

Chapter 1

STRATEGIES AND CHALLENGES OF INTERNET GROCERY RETAILING LOGISTICS*

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Abstract

One of the most challenging sectors of the retail market today is the grocery segment, specifically e-grocers. Since the mid-1990's multiple companies have entered the e-grocer market. Few have survived. What is it about e-grocers that make them fail? What makes them succeed? What can we learn from yesterday's e-grocers that will enable the new players to stay afloat or even be called "the greatest thing since sliced bread?" Given that the industry is still in "transition," it is difficult to find definite answers to these questions. With the goal of gaining useful insights on these issues, in this paper we analyze e-grocers, past

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and present, discuss different business models employed, as well as order fulfillment and delivery strategies. Among the three alternative business models, namely, pure-play online, brick-and-mortar going online, and partnership between brick-and-mortar and pure-play online, we observe that the latter model has a higher success potential by combining the strengths and minimizing the weaknesses of the former two models. We discuss order fulfillment methods used by current and defunct e-grocers, specifically, the mega-warehouse, in-store order fulfillment, and the hybrid store-warehouse, and provide an overview of their relative advantages and disadvantages. We also discuss alternative order delivery methods, including, attended and unattended home delivery, in-store pickup, and third-party pickup locations. We conclude with a discussion on lessons learned from failure and success stories of e-grocers, a summary of current trends and directions, and future opportunities.

1. Introduction

Growing interest by consumers to point and click their way through nearly all aspects of daily life has fueled the Internet economy to develop services and sell products online even in areas that were once the sole domain of traditional businesses, such as grocery stores and pharmacies. Businesses that sell consumer products online have been coined as “e-tailers” and as “e-grocers” in the case of online grocery retailers.

Some of the reasons why an increasing number of consumers buy groceries online are common to all Internet purchases, including better prices, larger selection, convenience, and time savings. Home delivery of items purchased online is appealing to those for whom going out to shop is difficult for various reasons, such as physical disability, the need to care for small children, the lack of adequate or convenient transportation, and/or a busy lifestyle. Buying groceries and other products online unchains consumers from physically driving to and shopping in traditional stores. As George Shaheen, former CEO of Webvan, a now defunct e-grocer, stated, “we (e-grocers) promise to give back your Saturday mornings” (Anonymous, 2000b). This prospect is very appealing for many people, especially considering that the typical shopper visits a grocery store 2.2 times per week (Kahn and McAlister, 1997). In a study by McKinsey and Company, 82 percent of consumers who order groceries online do it as a substitute for frequent regular trips to a grocery store, rather than substituting for infrequent trips to stock up on limited items or for special occasions (Sneader et al., 2000). Hence, the industry could obtain the mass critical to success.

The value proposition of e-grocers is to become a single-source solution for the busy consumer today. E-grocers provide information as well as products and services. For example, on NetGrocer’s website,

customers can preload a recipe onto the web page and with a simple click place an order for the ingredients of that recipe. Customization of weekly shopping lists and lists of frequently ordered products as well as personalized shopping aisles are additional benefits of shopping online versus in traditional stores. Storing weekly orders on the website makes repeat orders simple.

Despite its appeal not everyone has embraced online grocery shopping as a replacement to regular trips to the supermarket. In 2000, of the 4.5 million households that bought groceries online, only 1.1 million did so more than once a month. (Rubin, 2001). Having to plan and think about the delivery schedule are commonly cited reasons by customers as drawbacks for online grocery shopping. Most consumers are used to going to the grocery store on the spur-of-the-moment, and often combine grocery shopping with other activities including renting a DVD or video and dropping off or picking up dry cleaning. E-grocers' scheduling requirements and the desire to consolidate purchasing activities to a single trip are two factors affecting the consumers' desire to purchase groceries online.

Other factors negatively influencing consumers' decisions to purchase groceries or other goods online include shipping costs, credit card security, the need or want for immediate delivery of products, and the social aspects of the shopping experience. For most orders less than \$50, e-grocers charge shipping costs ranging from \$5 to \$20 (see Table 1.1). Customers need to tradeoff the convenience of online shopping with the additional price paid on shipping. The threat of credit card theft remains a real issue in the minds of many consumers, although incidents of fraudulent credit card use on e-grocers' websites have been scarce to none. Some consumers are also concerned about the freshness of the products they buy from e-grocers, or they simply want to squeeze and smell the products before purchasing. The need to touch and feel products remains a barrier for the online sale of groceries, as well as other typically "high-feel" items like clothing or shoes. Although many customers do not think that ordering groceries online is something they would be interested in, once some try it, they become captivated by the convenience (Smaros et al., 2000). A more detailed analysis of consumer behavior and demand management can be found in Smaros et al. (2000).

Table 1.1. A summary of leading e-grocers, past and present.

Company	Items Sold	Delivery Fee	Delivery Schedule	Year Opened	Year Closed
Peapod.com	Perishable	\$2.95 to \$9.95 based on market and order size	Next day to two weeks	1989	
Netgrocer.com	Non-perishable	\$4.99 to \$599.99 based on zone and order size	FedEx usually 2-3 days	1995 1995	
GroceryWorks.com	Perishable	See Safeway.com		1999	Reconfiguring Jun-Nov 2001 See Safeway.com
Albertsons.com	Perishable	\$9.95 for delivery \$4.95 for pickup	90 min slots, 10a-9p. Same day delivery after 5pm for orders placed before 10am, next day pickup or delivery for orders placed by midnight	1999	
GrocerOnline.com	Perishable	\$4.99-\$599.99 based on shipping zone and order size	UPS or FedEx 1-3 days based on zone	Founding company 1902 1999	July 2001
Webvan.com	Perishable	\$9.95 for orders < \$75 \$4.95 for orders \$75-100 None for orders >\$100 1999			
HomeGrocer.com	Perishable	None for orders >\$75		1998	July 2001
Kozmo.com	Perishable and miscellaneous	\$2 for \$5 minimum order		1998	April 2001
Safeway.com Vons.com	Perishable	\$9.95 for purchases ≤\$150 \$4.95 purchases >\$150	2-hr slots, 8a-10p		2001
Shoplink.com	Perishable	\$35 monthly		1996	Nov 2000
Streamline.com	Perishable	\$30 monthly		1993	Nov 2000
FreshDirect.com	Perishable	\$3.95 ¹	2-hr slots, 4-11:30pm weekdays, 9am-9pm weekends	2002	
PublixDirect.com	Perishable and DVD; VHS	\$7.95 with \$50 minimum order	90 min slots 8a-9p daily	2000	
Potashbros.com	Perishable	\$7-10	30 min slots, 3-8pm daily, same day delivery for orders placed by 10am		

E-grocer sales have been growing steadily but still only account for a small portion on total grocery sales. None of the chains expects it to account for more than 5 percent of total sales (\$400 billion in the US) over the long haul (Heim and Sinha, 2001). Yet online grocery sales are projected to be 46 percent higher this year (2003) from the previous, to \$3.5 billion (Heim and Sinha, 2001). Further, the online grocery market in the United States is expected to grow from \$600 million in 2001 to \$4.9 billion in 2006 (Lee, 2003).

From a business perspective, the pure-play (no retail storefronts, only web ordering and delivery, and possibly one or more warehouses) e-grocer model has several advantages over the traditional retail grocery model. First, e-grocers do not have the high costs associated with multiple retail locations, including rent, parking, and high property taxes. Second, by “pooling” their inventory in fewer locations, e-grocers can better manage their inventory, reducing inventory holding costs and increasing inventory turnover rates. This leads to less spoilage of products and shorter lead times from the producer to the consumer, key advantages in selling perishable products. Third, e-grocers can collect detailed information about their customers’ buying habits and preferences, which can then be used for targeted marketing and personalized promotions. Such one-to-one marketing is what the traditional grocers are trying to do by using loyalty cards to track purchases. Fourth, e-grocers may generate incremental sales growth for the industry. Although many retailers and consumers believe that impulse purchases diminish online, some companies such as Amazon.com have been able to foster impulse selling quite well with innovative marketing. Another sign that e-grocers can generate growth is an experiment the online grocer Streamline did with Procter & Gamble (Callahan, 2000). Streamline asked its customers if it could automatically add a toothbrush to the shopping cart every three months as the American Dental Association recommends. Customers liked not having to remember to replace their toothbrush. The computer kept track of it for them and created a large incremental increase in toothbrush sales.

