Volkswagen AG is Europe’s largest car manufacturer, producing 5 million car, trucks, and vans each year. The Volkswagen Group owns luxury car makers such as Audi, Lamborghini, and Bentley and family car makers SEAT in Spain and Skoda in the Czech Republic. The company has 300,000 employees and operates plants in Europe, Africa, the Asia/Pacific rim, and the Americas. Vehicles produced by the Volkswagen Group account for over 12% of the world market.

The various companies in the Volkswagen Group annually purchase components, automotive parts, and indirect materials worth about €60 billion euros, or about $73 billion (which constitutes about 70% of Volkswagen’s annual revenue). Obviously, the procurement process and relationships with suppliers are absolutely critical for Volkswagen’s success.

Today, the Volkswagen Group manages almost all of its procurement needs via the Internet. It began building its Internet platform, VWGroupSupply.com, in 2000. The Volkswagen Group was looking for ways to create more efficient relationships with its suppliers and reduce the cost of paper-based procurement processes. However, the company did not want to automate procurement using a public independent exchange or an industry consortium because it would have had to adapt its own business processes to a common framework that could be used by many different organizations. Volkswagen hoped that by building its own B2B network it could compete more effectively against other automakers. Volkswagen decided, for instance, not to participate in Covisint, the giant automotive industry consortium backed by major car manufacturers such as Ford, General Motors, and DaimlerChrysler, which provided procurement and other supply chain services for these companies, other automotive manufacturers, and their suppliers.

Instead, Volkswagen opted for a private platform which would allow it to integrate its suppliers more tightly with its own business processes, and where it could control more precisely who was invited to participate. VWGroupSupply.com
now handles 90% of all global purchasing for the Volkswagen Group, including all automotive and parts components. It is one of the most comprehensive Net marketplaces in the global automotive industry. The online Web-based platform can handle requests for quotations (RFQs), contract negotiations, catalog purchases, purchase order management, engineering change management, vehicle program management, and payments. The Volkswagen Group developed the platform using technology from a number of vendors, including Ariba, IBM, and I2 Technologies.

Suppliers of all sizes can access VWGroupSupply.com with standard Web browser software. The Web site is limited to suppliers who have done business with one or more companies in the Volkswagen Group and potential new suppliers who go through an authorization process. The system maintains a common data repository with details on each supplier concerning procurement, logistics, production, quality, technical design, and finance.

As of April 2005, its online catalog contained about 1.7 million items from 650 global suppliers. The catalog uses the eCI@ss standard for classifying its contents. All suppliers who participate in the catalog ordering process classify their products using this standard.

Online negotiations involve multiple bids by suppliers for various purchasing contracts. VWGroupSupply.com ensures that all participants meet its technical and commercial qualifications. Before an online solicitation begins, the system informs vendors about the data and precise rules governing the negotiations.

Shifts in market demand have a drastic impact on Volkswagen’s production activities and affect the ability of suppliers to deliver. Production bottlenecks can result if suppliers are unprepared for a sudden upsurge in demand. If suppliers stock too much inventory, they may incur excess costs from running at overcapacity. VWGroupSupply.com has an application called electronic Capacity Management (eCAP) to alert both Volkswagen and its suppliers to changes in trends in advance.

eCAP enables suppliers to track Volkswagen's continually updated production plans and materials requirements in real-time online. This capability captures information about participating suppliers' planned maximum and minimum capacities. If Volkswagen production requirements go beyond these limits, the system sets off an alarm so both parties can react quickly. As of May 2005, eCAP maintains information on over 200 suppliers and 4,000 critical parts.

During its first three years of operation, the material cost reductions and productivity gains from VWGroupSupply.com produced more than 100 million euros ($122 million) in cost reductions.

As of mid-2005, VWGroupSupply.com had handled over 675,000 transactions with more than 5,500 suppliers. More than 5,800 online contract negotiations involving 30,000 suppliers were conducted online, with a value of 70 billion euros ($84 billion). Over 14,000 people used the online catalog and placed orders totaling 190 million euros ($230 million).
RFID AUTOIDNETIFICATION: MAKING YOUR SUPPLY CHAIN VISIBLE

It’s 10 PM. Do you know where your containers are? If you’re in business anywhere in the world today, and that business involves physical goods, then chances are quite good that your business depends on the movement of goods in containers. In fact, there are 200 million sea cargo containers moving every year among the world’s seaports, and nearly 50% of the value of all U.S. imports arrive via sea cargo containers each year. The containers are loaded onto ships, and stacked high on the deck. The containers also fit on the back of trucks and on railway carriages. So when the containers are unloaded from the ship, they continue their journey from the port on the back of trucks or trains. It is a fast and efficient way of moving cargo. A standard container is 20 feet long, 8 feet wide, and 8 feet 6 inches high—big enough to hold a car.

