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Learning Objectives

- Upon completion of this chapter, you will be able to:
1. Define EC order fulfillment and describe the EC order fulfillment process.
 2. Describe the major problems of EC order fulfillment.
 3. Describe various solutions to EC order fulfillment problems.
 4. Describe RFID supply chain applications.
 5. Describe collaborative planning and the CPFR model.
 6. Describe other EC support services.
 7. Discuss the drivers of outsourcing support services.

OPENING CASE: HOW AMAZON.COM FULFILLS ORDERS

The Problem

With traditional retailing, customers go to a physical store and purchase items that they then take home. Large quantities are delivered to each store or supermarket; there are not too many delivery destinations. With e-tailing, customers want the goods quickly and to have them shipped to their homes. Deliveries of small quantities need to go to a large number of destinations. Also, items must

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be available for immediate delivery. Therefore, maintaining an inventory of items becomes critical. Maintaining inventory and shipping products costs money and takes time, which may negate some of the advantages of e-tailing. Let us see how Amazon.com, the “king” of e-tailing, handles the situation.

Amazon started with “virtual retailing” as a business model – no warehouses, no inventory, and no shipments. The idea was to take orders and receive payments electronically and then let others fill the orders. It soon became clear that this model, although appropriate for a small company, would not work for the world’s largest e-tailer.

The Solution

Amazon.com decided to change its business model and handle its own inventory and logistics. Furthermore, for a fee the company provides logistics services to any seller even its competitors. The company spent billions of dollars to construct their own warehouses around the country and became a world-class leader in warehouse management, warehouse automation, packaging, and inventory management. For a description see Harkness (2013).

How is Amazon.com able to efficiently fulfill many millions of orders every month?

- **Step 1.** When you place an order at Amazon.com and designate a destination, the computer program knows from where it is going to be shipped. It is usually shipped from Amazon’s fulfillment center, or from the sellers’ locations. Sellers have an option to ship their merchandise to Amazon.com for storage and processing. Amazon lists the products in its online catalog and may advertise the product(s). When an order arrives, a computer program will route the order to where it will be fulfilled. Amazon.com has dozens of distribution centers. In general, a typical Amazon.com distribution center operates in the follow way:
 - **Step 2.** All orders received are routed electronically by the dispatcher to specific parts pickers for fulfillment.
 - **Step 3.** The items (such as books, games, and CDs) are stocked in the warehouse in bins. Each bin is equipped with a red light. When an item in the bin needs to be picked up, the red light turns on. Pickers then pick up the items from the bins with red lights and then turn off the lights.
 - **Step 4.** Each picked item is placed in a basket with a barcode designating the order number. The baskets are placed on a 10-mile long winding conveyor belt in the warehouse. Each basket is directed automatically to a specific destination point guided by barcode readers.
 - **Step 5.** Each full basket is checked to assure that the barcodes are matched with a specific order. Then the items are moved to appropriate chutes, where they slide into delivery boxes. The system arranges for multiple items to reach this same box if there are several items in one order.
 - **Step 6.** The boxes are then sealed for delivery. If gift wrapping was selected, this is done by hand.
 - **Step 7.** The full boxes are then taped, weighed, labeled, and routed to one of the truck bays in the warehouse for shipment; some are owned by UPS, the U.S. Postal Service (USPS), and other shippers.
- Del Rey (2013) provides a photo slideshow of the operation of one of Amazon.com’s largest centers located in Phoenix, AZ.
- Amazon.com also rents out space in its warehouse and provides logistics services to other companies. It takes orders for them, too. How does this work?
1. Sellers label and ship items in bulk to Amazon.com.
 2. When Amazon.com receives sellers’ items, it stores them until an order is placed.
 3. When an order is placed, Amazon.com will pick, pack, and ship the items to individual customers and may combine several items in the same order.
 4. Amazon.com manages after-ordering customer service and handles returns as needed.
- Until a couple of years ago, Amazon.com outsourced the actual shipment of products to UPS and the USPS. This enabled them to locate their

warehouses and distribution centers in low-cost states in order to ship to high-cost states with larger populations. It also limited their shipments to next day or two-day service. In mid-2012 Amazon.com decided to offer “same day” delivery service in a select group of cities (Manjoo 2012). A number of EC companies tried out “same day” service before and failed. In order to deliver this service Amazon.com spent millions of dollars to construct distribution centers in major metropolitan areas in California, Texas, Virginia, Tennessee, and New Jersey. In these cases shipments are handled by other third-party delivery services.

Some Recent Innovations

Amazon is a great innovation company. Some recent innovations that will be discussed later in this chapter are: same day delivery (e.g., Amazon Fresh), the use of robots in warehouses, and the use of drones (in planning) for delivery within 30 minutes. Amazon also delivers in some cities in one hour!

The Results

In the beginning, Amazon.com’s warehouses were only able to deliver 1 million pieces a day, creating delays during peak periods. Today, the average warehouse can deliver hundreds of thousands of pieces a day. During the peak holiday season, their warehouses must handle millions of pieces per day. The current system gives Amazon.com the ability to offer lower prices and stay competitive, especially because the company is becoming a huge online marketplace that sells thousands of items.

To increase efficiency, Amazon.com combines several items into one shipment if they are small enough. Shipping warehouses do not handle returns of unwanted merchandise – the Altrecom warehouse in Auburn, Washington, handles returns.

More recently, Amazon.com created “Pantry,” a pilot program providing same day delivery of a number of the non-perishable items found in a grocery store (e.g., detergent). The program is aimed at Amazon’s Prime members and is designed to compete with Costco and Walmart’s Sam’s Club. The program is described in Barr (2013).

Sources: Barr (2013), Del Rey (2013), Harkness (2013), Manjoo (2012), and services.amazon.com/fulfillment-by-amazon/how-it-works.htm (accessed April 2015).

LESSONS LEARNED FROM THE CASE

The Amazon.com case illustrates the complexity and benefits of the overall order fulfillment process used by a large e-tailer. This chapter provides a detailed overview of the fulfillment process in EC, focusing on the major problems associated with this EC support service, as well as the solutions used to overcome those problems.

12.1 ORDER FULFILLMENT AND LOGISTICS: AN OVERVIEW

Comparatively speaking, taking orders over the Internet may be the easy part of B2C. Fulfilling orders and delivering the ordered items to the customers’ doors can be the tricky part. For example, as the open case showed, Amazon.com initially started out as a totally virtual company accepting orders and payments but relying on third parties to fulfill and deliver the orders. Eventually, they came to realize that they needed physical warehouses with thousands of employees in order to expedite deliveries and substantially reduce order fulfillment costs. In order to understand the importance of order fulfillment and delivery in EC, as well as the complexities and problems associated with each, you first have to have a general understanding of these concepts.

Basic Concepts of Order Fulfillment and Logistics

Regardless of the type of product and the type of commerce involved – online or off, **order fulfillment** refers to all the operations a company

undertakes from the time it receives an order to the time the items are delivered to the customers, including all related customer services. For example, a customer must receive assembly and operation instructions with a new appliance. This can be done by including a paper document with the product or by providing the instructions on the Web. In addition, if the customer is dissatisfied with a product, an exchange or return must be arranged.

Order fulfillment encompasses a number of *back-office operations*, which are the activities that support the fulfillment of orders, such as packing, delivery, accounting, inventory management, and shipping. It also is strongly related to the *front-office operations*, or *customer-facing activities*, such as advertising and order taking, that are visible to customers.

Obviously, the overall objective of order fulfillment is to deliver the right product, to the right customer in a timely, cost effective, and profitable manner. The way these objectives are achieved varies between e-tailing and offline retailing because e-tailers are focused on delivering smaller numbers of items directly to the individual consumer, while many retailers are focused on delivering volumes of products to the store shelf. Of course, these days e-tailing and conventional retailing are intertwined because most retailers have multiple sales and services channels – Web, mobile, in store, call center, etc. This requires them to integrate the various channels, enabling customers to order anywhere and

pick up or receive anywhere. The closing case in this chapter discusses the issues, use, and benefits of this multichannel integration.

Overview of Logistics

Logistics encompasses activities required to efficiently and effectively control and manage the movement and storage of items, services, and information across the entire supply chain to the consumer and potentially back. Logistics can be viewed as a major activity in order fulfillment.

Traditional Versus EC Logistics

EC logistics, or **e-logistics**, refers to the logistics of EC systems mainly in B2C. The major difference between e-logistics and traditional logistics is that the latter deals with the movement of large amounts of materials to a few destinations (e.g., to retail stores). E-logistics shipments typically are small parcels sent to many customers' homes. Other differences are shown in Table 12.1.

The EC Order Fulfillment Process

In order to understand why there are problems in order fulfillment, it is beneficial to look at a

Table 12.1 How e-logistics differ from traditional logistics

Characteristic	Traditional knowledge	EC logistics
Type, quantity	Bulk, large volume	Small parcels
Destinations	Few	Large number, highly dispersed
Demand type	Push	Pull
Value of shipment	Very large, usually more than \$1,000	Very small, frequently less than \$50
Nature of demand	Stable, consistent	Seasonal (holiday season), fragmented
Customers	Business partners (in B2B), usually repeat customers (B2C), not many	Usually unknown in B2C, many
Inventory order flow	Usually unidirectional, from manufacturers	Usually bidirectional
Accountability	One link	Through the entire supply chain
Transporter	Frequently by the company, sometimes outsourced	Usually outsourced, sometimes by the company
Warehouse	Common	Only very large shippers (e.g., Amazon.com) operate their own

logistics services. Digital items are usually available because their “inventory” is not depleted. However, a digital product, such as software, may be under revision, and unavailable for delivery at certain times. In either case, information needs to flow among several partners.

- **Activity 4: Insurance.** Sometimes the contents of a shipment need to be insured. This could involve both the finance department and an insurance company, and again, information needs to flow, not only inside the company, but also to and from the customer and insurance agent.
- **Activity 5: Replenishment.** Customized orders will always trigger a need for some manufacturing or assembly operation. Similarly, if standard items are out of stock, they need to be produced or procured. In both cases, production can be done in-house or by suppliers. The suppliers involved may have their own suppliers (sub-suppliers or tier-2 suppliers).
- **Activity 6: In-house production.** A plan is needed for in-house production. Production planning involves people, materials, components, machines, financial resources, and possibly suppliers and subcontractors. In the case of assembly, manufacturing, or both, plant services may be needed, including possible collaboration with business partners. Services may include scheduling of people and equipment, shifting other products’ plans, working with engineering on modifications, getting equipment, and preparing content. The actual production facilities may be in a different country than the company’s headquarters or retailers. This may further complicate the flow of information, collaboration, and communication. All this needs to be done efficiently and effectively.
- **Activity 7: Use contractors.** A manufacturer may opt to buy products or subassemblies from contractors. Similarly, if the seller is a retailer, such as in the case of Amazon.com or Walmart.com, the retailer must purchase products from its manufacturers. Several scenarios are possible. Warehouses can stock purchased items, which is what Amazon.com does with its best-selling books, toys, and

other commodity items. However, Amazon.com does not stock books for which it receives only a few orders. In such cases, the publishers or intermediaries must make special delivery arrangements. In either case, appropriate receiving and quality assurance of incoming materials and products must take place. Once production (activity 6) or purchasing from suppliers (activity 7) is completed, shipments to the customers (Activity 3) can be arranged.

- **Activity 8: Contacts with customers.** Sales representatives need to keep in constant contact with customers, especially in B2B, starting with notification of orders received and ending with notification of a shipment or a change in delivery date. These contacts are usually done via e-mail and are frequently generated automatically. For typical services that customers need, see Online File W12.1.
- **Activity 9: Returns.** In some cases, customers want to exchange or return items. Such returns can be a major problem, as billions of dollars in North American goods are returned each year for both online and offline situations. The movement of returns from customers back to vendors is called **reverse logistics**.

Order fulfillment processes may vary, depending on the product and the vendor. The order fulfillment process also differs between B2B and B2C activities, between the delivery of goods and services, and between small and large products. Furthermore, certain circumstances, such as in the case of perishable materials or foods or pharmaceuticals, require additional steps, administrative activities, and legal constraints and obligations.

