loyalty and private labeling; delivery options and challenges faced by diverse markets. This analysis is followed by an overview of ECR as it applies to logistics and the necessary supporting logistics system structure. Reverse logistics and electronic point of sale data collection and management of

supply chain by third and fourth party logistics providers are also factored in the supermarket industry analysis. Finally, the study provides analysis on the logistics challenges and opportunities for supermarkets in the areas of transportation and storage technologies and the potential to exploit breakthrough technologies. Various hypotheses and research questions proposed are also addressed when closely scrutinizing supermarket industry in different economies chosen for the study.

## 2. State of Industry

There are a number of factors, external and internal, that impact the supermarket industry. External factors include decreased population growth in established markets; trends in gross domestic product (GDP), inflation, and shifts in demographics. Internal factors impacting the industry include market saturation, limited market growth and competition.

In recent years, the customer base in much of the world has been declining or stabilizing and market demographics have shifted considerably. (Agnese, 2003) As illustrated in Figure 1(a), the rate of population growth has decreased across the board over the past thirty years. Today's woman bears, on average, less than three children down from five in the 60's. [World Bank, 2003] This trend is expected to continue until at least 2010. [World Bank, 2003]

Not only is the population growing more slowly, it is also changing. Many world citizens today are wealthier, older, more educated and more ethnically diverse. Changing demographics affect tastes and expectations, which in turn affect per capita food spending. According to Standard & Poor's Industry analysis, for example, older more educated consumers demand healthier food choices like fruits, vegetables and fish. In addition, as income increases consumers expect improved quality and convenience. Their higher incomes also allow them to eat out more often making restaurants viable competitors for today's grocery retailers.

With supermarkets on every corner and the prevalence of urbanization, the supermarket industry is well saturated. Growth opportunities, which traditionally came from opening new stores, are now found mainly in same store growth, complimentary markets and acquisitions. Saturation has given rise to intense competition and required many grocers to address new types of competitive threats (restaurants, home shopping delivery, etc) and rethink their traditional business model. (Stadler, 2002).

## 3. Industry Trends

Market saturation, extreme competition and shifts in demographics teamed with the recent economic slump restrict players in the supermarket industry to limited external market growth. As a result, supermarket retailers are forced to expand the array of services and products, increase loyalty of profitable customers, generate profits through private labeling, reach customer through new delivery methods like Internet shopping and home delivery and varied challenges of diverse markets.

### 3.1 Expanded Service Requirements

Increasing services has resulted in the proliferation of "combo" stores and hypermarkets that provide consumers with a one-stop shopping experience. In an effort to become increasingly more valuable to time-poor consumers, supermarkets now offer multiple services like pharmacies, photo processing, bill payment and banking options (Jones, 2001). In the Dutch Food Industry there is trend towards logistics acceleration and increasing time-sensitivity (Muilerman et al., 2005). In Poland, supermarkets often offer ski equipment and Thai supermarkets frequently stock electronics. Big ticket items are becoming more critical to profitability worldwide (Duff, 2003). In all cases, the objective is the same, namely, create organic growth. It is estimated that when a supermarket offers pharmaceutical services and beauty-aid products, overall sales benefit by 15-20% due to increases in store traffic. Not only do these combination stores enhance the consumer experience, they also help the supermarkets' bottom lines by providing high traffic, high margin products. The average gross margin on specialty items, like over-the-counter medications, is 30-50% while standard off-the-shelf staples generate only 15-20% margin. (Agnese, 2003).

### 3.2 Mass Customization

Not only are supermarkets being forced to expand the types of products they offer, they also have to cater to varied consumer tastes within categories. The increased demand for ethnic, natural and ready-to-eat lines is expanding quickly. A recent study by Williard Bishop Consulting found that in the year 2000, U.S. sales of ethnic foods generated \$50 billion in revenue. This number is expected to increase to \$75 billion by 2008. The Organic Trade Association reports that sales of organic, natural and health foods grew 20-24% annually in the 1990's. They anticipate this trend to continue with anticipated sales of \$13 billion in 2003. [Agnese, 2003] The benefits to the retailer are twofold, not only do specialty items and services improve consumer satisfaction, they are also expected to grow significantly in contrast to the more conventional grocery items which are experiencing low, single digit growth.