Prior to the development of containers, all ocean-going cargo was loaded and unloaded onto ships in huge nets loaded by dock workers one package at a time. While the container revolutionized ocean shipping, vastly increasing productivity and reducing breakage, keeping track of 200 million cargo containers is difficult. While each container has its own permanent ID number painted on the side, as well as a bar code identification tag, this number must be entered manually by dock workers, or scanned up close. Identification of containers is prone to errors and slow. If you had to find one container on a dock containing over 1,000 containers, you would have to read each ID number until you found the one you wanted.

Tracking containers is just one part of the larger B2B product identification problem. Retailers such as Wal-Mart, Target, and Amazon find it difficult and expensive to track millions of annual shipments into and out of their warehouse and sales floors; the automotive industry finds it costly and difficult to synchronize the flow of parts into its factories; the U.S. Department of Defense logistics system finds it difficult to keep track of the movement of troop supplies; and the airline industry often loses our bags in transit.

Thirty years ago, the development of the Uniform Product Code (UPC) and the ubiquitous bar-code label was an initial first step towards automating the identification of goods. But the bar code technology of the 1970s still required humans or sometimes machines to scan products. The problem with bar codes is that they don’t talk—they are passive labels that must be read or scanned.

A new technology to replace bar codes is quickly being deployed among the largest manufacturing and retailing firms. Radio frequency identification (RFID) involves the use of tags attached to products or product containers that transmit a radio signal in the 850 megahertz to 2.5 gigahertz range that continuously identifies themselves to radio receivers in warehouses, factories, retail floors, or on board ships. RFID labels are really tiny computer chips and a battery that are used to transmit the products electronic product code to receivers nearby.

RFID has several key advantages over the old bar-code scanner technology. RFID eliminates the line-of-sight reading requirement of bar codes and greatly increases the distance from which scanning can be done from a few inches up to 90 feet. RFID systems can be used just about anywhere—from clothing tags to missiles to pet tags to food—anywhere that a unique identification system is needed. The tag can carry information as simple
As a pet owner's name and address or the cleaning instruction on a sweater to as complex as instructions on how to assemble a car. Best of all, instead of looking at a warehouse filled with thousands of packages that can't talk, you could be listening to these same thousands of packages each chirping a unique code, identifying themselves to you. Finding the single package you are looking for is much simplified. RFID tags produce a steady stream of data that can be entered into Internet- and intranet-based corporate applications such as SCM and ERP systems.

Today, the largest user of RFID is the automotive industry, which in 2004 purchased over 100 million RFID tags at about .25 cents each to track packages and parts in the supply chain. Major computer firms such as Microsoft, IBM, and Hewlett-Packard are investing over several hundred million dollars each over the next five years to develop RFID software that will link RFID data to firms' SCM systems. Wal-Mart, the world's largest retailer, mandated that its top 100 suppliers place RFID tags on all cases and pallets headed for the firm's Dallas distribution centers by January 2005. According to Wal-Mart, the program achieved 100% compliance. The U.S. Department of Defense, Target Corporation, and the German retailer Metro AG have also required their suppliers to adopt RFID technology by mid-2005.

RFID will have a profound impact on Internet-based B2B commerce by greatly reducing the cost of tracking goods through industry supply chains, reducing errors, and increasing the chances that the right product will be sent to the right customer.


Although collaborative commerce can involve customers as well as suppliers in the development of products, for the most part, collaborative commerce is concerned with the development of a rich communications environment to enable inter-firm sharing of designs, production plans, inventory levels, delivery schedules, and even the development of shared products (see Figure 12.8).

Efforts to develop closer collaboration among suppliers and purchasers originated in the late 1970s at Xerox Parc, Xerox Corporation's research center in Palo Alto. Development of the appropriate software to enable rich communications was furthered by research conducted by Lotus Development Corporation in the early 1990s. The development of the Internet as a rich communications medium has displaced proprietary software tools, and today, collaborative commerce almost always involves the use of Internet technologies to support sharing of graphic designs, documents, messages, and network meetings.

Collaborative commerce is very different from EDI. EDI is a technology for structured communications among firms. Collaborative commerce is more like an interactive teleconference among members of the supply chain.
INSIGHT

ARE NET MARKETPLACES ANTI-COMPETITIVE CARTELS?