The opening case describes how Amazon.com fulfills its orders. Complex processes, such as those used by Amazon.com, may have problems (see Section 12.2) that are often minimized or eliminated through automation (as the slideshow in Del Rey 2012 demonstrates).

The Importance of Order Fulfillment

Order fulfillment is considered a critical success factor for e-commerce. Wozniak (2013) lists

the following five keys order fulfillment issues that are critical for profitability and customer satisfaction.

- *Correct product delivery.* Customers abandon shopping from a vendor that delivers even one incorrect item (295 of all shoppers).
- *On time delivery.* 42% of customers will change vendors that do not ship as promised.
- *Order tracking.* Order tracking and e-mail notifications are a must now.
- *Speedy delivery.* Retailers must meet customer expectations.
- *Free shipping.* Helps a lot. Common for expensive items, also see Amazon's Prime membership.

Order Fulfillment and the Supply Chain

The nine-activity order fulfillment process is an integral part of the *supply chain*. The flows of orders, payments, information, materials, and parts need to be coordinated among all the company's relevant department participants, as well as with and among all relevant external partners. The procedures of supply chain management (SCM) must be considered when planning and managing the order fulfillment process, which due to its complexity may have problems.

SECTION 12.1 REVIEW QUESTIONS

1. Define order fulfillment and logistics.
2. Compare traditional logistics with e-logistics.
3. List the nine activities of the order fulfillment process.

12.2 PROBLEMS IN ORDER FULFILLMENT ALONG SUPPLY CHAINS

During the 2011 holiday season online sales increased 15% from the previous year. Some retailers were caught off guard (Hayes 2012). For example, the large demand for some products from BestBuy.com led to problems in fulfilling orders made in November and December 2011. As a consequence, Best Buy was unable to fulfill many of these orders. The reason was that the supply chain management system was unable to

detect problems before they occurred. The problem resulted in bad publicity for Best Buy.

A similar situation arose during the 2013 holiday season in the U.S., although the fulfillment and delivery problems were much more widespread among e-tailers. While online sales increased a little over ten percent from the previous year, last minute orders were up close to 50%. Many of these last minute orders were no doubt predicated on the promise of one to two day deliveries. As a result of this last minute flood of requests, the major carriers – UPS and FedEx – were unable to handle the massive volume, resulting in a substantial percentage of orders failing to be delivered in time for Christmas (Heller 2013). A number of retailers had to offer gift coupons or other forms of remuneration to make up for the missed deliveries.

The inability to deliver products on time is a typical supply chain problem in both offline and online commerce. Several other problems have been observed along the supply chain: Some companies grapple with high inventory costs; shipments of wrong products, materials, and parts occur frequently; and the cost to expedite operations or shipments is high. The chance that such problems will occur in EC is often higher because of the mismatch between standard supply chain structures and processes and the special nature and requirements of EC. For example, most manufacturers' and distributors' warehouses are designed to ship large quantities to a set number of stores; they are not designed to optimally pack and ship small orders to a large number of customers' doors. Improper inventory levels are typical in EC, as are poor delivery scheduling and mixed-up shipments.

Uncertainties in Demand

Many problems along the EC supply chain stem from demand uncertainties and the difficulties that ensue across the supply chain in trying to meet this uncertain demand. This is where demand forecasting comes into play. The major goal of demand planning is to forecast at a very detailed level the number of products of a certain

type that will be needed to meet the demand at specific locations at particular points or time intervals in the future. For instance, a virtual retailer might want to estimate the number of smartphones of a particular model that will be needed to fulfill potential orders for a particular city or area of a city during the upcoming holiday season.

Usually, demand forecasts rest on statistical (time series) estimates from historical patterns and trends in sales or order data. The estimates try to incorporate a number of factors in understanding what produced these historical patterns and trends so these factors can be taken into account when making the estimates. Some of the factors might include economic conditions, prices, seasonal adjustments, weather conditions, estimates of consumer confidence, and the impact of promotions of various types. Obviously, anyone of these factors can change very quickly, as well as the fact that consumers tastes can change quite radically, which is why demand forecasting is as much an art as it is a science.

The problem is that demand planning is probably the most critical planning process in the supply chain because it determines many of the other processes in the chain. Among other things, it drives the plans of how many orders can be filled from inventory, how much a retailer will buy, how much manufacturers will need to build, what raw materials are needed, how much factory capacity is needed, how much will have to be shipped, and when and where it will have to be shipped, and so forth. Inaccurate estimates of demand ripple throughout the supply chain. This is why the demand forecast should be conducted frequently, and adjustments need to be made to plans in collaboration among the business partners along the supply chain. Companies attempt to achieve accurate demand forecasts by methods such as information sharing using collaborative commerce.

Inadequate Logistical Infrastructure

Pure play EC companies are likely to have more problems because they do not have a logistics infrastructure already in place and are forced to

use external logistics services rather than in-house departments for these functions. These external logistics services are often called **third-party logistics suppliers (3PL)**, or *logistics service providers*. Outsourcing logistics services can be expensive, and it requires more coordination and dependence on outsiders who may not be reliable. For this reason, large virtual retailers usually have their own physical warehouses and distribution systems. Other virtual retailers are creating strategic alliances with logistics companies or with experienced mail-order companies that have their own logistics systems.

Inefficient Financial Flows

Note that supply chain problems and improvements refer not only to the flow of goods but also to the flow of information and money. Money flow includes invoicing, payment, collection, and so forth.

In spite of the availability of computer-based systems, many suppliers, manufacturers, distributors and retailers rely on manual and paper-based systems to conduct financial transactions. These inefficient financial processes not only slow the flow of cash across the supply chain but halt the flow of goods and services and put the various partners at a competitive disadvantage. To succeed in today's global economy trading partners need to rely on automated systems to speed their financial transactions. For solutions to such problems, see Crossgate Inc. (2010).

Lack of Information Sharing

In today's world the flow of information across the supply chain is almost as critical as the flow of goods and services. Information systems support this flow, enabling communication and coordination of the various players and systems in the chain. Without these systems and the information sharing they support, the supply chain could not exist or survive.

Virtually every world-class company has a variety of information systems designed to support both supply chain planning and execution.

Included are some combination of integrated capabilities designed to support network design, demand, supply, and logistics planning along with systems enabling supply, transportation, warehousing, labor, and return logistics management.

One of the most persistent order fulfillment problems is the *bullwhip effect*. Basically, it refers to the mismatch between the actual demand for goods and the inventory supplied upstream in the supply chain to meet the assumed demand. The mismatch results in excess inventory and safety stock that is used as a buffer against underestimated demand. In practice the mismatch grows as you move up the chain from the retailer to the distributor to the supplier to the manufacturer so that variability in inventory and safety stock increases along the way. One way to reduce the mismatch is to ensure that information and, thus visibility, about demand flows to all the parties involved, so that there is only “one version of the truth” instead of each party either producing its own estimate from different data sources or only working with the previous link in the chain, rather than all parties relying on common data that is close to the actual point of sale.

The effect is described in Online File W12.2.

SECTION 12.2 REVIEW QUESTIONS

1. List some problems along the EC supply chain.
2. Explain how uncertainties create order fulfillment problems. List some of these problems.
3. What problems may exist in financial supply chains?
4. Describe the role of 3PLs.
5. Why is information sharing needed along the end-to-end supply chain?

12.3 SOLUTIONS TO ORDER FULFILLMENT PROBLEMS ALONG THE SUPPLY CHAIN

Many EC logistics problems are generic; they can be found in the non-Internet world as well. Therefore, many of the solutions that have been developed for these problems in brick-and-mortar companies also work for e-tailers. IT and EC

technologies facilitate most of these solutions. They also provide for automation of various operations along the supply chain that usually improve its operation. In this section, we will discuss some of the specific solutions to EC order fulfillment problems along the supply chain.

Improvements in the Order-Taking Activity

One way to excel in order fulfillment is to improve the order-taking activity and its links to fulfillment and logistics. Order taking can be done via e-mail or on a webstore and it may be automated. For example, in B2B, orders can be generated and transmitted automatically to suppliers when inventory levels fall below a certain threshold. It is a part of the *vendor-managed inventory* (VMI) strategy described in Chapter 5. The result is a fast, inexpensive, and more accurate (no need to rekey data) order-taking process. In B2C, Web-based ordering using electronic forms expedites the process, making it more accurate (e.g., automated processes can check the input data and provide instant feedback), and reduces processing costs for sellers. When EC order taking can interface or integrate with a company’s back-office system, it shortens cycle times and eliminates errors.

Order-taking improvements also can take place within an organization, for example, when a manufacturer orders parts from its own warehouse. When delivery of such parts runs smoothly, it minimizes disruptions to the manufacturing process, reducing losses from downtime.

Warehousing and Inventory Management Improvements

A popular EC inventory management solution is a **warehouse management system (WMS)**. On the surface, WMS refers to a software system that helps in managing warehouses. Behind the scenes, any market-leading WMS provides:

- **Inbound functions** such as yard management, appointment scheduling, multi-method

receiving, cross-docking, put-to-store, quality assurance, staging, and put-away

- **Inventory functions** such as inventory visibility, lot-serial control, multi-level holds, counts, replenishments, value-added services (VAS) processing, work order processing, internationalization, and slotting
- **Resource management** such as dynamic pick location assignment, equipment utilization, facility utilization, task management, automation interfaces, and workforce management
- **Outbound functions** such as shipment order management, multi-method order picking, retail in-store and dark-store picking and processing of e-commerce orders, cartonization, shipping and parcel manifesting, sequenced staging and loading, and compliance of shipping documents.
- **3PL/divisional support** such as multi-client architecture, client billing, client-based process modeling, cross-client optimization, client visibility and reporting

See, for example, jda.com, for a description of the detailed capabilities of a WMS.

A WMS is useful in reducing inventories and decreasing the number of out-of-stock incidents. Such systems also are useful in maintaining an inventory of repair items so repairs can be expedited; picking items out of storage bins in the warehouse; receiving items at the receiving docks; and automating the warehouse operations. For example, introducing a make-to-order production process and providing timely and accurate demand information to suppliers can minimize inventories and out-of-stock incidents. In some instances, the ultimate inventory improvement is to have no inventory at all; for products that can be digitized (e.g., software), order fulfillment can be instantaneous and can eliminate the need for inventory.

Changing the Structure and Process of the Supply Chain

An efficient solution to many supply chain problems is to change the supply chain structure from a linear to a hub structure as illustrated in

Figure 12.2. Notice that in a hub structure connection between supply chain partners and elements is much shorter. Also, coordination and control is done at the center of the hub, making the management more efficient, and the structure increases visibility. Long supply chains are usually more susceptible to problems. Also, the hub structure management is usually fully digital, making order fulfillment faster, less expensive, and less problematic.

Speeding Up Deliveries: From Same Day to a Few Minutes

As discussed earlier, a major success factor in EC is the speed within which shoppers receive their orders. And indeed, the competition for fast delivery is intensifying.

FedEx initiated the concept of “next day” delivery in 1973. It was a revolution in door-to-door logistics. A few years later, FedEx, introduced its “next-morning delivery” service. In the digital age, however, even the next morning may not be fast enough. Today, we talk about same-day delivery and even delivery within an hour. Deliveries of urgent materials to and from hospitals, shipping auto parts to car service shops, and delivering medicine to patients are additional examples of such a service. The opening case to this chapter described Amazon.com’s recent implementation of their “same-day” delivery service. Two other newcomers to this area are eFulfillment Service (efulfillmentservice.com) and OneWorld Direct (owd.com). These companies have created networks for the rapid distribution of products, mostly EC-related ones. They offer national distribution systems across the United States in collaboration with shipping companies, such as FedEx and UPS.