Despite its potential advantages, the e-grocer model has its drawbacks. Brick-and-mortar stores have established locations, brand names, and a large customer base. A majority of consumers still prefer to buy groceries from a retail store. They may like to smell the vegetables and squeeze the fruit, or they may like to unwind from a long day by walking among the fresh breads of the bakery. Consumers also trust the grocery stores they have known for many years, and like to shop where they feel assured the quality is consistent and the price is right. But probably the biggest challenges for e-grocers are in order fulfillment and

home delivery. Supermarkets aggregate demand by allowing customers to come to the stores, and therefore customers do the order picking and delivery. According to Procter & Gamble, traditional in-store shoppers who pick, pack, and deliver their own products now save the industry approximately 13 percent of the total cost of sales (Tapscott and Ticoll, 2000). For e-grocers, the more deliveries in a given area, the lower the costs per delivery. Except for a few cities, Americans who can afford computers and Internet access are more likely to live in suburbs, which means more driving and fewer deliveries per hour for any company that offers home delivery. In this paper we present various models used by e-grocers, discuss the strengths and weaknesses in each, and provide an outlook for the future of the e-grocers. In Section 2 we discuss alternative e-grocer models. Sections 3 and 4 address order fulfillment and the methods by which the goods reach the customer. We offer our conclusions in Section 5.

2. Alternative E-Grocer Models

Major players in the e-grocery landscape differentiate themselves by the types of products and services they offer, particularly, by their method of order fulfillment and delivery (which is closely related to the types of goods sold), and by the geographical markets in which they operate (see Table 1.1 and Figure 1.1). All of these decisions are highly dependent on the business model of an e-grocer, i.e., whether it is (i) pure-play online, (ii) a brick-and-mortar company selling online, or (iii) a partnership/merger between a pure-play online and a brick-and-mortar company. In this section, we categorize and provide an overview of the major players in the e-grocer arena along these three dimensions.

The term “perishable” is used for those goods that are not pantry items and need to be stored in a refrigerator or a freezer. This category includes products like fresh vegetables and meats. Non-perishable products include all other household goods, including canned soup, canned fruits and vegetables, drinks, laundry detergents, and candy. Almost all e-grocers offer both perishable and non-perishable products (see Table 1.1). The goal of these companies is to replace consumers’ trips to the grocery store completely. The main advantage of limiting the product selection to non-perishables is the ease of storage and delivery. But the trade-off is that customers would still need to go to a store to buy perishables such as milk, bread, and meat. To avoid having to shop both online and offline, some customers might prefer to buy only from those e-grocers who cater to all their grocery needs, while others may simply choose to go to the stores and avoid online purchasing altogether.

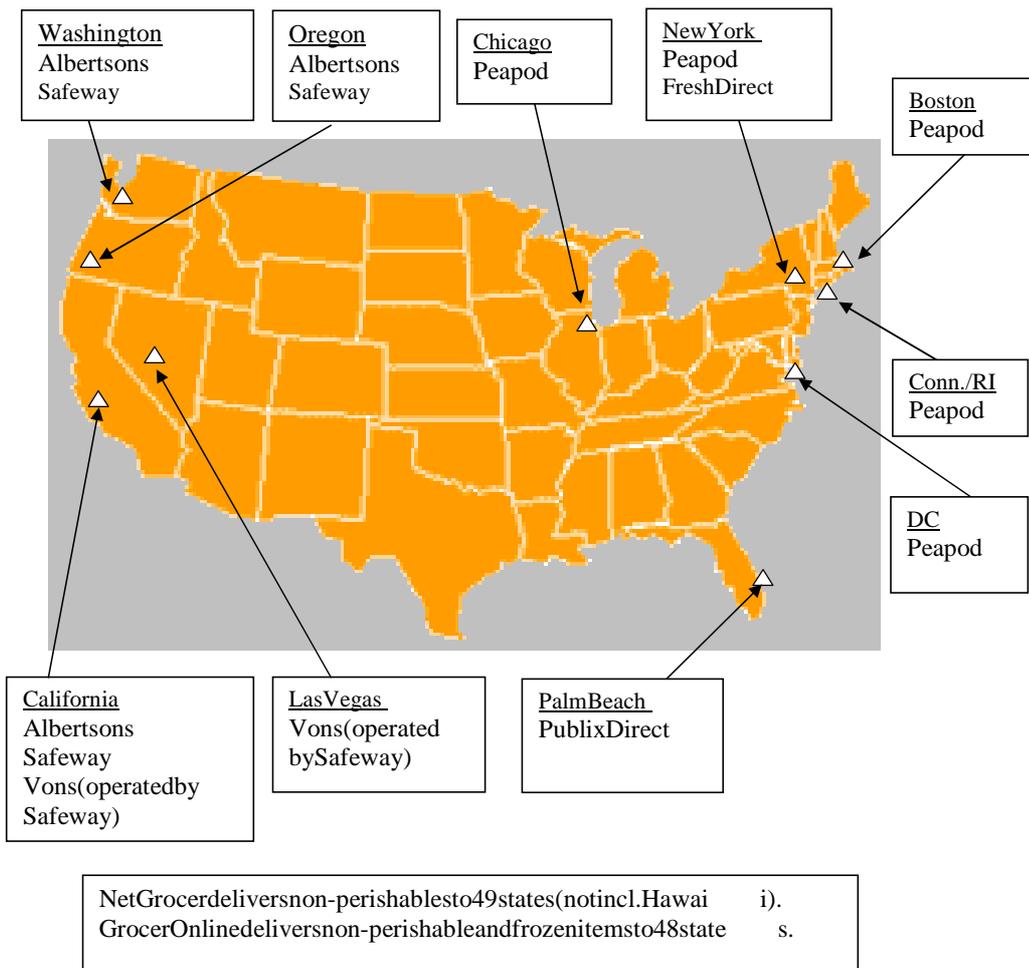


Figure 1.1. E-Grocer locations.

Currently, the main competitors in the e-grocer arena, selling both perishable and non-perishable goods, are Peapod, Albertsons, PublixDirect, and Safeway/GroceryWorks. NetGrocer delivers non-perishable, packaged groceries anywhere in the continental US using FedEx as its carrier.

A number of e-grocers, such as EthnicGrocer.com and LatinGrocer.com (also known as mexGrocer), have found and established themselves in niche markets such as specialty or ethnic food. Besides selling groceries, some of these companies also serve as a portal for the ethnic community they target, by posting events, news, community activities, etc.

2.1 Pure-Play Online E-Grocers

Several pure-play online e-grocers have entered, and left, the market in the past decade. In fact, the defunct e-grocers, including Webvan, HomeGrocer, Shoplink, and Kozmo, far outnumber the survivors. Most of the e-grocers who began as pure-plays have survived by merging or forming partnerships with other companies. For example, Streamline was sold to Peapod, another pure-play online, which was later sold to Ahold, a brick-and-mortar grocery giant. Players which fall into this category are discussed in Section 2.3. In this section, we focus on one of the newest and most innovative companies to enter the online grocer market, FreshDirect, and the most famous pure-play failure, the late Webvan.

Newcomer FreshDirect launched its grocery delivery service in New York in September of 2002. It expects \$100 million in revenue for 2003 and projects \$225 million for 2004 according to the FreshDirects CEO Joseph Fedele (Kirkpatrick, 2002). With an initial investment of more than \$100 million and 200 employees, FreshDirect hopes to turn an operating profit in six months (Dillon, 2002).

FreshDirect has a different product mix and value proposition than most online and brick-and-mortar grocers. Roughly, 83 percent of the foods sold by FreshDirect are perishables, compared to 20 percent in most grocery and 50 percent in the case of online grocer Peapod (Fabricant, 2002). Putting a very high emphasis on the freshness and the quality of its products, FreshDirect buys directly from the suppliers, farms, fishermen, etc. Storage, order processing, and food preparation takes place in its 300,000 square foot, twelve temperature zone warehouse in Long Island City, New York.

Defunct Webvan Group, Inc. was one of the leading e-grocers in 1999 and 2000, but closed its doors in July 2001 due to its failure to reach

profitability. Webvan was headquartered in Foster City, California, was founded in 1998 by Louis Borders, who also founded Borders Books. Webvan introduced its service in the San Francisco Bay Area in June 1999 (Bellantoni, 2000). The company completed a \$375 million initial public offering on November 5, 1999. In the first quarter of 2000, Webvan had 87,000 active customer accounts, up 85 percent from December 1999. The company had total sales of \$259.7 million in 2000 (King, 2001).