### 3.3 Customer Loyalty and Private Labeling

As in any retail environment, customer loyalty is paramount. Customer needs must replace operational challenges (Retail Week, 2003). Very sophisticated loyalty programs are rapidly replacing dependence on newspaper coupon inserts to entice consumers into the store. Supermarket News reported that 64% of U.S. retailers operate a loyalty program and 74% of U.S. households participated in such a program in 2000. For the retailers who offer loyalty programs, loyal consumers generated 79% of their store sales. [Agnese, 2003] Today's frequent shopper programs use bar-coded cards to track consumer purchases, offer discounted prices and customize promotions based on past use. (Corsten & Kumar, 2003).

Private label programs also promote consumer loyalty and create brand recognition. In the past, generic products were viewed as inferior to the nationally recognized brands. This stereotype is dwindling. In fact, 33% of respondents in a recent Gallup Poll stated they were "more likely" to purchase a store brand today than they had been one year ago. [Agnese, 2003]. Standard & Poor's estimates that sales of private-label products will grow to approximately 24% of total industry sales by 2006. The trend towards private labeling is not just a U.S. phenomenon. Tesco, a significant U.K. retailer, has developed their private label program by introducing "Finest" and "Value" products. The Tesco "Finest" brand is worth £400 million and represents 1.6% of their total sales (www.tesco.com). The increase in consumer acceptance of private label brands is good news for retailers. These brands generally cost 20-40% less than national brands, but can generate as much as 13% higher margins with their store brands versus national brands. [Standard and Poor's, 2002].

### 3.4 Delivery Options

Internet shopping and home delivery services are becoming an increasingly important sector of the grocery market. By 2006, Internet grocery sales are expected to grow to an \$11 billion business, about 2% of total grocery sales (Taylor & Dale, 2001). While this market is tempting, it is also relatively new and few companies have yet been able to establish profitable business cases. In 1998, three-quarters of the respondents to a survey of grocery retailers said that they had an Internet presence. (Forester, 1998). Many online grocery retailers, who lack a strong brand name and the volume to support the logistics, are struggling and exiting the market (Taylor & Dale, 2001). In the Internet grocery arena a few critical success factors have emerged: brand recognition, solid logistics systems that are linked closely with a marketing plan, and small market segment focus until it is profitable and then "copy" that system to the next market (Kamarainen and Punakivi, 2002, Van der Vorst et al., 2002).

The U.S. based chain Albertson's is one of the pioneers testing the waters by introducing their own Internet service in two markets, Texas and Seattle. Albertson's uses dedicated fulfillment centers and their own truck fleet in Seattle to provide on-line shoppers with access to over 16,000 SKUs. The tests worked so well that Albertson's expanded to San Diego in late 2001. (Agnese, 2003).

Safeway is another mega-retailer who had ventured into the Internet market, although their approach was slightly different than Albertson's. In June 2000, Safeway invested \$40 million and entered into a strategic alliance with GroceryWorks.com. In return for their investment, Safeway obtained 50%

ownership in GroceryWorks. Approximately one year later, Tesco, a major U.K. retailer, acquired 35% of GroceryWorks and formed an alliance with Safeway. It appears to have been a win-win for all involved, GroceryWorks got the backing of a strong brand name like Safeway, Tesco gained entry into the giant U.S. market and Safeway expanded into a complimentary market with an existing infrastructure that required less capital investment. (Tillett, 2003).

Perhaps the most surprising Internet grocer story comes out of Dublin from a relatively small retailer, Superquinn. Superquinn turned their fledgling Internet grocery service into a profitable enterprise within 18 months, a feat that even the mega-retailers like Wal-Mart envy. The cornerstone of their success is a “portal” philosophy in which Superquinn shares space and costs with other retailers on a large portal called Buy4Now. Superquinn invested in the portal with two other investors and consumers can now purchase from 19 retailers offering a variety of products with Superquinn’s Internet grocery store acting as an “anchor.” Approximately 200,000 unique visitors log onto the portal per month. [Cottrill, 2002).

Portal investors also own a fleet of delivery vehicles that may be used to deliver products for all Buy4Now retailers. The process works as follows:

An order is received the consumer is coded geographically and their order is sent to the correct retail location.