Delivering groceries is another area where speed is important, as discussed in Chapter 3. Quick pizza deliveries have been available for a long time (e.g., Domino’s Pizza). Today, many pizza orders can be placed online. Also, many restaurants deliver food to customers who order online. Examples of this service can be found at gourmetdinner.com.au and the

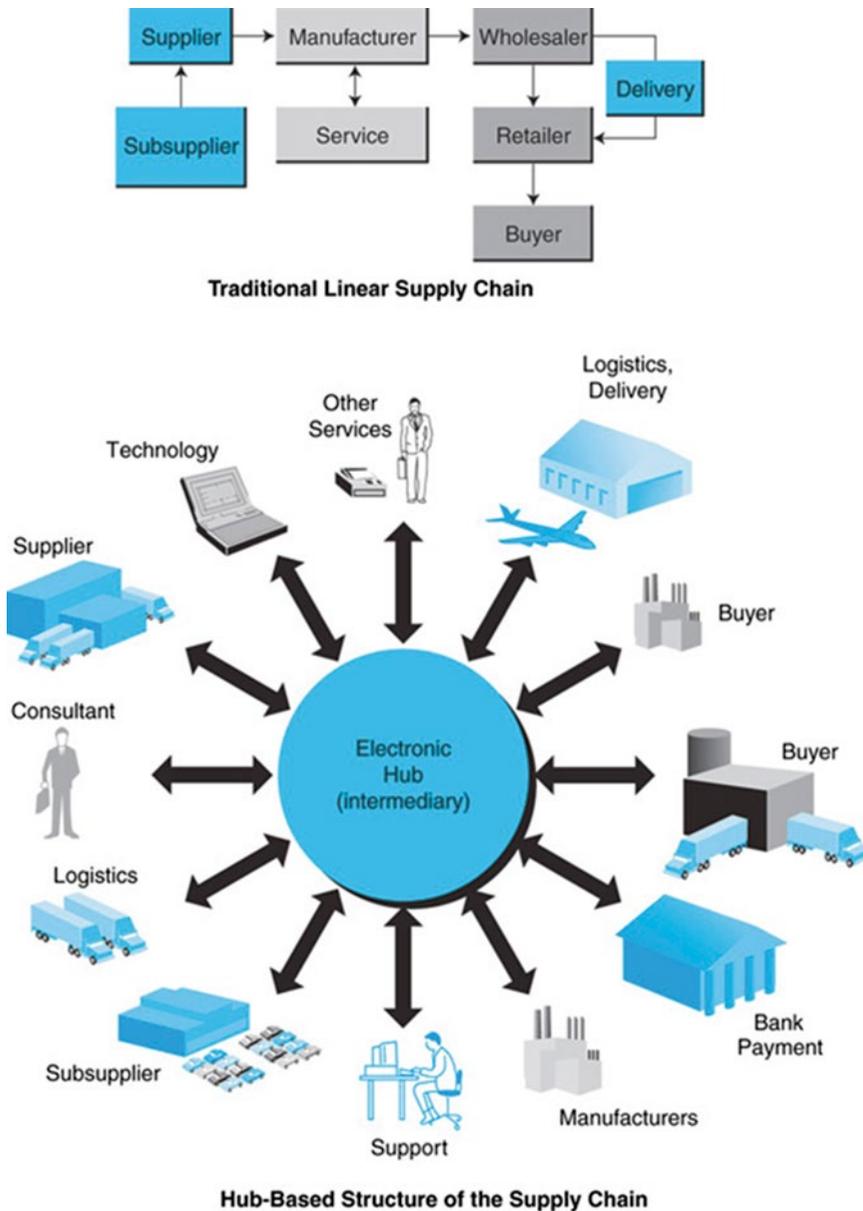


Figure 12.2 Changes in the supply chain

GrubHub company. Some companies even offer aggregating supply services, processing orders from several restaurants and then making deliveries (e.g., dialadinner.com.hk in Hong Kong).

Supermarket deliveries are often done same day. Arranging and coordinating such deliveries may be difficult, especially when fresh or

perishable food is to be transported. Buyers may need to be home at certain times to accept the deliveries.

Delivery by Drones

Ideally, e-tailers want to deliver faster than you can get products by going to a store and buying

then. The futuristic solution is delivery of packages by drones in minutes. A dream? Amazon.com believes that the dream will come true in 2015. However, this may take much longer due to legal, technological (sensors' capabilities) and other constraints, see Black (2014).

Example: Amazon Prime Air

One day we will see a fleet of Prime Air vehicles in the sky, delivering packages to customers' doors. For how the delivery is envisioned see the video and text at [amazon.com/b?node=8037720011](https://www.amazon.com/b?node=8037720011). The technology is available today, the cost is declining and the Federal Aviation Administration is working on the regulations. According to a lobbying registration filing, Amazon Prime Air hired Akin Gump Strauss Hauer & Feld to lobby regarding testing and operation of unmanned aerial vehicles.

Amazon is not the only company that banks on delivery by drones. For example, QuiQui is a startup that plans to deliver medicine in the San Francisco Bay Area with delivery time of 8–12 minutes (see Segall 2014).

Same Day Delivery

We covered this topic in Chapter 3 as it related to groceries. Also cited there is the increased competition. In addition to Amazon Fresh many other companies are active in the market. Notable are Instacart, Postmates, and Google Express (see Pisani 2014). But, same day delivery does not only apply to groceries. Amazon is starting same day delivery of everything in several large cities. Google Shopping Express is active too, and so are eBay, Uber Rush and others (Bowman 2014). For one hour delivery see Halkias (2015).

Partnering Efforts and Outsourcing Logistics

An effective way to solve order fulfillment problems is for an organization to partner with other companies. For example, several EC companies have partnered with UPS or FedEx.

Logistics-related partnerships can take many forms. For example, marketplaces may

be managed by one of many freight forwarders such as A & A Contract Customs Brokers, a company that helps other companies find “forwarders.” Forwarders help prepare goods for shipping and work with carriers to determine the optimal way to ship. Forwarders can also find the least expensive prices on air carriers, and the carriers bid to fill the space with forwarders' goods that need to be shipped.

Example

SkyMall (skymall.com; a subsidiary of Gemstar-TV Guide International), is a retailer that sells from catalogs on airplanes, over the Internet, and by mail order. It relies on its suppliers to fill the orders. For small suppliers that do not handle their own shipments and for international shipments, SkyMall contracts the appropriate distribution centers owned by Sykes Enterprises. Note: The company went out of business in 2015.

Instead of a joint venture or equity ownership with partners, many companies simply outsource logistics with comprehensive logistics service providers like UPS and FedEx. Their services cover all forms of EC including B2C, B2B, and G2B. See Case 12.1 for a description of the broad EC services that UPS provides. One advantage of outsourcing is that it is easy to change the logistics provider. Outsourcing is especially appealing to small companies.

CASE 12.1: UPS PROVIDES BROAD EC SERVICES

In 2013 United Parcel Service (ups.com) delivered close to 17 million packages with the help of over 395,000 employees, each day, all over the globe, using a network of hundreds of planes and thousands of vans. This represents a volume of 4.3 billion packages per year, an increase of over a 4% increase in volume from the prior year, due in large part to increases in deliveries for EC. UPS is the undisputed leader in packages delivery worldwide. Towards this end, they provide customers with tools and applications

for tracking packages, examining shipping histories, figuring time-in-transit, and verifying on time arrival.

In their annual financial reports UPS describes their business as being divided into three segments: U.S. Domestic Package, International Package, and Supply Chain and Freight. For the past few years, these segments have represented around 62%, 22%, and 16%, respectively. While package delivery represents the major part of their business, they also provide expertise, infrastructure, and technology for managing global logistics services. These logistics services include “transportation, distribution, forwarding, ground, ocean and air freight, brokerage and financing” (UPS 2014). In essence, for customers who utilize these services, UPS runs major parts of their supply chains.

A major component of their Supply Chain and Freight business segment is their worldwide network of distribution centers. For example, in China they have over 130 centers for supporting the distribution of goods to customers in close to 90 cities in the country. The centers manage receiving, storage, order processing, and shipment. The centers are also used to provide post-sales services including planning, fulfillment, testing, reporting, refurbishing, and reverse logistics for critical parts. These latter capabilities, for example, are utilized by the manufacturers and suppliers of automobile parts.

Even Experts Can Encounter Problems

As noted in Case 12.1, in spite of UPS’ supply chain expertise and infrastructure, they were still unable to handle the peak in demand and the surge in last minute orders experienced during the 2013 holiday season. The overall volume of orders throughout December, as well as the number of last minute orders spurred by retailers guaranteeing next day delivery, even for orders placed at 11 PM on Christmas Eve, far exceeded UPS’s projections and, consequently, the ability of their supply chain networks to

process and handle the orders. In response, UPS is focusing on:

- **Improved Forecasts.** Online retail is growing rapidly – faster than many companies have anticipated. The methods used for forecasting demand and the impacts of this demand upstream on the supply chain no longer work in this environment. Greater collaboration is required with large customers in order to estimate the impact of evolving consumer behavior and promotions (like guaranteed free delivery).
- **Network Throughput.** Investments are required to update the infrastructure of a number of UPS’ distribution centers and to improve the routing capabilities of their delivery systems. Increased automation is critical to the improvement of the distribution centers, while the rollout of their On-Road Integrated Optimization and Navigation (ORION) system is key to improved routing. ORION optimizes the routes taken by delivery vehicles resulting in shortened overall distances for a given delivery cycle, improved delivery times, and more efficient fuel consumption (see Konrad 2013). It also supports better tracking of packages.
- **Shipment Visibility.** With the growth of their Supply Chain and Freight business, there has been a substantial increase in the number of truck trailers that customers leave at their distribution centers. UPS has limited visibility to the contents in these trailers.
- **Improved Communication.** Better communication between shippers and receivers is needed during peak periods and when disruption occur in the network. Better communications will enable their customers to not only respond to disruptions but also to proactively plan for the peaks.

Impact of Ship from Store

Many of the EC orders that UPS handles involve shipments that travel long distances from one of their or the retailer’s distribution center to the customer. Obviously, this results in a higher cost

to either the customer or the retailer or both. Although UPS has adjusted their shipment costs so that the margin percentage is essentially the same regardless of distance, longer distances mean higher revenues.

In an effort to reduce shipping costs, some of the specialty retailers like the Gap, are servicing online orders by shipping directly from the store to the customer (Nilsson 2013). Similarly, larger retailers, who have been shipping directly from their stores for quite some time, have substantially increased these shipments. For example, in the past year Walmart has doubled the number of their stores using direct from store shipments. In essence, the store nearest the customer becomes a distribution center. While UPS and their main competitor FedEx are still used for a majority of these deliveries, the fact that the distances are shorter means that their revenues are also reduced.

In the short run this is not likely to have a major impact on UPS's overall revenues. However, over the next few years, as alternative EC distribution methods emerge (e.g., order online and ship from store and pick up in store), and as Amazon.com's distribution network expands (see opening case), UPS and FedEx will have to come up with alternative strategies to address the potential revenue impacts.

Sources: Based on Nilsson (2013), Konrad (2013), UPS (2014), and ups.com (accessed April 2015).

Questions

1. What sort of outsourcing services does UPS provide besides package delivery?
2. Why would a shipper, such as UPS, expand to other logistics services?
3. What changes is UPS contemplating to avoid the problems encountered during the 2013 holiday season?
4. Why does "ship from store" EC delivery represent a threat to UPS' business?

Using Robots in Warehouses

Robots have been used in warehouses to fetch parts stored in bins for many years. What is new

is using them on a large scale in EC. According to Lobosco (2014) Amazon planned to use 10,000 robots in its warehouses by the end of 2014. You can watch the video titled "Robot Army Helps Run Warehouse" (3:10 minutes), cited by Lobosco (2014), to see what the robots are doing. In 2015 Amazon was using over 20,000 robots.

Integrated Global Logistics Program

An increase in global trading created a need for an effective global logistics system. Order fulfillment problems described earlier tend to be even larger in longer supply chains that cross country borders. The number of partners in such situations is usually larger than in domestic logistics (e.g., customs brokers, global carriers), and so is the need for coordination, communication, and collaboration. Furthermore, such systems require a high level of security, especially when the Internet is the centric technology platform. Integrating separate segments of the supply chain can be very beneficial for minimizing problems in long global chains.