In June 2000, Webvan agreed to buy HomeGrocer.com in an all-stock deal valued at about \$1.2 billion. Before the merger, the companies had to compete not only with brick-and-mortar alternatives to win customers, but also with each other. The merger was designed to help the companies reduce marketing and customer acquisition costs and leverage their combined buying power with suppliers. The purchase reduced Webvan's capital needs by 50 percent, the company said, since HomeGrocer was already in several key markets, including Seattle and Los Angeles. Webvan instantly vaulted from two markets (three, including Sacramento as separate from San Francisco) to nine, and was expected to be in 13 markets by the end of 2000 (including Atlanta, Baltimore, Bergen County, New Jersey, Chicago, Dallas, Los Angeles, Orange County, California, Portland, Oregon, Sacramento, San Diego, San Francisco, Seattle, and Washington, D.C.) and in 15 markets by mid-2001.

Investors did not see the union positively, and the stock prices of both companies dropped sharply after the deal was announced. While long-term prospects for the merger had good potential, investors felt that in the near term the new company faced a host of hurdles. The two companies (i) had overlapping market expansion plans that had to be rectified, (ii) used different technology platforms, and (iii) had different approaches to logistics. Webvan preferred large distribution centers and a 30-minute delivery time, while HomeGrocer.com used smaller centers and delivered within 90 minutes. HomeGrocer's smaller distribution centers cost about \$5 million each to build. They were far less automated than Webvan's \$35 million warehouses, and in fact, the company tried to build a warm and fuzzy image around the idea of human picking and packing.

While the two companies struggled to decide on which business model would survive, Webvan's web pages replaced HomeGrocer's web pages. This change, apparently thought to be cosmetic and largely transparent to the customer, caused a one-third drop in demand from HomeGrocer's. The switching cost of learning a new web page and the difference in delivery policy, plus technical problems with the web page was more than some customers wanted to bear.

At the end of 2000, Webvan averaged 2,160 orders a day in the San Francisco Bay area. The break-even point was close to 2,900 orders per day, which meant that Webvan was operating at more than 25 percent below its breakeven point. In March 2001, the average customer order was \$114. In April 2001, Webvan said that it was breaking even in Orange County. However, this was not enough to gain investors' confidence. Between February and June of 2001, Webvan's stock plummeted. Louis Borders and George Shaheen left Webvan, operations were closed in three cities (Atlanta, Sacramento, and Dallas/Ft.Worth) and 1,150 employees were laid off. Webvan never recovered and closed its operations in July 2001 (Knowledge at Wharton, 2001). Webvan and Homegrocer combined raised a total of \$1.2 billion in capital in their short lives and used it all (Lee, 2003; Kane, 2002).

Comparison of the business models employed by Webvan and FreshDirect demonstrates sharp contrasts. While FreshDirect chose to stay focused, Webvan followed a quick expansion approach both in terms of the markets served and the products and services offered. It is now evident that the latter approach had several problems. It required large investments in multiple markets, before the concept and implementation was fully tested and refined in any market.

2.2 Brick-and-Mortar Grocers Selling Online

Large brick-and-mortar companies have been slow in entering the e-grocery market, but fared better than pure-plays. Traditional grocery stores did not initially perceive the need to offer online ordering and delivery service, but the entrance and perceived success of pure-plays caused them to reevaluate their strategy. The benefit for the traditional stores is the retaining of their original customers and the possibility of tapping into a new market. The clicks-and-bricks strategy gives customers the flexibility of shopping the brick-and-mortar store, as well as ordering via the Internet and to pick up their order at the store or having the order delivered. Customers can also place their orders using store-based computers. The most prominent brand-name grocery stores now online are Albertsons, Publix, and Safeway. Safeway's online store is a partnership with the former pure-play firm Groceryworks.com, and also Tesco, therefore we discuss both Tesco and its partnership with GroceryWorks/Safeway in Section 2.3. Also briefly mentioned are some e-grocers in the Asian market.

Headquartered in Boise, Idaho, Albertsons was founded in 1939. Currently, Albertsons is the second largest supermarket company in the United States, and its online store Albertsons.com serves more than 700

zip codes in California, Oregon, and Washington giving it the largest geographic reach of any online grocery provider (Albertsons, Inc., 2002). Albertsons.com was launched in November 1999 in Seattle, expanded to San Diego in October 2001, and then to Southern California in March 2002. Albertsons has an annual revenue of \$36 billion, and employs 200,000 associates in 2,300 stores. Although the percentage of revenue from the online sector was not available, the first quarter earnings this year (2003) are up from last year's loss by \$337 million. All goods offered in stores are available on the website at the guaranteed same price. Online orders are fulfilled by Albertsons.com via existing stores. Pickers, dubbed "e-shoppers" by the company, fill orders by shopping the aisles of Albertson stores alongside regular customers.

PublixDirect, headquartered in Alpharetta, Georgia is a wholly owned subsidiary of Publix Super Markets Inc. Publix operates 759 stores in Alabama, Georgia, Florida, Tennessee, and South Carolina, with 2002 retail sales of \$15.9 billion. Publix is one of the top ten largest volume supermarket chains in the US, with 119,500 employees. In October 2001, PublixDirect began accepting online orders for grocery delivery in several areas of Palm Beach and Broward counties in Florida. They have now expanded to include 106 zip codes in Broward, South Palm Beach, North Dade, and Key Biscayne. They also offer non-grocery products such as DVD, VHS, and flowers.

In Asia, clicks-and-bricks grocers include Fairprice and Cold Storage in Singapore, and Wellcome Supermarkets and Park'n Shop in Hong Kong. FairPrice has a network of more than 90 stores island-wide. Owned by more than 400,000 Singaporeans, it had sales of \$1 billion in 2000 and employs a staff of 4,000. FairPrice was the first supermarket retailer in Singapore to own its own central warehousing and distribution system and named it the Grocery Logistics of Singapore. Cold Storage operates 35 supermarkets in Singapore and is a wholly owned subsidiary of Dairy Farms, a large supermarket, convenience store, and drugstore conglomerate. In 1997, Cold Storage began its Dial and Deliver service, allowing delivery of customer orders placed via the Internet, telephone, and fax within 24 hours. The chain has an aggressive expansion plan and delivers to all stores through its Fresh Food Distribution Center.

In Hong Kong, Wellcome is a wholly owned subsidiary of Dairy Farms (see above), which operated 239 stores as of June 2001. Wellcome delivers groceries, including frozen foods, alcohol, and tobacco, to Hong Kong Island, Kowloon, and New Territories. Park'n Shop is a subsidiary of A.S Watson Group (HK), a large retail and manufacturing company with a strong presence in Mainland China, Hong Kong, Macau, Taiwan, Singapore, Malaysia, and Thailand. Park'n Shop has over 190 stores and

9,000 employees in Hong Kong and delivers groceries, including frozen foods, baked goods, and miscellaneous general merchandise (over 4,000 items).

Hong Kong and Singapore seem to lead the western world in the e-grocer arena by quickly assimilating technology into everyday life. Both of these countries are very prominent in terms of Internet connectivity and have a high density in population. The former characteristic makes it easier for customers to adopt the e-grocery concept, while the latter provides both advantages and challenges for grocery delivery. In both of these countries, owning a car is not nearly as common as it is in the United States, hence customers often need to use public transportation for shopping. Having groceries delivered to their door rather than carrying them in crowded buses or subways is a big advantage. From the e-grocer's perspective, it is advantageous to have a large number of deliveries in a relatively small area, but making timely deliveries might be a challenge due to heavy traffic. In these respects, these two Asian countries share similar characteristics with New York City, where FreshDirect has been operating successfully.

2.3 Partnerships Between Pure-Play Online and Brick-and-Mortar Companies

Partnerships or mergers between pure-play online and brick-and-mortar companies have been increasing recently. Brick-and-mortar supermarkets have a large, loyal customer base and an efficient logistics system that allows them to make profits in the narrow-margin grocery business. Along with their infrastructure, brick-and-mortar companies often have tremendous brand name recognition and financial backing, allowing them to try different channels to reach new customers, and reducing marketing/advertising costs to attract customers online. Such costs can be prohibitively high for pure-play e-grocers; for example, Webvan spent between 25 and 35 percent of its revenue on advertising, compared with about one percent for traditional grocery chains, according to Rob Rubin, an analyst at Forrester Research (Moore, 2001). The high fixed costs of building a logistics infrastructure for order fulfillment and delivery discourage investors who are looking for quick profits. Partnerships between the brick-and-mortar companies and pure-plays create clicks-and-bricks companies that combine the strengths and minimize the weaknesses of both types of models.