Each location is responsible for picking the item and notifying the Buy4Now fulfillment system when it is ready for pick-up.

Orders are consolidated using load-matching software and delivered to the end user.

Superquinn claims that their city based strategy can be adapted to fit any city with over one million people as long as a known grocery retailer anchors the portal. (Cottrill, 2002).

### 3.5 Varied Challenges of Diverse Markets

Common trends in the supermarket industry reach the diverse world market to different degrees. Specific operational strategies to increase efficiency, logistics, procurement and cost control must be customized by market based on the specific challenges of each market. Shopping habits, available storage space, transportation and infrastructure affect priorities and opportunities for improvement. All challenges must be met by effective use of technology.

Lifestyle differences throughout the world determine attitudes toward where, when and how often people shop. Europeans are accustomed to shopping nearly every day. Continuous stocking keeps shelves full. Americans and Canadians shop an average of 2.2 times per week, a frequency that has remained steady for more than 12 years. American and Canadian shoppers’ visits to the store also fall more heavily on weekends, creating extreme variance in stocking requirements on certain days of the week. (Agnese, 2003)

Consumers’ general attitudes towards supermarkets also vary. Hong Kong citizens buy 40% of their groceries in a supermarket, while Americans consider supermarkets their primary food source. Most Americans feel comfortable buying a specialty item like fresh fish in the supermarket, while Hong Kong citizens maintain the attitude that the easily accessible wet markets have fresher stock, even though the reality is that quality and freshness of supermarket fish are often the same. Examples of shopping habits are relevant to operations and logistics managers because they illustrate the flexibility required in systems that support customer needs.

The industry trends and analysis clearly show that diverse markets are pushing supermarkets to customize their operating strategies which confirms the validity of the first hypothesis (H1).

## 4. Effects on Operations and Logistics

Responding to industry trends requires increased customer focus. To achieve profitability while meeting this need, operations and logistics managers must significantly improve efficiency, logistics, procurement and cost control. The following sections describe how supermarkets are achieving this

through efficient consumer response (ECR) systems and supporting logistics structures. After a brief history and overview of ECR, we describe how retailers are improving efficiency and reducing costs in the supporting logistics structure and through the supply chain. We then discuss reverse logistics, improvements in transportation and storage technology, and the resulting data management requirements these systems require to operate effectively. Finally, we touch on the potential benefits of some breakthrough technologies to the industry.

#### 4.1 Reverse Logistics

Getting food into the stores is just part of the supermarket logistics picture. An increasing number of supermarket retailers are taking the cue from large merchandise retailers like Wal-Mart and implementing reverse logistics systems with their suppliers. Reverse logistics involves removing slow moving, damaged or spoiled goods from stores and shipping them back to suppliers to make room for products that will sell. Typically the system is used for non-perishable non-food items. This practice may be changing.

Coles Myer, an Australian retailer, started a test involving 110 Coles supermarkets in Victoria. Under the program, damaged and out-of-date stock is returned to a central processing center for sorting, and then returned to suppliers. Previously, materials would be dumped, given to charity, shifted to clearance racks or picked up by suppliers at individual stores. The test is controversial, as it may shift as much as \$50 million in costs to suppliers (Hannen, 2002). Some suppliers, including Coca-Cola, Amatil, Kellogg, Nestle, and Unilever are cooperating with Coles during the trial period. Many suppliers are concerned that they will not receive benefits from this brand of reverse-logistics, which completely changes the relationships between members of the supply chain. Many suppliers feel that it is only the power exerted by huge retailers that prompts them into agreeing to at least trying the system.

#### 4.2 Collecting and Managing Data

Achieving the goals of ECR and overseeing increasingly complex logistics systems requires efficient use of technology in complex inventory management systems. All large retailers utilize wireless technology to some extent. This, combined with electronic point of sale (POS) system technology, allows stores to continuously track what is on shelves and what products are being purchased, allowing each store to customize inventory (Chain Store Age, 2002). Hannaford stores in Scarborough, Maine set an excellent model in this area. Their perpetual inventory system tracks units and costs, and calculates a daily margin and inventory based on average item cost for all 35,000 items in the stores. (Chain Store Age, 2002).