Order Fulfillment in Make-to-Order and Mass Customization

As you may recall from Chapter 1, one of the advantages of EC is the ability to easily customize products and personalize services. Although taking customized orders is easily done online, the fulfillment of such orders may not be simple. Mass production enabled companies to reduce the price per unit. Customization is usually expensive, since each item must be handled separately. Customization also requires time, especially for large products like cars. However, consumers usually want customized products to be delivered in a timely fashion at price points that are not much higher than those of a similar product that is mass produced. So, the question is: how does a supplier, manufacturer or retailer do this at a reasonable cost to themselves and in a reasonable time for their customers?

Fulfilling Orders

Dell was a pioneer in providing customized products to end consumers in a timely and cost effective fashion. They were able to do this using mass produced components that were assembled to meet the customized orders of their customers. This approach has been adopted by many other manufacturers. Most customized cars, shoes, toys, textbooks, and wedding rings are made this way. Of course, when you talk about millions of computers at Dell, the supply chain, the logistics, and the delivery of components become critical (see EC Case 12.2 p. 578 for a discussion of Dell supply chain practices). You also need to closely collaborate with your suppliers. In addition, you need to have flexible production lines where changes are made quickly and inexpensively (e.g., painting cars at Toyota), and you need tools that enable quick and not-so-expensive changes (usually driven by computerized systems). This is usually a part of *intelligent factories* or production lines.

For sources on intelligent factories and mass customization, see the *International Journal of Mass Customization* and Smart Factory KL (smartfactory.eu).

Here, we present examples of how customization is accomplished by these methods.

Example 1: Intelligent Factories

These factories work on totally integrated automation that enables mass customization to be executed at a reasonable cost and speed. Major developers are Siemens AG, IBM, and General Electric.

Example 2: Distributed Mass Customization

Etsy (etsy.com) is a market maker for handmade goods, many of which are customized and sold online. Thousands of small producers custom produce on demand. Etsy aggregates them into one electronic marketplace.

Handling Returns (Reverse Logistics)

Allowing for the return of defective or unsatisfactory merchandise and providing for product exchanges or refunds, are necessary to maintain-

ing customers' trust and loyalty. Some time ago, it was found that the absence of a good return mechanism was the number two reason for shopper reluctance to buy online. A good return policy is a must in EC.

Dealing with returns is a major logistics problem for EC merchants. Several options for handling returns are:

- **Return the item to the place of purchase.** This is easy to do with a purchase from a brick-and-mortar store, but not a virtual one. To return a product to a virtual store, a customer needs to get authorization, pack everything up, pay to ship it back, insure it, and wait up to two billing cycles for a credit to show up on his or her credit card statement. The buyer is not happy and neither is the seller, who must unpack, check the paperwork, and resell the item, usually at a loss. This solution is workable only if the number of returns is small or the merchandise is expensive (e.g., Blue Nile). Some vendors, (e.g., Amazon.com), enable customers to print prepaid UPS or USPS shipping labels that make returns easier for the customers.
- **Separate the logistics of returns from the logistics of delivery.** With this option, returns are shipped to an independent returns unit and are handled separately. This solution may be more efficient from the seller's point of view, but it does not ease the return process for the buyer.
- **Completely outsource returns.** Several outsourcers, including UPS and FedEx, provide logistics services for returns. The services deal not only with delivery and returns but also with the entire logistics process. FedEx, for example, offers several options for returning goods.
- **Allow the customer to physically drop the returned item at a collection station or at a physical store of the same**

vendor. Offer customers locations (such as a convenience store or the UPS Store) where they can drop off returns. In Asia and Australia, returns are accepted in convenience stores and at gas stations. For example, BP Australia Ltd. (gasoline service stations) teamed up with wishlist.com.au, and Caltex Australia is accepting returns at the convenience stores connected to its gasoline stations. The accepting stores may offer in-store computers for ordering and may also offer payment options, as at Japanese 7-Elevens (7dream.com). In Taiwan and some other countries, you can order merchandise (e.g., books), pay, pick up the item ordered, and return unwanted items, at a 7-Eleven store. Click-and-mortar stores usually allow customers to return merchandise that was ordered online to their physical stores (e.g., walmart.com and eddiebauer.com).

- **Auction the returned items.** This option can go hand-in-hand with any of the previous solutions.

For strategy, guidelines, and other information on returns, see The Reverse Logistics Executive Council.

Order Fulfillment in B2B

According to recent forecasts by Forrester Research (reported by Sheldon and Hoar 2013), online revenues for B2B EC in 2013 were substantially higher than online revenues for B2C EC. The figures were close to \$570 billion versus \$250 billion, respectively. In spite of the sizeable difference, B2B EC is far less developed than B2C EC. The differences are found not only in the front-end experience but also in the back-office functionality including information management, Web content management and order management.

Some of the major differences in order management capabilities were pinpointed in another survey sponsored in 2013 by Honeywell and conducted by Peerless Research Group (2013) for *Logistics Management and Supply Chain Management Review*. Based on responses from 469 supply chain managers, most of whom were responsible for either B2B or a combination of B2B and B2C EC systems across a range of industries, the survey revealed that:

- The most important missions for their systems were increasing the volume and speed of fulfillment while reducing costs per order, increasing profitability, and improving customer service.
- Many of the inefficiencies and increased costs in order fulfillment were due to increased transportation, packaging, and materials costs.
- The keys to addressing the inefficiencies and costs rest with improved supply chain software applications, re-engineered (fulfillment) operations, and adoption of supply chain analytics.

B2B fulfillment tends to be more inefficient than B2C because it is usually more complex. Typically, the shipments are larger, there are multiple distribution channels, the shipment frequency is more varied, the breadth of the carrier services is more uneven, there are fewer EC carrier offerings, and the EC transaction paths are much more complicated. The types of improvements in applications and re-engineering of processes needed to resolve these sorts of complications revolve around the automation of physical systems, as well as the use of business process management (BPM) software to automate processes.

Using E-Marketplaces and Exchanges to Ease Order Fulfillment Problems in B2B

In Chapter 4, we introduced a variety of e-marketplaces and exchanges. One of the major objectives of these entities is to improve the operation of the B2B supply chain. Let's see how this works with different business models.

- A company-centric marketplace can solve several supply chain problems. For example,

CSX Technology developed an extranet-based EC system for tracking cross-country train shipments as part of its supply chain initiative, and was able to effectively identify bottlenecks and more accurately forecast demand.

- Using an extranet, Toshiba America provides an ordering system for its dealers to buy replacement parts for Toshiba's products. The system smooths the supply chain and delivers better customer service.
- HighJump Software suggested taking into account a number of key elements for optimal order fulfillment including the automation of picking, packing and shipping, the transformation of paper-based processes, and the inclusion of sales and marketing input into various supply chain processes.

For additional discussion on how fulfillment is done in B2B, see fedex.com/us/supply-chain/services/fulfillment-services and Demery (2012).

Order Fulfillment in Services

Thus far, we have concentrated on order fulfillment with physical products. Fulfilling service orders (e.g., buy or sell stocks, process insurance claims) may involve additional information processing, which requires more sophisticated EC systems.

Other Solutions to Supply Chain Problems

- *Visibility* increases along the supply chain. It is critical to know where materials and parts are at any given time. This is referred to as **visibility**. Such knowledge can help in solving problems such as delays, combining shipments, and more. Visibility is provided by several tools, such as bar codes, RFID, collaborative devices, and collaborative portals that provide access to information required to manage various aspects of the supply chain. Visibility enables the efficient coordination of supply chain activities in spite of rapid changes in the market.
- *Order fulfillment* can become instant if the products can be digitized (e.g., software). In other cases, EC order taking interfaces with the company's back-office systems, including

logistics. Such an interface, or even integration, shortens cycle time and eliminates errors.

- *Managing risk* to avoid supply chain breakdown can be done in several ways. Carrying additional inventories is effective against the risk of stock-outs, and hence, poor customer service, but it can be expensive. Also, in certain cases the risk increases because products may become obsolete. (Managing inventories was described in Chapter 4.)
- *Inventories can be minimized* by introducing a build-to-order manufacturing process as well as by providing timely and accurate information to suppliers. By allowing business partners to electronically track in route orders and production activities, inventory management can be improved and inventory levels and the expense of inventory management can be minimized. Inventories can be better managed if we know exactly where parts and materials are at any given time (e.g., by using RFID). Retailers' inventories can be managed electronically by their suppliers.
- *Self-service* can reduce supply chain problems and costs. Some activities can be done by customers, business partners, or employees. For example, customers can self-track the status of their orders (e.g., at FedEx, UPS, USPS, etc.); using FAQs, customers and business partners may solve small problems by themselves. Customers can self-configure details of orders (e.g., for a computer at HP, Dell, and Apple), and finally, employees can update personal data online.
- *Collaboration* among members of the supply chain can shorten cycle times, minimize delays and work interruptions, lower inventories, and lower administrative costs. A variety of tools exists ranging from collaborative hubs and networks to collaborative planning.

Innovative E-Fulfillment Strategies

Several innovative e-fulfillment strategies exist. For example, supply chain partners can transmit information flows and hold off shipping physical

goods until a point in time when they can make more direct shipments. An example of logistics postponement is merge-in-transit.

Merge-in-transit is a model in which components for a product need to arrive from two or more physical locations. For example, in shipping a desktop PC, the monitor may come from the East Coast of the United States and the CPU from the West Coast. Instead of shipping the components to a central location and then shipping both together to the customer, the components are shipped directly to the customer and merged into one shipment by the local deliverer (so the customer gets all the parts in one delivery), reducing unnecessary transportation.

One of the most innovative logistics systems is that of Dell Computers, as described in Case 12.2.

CASE 12.2: DELL'S WORLD-CLASS SUPPLY CHAIN AND ORDER FULFILLMENT SYSTEM

Since 2004, AMR Research, now part of Gartner, has been publishing an annual Supply Chain Top 25 Ranking. The ranking is based on a combined assessment from Gartner's supply chain experts along with votes from external supply chain peers. Since its inception, Dell has appeared on this list every year, reaching as high as number 2 in 2011.

Direct-to-Consumer and Configure-to-Order

One of the key reasons for their continued high ranking has been the quality of their logistics and order fulfillment systems. Dell was a pioneer in the direct-to-order consumer business model, as well as the configure-to-order method of manufacturing. For much of the time period between 2004 and present day, this business model and manufacturing method served them well. Dell was able to automate the order taking and fulfillment processes, enabling them to coordinate with their suppliers to produce the specific

components and finished products required to fill the various customer orders.

This system enabled Dell to handle the overwhelming majority of their purchase orders online through an Internet portal. The portal was used by suppliers to view the requirements of various orders and to work with Dell on forecasted requirements and delivery dates. In this way, only those components required to fulfill current orders were shipped to Dell's factories. The result was a substantial reduction in the flow of parts, the warehouse space required to manage the parts, and idle inventory. Compared to other competitors, Dell had less than 4 days of inventory at any given time, while their competitors had more than 30 days of inventory on hand.

In both the B2C and B2B world of computer electronics, components and models have a short lifespan. Today's computer models are rapidly becoming obsolete. Dell's automated system enabled them to avoid this problem, as well as helping their suppliers respond rapidly to changing demand.

Segmented Supply Chain

In 2008, things began to change for Dell. Dell found that their online configure-to-order system was too inflexible and resulted in configurations that were too expensive for its other, faster growing business segments – their retail stores, enterprise customers, and high-volume consumer products. In each case, fewer, cheaper configurations were required. Because of the mismatch between their supply chain model and the expectations of their newer customers in newer channels, Dell's competitors were able capture significant market share. In response, Dell decided to transform its supply chain into a segmented model with different policies for different types of customers. The result was four supply chain segments, each focused on a different type of customer. The four segments are displayed in Table 12.2 along with their distinguishing characteristics.