2.3.1 Peapod with Royal Ahold. Founded and headquartered in Chicago (Skokie), Illinois, Peapod is one of the largest e-grocers

and first to the market, delivering directly to customers' homes in major metropolitan areas including Boston, Chicago, Greater Washington D.C., southern Connecticut, and Long Island. Peapod expanded its markets and increased its sales fairly quickly, but at the same time its expenses also rose significantly. After unsuccessful attempts to raise financing in the public markets, Peapod sold a 51 percent stake in April 2000 to Royal Ahold, for \$73 million, or \$3.75 a share (Peapod, 2000a). Royal Ahold is an international leading food provider with annual sales that reached nearly 63 billion euros in 2002, with U.S. retail sales of over \$26 billion (Ahold, 2002b). In September 2000, Peapod-Ahold agreed to acquire the Washington D.C. and Chicago assets of Streamline.com for \$12 million. Streamline's operations switched to the Peapod brand in the Baltimore-Washington area in the fourth quarter of 2000. Simultaneously, Peapod withdrew from the Texas and Ohio markets. Streamline's Chicago assets served to help Peapod expand in that region. In July 2001 Royal Ahold offered to buy the remaining 42 percent of Peapod for \$35 million. After the deal closed in August 2001, Ahold owned over 90 percent of Peapod. The purchase of Peapod by Ahold has brought this e-grocer completely under the wing of an existing brick-and-mortar grocery giant. In July 2001, Peapod in Chicago reported an operating profit. But, order growth was not rapidly increasing and high costs associated with logistics made Peapod vulnerable to ceasing its operations because of negative cash flow. By the end of 2001, Peapod reported an annual operating loss of \$47.9 million on turnover of \$100 million. In its third quarter net earnings report for 2002, Ahold reported a reduction in losses by Peapod with only \$7.4 million in 2002, compared to \$11.1 in 2001 (Ahold, 2002a).

As in other pure-play online and clicks-and-bricks alliances, what Peapod and Streamline bring to the partnership is e-commerce and home shopping expertise, web-based software and ordering systems, web marketing and additional information technology (IT) skills. Ahold's contributions lie in its considerable buying power, real estate, strong store brand recognition, extensive customer base and category management expertise.

2.3.2 GroceryWorks.com with Safeway and Tesco. Founded in 1999, GroceryWorks is headquartered in Dallas, Texas, and operates in Dallas, Fort Worth, Houston, and Austin. In June 2000, Safeway invested \$30 million for a 50 percent stake in GroceryWorks (Sandoval, 2002a). Safeway operates more than 1,700 stores with annual sales of \$34 billion (Sandoval, 2002a). Under the terms of this arrangement, GroceryWorks became Safeway's Internet division, and the two companies

brought online grocery shopping to markets where Safeway operates. In September 2000, GroceryWorks and Randalls Food Markets partnered to provide home delivery to Austin area residents. The service operated in Austin as "GroceryWorks.com by Randalls." On June 25, 2001, Tesco, the British food giant, acquired 35 percent of GroceryWorks voting stock and raised \$35 million in additional financing (Anonymous, 2001; Sandoval, 2002a). Today, the strategic partnering of the two food titans, Safeway and Tesco, with GroceryWorks is making a significant impact on the e-grocer industry.

Going to www.groceryworks.com automatically brings the customer to the Safeway order and delivery website, www.safeway.com with service to Northern California, Oregon, and Washington (GroceryWorks, 2003). In addition to these two sites, Safeway also operates online grocery services via Vons.com to Las Vegas and San Diego. Vons.com also uses Groceryworks software and Tesco know-how like its sister site, Safeway.com.

Tesco was founded in 1924 and became the largest food retailer in the U.K. by 1995. Tesco Direct, the online operation of Tesco, claims to be the biggest online grocery business in the world. In 2000, Tesco Direct had nearly 300,000 registered customers and 2000 sales of more than £250 million (Hodges, 2000; Wallace, 2000). In 2001, it has "almost one million registered customers, annual sales of about 300 million pounds, and is profitable" (Muehlbauer, 2001). Tesco argues that it makes a respectable margin on its Internet sales, because the average web-shopping basket is worth about £100, much more than people normally spend when they shop in stores. To improve revenues, Tesco expanded its product selection beyond groceries to include higher margin products, such as books, CDs, DVDs, games, flowers, baby items, home furnishings, and clothes that online customers seem more willing to mix with food than do customers in the supermarket. This is a similar strategy that Webvan attempted to follow. "Amazon developed a book business and then diversified into a whole load of other services, including groceries," says Tim Mason, Tesco's e-commerce chief (Hodges, 2000). "We're doing it the other way around."

As part of its web strategy, Tesco also offers a number of non-grocery services. For example, Tesco.net, the supermarket's free Internet service provider, has around one million members and ranks among Britain's largest ISPs. Once a customer is connected to Tesco's portal, she could buy one of 1.2 million books from Tesco's branded online store or choose from a stock of thousands of CDs and videos. Alternatively, she could click on Tesco's financial services Website, a joint venture with the Royal

Bank of Scotland, and apply for a Tesco home-insurance policy, a Tesco savings account, or a Tesco Visa credit card.

2.3.3 NetGrocer.com with Various Supermarket Chains.

Founded in 1996, privately held NetGrocer.com offers 7,000 SKUs and enables shoppers nationwide (48 contiguous states) to purchase nonperishable groceries, drug store items, and general merchandise online and have them delivered to their homes and offices. Netgrocer.com's largest shareholders are Parmalat S.p.A. and Cendant Corporation. Parmalat S.p.A. is a subsidiary of Parmalat Finanziara S.p.A., a listed company incorporated in Italy. Its business is concentrated in milk and its derivatives, fruit juices and bakery products. Cendant Corporation is a global provider of financial and customer services.

NetGrocer.com is now a division of NeXpansion, Inc. and expanded its offerings to include e-commerce solutions for manufacturers and retailers, in addition to its primary business as an online grocer. As explained on their website, nexpansion.com, NeXpansion has partnered with numerous supermarket chains, including Lowes Foods, Harris Teeter, Pathmark, Big Y, Clemens Family Market, and Stop & Shop to offer customers hard-to-find and specialty items. NeXpansion provides a customizable web solution to these firms called "Endless Aisle." This deliverable allows customers to access the web via home computers or in-store kiosks, log on to the store's website, and from there search for items not available in the store. The items are then shipped to the customer.

3. Order Fulfillment

The trend for order fulfillment among most pure-play online e-grocers has been to establish large, automated distribution centers for each major market they serve, while some brick-and-mortar chains have employed only in-store order fulfillment. In addition to these two alternatives, consolidation in the market and the entry of existing brick-and-mortar stores into the e-grocer segment lead to a hybrid model that combines fulfillment from existing stores and smaller fulfillment centers. We discuss each of these models in this section (see Table 1.2).

3.1 The Mega-Warehouse

The mega warehouse model is employed by several e-grocers. NetGrocer began with a large, automated warehouse, a football-field sized structure to house all its non-perishable groceries, electronics, books, and music. Webvan also began with a huge, \$20 million warehouse,

to host its Oakland operation (Richtel, 1999), as did HomeGrocer and ShopLink. FreshDirect has a 300,000 square feet facility which hosts 12 different temperature zones to keep produce fresh and avoid contamination. Due to FreshDirect's focus on food preparation, the facility in Long Island City, New York appears to be more of a food processing center, or giant kitchen, than a warehouse or distribution center. Park'n Shop of Hong Kong has six regional computerized distribution centers. The company committed considerable capital investment to advanced food technology and owns Asia's first multi-temperature distribution and processing centers, built at a cost of \$30 million. This state-of-the art facility provides an unbroken cold chain for fresh, chilled, and frozen foods from source to customer.

For most of the e-grocers, very limited information is publicly available on warehousing and order fulfillment. We had the opportunity to visit the Webvan distribution center (DC) in Suwanee, Georgia, and also talked to several of their logistics managers; hence, in the remainder of this section we focus on Webvan's distribution centers and operations. For an in-depth discussion on designing, operating, and managing warehouse facilities, we refer the reader to Bartholdi, III and Hackman (2003).