Although Net marketplaces and private industrial networks often lead to extraordinary gains in efficiency for both firms and industries as a whole, ironically, they also provide some equally powerful tools for reducing competition in the marketplace and driving up prices to consumers, and even reducing variety in the marketplace as well. There are two types of antitrust concerns: the market for goods and the market for B2B marketplaces themselves.

In the market for goods, the primary antitrust concerns are information sharing that permits or encourages price fixing, monopsony (when a cartel or monopoly drives down input prices below the value of goods), and exclusion (preventing new companies from entering a marketplace).

For instance, in a Net marketplace owned by large industry players (such as the chemical exchange Elemica), owner-members could collude with one another on the prices they are willing to pay for inputs. Price collusion does not necessarily involve a formal agreement among colluders, but can take place in highly efficient markets through “parallel pricing,” or informal arrangements among suppliers to a market to “agree” on prices through market communication.

Information sharing may also lead to market-sharing agreements in which manufacturers divide the market into segments and agree to produce only enough for their allocated segment. In a monopsony, large buyers have so much power that they can control input prices by buying less of an input. Net marketplaces could be used to coordinate the reduction of purchases, forcing prices of suppliers below competitive levels. Net marketplaces owned by large industry players could be used to exclude rival competitive firms, forcing their rivals to pay higher prices for inputs. For instance, chemical firms that do not pay to support ChemConnect or Elemica might be precluded from obtaining the best prices possible on the market.

The recent brief history of Net marketplaces suggests that they inherently consolidate into one or two Net marketplaces in each industry and therefore become the dominant players; they experience network effects in the sense that the larger Net marketplaces become, the more attractive they are to join; and they experience economies of scale insofar as the larger they become, the more efficient and liquid they become. Together, these factors lead to the surviving Net marketplaces having extraordinary market power. These concerns primarily apply to industry consortia, although they also arise in independent exchanges as well.

In the market for Net marketplaces, a very large Net marketplace formed by buyers or sellers could prevent other entrepreneurial market makers from starting up because of the high switching costs involved and the network effects of large markets. Such Net marketplaces may devise rules that specifically proscribe the members from purchasing in any other markets. Moreover, once a Net marketplace attracts, say, 90% of the buyers and sellers in a marketplace, it experiences powerful network effects and resulting high levels of liquidity; it becomes, in essence, the only marketplace with a sufficient number of buyers and sellers to support trading systematically.

Even though B2B Net marketplaces are new, the antitrust issues and concepts are not. Information sharing among competitors, monopsony, and exclusion from necessary
facilities are issues that have arisen in the context of airline reservation systems, railroad terminal facilities, and film distribution by the motion picture industry. There are Justice Department rules (Competitor Collaboration Guidelines) that describe permissible information sharing and collaboration among competitors, and a large body of case law and scholarship that has developed principles for determining when collaboration among competing firms becomes illegal. In general, courts and scholars have sought to prescribe any behavior that would harm competition in the marketplace and harm customers by raising prices and/or reducing selection. A wide variety of behaviors are tolerated by courts up until the point where the consequences are harmful to competition, and ultimately to the consumer or buyers who are forced to pay higher prices.

In a report on competition in B2B markets, the Federal Trade Commission (FTC) concluded that no action was needed now to ensure B2B markets remained competitive. The FTC, however, continues to monitor the behavior of large Net marketplaces, as well as the trading that occurs within them, for signs of collusion, monopsony power, and exclusionary behavior that might harm competition.

**WHAT ARE PRIVATE INDUSTRIAL NETWORKS?**

As noted at the beginning of this chapter, private industrial networks are direct descendants of existing EDI networks, and they are closely tied to existing ERP systems used by large firms. A private industrial network (sometimes referred to as a private trading exchange, or PTX) is a Web-enabled network for the coordination of trans-organizational business processes (sometimes also called collaborative commerce). A trans-organizational business process requires at least two independent firms to perform (Laudon and Laudon, 2006). For the most part, these networks originate in and closely involve the manufacturing and related support industries, and therefore we refer to them as "industrial" networks, although in the future they could just as easily apply to some services. These networks can be industry-wide, but often begin and sometimes focus on the voluntary coordination of a group of supplying firms centered about a single, very large manufacturing firm. Private industrial networks can be viewed as "extended enterprises" in the sense that they often begin as ERP systems in a single firm, and are then expanded to include (often using an extranet) the firm’s major suppliers. Figure 12.17 illustrates a private industrial network originally built by Proctor & Gamble (P&G) in
WAL-MART DEVELOPS A PRIVATE INDUSTRIAL NETWORK

Wal-Mart is a well-known leader in the application of network technology to the coordination of its supply chain. With sales of more than $298 billion for the fiscal year ending January 31, 2005, Wal-Mart has been able to use information technology to achieve a decisive cost advantage over competitors. As you might imagine, the world's largest retailer also has the world's largest supply chain, with more than 30,000 suppliers worldwide. In the next five years, the company plans to expand from around 3,700 stores in the United States to over 5,000, and increase its selection of goods to include automobiles, pianos, groceries, high-fashion clothing, and personal computers. In other words, Wal-Mart's strategic plan is to be where they are not now. All of this will require an even more capable private industrial network than what is now in place.