Table 12.2 Dell's segmented supply chain

	Build-to-order: built when configured order received	Build-to-plan: built in anticipation of forecasted demand	Build-to-stock: built and stocked in anticipation of demand	Build-to-spec: built in short time period according to corporate specs with no inventory stocks
SC production policy	Online	Retail	Online	Corporate
SC segment	Low	High	High	Med-high
Volume	One	Large	Large	Med-large
Product batch size	No	Yes, at retailer	Yes, at Dell	No
Finished goods inventory	Short	Long	Long	Long
Lead time				

Source: Based on Simchi-Levi et al. (2012) and Thomas (2012)

The Results

Dell's shift to a segmented supply chain substantially impacted the efficiencies and effectiveness of their supply chain. Some of the major benefits included:

- Improved product availability
- Reduced order-to-delivery times
- Fewer configurations required to meet customer demand
- Improved forecast accuracy
- Reduced transportation and manufacturing costs.

Up until 2011, these improvements served Dell's bottom line well. In 2011 they were ranked number 2 on the Supply Chain Top 25; in 2012 they were number 4, and in 2013, number 11. The shift in rankings was primarily a function of the declining revenues in their PC business and had little to do with the performance of their supply chain. Dell's overall business model was built on providing PC systems for businesses and consumers. This business has been severely impacted by the rapid increase in smartphones and tablets, which has eroded the demand for PCs. It will take more than improvements in the supply chain to address the declining demand.

Sources: Based on Hofman et al. (2013), Simchi-Levi et al. (2012), and Thomas (2012).

Questions

1. If Dell was ranked number 11 in 2013, what companies were ranked 1 through 3? Were

these the same companies ranked 1 through 3 in 2012?

2. What type of supply chain did Dell originally have? What were its benefits?
3. Why did Dell encounter supply chain problems around 2008?
4. What is a segmented supply chain?
5. Describe Dell's segmented supply chain.

Integration and Enterprise Resource Planning

If you review Figure 12.1 (p. 565) for the order fulfillment process, you will notice that certain activities involve interfacing with other information systems, such as finance, inventory management, production schedule, vendor and customer contact, and logistics. Most of these interfaces are internal, but some are external (most with suppliers and customers). For the sake of effectiveness and efficiency, such interfaces need to be done quickly and without errors. The fewer manual interfaces we need to make, the better. How wonderful it would be if we used only one interface, and if it was automated! This is exactly what an enterprise resource planning (ERP) system does.

The Supply Chains of Tomorrow

According to a comprehensive study done at MIT, tomorrow's supply chains will have to deliver various degrees six outcomes (reported by Melnyk et al. 2010), each with a corresponding

set of specific design traits. The outcomes that drive the supply chains are:

1. Monitoring cost, quality, and on-time delivery
2. Safety and security of goods delivered
3. Eliminating waste, reducing pollution, improving the environment
4. Resilience, quick recovery from disruptions of all kinds
5. Responsiveness – change quickly to adapt to changing conditions
6. Innovation – using the supply chain as a source of new processes and products, both internally and with business partners

These outcomes will assure effective and efficient order fulfillment.

SECTION 12.3 REVIEW QUESTIONS

1. List the various order-taking solutions.
2. List solutions for improved delivery.
3. Describe same-day shipments.
4. Describe some innovative e-strategies for order fulfillment.
5. Describe how to effectively manage the return of items.
6. Describe issues in B2B fulfillment.
7. List three outcomes of tomorrow's supply chain.

12.4 RFID AND CPFR AS KEY ENABLERS IN SUPPLY CHAIN MANAGEMENT

Two major technologies were found to be effective for improving and reducing problems along the end-to-end supply chains: RFID and CPFR.

The Essentials of RFID

Radio frequency identification (RFID) is a tag technology in which RFID (electronic) tags are attached to or embedded in objects (including people) and employ wireless radio waves to communicate with RFID readers so that the objects can be identified, located, or can transmit data. Tags are similar to barcodes, but they contain

much more information. Also, they can be read from a longer distance (up to 50 feet).

Theoretically, RFID can be utilized and read in many places along the supply chain, as illustrated in Figure 12.3. Over the long run, RFID tags will be attached to most items flowing through the supply chain and tracked and monitored at most of the places depicted in Figure 12.3. To date, cost has been a major inhibitor to the uptake of RFID technology. However, costs are coming down to the point where companies will be willing to invest in RFID because they can be more certain of achieving an ROI on their RFID investments. Even if costs are reasonable, organizations still need to learn how to effectively use RFID technologies with their back-office systems and how to redesign and retool their business processes so they can accrue solid business benefits from these technologies.

Given these developments, what effect will RFID have on supply chains? Let's look at Figure 12.4, which shows the relationship between a retailer (Walmart), a manufacturer (such as P&G), and P&G's suppliers. Note that the tags are read as merchandise travels from the supplier to the retailer (steps 1 and 2). The RFID transmits real-time information on the location of the merchandise. Steps 3 through 6 show the use of the RFID at the retailer, mainly to confirm arrivals (step 3) and to locate merchandise inside the company, control inventory, prevent theft, and expedite processing of relevant information (steps 4 through 6). It is no longer necessary to count inventories, and all business partners are able to view inventory information in real time. This transparency can go several tiers down the supply chain. Additional applications, such as rapid checkout, which eliminates the need to scan each item, will be provided by RFID in the future.

According to Reyes (2011), RFID can help improve supply chain visibility, asset visibility and capital goods tracking, returnable asset tracking, work-in-process tracking, as well as managing internal supply chains. Examples of several applications are presented next.

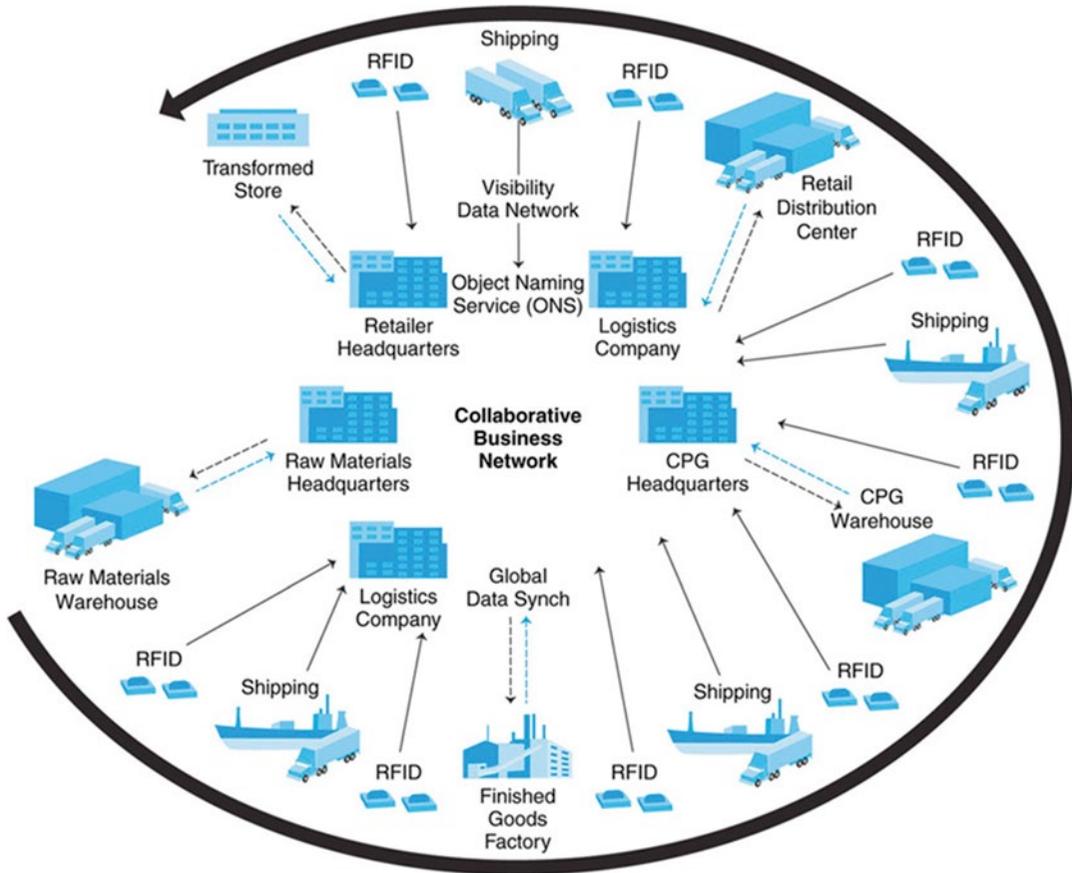


Figure 12.3 Digital supply chains (Source: Intel, “Building the Digital Supply Chain: An Intel Perspective.” Intel Solutions White Paper, January 2005, Figure 5, p. 9. Reprinted with permission from Intel Corporation)

RFID Applications in the Supply Chain Around the Globe

Many potential and actual applications exist in enterprises using RFID (e.g., see *RFID Journal*). The following are examples of how RFID is used in the supply chain. For a comprehensive review see Reyes (2011) and the *RFID Journal* (rfidjournal.com/case-studies).

RFID at Starbucks

As Starbucks expands its range of fresh foods (such as salads, sandwiches, and the like) available at its stores, the complexity and demands of managing this supply chain increases. Keeping the food fresh depends on keeping it at a steady

cool state and in ensuring timely delivery. Starbucks is requiring its distributors to employ RFID tags to measure the temperature in the delivery trucks. These tags are programmed to record the temperature inside the truck every few minutes, and on return to the depot, this temperature data can be downloaded and analyzed carefully. If there are unacceptable readings (e.g., the temperature is deemed to have risen too high), efforts are made to determine the cause and remedy the problem. This can then cause a redesign of critical business processes with regard to the transportation and handling of food. As RFID technology matures, it is conceivable that in the future, the tags themselves will be able to detect variations in temperature and send a signal to a

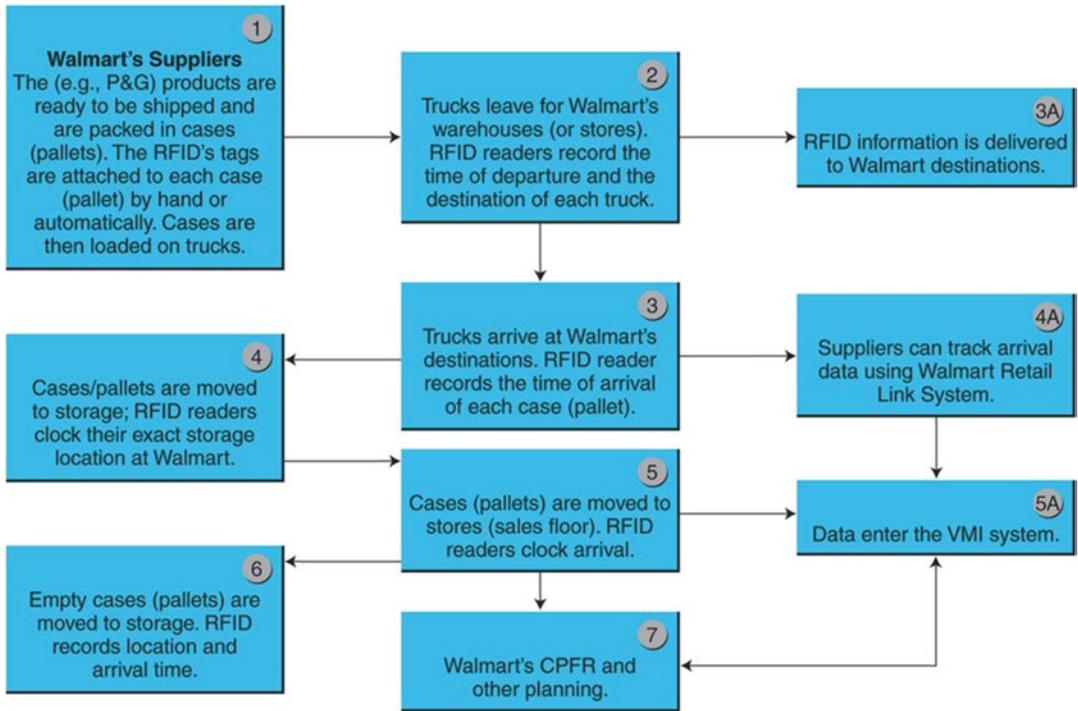


Figure 12.4 RFID at Walmart and its suppliers: the seven-step process (Source: Drawn by E. Turban)

thermostat to activate refrigeration fans within the truck. For details, see Xue (2010).