Webvan made a strategic decision to build massive, highly automated warehouses with sophisticated inventory software, for \$35 million each. In July 1999, Webvan contracted with the construction firm Bechtel to build up to 26 of these centers for \$1 billion. Among the most publicized was Webvan's 336,000 square-foot distribution center in Oakland, California, 42 times the size of the fast-pick in-store fulfillment centers being rolled out by Ahold. Webvan's fully automated and temperature-controlled DCs allowed for processing 50,000 SKUs and roughly the volume of 18 supermarkets. Orders were processed with proprietary software, using automated carousels and conveyors for order picking. DCs were filled with miles of conveyor belts carrying bins. These bins, as well as the different zones in the warehouse, were color-coded: yellow for ambient products (which do not need refrigeration), green for chilled goods, and blue for frozen products. There were also deli and produce areas and a butcher, where meat was cut to order.

To fulfill an order placed by a Webvan customer online, a computer launched a set of multi-colored bins that correspond to like colored zones in the warehouse. Employees stood at one end of fifteen-foot high rotating racks, picked items off the racks and placed them in their respective bins on the conveyor belt (see Figure 1.2). Employees knew which item to pick via a computerized system of lights. The system illuminated by electronic display what rack the proper items were on, and which items

should have been placed in which bin. A network of computers and scanners were controlled by logistics software from Descartes and Harbinger, which coordinated the movements of the racks of products and the conveyor belts. With these warehouse management and automated pick and pack systems, Webvan claimed that the 150 or so workers in the Oakland facility never had to move more than 19 feet to fill an item in an order.



Figure 1.2. Carousels at Webvan's automated distribution center in Suwanee, Georgia.

To reduce the delivery costs to customers and increase delivery timeliness Webvan delivered its products to consumers via a “hub-and-spoke” distribution network. In the DC, the color-coded totes holding customers' orders were grouped and sorted by order number and destination, and loaded onto carts, which were then loaded onto trucks and shipped to one of the “stations” near the final delivery locations. The carts (loaded with totes) were cross-docked from trucks to vans in the stations and the vans delivered the orders to customers (see Figure 1.3). With this mechanism, each tote was lifted manually only twice after being filled: when it was loaded onto the cart in the DC and when it was carried from the van to a customer's home. This network centralized the order fulfillment and decentralized the delivery system, providing a more cost- and time-efficient process in conquering the last mile of e-commerce.

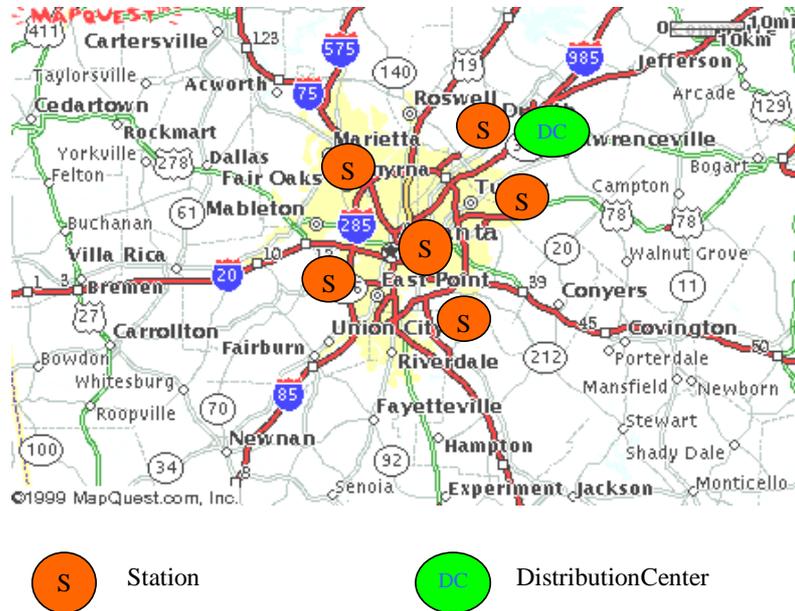


Figure 1.3. Webvan's hub and spoke delivery network in Atlanta area.

Webvan entered multiple markets simultaneously to gain the coveted first mover advantage. But such a large initial investment in so many markets, without a proven business model, resulted in significant financial challenges. The high fixed cost of implementing the warehouse and inventory management software coupled with high facility construction costs gave Webvan a high breakeven point for its sales. Unfortunately, the expectations and forecasts of demand were overly optimistic, and Webvan's facilities were only operating at half capacity, making it impossible to reach breakeven.

There are several advantages of a large, centralized distribution center. Inventory is centralized, leading to higher turnover, lower inventory costs, and fresher products. Delivery costs from the suppliers are lower, since deliveries are made to a single location in higher volumes. Order picking and packing can be automated using high-tech warehousing equipment and systems. Unlike the "pick and deliver from stores" model, a large automated DC leads to lower labor costs, is more efficient, and scalable for larger volumes. The main disadvantage of the mega warehouse model is that the distribution centers are very expensive to build, costing \$25 million to \$35 million each. To realize cost savings, capacity utilization must be high and not vary significantly over time (Kamarrainen, 2003). The cost of experimenting on such a facility is very high,

and in case a mistake is made in the design, it can have disastrous effects. Cost of delivering to homes also can be prohibitive, since such big warehouses usually need to be built in distant locations. To mitigate this drawback, some e-grocers used a hub-and-spoke system for deliveries, as discussed above. In short, most e-grocers still do not have the critical mass of customers that is needed to attain profitability with this model, and hence, a flexible distribution center which relies on manual solutions rather than automation could be more viable.

3.2 In-Store Order Fulfillment

The trend among brick-and-mortar companies entering the online grocer market is to use their existing facilities to fulfill orders. Our discussions of Tesco and Safeway (GroceryWorks) in this section describe how just a few of the growing number of clicks-and-bricks grocers leverage their stores for order fulfillment.

Tesco's fulfillment and delivery model resembles the early days of Peapod. Instead of building highly automated new warehouses dedicated to filling online orders, the strategy of rival Sainsbury's, Tesco is exploiting its network of nearly 700 stores nationwide (in the U.K.). Tesco employs teams of people to pick the items on their customers' web-transmitted shopping lists from the shelves of the nearest supermarket, and teams of drivers deliver the orders at agreed times. When an order is received from the Tesco Direct website, it is routed to the nearest physical outlet. For assembling an order, employees use special carts (called "picking trolleys") mounted with screen guides and "shelf identifier" software instructing them where to pick the items in the list (Sandoval, 2002a; Beck, 2000). Once the trolley is loaded, it goes straight to the van for delivery (Maddali, 2003; Millenium, 2003).

With its current fulfillment and delivery model, Tesco has been able to develop its online business faster than its competitors who are creating parallel distribution systems from scratch. But there are doubts about the profitability and the scalability of its web business. Tesco's fulfillment model is very labor-intensive. The £5 Tesco charges for home delivery may not be enough to cover the cost of employing pickers and drivers. Recently, the cost of picking and home delivery operations at Tesco have been estimated at 14 percent of sales, divided evenly between both operations (Reinhard, 2001). Moreover, when stores are crowded at weekends, which are when most orders arrive, efficiency falls off further as pickers jostle their way down aisles and queue like any other shopper. Therefore, to avoid a potential competition between regular shoppers and pickers in busy stores, it might be more efficient to do the

order picking from less-busy stores rather than from the nearest store to the consumer (Kumar, 2001). In assigning orders to stores an e-grocer needs to tradeoff the picking efficiency with delivery distances, times, and costs. Finding the “best” picking location for an order is an interesting research problem. It could potentially be modeled as a variant of the multiple-depot vehicle routing problem with time windows (Laporte, 1992; Desrosiers et al., 1995), where there is a “congestion cost” at each retail store (depot) which increases in the number of orders assigned to that store. The goal is then to assign the orders to the stores and construct delivery routes for the vans such that the total congestion and travel costs are minimized, subject to constraints such as the capacities of the vans, the delivery time windows, the number of pickers (or the picking capacity) available at each store, etc.

Throughout its short history, GroceryWorks was invested in and bought partially by Safeway, then Tesco. GroceryWorks’ business model changed several times when the new investors (buyers) purchased their portions of the company. The model started with one large warehouse, changed to multiple, smaller warehouses, and it is now in-store picking. At the end of June 2001, GroceryWorks announced that it was closing all of its Texas distribution centers and now has a new business model of delivering completely out of existing stores under the Safeway and Tesco umbrellas (Kane, 2002). The emergence of this new model allows GroceryWorks to reduce costs by not building and staffing its warehouses.