In the late 1980s, Wal-Mart developed the beginnings of collaborative commerce using an EDI-based SCM system that required its large suppliers to use Wal-Mart's proprietary EDI network to respond to orders from Wal-Mart purchasing managers. In 1991, Wal-Mart expanded the capabilities of its EDI-based network by introducing Retail Link. This system connected Wal-Mart's largest suppliers to Wal-Mart's own inventory management system, and it required large suppliers to track actual sales by stores and to replenish supplies as dictated by demand and following rules imposed by Wal-Mart. Wal-Mart also introduced financial payment systems that ensure that Wal-Mart does not own the goods until they arrive and are shelved.

In 1997, Wal-Mart moved Retail Link to an extranet that allowed suppliers to directly send over the Internet into Wal-Mart's inventory management system. In 2000, Wal-Mart hired an outside firm to upgrade Retail Link from being a supply chain management tool toward a more collaborative forecasting, planning, and replenishment system. Using demand aggregation software provided by Atlas Metaprise Software, Wal-Mart purchasing agents can now aggregate demand from Wal-Mart's 3,700 separate stores in the United States into a single RFQ for suppliers. This gives Wal-Mart tremendous clout with even the largest suppliers. Wal-Mart and its partners at Atlas plan to first build a global sourcing network. Previously, Wal-Mart's 1,500 foreign location buyers relied on a mix of telephones, fax, and e-mail to communicate their spend forecasts. The new system allowed them to submit forecasts via the Internet, Wal-Mart headquarters in turn issued worldwide RFQs for all stores. The Atlas software helps Wal-Mart purchasing agents select a winning bid and negotiate final contracts.

In addition, suppliers can now immediately access information on inventories, purchase orders, invoice status, and sales forecasts, base on 104 weeks of online, real-time, item-level data. The system now does not require smaller supplier firms to adopt expensive EDI software solutions. Instead, they can use standard browsers and PCs loaded with free software from Wal-Mart. There are now over 10,000 suppliers—small and large—participating in Wal-Mart network.

In 2002, Wal-Mart switched to an entire Internet-based private network. Wal-Mart
adopted AS2, a software package from iSoft Corporation, a Dallas-based software company. AS2 implements EDI-INT (an Internet-based standard version of EDI), and the result is a radical reduction in communications costs. Wal-Mart uses Sterling Commerce (the largest single provider of EDI communication systems to industry) and IBM to support this EDI initiative. The AS2 initiative lets suppliers connect, deliver, validate, and reply to data securely over the Internet. IBM uses its expertise to assist Wal-Mart suppliers in selecting and implementing the appropriate AS2-certified solutions that best meet their needs. Sterling Commerce provides interoperability services for EDI-INT AS2 connectivity between Wal-Mart and its suppliers.

In mid-2003, Wal-Mart joined other super-sized retailers such as Target and Germany's Metro AG in requiring its top suppliers to use RFID tags on shipments to its distribution centers by January 2005. According to Wal-Mart, the program has achieved 100% compliance.

Wal-Mart's success has spurred its competitors in the retail industry to develop industry-wide private industrial networks such as GlobalNetXchange in an effort to duplicate the success of Wal-Mart. Wal-Mart executives have said Wal-Mart would not join these networks, or any industry-sponsored consortium or independent exchange, because doing so would only help its competitors achieve what Wal-Mart has already accomplished with Retail Link. To compete with the efficiencies attained by Wal-Mart, other retailers, such as J.C. Penney, have implemented their own extensive private industrial networks to link suppliers to their stores' inventories directly over the Internet. J.C. Penney has even given over its inventory control and product selection to its largest apparel provider, TAL Apparel Ltd. of Hong Kong.


PRIVATE INDUSTRIAL NETWORKS AND COLLABORATIVE COMMERCE

Private industrial networks can do much more than just serve a supply chain and efficient customer response system. They can also include other activities of a single large manufacturing firm, including design of products and engineering diagrams, as well as marketing plans and demand forecasting. Collaboration among businesses can take many forms and involve a wide range of activities—from simple supply chain management to coordinating market feedback to designers at supply firms (see Figure 12.18).