RFID at Deutsche Post (Germany)

Deutsche Post owns six million shipping containers that it uses to hold and transport about 70 million letters and other items that pass through its distribution centers daily. In order to process these crates, Deutsche Post prints in excess of 500 million thick paper labels, all of which are thrown away after a single use. It was environmental concerns, rather than purely economic ones, that drove Deutsche Post's RFID initiative.

Deutsche Post uses passive RFID tags with a bi-stable display, meaning that the text displayed remains on-screen after the power is removed and does not change until power is restored and the text is rewritten by an RFID interrogator. Tags on the crates must be readable from all angles and in all types of weather, requiring a

robust tag. Furthermore, the tags need to last about five years in order for the application to be financially viable.

Deutsche Post developed a custom tag and RFID reader, and uses specialized software in this innovative application. Several other post offices around the world use RFID (e.g., Canada).

RFID at Atlantic Beef Products (Ontario, Canada)

Cow's ears are tagged with RFID tags. After a cow is slaughtered, its ear tags are scanned for food traceability. The carcass goes onto two leg hooks, each equipped with an RFID chip. They are synced to each animal's database record. The RFIDs replace barcodes, which could get contaminated with *E. coli* on the slaughter house. The RFID helps track the movement of each cow and the meat produced at any time. The system won a gold medal from the Canadian IT organization. For details, see Makepolo (2014).

Collaborative Planning, Forecasting, and Replenishment

As you may recall, a major problem in order fulfillment is the demand forecast. A related problem is the bullwhip effect. A possible solution to both problems is CPFR.

Collaborative planning, forecasting, and replenishment (CPFR) refers to the practice of suppliers, manufacturers, and retailers collaborating on the planning and forecasting of demand so that the supply of goods and services matches customer demand at the retailer's shelf. The goal of CPFR is to minimize the inefficiencies in the supply chain that result from the mismatch of supply and demand, both in the amount of goods that flow as well as in the timing of the flow. Large manufacturers of consumer goods, such as P&G, have superb supply chains resulting from their use of CPFR.

For the essentials of CPFR “Google Images of CPFR model.” This figure is based on the guidelines originally conceived and approved by the Voluntary Interindustry Commerce Solutions (VICS) committee in 1998. The guidelines prescribe a cyclical process in which sellers, buyers, and end customers are considered. The process starts with strategy and planning, followed by demand and supply management, which results in execution. The results are analyzed, leading to a reexamination of the strategy.

CPFR can be used with company-centric B2B and with sell-side or buy-side marketplaces. The major benefits that follow from CPFR include: faster adjustments to consumer demand; more precise sales forecasts; reduced out-of-stock resulting in improved sales; reduced safety stock resulting in reduced inventory; and reduced handling and administrative costs. There have been a number of case studies detailing the realized benefits of CPFR. Many of these case studies have involved consumer packaged goods (CPG), companies like Kraft Foods, Kimberly Clark, Proctor & Gamble, and Johnson & Johnson to name a few (see Sadhu et al. 2011 for a summary of these cases).

In spite of its long history and a relatively large number of success stories, acceptance and

use outside the CPG arena is not widespread. As Jakovljevic (2010) highlights, the gap between reality and hype is attributable to a number of factors, including:

- There is a general reluctance and lack of trust among trading partners to share data.
- The overall approach is complicated and involves a number of steps and processes. This makes it difficult to start and maintain the intertwined processes.
- The approach overlooks the fact that the different parties have different goals and objectives. As a result, they tend to focus on those parts of the approach that directly impact their goals and ignore those parts of the approach that don't.
- Existing technologies are incapable of handling the breadth of processes and/or the volumes of data required to support the required planning, forecasting, and replenishment.

Since 2012, a special Voluntary Interindustry Commerce Solutions (VICS) advisory committee (VICS 2013) has been focusing on one of the key elements of CPFR – store-level Distribution Resource Planning (DRP). The use and benefits of DRP are discussed in EC Case 12.3.

CASE 12.3: STANLEY BLACK & DECKER'S COLLABORATIVE SUCCESS WITH LOWE'S AND HOME DEPOT

In today's retail world, consumers are in the driver's seat. They expect a “seamless” experience across all the shopping channels that a retailer offers. This has put a strain not only on retailers to deliver the right products to the right channel at the right time, but also on every other node in the supply chain, particularly their suppliers. This strain has resulted in a renewed interest on collaboration focused on optimizing inventory and order fulfillment.

One of the key technologies supporting this renewed collaboration is store – level DRP. **Store-Level Distribution Resource Planning (DRP)** is a collaborative approach that utilizes the retailer's POS data to produce a model that yields a bottoms-up, time-phased forecast of consumer

sales, shipments, receipts, and inventories at all stores or channels and distribution centers (DCs) for all items usually over a 12-month period. Typically, the forecasts are for daily periods in the near-term (say the next 3 months) and weekly for the remaining time. These forecasts are then used by the suppliers (manufacturers) to calculate – not forecast – what should be produced and delivered, where it should be produced and delivered, and when it should be produced and delivered. In this way, supply is tied directly to demand on the (real or virtual) shelf. If there are changes in the demand at a store or channel, then the model is used to adjust production and delivery.

The model for a single forecast provides visibility across the supply chain with a number of attendant benefits (VICS 2013):

- Improved availability at the shelf, in-stocks, service levels, forecast accuracy and productivity.
- Reduced safety-stock, product costs, transportation costs and lead times.

In alliance with the superstore retailers Lowe's and Home Depot, Stanley Black & Decker has been one of the strongest proponents of DRP. Stanley Black & Decker was built in 2010 from the merger of The Stanley Works with Black & Decker. According to their latest financial reports, today they are a global provider of power and hand tools, products and services for industrial applications, mechanical access solutions (e.g. door locks), and electronic security and monitoring systems. In 2013, their revenues were approximately \$11 billion with close to 50% coming from North America. Within North America two of their largest customers are Lowe's and Home Depot.

A few years back, before the merger, Black & Decker established dedicated demand forecasting teams for one of their three divisions (Hardware and Home Improvement) that worked directly with Lowe's and Home Depot in the same cities where the two retailers were located. The focus was on matching supply levels with consumer demand while maintaining the high fill rates and delivery schedules required by the two retailers. The overall process, which rested on spreadsheets, proved too cumbersome, inflexible and time consuming. The result was increased

overtime costs, unfulfilled demand, and problematic inventory levels.

After a thorough review, the process and system was replaced by a 3rd party software demand forecasting system which provided the means to use POS data from Lowe's and Home Depot to model item level demand at the store level across time. In this way they had a centralized process for conducting line reviews, as well as determining the impacts of price changes and promotions. Later they added a system for master planning at the plant level and for fulfillment which improved operating efficiency and improved fill rates and optimized the multi-level replenishment process. All of the systems were provided by JDA Software Group, Inc. (jda.com).

In 2010, Stanley Black & Decker and Lowe's were nominated for the VICS CPFR Implementation Excellence award for their DPR implementation. The nomination noted the joint improvements in fill rates to 98% percent levels, in-stock improvements to 98%, reduction in excess inventory, and a 10% improvement in forecast accuracy, along with reduced transportation costs.

Sources: Based on Ackerman and Padilla (2009), Fiorletta (2013), Pappas (2013), VICS (2013), and stanleyblackanddecker.com (access April 2014).

Questions

1. What is DPR?
2. What are the benefits of DPR?
3. Describe the DPR system established by Stanley Black and Decker in collaboration with Lowe's and Home Depot.
4. What benefits did Stanley Black & Decker and Lowe's realize with their DPR system?

SECTION 12.4 REVIEW QUESTIONS

1. What is RFID?
2. How can RFID improve supply chain visibility?
3. Describe three RFID supply chain applications.
4. What is CPFR?
5. How can CPFR improve supply chain operations of an e-commerce retailer?
6. What are some of the reasons that CPFR has not enjoyed widespread use?

12.5 OTHER E-COMMERCE SUPPORT SERVICES

Depending on the nature and magnitude of its EC initiatives, a company may require several other support services. The services range from consulting to directory services, newsletters, specialized search engines, a number of value-added services, and outsourced EC services.

Consulting Services

How does a firm learn how to do something that it has never done before? Many firms, both start-up and established companies, rely on outside consulting firms. Some of these firms have established a reputation in one area of expertise, whereas others are generalists. Some consultants even take equity (ownership) positions in the firms they advise. Some consultants will build, test, and deliver a working website and may even host it and maintain it for their clients. There are three broad categories of consulting firms.

The first type of consulting firm includes those that provide expertise in the area of EC but not in traditional business. In the past there were a number of larger consulting firms specializing in EC services. Many of these firms were acquired or changed direction. Today, this expertise is provided by smaller firms such as Candid software (candidinfo.com), Holbi (holbi.co.uk), and Lounge Lizard (lounge lizard.com). These firms were all started prior to the dot-com bubble and are still in operation today.

The second type of consulting firm is a traditional consulting company that maintains organizational units that focus on EC. These firms leverage their existing relationships with their corporate clients and offer EC value-added services. Representative companies are Accenture, Boston Consulting Group, Deloitte & Touche, Ernst & Young, McKinsey, and PricewaterhouseCoopers.

The third category of consulting firms is EC hardware and software vendors that provide

technology-consulting services. These include SAP, IBM, HP, Oracle, Microsoft, Cisco, Intel, and many more.

Directory Services, Newsletters, and Search Engines

The EC landscape is huge, with hundreds of thousands of companies selling products and services online. How can a buyer find all the suitable sellers? How can a seller find all the suitable buyers? In B2B, vertical exchanges can help with this matching process, but even vertical exchanges include only a limited number of potential partners, usually located in one country. To overcome the problem of finding buyers or sellers online, a company may use directory services.

Directory Services

There are several types of *directory services*. Some simply list companies by categories; others provide links to companies. In many cases, the data are classified in several different ways for easy search purposes. In others, special search engines are provided. Finally, value-added services, such as matching buyers and sellers, are available. The following are some popular directories:

- B2B-Today.com (b2b-today.com) is an e-business portal aimed at small to medium enterprises and providing B2B directory services to Chinese suppliers of goods and services across a wide variety of industries ranging from automotive to medical to office supplies just to name a few. The portal supports the RFQ process (Request for Quotation from buyers to suppliers), as well as a number of other related activities.
- Websters (webstersonline.com) is a large business directory organized by location and by product or service. In addition, it provides listings by industry and subindustry (according to SIC and NAICS codes).
- ThomasNet (thomasnet.com) provides a directory of several hundred thousands of manufacturers of industrial products and services in about 70,000 categories.

Newsletters

There are many B2B newsletters to choose from. Several are e-mailed to individuals free of charge. Examples of B2B newsletters are shown at savvyb2bmarketing.com/home/newsletters_magazines. Many companies (e.g., Ariba) issue corporate newsletters and e-mail them to people who request them.

Directories and newsletters are helpful, but they may not be sufficient. Therefore, one may need specialized search engines.

Search Engines and News Aggregators

Several search engines can be used to discover B2B-related information. Some of these are embedded in the directories. Here are some examples:

- iEntry (ientry.com) provides B2B search engines, targeted “niche engines,” and several industry-focused newsletters. iEntry operates a network of websites and e-mail newsletters that reaches more than two million unique opt-in subscribers. Newsletters are available in each of the following categories: Web Developers, Advice, Technology, Professional, Sports & Entertainment, Leisure & Lifestyles, and Web Entrepreneurs. Click on a newsletter to get a brief description and view sample content.
- Sourcetool (sourcetool.com) is a search engine that locates information and aggregates B2B (and other business) news.

More EC Support Services

Many other service providers support e-commerce in different ways. Each service provider adds a unique value-added service. This section describes only several representative examples.