3.3 Hybrid Store-Warehouse

The third model of order fulfillment seems to be a natural evolution from the previous two. Picking from existing stores is a good alternative if fast roll-out with low investments is required (Yrjölä, 2003). The in-store pick model is also appealing to brick-and-mortar supermarkets cautiously entering the market. Leveraging existing assets lets them test the market without spending a great deal on new facilities. On the down side, in-store picking is naturally more inefficient than having a warehouse with shelves and aisles strategically planned for quickest picking and packing time. Therefore, when the market has developed, the customer base has been established, and the proper density is achieved, a plausible alternative is to move to a distribution center and for a time, maintain both in-store picking, either straight from the aisles or from a dedicated non-customer area in the store, and a warehouse. The three companies discussed below, Sainbury’s of U.K., Peapod, and Albertsons, are traversing this path.

Sainsbury's evolution followed the path described above: orders were originally picked and packed in-store by a team of personal shoppers and customers could pick up their orders from the store at a service charge of £3.50 or have it delivered to their home at an agreed time for a charge of £5. In May 1999, Sainsbury's announced that it will open the U.K.'s largest food picking center to fulfill customer orders received online. Sainsbury's has since built two picking centers and stores nearly 15,000 products in these picking centers. The decision was based on Sainsbury's belief that while a store-based system is operable in principle, it is neither viable nor capable of dealing with significant volume without affecting the quality of services being offered to shoppers in-store. Currently, Sainsbury's employs a hybrid-picking model based on two dedicated picking centers and in-store-picking in 33 stores. By moving to this hybrid fulfillment center/in-store picking model, Sainsbury's forges new ground and differentiates itself from its rival Tesco (Davis, 2001).

Peapod began its service by having personal shoppers go to grocery stores and fill orders made online by picking items right off the shelves. Orders were then delivered by mini-vans to customers. Peapod soon realized the high cost and inefficiency of picking orders in this fashion, and decided to move towards a centralized distribution model in every market in which it offers online shopping and delivery services (Peroni, 2001).

This centralized model employs formats for both large and smaller markets: freestanding warehouse facilities and smaller fast-pick fulfillment centers, depending on the size of its customer base. Through improved supply chain processes, Ahold and Peapod are converting former mezzanine storage areas at Ahold's US stores into efficient "fast pick" fulfillment centers for Peapod.

Peapod works closely with Ahold's operating companies, Stop & Shop in the Boston metropolitan area and Edwards in the New York area. In June 2000, Peapod and Stop & Shop started offering online shopping and delivery service in southern Connecticut. Orders are filled from a dedicated, fast-pick fulfillment center in Norwalk, Connecticut, adjoined to a Super Stop & Shop. The fulfillment center offers a wide variety of Stop & Shop and national brands (Peapod, 2000b).

In Seattle, Albertsons.com uses a retrofitted Albertsons unit and combines a brick-and-mortar operation with a fulfillment center. This strategy employs an existing 31,000-square-foot unit remodeled to present a 14,000-square-foot conventional supermarket with 17,000 square feet reserved as a fulfillment center for picking and packing of orders. Albertsons has continued the strategy of slow expansion using existing stores for

order fulfillment as it moved into the Southern California and San Diego markets. As commented on by Matt Muta, Vice President of Technology at Albertsons, “The advantage that we have vs. a centralized fulfillment model (favored by Webvan and other online-only grocers) is that we’re not building the multimillion-dollar structures. We are making use of existing structures, existing resources and technologies, and adding the Web front end to it” (Sandoval, 2002b).

In a June 2001 press release, Albertsons Chairman and CEO Larry Johnston discussed his strategic imperatives to be: “. . . aggressive cost and process control, maximization of return on invested capital, customer-focused approach to growth, company-wide focus on technology, energized associates” (Albertsons, Inc., 2001). These imperatives do not specifically mention the online operations of Albertsons, but the focus on technology, aggressive cost and process control, and maximum return on invested capital facets address Albertsons’ approach to its online segment.

With the entrance of large brick-and-mortar grocers into the e-grocery segment, the model of large, automated warehouses has migrated to a larger number of smaller fulfillment centers in conjunction with the existing stores. There are several advantages to the smaller, more dispersed centers. It is often less costly to modify existing stores or structures than to build gargantuan warehouses. Therefore, existing businesses can experiment with the e-grocery segment without a massive outlay of resources. Compared to store-based fulfillment, order picking can be done more efficiently, and it is easier to scale for larger volumes. Having more centers reduces transportation costs due to shorter distances to consumers’ homes, and also increases delivery time accuracy and hence customer satisfaction. Additionally, brick-and-mortar grocers that utilize warehouses for online sales as well as traditional distribution to their stores have the potential to increase their efficiency by increasing opportunities for risk pooling, leading to reduced inventory, stock-outs, and lead-times; shared resources, leading to reduced overhead costs; and reduced inbound transportation costs (Beamon, 2001). A problem with having a warehouse handle both online and regular orders to stores is the difficulty of integrating the online and traditional handling, inventory and storage systems. Also, transportation costs to the centers from the suppliers increase because of the additional mileage required. For a detailed discussion on issues and challenges of designing and operating bi-functional distribution centers serving both traditional retail outlets and online orders, see Beamon (2001).

4. Order Delivery

Prior to the advent of supermarkets and chain grocery stores, home delivery of groceries was a common occurrence. Milk was delivered fresh each morning on the doorstep and other groceries were delivered from the corner grocery. Home delivery of groceries has mostly disappeared along with the corner grocery store as huge supermarkets drove small “mom-and-pop” stores out of business. E-grocers are now trying to bring back the home delivery service, together with the customized and personalized shopping experience offered by traditional grocery stores. There are currently four ways by which e-grocers deliver goods to customers: attended delivery, unattended delivery, in-store pickup, and third party pickup locations (see Table 1.2). In this section, we give an overview of each method and discuss their relative advantages and disadvantages. For an in-depth study of attended vs. unattended delivery models in the e-grocery industry, see Punakivi (2003).

4.1 Attended Delivery

Customers of e-grocers, which offer attended home delivery, can usually choose a time window to receive their delivery. In most cases, customers need to place or finalize changes to their orders at least one day before the scheduled delivery time window. For example, FreshDirect allows customers to schedule next day delivery from as late as midnight for weekday deliveries and 9pm on weekend deliveries. Fairprice (in Singapore) makes deliveries 6 days per week with orders received prior to 8am delivered the same day and all others are delivered the following day.

Most e-grocers view having and operating their own delivery fleet of trucks or vans as a strategic advantage. All but two of the top twelve e-grocers ranked by Gomez Advisors Spring 2000 Survey of E-Grocers use company-owned vans or trucks to deliver products to customers. NetGrocer uses FedEx, and GrocerOnline uses both UPS and FedEx for delivering goods to customers.

Table 1.2. A summary of the general logistics model of each company. The level of automation varies and several companies have tried multiple models, including the concurrent use of more than one model.

	Large Automated DC	Smaller, not as highly automated	In-store Picking	Attended Delivery	Unattended Delivery	Installed Receptacles	In-store Pickup
Peapod		**	* (early)	*	*		
PublixDirect	*			*			
NetGrocer	*				*		
Safeway/GroceryWorks	* (early)	* (early)	* (now)	*			
Albertsons		*	*	*			*
Tesco			*	*			
Sainsbury's	* (now)		* (now)	*			*
Peachtree Network			*	*			
Grocery Gateway		*		*			
Fairprice		*		*			
Cold Storage		*		*			
ParkNShop	*			*			
Webvan	*			*	*		
Homegrocer		*		*			
Shoplink		*			*	*	
Streamline		*		*	*		
Kozmo			*	*			

For e-grocers, which own and operate their own delivery network, an important issue is to assign and meet delivery time windows. This requires dynamically assigning delivery time windows to customers as new orders arrive, and dynamically creating and adjusting delivery routes for trucks. High demand for certain time slots, travel time uncertainties due to traffic and other factors, and short time windows further complicate this task. The objectives include maximizing vehicle utilization and minimizing costs, while maintaining acceptable customer service and satisfaction rates. While some e-grocers use commercial routing software, others prefer to use home grown systems or customized versions of commercial software that better meet their needs. Mike Smith, former director of distribution at Homegrocer, noted the challenges in getting routing companies to move at 'Internet speed': "The routing companies are used to working with traditional companies that are not tremendously technology oriented like the dot.coms. If HomeGrocer wants an important change in the software, we often do it ourselves because it is quicker, and we have the technology know-how" (Partyka and Hall, 2000).