About 50% of supermarket sales are in perishable goods. This is also the category that shrinks the most. On average, supermarkets experience between 5 and 15 percent shrinkage in perishable items. (Hennessy, 1998). Items with short shelf life are harder to manage. Lack of data makes it more difficult. The wireless inventory management systems that have enabled huge improvements in non-perishable grocery category management are not always a choice for perishables. Unfortunately, oranges lack barcodes. Variations in size, weight and quality make it more difficult to manage items like oranges and other fruits, vegetables, meats and fish.

Grocers are meeting the challenge by carefully tracking POS data. The POS systems allow perishable tracking, while also speeding checkout and data collection that is useful in customer loyalty programs. Self-scanners go one step further; they collect all the same information and eliminate the need for checkout personnel. As labor costs are as much as half of a supermarket's operating budget, this creates significant savings for supermarket chains. (Agnese, 2003).

The data created by ECR systems has sparked a need for a new level of logistics: Fourth Party Logistics. This business entity can be described as the one responsible for collection, coordination and management of information in order to decide on the most efficient supply chain solution in any given situation, leaving asset management for third party logistics providers. 3PLs now rely on 4PLs for information management and logistics. 4PLs are contracted to manage supply chain information,

especially in cross border activities. Tibbett & Britten, a major international logistics services company, has established 4PL subsidiary that will handle many of Sainsbury's logistics systems in the UK. The company, International Supply Chain (ISC), manages operations for retailers and manufacturers through all modes of transportation. (Claire, 2002). Some key 4PL relationships in US of interest are: UPS Logistics/Ford arrangement and also the Fritz/CASE integration relationship, which began in late 1990's. It is estimated that as many as 50 4PLs are already operating in the United States alone. (Serant, 2002). According to Frost & Sullivan (2004), the 4PL market as a whole is expected to witness considerable revenue growth from approximately EUR 4.7 billion in 2002 to about EUR 13 billion by 2010. Further, the 4PL market in western Europe is set to make its presence strongly felt in the chemicals, electronics/high-tech, Food and automotive sectors.

The supporting information and analysis demonstrate that supermarket chains operating in different economies are implementing ECR to gain efficiencies including costs reductions across their value chains. ECR implementation is also instrumental in shaping new logistics trends in the industry. These inferences validate second and third hypotheses (H2 and H3).

## 5. Logistics Challenges and Opportunities for Supermarkets

Despite the dramatic efficiency improvements, ECR has a long way to go, even for the most successful chains. Sainsbury, Tesco, and most other large chains boast a 99% availability rate. When compared to other industries, that measure failures in parts per million, supermarket fulfillment rates are pathetic. (Jones, 2001). In the ECR Journal, author Daniel T. Jones compares supermarket performance to that of the automobile manufacturer, Nissan. Nissan experiences approximately 150 failures per 1,000,000 parts. Assume that an average purchase is 40 items per week. If Nissan were a grocery store, the probability that a customer would get all 40 items every week after four months of shopping would be about 93 percent. For a grocery store, the chances would be 19 percent at the highest. If the grocery store didn't carry the desired products, that number would drop to near zero.

Supermarkets are trying to deal with this gap in part by hiring logistics experts from outside the industry. Demand for category managers is up 240%, and distribution/logistics positions up 90%. (Springer, 2000) Although supermarket chains don't pay as well as some other industries, they are optimistic that they will be able to fill critical positions with people qualified to take ECR and other initiatives to the next level (Stephens and Wright, 2002).

### 5.1 Transportation and Storage Technologies

Admittedly, supermarkets deal with challenges that their counterparts in other inventory-intensive businesses do not. Car parts do not spoil as fast as peaches. Improvements in transportation and storage technology are beginning to level the playing field. These technologies are widening the options for what supermarkets can offer, and when. Food quality is also feeling a positive impact from improvements in refrigeration technology.

Global positioning systems (GPS) allow shippers to track products as they move. Automated loading and unloading, and packaging that allows for efficient movement through the transportation systems both create incremental improvements in the time it takes to transport goods from the grower or manufacturer to the market, and ultimately, the customer.

Transportation cooling systems have also become significantly more sophisticated. Specially equipped containers can now measure and control the levels of various gasses in the air, cool within an accuracy tolerance of a quarter degree Celsius and control specific levels of relative humidity. (Coyle, 2001). Combined with improved inventory and logistics planning, these technologies have the potential to transform the process of moving perishable goods. In Japan, Dole is taking advantage of high-tech ripening equipment, locating it near distribution plants and revising the delivery methods to supermarkets to cut the cost of delivering a case of bananas by 250-500 yen per box. (Pollitt, 1998).