Trust Services

Chapter 13 introduced the role of trust in B2C. Trust also is important in B2B because one cannot touch the seller’s products and because buyers may not be known to sellers. Trust-support services such as TRUSTe and BBBOnline (Better Business Bureau) are used both in B2C and B2B.

Trademark and Domain Names

A number of domain name services are available. Examples are mydomain.com, register.com, easyspace.com, and whois.net.

Digital Photos

Companies such as IPIX (ipix.com), which is part of Minds-Eye-View, Inc., provide innovative pictures and video capabilities for websites.

Access to Commercial Databases

Subscribers to ProQuest Dialog (dialog.com) can access about 900 databases, including those containing patents, trademarks, government reports, and news articles.

Knowledge Management

IBM Domino offers the capability to integrate social knowledge with IBM’s Websphere Portal software, providing enhanced team collaboration and networking.

Client Matching

TechRepublic (techrepublic.com) matches business clients with firms that provide a wide variety of IT services. It works like a matchmaking service. Clients define what they want, and TechRepublic performs the searching and screening, checking against some general parameters and criteria. This reduces the risk of clients making bad choices. Buyers also save time and have greater exposure to a larger number of IT service providers.

E-Business Rating Sites

A number of sites are available for businesses to research rankings of potential partners and suppliers. Bizrate.com, forrester.com, gomez.com (now part of Compuware), and consumersearch.com all provide business ratings.

Security and Encryption Sites

An example of security/encryption sites is VeriSign (verisign.com). The company provides valuable encryption tools for all types of EC organizations. It also provides domain site registration and several security mechanisms.

Table 12.3 Other B2B services

Category	Description	Examples
Marketplace concentrator (aggregator)	Aggregates information about products and services from multiple providers. Purchasers can search, compare, shop, and sometimes complete the purchase transaction	Internet Mall, Insweb, Industrial Marketplace
Information brokers (infomediaries)	Provide product, pricing, and availability information. Some facilitate transactions, but their main value is the information they provide	Travelocity, Autobytel
Transaction brokers	Buyers can view prices and terms, etc. but the primary business activity is to execute the transaction	E*TRADE, TD Ameritrade
Digital product delivery	Sells and delivers software, multimedia, and other digital products over the Internet	Most software and media vendors. Also sandowl.com
Content provider or publisher	Creates revenue by providing content	Most publishers
Online service provider	Provides service and support for hardware and software users	CyberMedia.com, TuneUp.com
Specialized directories	Provide leads to a variety of B2B services categories	Business.com, KnowledgeStorm, Searchedu.com

Web Research Services

A number of Web research providers help companies learn more about technologies, trends, and potential business partners and suppliers. Some of these are idc.com, zdnet.com, and forrester.com.

Coupon-Generating Sites

A number of vendors help companies generate online coupons. Q-pon.com and centsoff.com are a couple of examples.

Table 12.3 presents additional services available for B2B operations.

Outsourcing EC Support Services

Most companies do not maintain in-house EC support services. Instead, they outsource many of these services.

Why Outsource EC Services?

In general, outsourcing has many benefits and only few limitations and risks. For a comprehensive list of benefits, see outsourcing2india.com/why_outsource/articles/benefit_outsourcing.asp.

To show the importance of outsourcing, we will look briefly at the typical process of developing and managing EC infrastructure and applica-

tions. The process includes the following major steps:

1. EC strategy initiation, formulation, and implementation (Chapter 13)
2. Systems design (Chapter 14)
3. Building (or buying) the systems (Chapter 16)
4. Hosting, operating, and maintaining the EC site (Chapter 16)

IT Outsourcing and Application Service Providers

In the past many outside contractors focused on serving SMEs with few IT staff and smaller IT budgets. Today, enterprises of all sizes rely on outside contractors to service a substantial part of their EC system requirements. The list of large companies who rely on third-party vendors to run their B2C websites is extensive. Examples include sites such as eddiebauer.com, 1800flowers.com, and lenovo.com. Several types of providers offer services for creating and operating electronic webstores.

SECTION 12.5 REVIEW QUESTIONS

1. Describe the role of EC consultants and list their major types.
2. Describe the value offered by directory services. Provide three examples of what value they add.

3. Explain why specialized search engines are needed.
4. List some other EC support services.
5. List the major reasons why companies outsource EC support services.

MANAGERIAL ISSUES

Some managerial issues related to this chapter are as follows:

1. **If you are an EC vendor, what is the bottleneck in the order fulfillment process?** Order fulfillment is an important task, especially for e-tailers. The problem is not only the physical shipment, but also the efficient execution of the entire order fulfillment process, which may be complex along a lengthy supply chain. To enhance the order fulfillment process, the vendor needs to identify the bottleneck that needs improvement. Potential issues are delayed delivery date, high return rate, high inventory cost, high shipping cost, and poor integration along the supply and demand chains. The EC vendor should identify its own problem first.
2. **For which items should we keep our own inventory?** As Amazon.com has experienced, online vendors try to avoid keeping inventory because it is expensive. However, we should not neglect the fact that retailing with appropriate inventory is a source of extra profit as well. In addition, for certain items, it is not possible to assure on-time delivery without having controllable inventory; the no-inventory policy is not always the best policy. A company has to design the portfolio plan of inventory and distribution centers for the items that have a positive effect of having inventory. A CPFR program may be adopted to minimize the burden of holding inventories. The plan for distribution centers must be balanced with the plan of outsourced items through partners.
3. **What is the alliance strategy in order fulfillment?** Partnerships and alliances can improve collaboration and increase the efficiency of the supply chain. We need to decide in which part of order fulfillment we should count on partners. The typical activities that may be outsourced are shipping, warehousing, inventory holding, return management, and so on. Decide on the appropriate third-party logistics supplier that can provide reliable service for these activities. For certain items that you cannot supply well, a partner may take care of the entire merchandising as well as order fulfillment, especially if you have leverage on the online brand image. An example is Fulfillment by Amazon (FBA) sellers.
4. **How should we manage returns?** Dealing with returns is important for CRM, yet may not be simple. Reverse logistics is very costly, and most companies cannot continue online business if the return rate is too high. Use the CRM system to identify the items with higher return rates and resolve the reason or stop the online sales of these items. A company should estimate its percentage of returns and plan a process for receiving and handling them. The logistics of returns may be executed through an external logistics service provider.
5. **What logistics information should we provide to customers?** Customers, particularly business customers, want to know the availability of inventory and delivery date at the time of order. To meet these needs, the EC system should be integrated with the back-end information system. Customers may also want to trace the status of order processing, which should be managed by more than one company along the order fulfillment process. To provide seamless information beyond the boundary of the vendor, the partners should collaborate while developing their information systems.
6. **Should we use RFID for the order fulfillment?** If your buyer requires you to use RFID tags, there is no choice but to follow the request; however, the expertise and equipment of RFID are not always available within a company. Some third-party logistics service providers support the tagging service. One question is who pays for the cost and who gets the benefit? So far, big buyers such as Walmart

and the Department of Defense get the benefit, while the suppliers pay the cost. In the long run, suppliers may be able to share the benefit in inventory management. However, it will take time until the penetration becomes pervasive enough to maximize the benefit of RFID technology.

7. **Can we use CPFR in SMEs?** CPFR is a conceptual model for working with business partners and is usually effective and efficient with for large organizations. However, since it is basically a conceptual model of collaborative planning, it may work in some SMEs where collaborative planning is critical. A visit to gs1us.org/industries/apparel-general-merchandise, and an examination of some of the applications there, can help identify places where CPFR can help SMEs.

SUMMARY

In this chapter, you learned about the following EC issues as they relate to the chapter's learning objectives.

1. **The order fulfillment process.** Large numbers of support services are needed for EC implementation. Most important are payment mechanisms and order fulfillment. On-time delivery of products to customers may be a difficult task, especially in B2C. Fulfilling an order requires several activities ranging from credit and inventory checks to arranging shipments. Most of these activities are part of back-office operations and are related to logistics. The order fulfillment process varies from business to business and also depends on the products to be delivered. Generally speaking, the following steps are recognized: payment verification, inventory checking, shipping arrangement, insurance, production (or assembly), plant services, purchasing materials, customer contacts, and return of defective or unwanted products.
2. **Problems in order fulfillment.** It is difficult to fulfill B2C orders due to difficulties in forecasting demand and potential delays in supply and deliveries. Problems also result from insufficient coordination and information sharing among business partners.
3. **Solutions to order fulfillment problems.** Automating order taking (e.g., by using forms over the Internet) and smoothing the supply chain are two ways to solve order fulfillment problems. Several other innovative solutions exist, most of which are supported by software that enables more accurate inventories, coordination along the supply chain, and appropriate planning and decision making.
4. **RFID tags.** Replacing barcodes with RFID can greatly improve locating items along the supply chain quickly. This technology has many other benefits, which will soon outweigh the major limitations. The major applications are improving supply chain visibility, expediting tracking, speeding up inventory counting, speeding up deliveries, and reducing errors.
5. **Collaborative planning and CPFR.** Collaborative planning concentrates on joint demand forecasting and on accurate resource and activity planning along the supply chain. Collaborative planning tries to synchronize partners' activities. CPFR is a business strategy that attempts to develop standard protocols and procedures for collaboration. Its goal is to improve demand forecasting by collaborative planning in order to ensure delivery of materials when needed. In practice there are a number of successful implementations, although there is not widespread use. Recently, VICS has focused on another collaborative process – store-level DPR – which provides detailed demand forecasts used to calculate inventory and distribution requirements from sourcing to the retail shelf or channel.
6. **Other support services.** EC support services include consulting services, directory services, infrastructure providers, and many more. One cannot conduct EC without some of them. These support services need to be coordinated and integrated. Some of them can be done in-house; others must be outsourced.
7. **Outsourcing EC services.** Selective outsourcing of EC services is usually a must. Lack of resources, time and expertise forces

companies of all sizes to outsource, despite the risks of doing so. Using ASPs is a viable alternative, but they are neither inexpensive nor risk-free.

- Investigate and discuss how artificial intelligence can be used to pick and pack orders faster and more accurately. Begin with McGown (2010).

KEY TERMS

Collaborative planning, forecasting, and replenishment (CPFR)
 Distribution Resource Planning (DRP)
 E-logistics
 Logistics
 Merge-in-transit
 Order fulfillment
 Radio frequency identification (RFID)
 Reverse logistics
 Third-party logistics suppliers (3PL)
 Visibility
 Warehouse management system (WMS)

DISCUSSION QUESTIONS

- Discuss the problem of reverse logistics in EC. What types of companies may suffer the most from this problem?
- Explain why UPS views itself as a “technology company with trucks” rather than as a “trucking company with technology.”
- Under what situations might the outsourcing of EC services not be desirable?
- UPS and other logistics companies also provide financial services. What does this mean and what is the logic behind this?
- Differentiate order fulfillment in B2C from that of B2B.
- Discuss the motivation of suppliers to improve the supply chain to customers.
- Describe the advantages of RFID over a regular barcode in light of supply chain management.
- Discuss how CPFR can lead to more accurate forecasting and how it can resolve the bullwhip effect.
- Describe the importance of providing a single demand forecast for improving control along the entire supply chain.

TOPICS FOR CLASS DISCUSSION AND DEBATES

- Chart the supply chain portion of returns to a virtual store. Check with an e-tailer to see how it handles returns. Prepare a report based on your findings.
- Discuss how CPFR can solve order fulfillment problems along the supply chain. Use any image from Google of the CPFR model to relate the elements of the figure to your proposed solutions.
- Identify the major concerns about using RFID by companies. Discuss the validity of these concerns.
- Should a B2B EC company outsource its delivery of ordered goods?
- Some say outsourcing B2B services may hurt the competitive edge. Others disagree. Discuss.
- Which activities are most critical in order fulfillment of B2C (check Table 12.1)? Which are for B2B? Discuss the differences.
- Debate the issue of outsourcing EC order fulfillment. Consult Johnson (2010).
- Debate: Should companies use RFID or not?
- Find the status of Amazon.com’s same day delivery project. Write a report.