One area that differentiates the routing problem faced by e-grocers compared to traditional companies is the need for creating "dynamic" routes which meet short time windows, i.e., creating and adjusting the routes dynamically as orders are placed or changed online. For example, Webvan's windows were 30 minutes long, and Kozmo attempted to form routes within 5 minutes, while taking into account the size and weight of orders, mode of delivery, product type, etc. "Routing companies weren't ready to work on that kind of solution." said Chris Kantarjiev, formerly of the Webvan technology staff (Partyka and Hall, 2000). "Only two vendors showed interest, and we had to customize a commercial package to meet our needs. To make our windows, we take a hit on efficiency and occasionally spend more time driving than delivering." According to Scott Evans, former vice president of Logistics at Kozmo, "We went shopping for routing software last August and decided the offerings were unworkable. They are built for a different type of operation and the algorithms take too long to optimize" (Partyka and Hall, 2000). Kozmo decided to create its own in-house routing system.

To meet the high expectations of on-time deliveries while keeping the delivery costs low, e-grocers need to use fairly advanced optimization techniques and information technology systems. "We have great systems," says Brownell, formerly an industrial engineer at the Webvan distribution center in Suwanee, Georgia (O'Briant, 2000). "When the customer logs onto the Web site and goes to schedule a delivery, we've already done some pre-processing that allows us to know where that

customer is. When it shows them the available 30-minute windows that they can schedule, it only shows them the ones that we are able to service them within. So, the system has already done some logic to understand where the customer is, whether there are other orders in the neighborhood, and whether we have capacity available at that given time for that customer to place the order.” The routes are built as customers place their orders, and their effectiveness and accuracy are double-checked daily. Brownell adds, “After they place their order, we’ve held a spot for them in a route. Then at the end of the day, after cutoff, we break all those routes apart; we re-optimize just to make sure that what we’ve got throughout the daily process is the best match for our utilization of our equipment and for customer service” (O’Briant, 2000).

The concept of integrated order promise and delivery decisions is an interesting one, and to our knowledge, not much studied in the literature (Campbell and Savelsbergh, 2003). While deciding which delivery time windows to offer to a customer, e-grocers need to consider whether (and how) the probability that a customer places an order depends on the available time windows. For example, if the only delivery times offered to a particular customer are between 2pm and 6pm, would the customer still place an order? E-grocers should also determine how this customer’s delivery request fits into the current delivery schedule, given current and potential future orders. Of particular concern are the potential arrivals of more profitable orders in the future, which could utilize the time slots offered to the current customer. With the goal of creating balanced delivery schedules that lead to an efficient and effective utilization of the existing fulfillment/delivery capacity, we envision that revenue management techniques could be applied to the delivery fees. For example, e-grocers could set different delivery fees depending on the delivery time and day, similar to package delivery services; e.g., higher fees for popular time windows or for morning or evening rush-hour times. Delivery fees could also be dynamically adjusted depending on how a new order fits into the current delivery schedule. For example, the delivery fee can be waived (or lowered) if a customer accepts her delivery in the same window as another customer (who already placed an order) from the same neighborhood. Webvan had taken a first step in this direction by highlighting the time windows at which deliveries were already scheduled to a customer’s neighborhood. However, since Webvan did not offer any discounts or other incentives for choosing these particular windows, it is not clear how much that information influenced the customers’ decisions.

Creating dynamic routes given tight delivery windows and uncertainties in demand and travel times is an extremely difficult task. To increase delivery efficiency and timeliness, some companies put restrictions on

delivery times. For example, FreshDirect, which operates in New York City, limited delivery slots to evenings (4-10pm) to minimize delays due to traffic. Concentrating delivery times to this shorter time frame has a two-fold benefit for the company. First, the trucks avoid morning rush hour, minimizing the time they are immobilized in traffic. Second, the shorter delivery time frame concentrates the demand per window, leading to fewer trips, better truck (and driver) utilization, less gas usage, and lower wear and tear on the vehicles.

Besides the debates on the profitability of the home delivery model, the views are also divided about the impact of this model on the environment. Some opponents of the e-grocery model cite state that e-grocers do more damage to the environment than traditional stores. Their studies show that fuel emissions from operating home delivery services are higher than the combined trips of individuals shopping for groceries (Galea and Walton, 1997). Although environmental issues are a concern, we do not discuss them further in this paper.

4.2 Unattended Delivery

Currently, only two e-grocers, Netgrocer and Peapod, are offering unattended delivery. Netgrocer delivers only non-perishables via FedEx. Peapod drivers leave insulated coolers packed with dry ice in a customer-designated secure location, and pick the coolers up on their next delivery. Peapod's method of unattended delivery is fairly low cost (coolers and dry ice) and the benefits gained by customer goodwill due to the added convenience may outweigh the cost. Using a national carrier for delivery, as in the case of Netgrocer, takes off this burden from the shoulders of the e-grocer, but increases the possibility of spoilage and theft.

Previously, e-grocers used other methods for unattended delivery. For example, Shoplink.com and Streamline.com installed refrigerated boxes or storage shelves at customers' garages to hold the groceries. Streamline.com provided two delivery options: orders could be delivered in specially designed temperature-controlled bins, or placed in a full-sized Streamline.com refrigerator. The refrigeration unit, which Streamline.com designed with Sears, sat primarily in a garage or basement area for each weekly delivery. Streamline installed a keypad entry system or lockbox to the customer's garage or basement to be able to make the delivery while the customer was not at home.

According to a recent study, unattended delivery is found to be the most cost-efficient e-grocery home delivery model, since it enables the optimal routing and scheduling of delivery vehicles (Punakivi, 2003). Unattended delivery also appeals to the lifestyles of the majority of e-

grocer customers, who are working individuals not likely to be at home during the day to receive deliveries (Blackwell, 2001). Despite its cost advantages and convenience for the customers, this method has serious drawbacks. First, apartment dwellers cannot partake of this service unless packages can be left at a management office or with a doorman. Second, even if the customers do not pay for the storage boxes, they still have to give up part of their precious garage or storage space. Third, the cost of buying and installing storage boxes and shelves is relatively high and has to be amortized across the expected duration of the boxes' use. Punakivi (2003) finds that while using customer-specific reception boxes in home delivery operations leads to a cost reduction of 44-53 percent (compared to attended delivery with a two-hour time window), due to the high investments involved in customer-specific storage boxes, the payback period is 6-13 years.

Although unattended delivery may be an attractive service for some customers, the reality of its implementation is prohibitive or undesirable for most e-grocers. Finding a method of keeping perishable grocers cool and safe until customers come home and store them away, can be difficult, or costly, or just plain time-consuming. With the other available methods of getting the goods to the customer on the go, such as in-store pick-up and third-party pickup locations, unattended delivery is a serviceable, but not necessary option.

4.3 In-Store Pickup

With so many traditional supermarket chains joining the ranks of e-grocers, they leverage their assets for yet another feature they possess not available to pure-plays - in-store pickup. Albertsons.com is one of the online grocers currently offering this service. Especially for those customers constantly on the go, or unsure about scheduling, this may be a desirable option. The downside to in-store pickup is that customers still have to make a trip to the grocery store. However, with lower delivery costs for the e-grocer and the customer, this method certainly has a potential to be around for much longer.

4.4 Third Party Pickup Locations

Customer pickup in third party locations has been long discussed in the e-grocer industry, but none of the e-grocers in the U.S. provided this option until recently. In Japan, convenience stores have been used for some time for picking up orders placed online (Strom, 2000). Similarly, in Taiwan there have been partnerships between online stores and convenience stores for payment and delivery. For example, the partnership

that took place between Music.com.tw and FamilyMart in 1998 allowed consumers order music CDs online, and then pay and pick up the CD at any of FamilyMart's outlets. More than 6,000 CDs were sold in just a few weeks (Ling, 2000).

FreshDirect is now using office parks and train stations as remote pickup locations for groceries in suburban New York. According to FreshDirect CEO, Joseph Fedele, refrigerated trucks carrying up to 500 customers' groceries wait at designated locations from 2-8pm for customer pickup. This adds to the convenience factor for on the go customers by having someone else waiting for deliveries, says Fedele, "You don't wait for us to come. Our trucks wait for you" (O'Connell, 2002). An interesting question is how to choose such pickup locations. In these decisions, e-grocers need to tradeoff convenience to the customers against the cost. For example, convenience to the customers could require a higher number of pickup locations possibly in areas where land is expensive and congestion is high, which would increase the costs. The rich literature on facility location problems (Drezner, 1995) could provide useful insights to e-grocers in evaluating alternative pickup locations and choosing the best ones.