Ensuring food safety, maintaining quality and improving energy efficiency are also key priorities for supermarket operators. Refrigeration technology in stores is helping supermarkets improve in each of these areas. Georgia manufacturer Hill Phoenix has developed a refrigerated display case that

reduces air circulation and maintains even temperatures to increase the shelf life of meat to three times that of conventional cases. (Lewis, 2001).

Other changes are occurring across-the-board. Multiple refrigeration units are replacing large mechanical rooms. These systems are more energy efficient, flexible, and have lower construction and operation costs. Also, there are companies that can now provide supermarkets with an energy audit and continuous monitoring services for HVACR, lighting and building control systems. Even tasks as simple as making and transporting ice are improving. New ice-making units that make ice for display systems now create cleaner ice. Also, ice is now more easily dispensed at the case, reducing the requirement to transport ice through the store manually. (Powell, 2002)

## 5.2 Breakthrough Technologies

Supermarkets may soon have features that until recently seemed like science fiction. Forward-thinking grocery retailers and research institutions like MIT are teaming with companies like SAP and Intel and working on technology that will allow supermarkets to interact with customers to create extremely personal, interactive shopping experiences. (Albright, 2003; Lewis, 2001). Soon radio frequency identification (RFID) tagging will help create “smart shelves” that know when to be restocked, intelligent camera-based scales could measure fruits and vegetables, and in-cart scanners that may eliminate the need to unpack groceries from the cart before checkout may be a reality. (Albright, 2003). Their projects, which they term “extreme future” technologies, measure things like finger taps on windows, steps on the floor and the path of food containers from the manufacturer to the garbage. (Lewis, 2001).

Metro Group has already opened a “Future Store” that is the first real world store with many of these new technologies. RFID tags at this Metro store, combined with wireless technology and personal shopping assistants (PSAs), PDAs, and electronic shelf labels (ESLs) allow shoppers to scan goods as they put them into the shelves alert inventory stockers to replace goods and checkout terminals log purchases. Customers do not have to empty their carts at the checkout. (Blau, 2003). Many industry leaders feel this technology will be implemented on a wide scale as soon as RFID tag manufacturers can reduce the price of RFID tags and supermarkets can convince consumers that their privacy will not be in jeopardy. (Thomas, 2003).

Tapper Technology is similar to that used in a Kiosk but is able to track where taps are coming from and how hard they are. Applications for this technology will include interactive displays, viewable while shopping, not only while standing at a private kiosk. Floor sensor technology will be able to measure where people walk and how fast they are stepping. This information is useful for evaluating what people find interesting in a store and what they avoid. The same types of technology can be used to guide customers through a store. (Lewis, 2001). Other types of “breakthrough technologies” including fingerprint scanning are also not so far off. In 2002, six supermarkets implemented fingerprint recognition as a payment option. (Harpers, 2002).

MIT is also doing research on Electronic Product Code (ePC) technology. (Chain Store Age, 2002). This technology will allow retailers to track products through the entire life cycle from the time product is delivered, to the warehouse, until disposal. This technology holds considerable opportunity to increase the level of product usage detail. It may also have significant impact on the supply chain as members of the chain are experiencing significant shifts in responsibility for unused products. (Lewis, 2001).

## 6. Conclusion

Analysis of the supermarket industry across developed and developing economies has shown the need for grocery retailers to become increasingly more creative and efficient in the face of intense competition, limited market growth, unique market situations, economic conditions, and shifting demographics. The challenge to operations and logistics managers is to put customer needs before operational concerns through implementation of higher ECR standards. In order to be successful, chains will have to rely on third and fourth-party logistics to manage logistics and supply chain

information. Costs throughout the supply chains could be reduced through reverse logistics systems and advancements in transportation and storage technologies, and also by investing heavily in breakthrough technologies. Effective use of technology and enhanced logistics systems will enable supermarkets to explore new sources of revenues by increasing the likelihood of success in adding services, expanding product lines, creating loyalty, and developing new delivery options through Internet shopping.

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