INTERNET EXERCISES

- The U.S. Postal Service (USPS) is also in the EC logistics field. Examine its shipping services and tracking systems at usps.com. What are the potential advantages of these systems for EC shippers?
- Enter xpertfulfillment.com, shipwire.com, and infifthgear.com. Compare their EC order fulfillment services. Write a report.
- Visit freightquote.com and the sites of two other online freight companies. Compare the

features offered by these companies for online delivery.

4. Enter efulfillmentservice.com. Review the products you find there. View the video about their operation. How does the company organize the network? How is it related to companies such as FedEx? How does this company make money?
5. Enter cerqa.com and find information about products that can facilitate order fulfillment. Write a report.
6. Enter kewill.com. Find the innovations offered there that facilitate order fulfillment. Compare it with shipsmo.net. Write a report.
7. Visit b2b-today.com. Go to the B2B Communities area and identify the major vendors there. Then select three vendors and examine the services they provide to the B2B community.
8. Go to ariba.com. Who is Ariba and what supply chain solutions do they provide? Prepare a report describing the solutions they offer in the procurement arena.
9. Investigate the status of CPFR. Start at gs1us.org/industries/apparel-general-merchandise, conduct a search. Also enter apics.org/sites/apics-supply-chain-council and find information about CPFR. Write a report on the status of CPFR.
10. Enter future-store.org and find the progress on the use of RFID and other tools in supply chain improvements in retailing.
11. Enter reverselogistics.com and summarize the differences between reverse and forward logistics.
12. Discuss the difficulties in fulfilling orders for fresh food. Start with Thau (2010).
13. Enter freshdirect.com and examine the methods it uses to improve order fulfillment of online grocery items. Also explain how they do an eco-friendly fulfillment.
14. Visit alice.com. What type of business is it? What supply chain services do they provide? Describe their relationship with OHL. What services does OHL provide and why are they critical to Alice.com's operation?
15. Enter corporate.sifycorp.com and study their enterprise services. Specifically find what support services they provide. Write a report.

TEAM ASSIGNMENTS AND PROJECTS

1. Assignment for the Opening Case

Read the opening case and answer the following questions:

- (a) What were the drivers of the centralized warehousing?
 - (b) Amazon.com is using third-party companies for delivery. Can you guess why?
 - (c) Can Amazon.com use RFID in its warehouses? If yes, where and when? If no, why not?
 - (d) Find how Amazon.com handles returned merchandise.
 - (e) Draw Amazon.com's supply chain for books.
 - (f) Where do you think there are intelligent (software) agents in Amazon.com's order fulfillment/logistics?
2. Each team should investigate the order fulfillment process offered at an e-tailer's site, such as barnes-andnoble.com, staples.com, or walmart.com. Contact the company, if necessary, and examine any related business partnerships. Based on the content of this chapter, prepare a report with suggestions for how the company can improve its order fulfillment process. Each group's findings will be discussed in class. Based on the class's findings, draw some conclusions about how companies can improve order fulfillment.
 3. FedEx, UPS, the U.S. Postal Service, DHL, and others are competing in the EC logistics market. Each team should examine one such company and investigate the services it provides. Contact the company, if necessary, and aggregate the team's findings into a report that will convince classmates or readers that the company is the best. (What are its best features? What are its weaknesses?)
 4. Enter Ingram Micro's resources site (ingram-micro.com). Use the case studies and articles there to write a report on the importance and benefits of Web fulfillment. Include both order fulfillment and reverse logistics.
 5. Watch the video titled "Marks and Spencer Expands RFID to All Its Stores" (22:50 minutes)

- at rfidjournal.com/videos/view?1282. Write a report describing who M&S is, how they have and are going to use RFID in retail, and the benefits they hope to achieve.
6. Read about the warehouse management systems provided by JDA (RedPrairie) and Manhattan Associates (including some of their warehouse case studies) and answer the following:
 - (a) What supply chain processes are supported by both systems?
 - (b) What are the major benefits of each system?
 - (c) What are the major differences in the capabilities provided?
 7. The competition on ‘same day delivery’ is intensifying with more and more competitors enter the race. Investigate the status of the competition including delivery by drones (e.g., FAA’s approval). Start with Bowman (2014). Write a report.

CLOSING CASE: MULTICHANNEL RETAILERS – EXPERIENCES OF NORDSTROM AND REI

Retail channels such as store, Web, catalog, call center, or kiosk cannot satisfy the expectations of today’s consumers alone. In today’s consumer-centric world, customers want to buy what they want, at a price they want, where and when they want, and all these with same day delivery or easy pickup. The result is that many online and offline retailers are providing customers multiple channels for satisfying these demands. For example, a multi-channel retailer might offer customers the means to purchase online and pick up their purchase in the physical stores. Or, a retailer with stores might provide in-store kiosks that enable customers to search online for merchandise that is not in the store, locating the merchandise at either a nearby store, or offering the ability to purchase it online and have it delivered to the customers homes or to a store location of their choice. One retailer who has long history of providing multi-channel sales and service is Nordstrom.

Multichannel Evolution at Nordstrom

Founded in 1901 in Seattle, WA, Nordstrom, Inc. is a high end fashion retailer offering clothing, shoes, and accessories for men, women, and children. They have 117 full-line stores in 44 countries. Additionally, they have 119 Nordstrom Rack stores, 2 Jeffrey boutiques, one clearance store, a private subsidiary called HauteLook, a NYC boutique called Treasure & Bond, and their online site, nordstrom.com.

Nordstrom began their online presence in 1998 with nordstromshoes.com. In 2000 this was enhanced to include their entire catalog but did not incorporate the inventory in the stores. In the same vein, the merchandising, marketing, and accounting systems used to run their online and offline stores were different. Around 2004, Nordstrom began to look at the possibility of combining the systems and providing online customers with the same experience they got in the store. From the customer’s perspective, the key to providing a similar experience across multiple channels: in store, Web, catalog, call center, mobile, etc. – is providing access to inventory information and the capability to fulfill an order from any point in the system – ship to home, ship to store, or pick up in store.

It took 4 to 5 years to combine the online and in store experience into an integrated multichannel system. By 2009, Nordstrom had aggregated its inventory and was providing visibility to in-store inventory on its website. Basically, stores were treated as warehouses or distribution centers for online customers. Under this scheme, customers were able to pick up online purchases in stores.

Nordstrom’s Multichannel Systems

The technical underpinning for these multichannel capabilities was provided by Sterling Commerce’s Selling and Fulfillment Suite which included Sterling Catalog and Offer Management, as well as their Order Management capabilities. At the core of the Suite is a centralized order hub that synchronizes orders and provides access to inventory across all the channels. In today’s terminology, this sort of system is called a “Distributed

Order Management” (DOM) system. Today, there are a variety of software vendors that provide DOM capabilities including Oracle, Manhattan Associates, IBM Sterling, and JDA Software. All of these DOMs offer a baseline of capabilities including:

- System-wide views of inventory across the entire supply chain, anticipating shortages and delivery problems
- Optimized fulfillment across the system taking into account, transportation cost, labor, and service level
- Determination of fulfillment location for ship to home, ship to store, or pick up in store.
- Support order lifecycle management including creation, modification, and cancellation
- Availability of information about items, prices, and promotions across the supply chain
- Full financial functionality including authorization, fraud management, invoicing, and settlement.

Multichannel Impact at Nordstrom

From the inception, Nordstrom’s multichannel integration had immediate effects. Same-store sales went from declining to an increase close to 10%. At the same time, the percentage of customers who completed purchases after searching for an item almost doubled. Inventory turns improved from 4.8 in 2005 to 5.4 in 2009. Finally, overall sales reached \$8.3 billion in 2009.

Multichannel Experiences at REI

Even today, the various sales and marketing channels of most retailers are managed as separate silos rather than as an integrated whole. Like Nordstrom, another well-known exception is Recreational Equipment, Inc. (or REI for short). REI was started in 1938 and is headquartered in Kent, WA. They have 129 stores in 22 states and are the largest consumer co-op with over 10 million members. Since the late 1990s, REI has provided a number of multi-channel options for customer sales and service including:

- **Web-Based Kiosks** – Like many other retailers, REI got its online start in the late 1990s. However, unlike most retailers, they brought web-based kiosks into their stores shortly after that. In this way, customers can order from their portfolio of over 40,000 products. Obviously, this is many more items than are stocked in the average store.
- **In-Store Pickup** – Customers can shop online and have the item shipped to a local store of their choice. The main benefit of this service is that once customers are in the store they are much more likely to purchase other products.
- **Gift Registry** – Many retailers provide online gift registries. Like their other services, REI’s registry can be established, followed, and updated online, in the store, or through their call center.

REI’s multi-channel capabilities are built on top of IBM’s WebSphere Commerce platform. Over the years this platform has enabled REI to integrate the disparate systems from the individual channels into a set of cohesive supply chain capabilities, such as order fulfillment or the product catalog, that are uniformly available to all the channels.

Like Nordstrom, REI has enjoyed strong revenue growth since the inception of its integration multichannel capabilities. In 2011, revenues were around \$1.7 billion making it one of the leaders in outdoor equipment and apparel. In addition to their bottom line growth, all of the multi-channel capabilities enjoyed immediate growth and rapid payback. Customers who participated in two channels spent 114% more and those using three channels spent 48% more. Also, REI’s In-Store Pickup capabilities increased sales by 1% within the first year of operation.

What Nordstrom and REI have recognized is that the key to multichannel support is the customer. Retailers need to concentrate on providing uniform sales and services to customers where, how, and when they want them, regardless of the channel.

Sources: Based on Banker (2011), Clifford (2010), Friedman (2011), Lynch (2012), Taylor (2012), nordstrom.com and rei.com (both accessed February 2014).

Questions

1. How would you define multichannel retail?
2. What multichannel capabilities does Nordstrom support?
3. What multichannel capabilities does REI have?
4. What are some of the major features of a distributed order management (DOM) system?
5. What are some of the benefits that arise from integrated multichannel sales and services?

ONLINE FILES

available at affordable-ecommerce-textbook.com/turban

W12.1 What Services Do Customers Need?

W12.2 The Bullwhip Effect

COMPREHENSIVE EDUCATIONAL WEBSITES

rfid.org: News, videos, cases.

rfidjournal.com: Comprehensive collection of articles, cases, videos.

vics.org: Business guidelines, collaboration (CPFR).

apics.org: Association for Operations Management.

cscmp.org: Council of Supply Chain Management.

asuscma.org: Supply Chain Management Association.

reverselogisticstrends.com: News, trade shows, cases, etc.

agents.umbc.edu: Large collection of information about intelligent agents.

silicon.com/white-papers: Publications on enterprise planning and supply management.

GLOSSARY

Collaborative planning, forecasting, and replenishment (CPFR) The practice of suppliers, manufacturers and retailers collaborating on the planning and forecasting of demand so that the supply of goods and services matches customer demand on the retailer's shelf.

E-logistics The logistics of EC systems, typically involving small parcels sent to many customers' homes (in B2C).

Logistics Activities required to efficiently and effectively control and manage the movement and storage of items, services and information across the entire supply chain to the consumer and potentially back.

Merge-in-transit Logistics model in which components for a product may come from two (or more) different physical locations and are shipped directly to the customer's location.

Order fulfillment All the operations a company undertakes from the time it receives an order to the time the items are delivered to the customers, including all related customer services.

Radio frequency identification (RFID) Tag technology in which RFID (electronic) tags are attached to or embedded in objects (included people) and employ wireless radio waves to communicate with RFID readers so that the objects can be identified, located, or can transmit data.

Reverse logistics The movement of returns from customers to vendors.

Store-level distribution resource planning (DRP) A collaborative approach that utilizes a retailer's POS data to produce a model that yields a bottoms-up, time-phased forecast of consumer sales, shipments, receipts and inventories at all stores or channels and DCs for all items, usually over a 12-month period.

Third-party logistics suppliers (3PL) External, rather than in-house, providers of logistics services.

Visibility The knowledge about where materials and parts are at any given time, which helps in solving problems such as delay, combining shipments, and more.

Warehouse management system (WMS) A software system that helps in managing warehouses.

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