If the customer pickup method catches on, we may see in the future an expansion of this service, perhaps placing refrigerated containers with personalized locks in mall parking lots, gas stations or convenience stores. E-grocers as well as other retailers could form alliances to lower costs by delivering through third-party or shared facilities. An alliance could consolidate customers' orders from multiple e-tailers in "collection centers" built in convenient locations, which could be a new facility or perhaps a gas station, convenience store, or a local Wal-Mart store, and then either deliver from there, or let the customers pick up all the goods they ordered online (see Figure 1.4). Consolidating online orders from multiple retailers could result in reduction of costs of delivery as expenses are spread between several companies.

5. Conclusions

Just a few short years ago money seemed to be plentiful. Almost anyone with a good idea could obtain venture capital, start a business, and if it failed it was considered a "learning experience." Those days are gone. The rules of old business now apply to 21st century businesses, especially e-businesses. Companies must not only have a good idea, but they must have competent management, solid logistics, and must be profitable to stay relevant and stay alive. This rule applies to all companies, regardless of sector, but the logistics aspect is particularly crucial

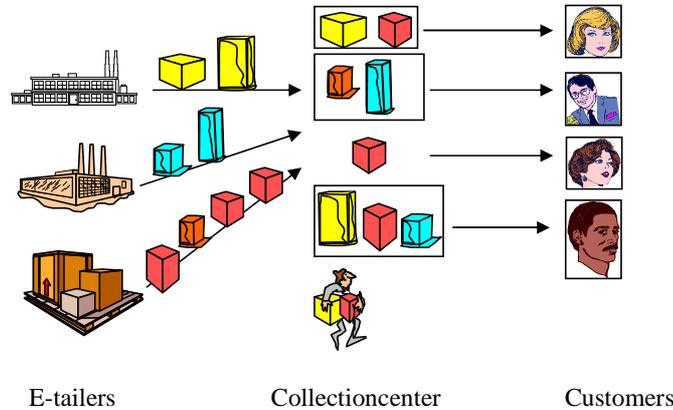


Figure 1.4. Collection centers consolidate the orders a customer placed from multiple retailers, for one-stop pickup or aggregate home delivery.

for e-grocers. Grocery business operates on thin margins, and hence it is imperative that e-grocers identify the most efficient and effective ways for order fulfillment and delivery of the bulky and/or perishable items they sell.

Today, the surviving and thriving online grocers are not pure-plays but companies such as Safeway, Albertsons, and Publix. The existing giants' most predominant advantages over pure-plays are massive resources, logistics infrastructures, and existing customer base, which lower the barrier to entry of traditional grocery stores while maintaining the high barrier to entry for pure-play e-grocers. Current trends indicate that survival is quite difficult, if not impossible, for e-grocers with no "brick base," with the notable exception of niche players. Albertsons, Safeway, Publix, and other established grocers with online stores will grow stronger, especially in those cities with dense populations where driving to a grocery store is inconvenient and the cost of groceries is high (New York, Chicago, San Francisco, etc.). Once consumers have more than one online grocery service in each market to choose from, customer loyalty will be a key factor in an e-grocer's success. One study shows that "product availability, timeliness of delivery, and ease of return have statistically significant association with customer loyalty" (Heim and Sinha, 2001). Customer-acquisition costs for a startup online grocer range between \$200 and \$700 per customer (Kumar, 2001). This means that attracting consumers alone will not determine success, but retaining existing customers is crucial.

One mistake most e-grocers made in facing the challenges of this business was rapid growth, both in terms of the markets served and the vari-

ety of product/service offerings. Back in the late 1990s, most e-grocers, as well as other e-tailers, went by the philosophy “If you build it, they will come.” They spent millions of dollars on state-of-the-art warehouse facilities, fleets of trucks, and advertising, but could not build the customer base needed for break-even, let alone profitability. Most customers were not ready to change their shopping habits, and even if they were, they preferred to buy from existing stores selling online, which they found familiar and more reliable.

Similar to rapid expansion into too many markets, rapid expansion into too many products and/or services also proved to be costly for most e-grocers, especially pure-plays. For example, now defunct Streamline.com’s services included fresh flower delivery, shoe repair, dry cleaning, UPS package pickup and mailing, film development, and video rental. Further along those lines, some e-grocers, such as Webvan, wanted to position themselves less as a grocery player and more as a fulfillment player. Webvan repeatedly stressed that the notoriously low-profit-margin grocery business (the big chains earn about a 2 percent margin) is not its main business. Once grocery markets were established and a strong brand image was built, Webvan’s plan was to move into higher margin products. That is one reason why the company originally choose the name Webvan, rather than Webgrocer or some other name that directly associates it with the grocery industry. Instead, Webvan wanted to be a “last mile” Internet retailer, the retailing equivalent of telecom’s “last mile” companies – the firms that want to own that critical last-mile connection to customers’ homes and pockets. Webvan would then compete as much with UPS for rapid package delivery as it did with Safeway for food sales. The attraction of such home delivery fulfillment services is that they have an opportunity to prompt a lot more impulse purchases than the Internet normally does.

In many ways, such a move set e-grocers like Webvan and Streamline.com on a collision course with other retailers, such as Amazon.com, who were moving from being a specialist towards becoming a generalist. This attempted product/service diversification strategy of e-grocers was partly due to their need for finding ways to generate new revenue sources, increase margins, and better utilize existing resources, in particular, the capacity of their highly automated warehouses and delivery networks. That is why Amazon took stakes in HomeGrocer and Kozmo.com, companies that bypassed postal services like Federal Express and UPS to deliver products right to consumers’ homes.

On the other side of the spectrum, there are those companies that take pride in catering to a smaller, select group of customers. Already we see New York’s FreshDirect focusing on fresh, perishable foods. CEO

Fedele seems to distance his company from other e-grocers and online retailers, stating “This isn’t about the Internet. It’s about offering a better, fresher product at prices 10 percent to 35 percent cheaper ... We understand the money is made in expert manufacturing, not in distribution” (Dillon, 2002). With the setup at the FreshDirect processing center, one might opine that they could broaden their scope to delivery of fresh products to restaurants, hotels and specialty stores, themselves becoming middlemen, should the online delivery business not progress as anticipated; however, nothing along those lines has been stated publicly by the company. To avoid the Webvan mistake of overreaching, FreshDirect delivers in only five zip codes, mostly in Manhattan, and is adding new ones slowly as it fine-tunes its systems. It has no immediate plans to expand beyond New York; the longer-term goal is to open one or more additional plants in the region before expanding to four or five other East Coast cities (Kirkpatrick, 2002).

Currently, the existing e-grocers in the U.S. and Asia are not extending their product lines to include higher margin items, such as DVDs or dry cleaning services. They are focusing on their core business of groceries/consumer items and using home delivery as an alternate channel, rather than expanding into items outside their current product mix. In Europe, however, the trend is mixed, with some retailers carrying high margin, non-grocery items, and others are not. For example, U.K.’s Tesco expanded its product selection beyond groceries to include higher margin products that online customers seem more willing to mix with food than do customers in the supermarket. We have yet to see the full effect of Tesco’s strategy but it may well turn out that the answer may be a careful selection of additional high-margin products and, perhaps most importantly, a familiar store brand from which to buy all these goods.

There is room for many niche suppliers in the online world. We see opportunity for growth in the niche areas of fresh and prepared foods (e.g., FreshDirect), non-perishable pantry items (e.g., NetGrocer), convenience store items, and alcoholic beverages. There is also potential in the ethnic markets. Certain companies such as EthnicGrocer.com and LatinGrocer.com are already taking advantage of this opportunity by catering to the Hispanic market, but there are yet untapped markets to be reached in the future.

A number of consumers, investors, and traditional retailers remain skeptical of the promise of online grocery retailing. At the heart of all the criticism is that the grocery business is mature and has very thin margins, which are not high enough to offset the high costs of order fulfillment and home delivery for online orders. “Running a delivery service

- with trucks and staff to maintain - is pricey.” Says Ken Cassar, a senior analyst for Jupiter Research: “It is a very expensive business to bid out, and consumer habits die hard. Consumers have been accustomed to selecting their own tomatoes, and they don’t trust anyone else to pick them out for them” (Anonymous, 2000a; Mott, 2000). Yet we see opportunity for growth and success for a select few online grocers. To summarize, our recipe for success in the online grocer business is as follows: don’t grow too soon, too fast; partner with existing brick-and-mortar companies; design logistics infrastructure for efficiency and scalability; attract and retain customers; communicate the value clearly; and do not try to compete on price, but on overall “value.” If online grocers combine these ingredients we expect the results will be highly palatable.

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