

Order Fulfillment: The Hidden Key to e-Commerce Success

By Fred R. Ricker and Ravi Kalakota

In July 1995, a young Wall Street computer whiz named Jeff Bezos opened a bookstore offering more than one million titles yet virtually no inventory. His brainchild—Amazon.com—has grown since then from four employees operating out of a 400 square-foot garage in Seattle into an online company with a stock valuation greater than most *Fortune* 500 companies. His initial concept—a virtual bookstore

designed to do business exclusively on the Internet—was obviously brilliant and well executed, as evidenced by Amazon.com's success in gaining and keeping customer attention and generating orders.

Yet the company's success to date is dwarfed by the potential of its apparent ambition—to build the world's most efficient consumer-direct order-fulfillment system. Amazon.com envisions a “killer” supply chain that can deliver virtually any product—not just

books—directly to customers better than its competitors. In fact, it took Amazon.com only one quarter after adding music to its offerings to become the Net's leading music seller. The company currently is targeting the \$150 billion pharmaceuticals market with a 40-percent stake in Drugstore.com.

Today, the emphasis among more mature Web retailers like Amazon.com is shifting from marketing to fulfillment logistics—what happens after the order is placed. Good fulfillment—taking the right product, putting it in the right box, shipping it, and gaining the customer's approval on arrival—is a demanding task. We believe it is here—in the down-and-dirty details of consumer direct order fulfillment—that the epic battles for domination of the e-Commerce marketplace will ultimately be won or lost.

The emergence of the e-Supply chain, a group of strategically aligned companies focused on delivering differentiable value, signals a shift in the nature of online competition. It involves rethinking traditional supplier relationships and the role of information-driven fulfillment logistics.

In the new network economy, establishing a sustainable e-Commerce position is as much about using the right fulfillment strategies to get your products or services to buyers as it is about having the right product at the right price. The key to success is being able to give customers what they want,



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Illustration by Roger Roth

when they want it, and how they want it—all at the lowest cost. That requires “real-time fulfillment” solutions.

These rising demands have driven a three-phase evolution. First the e-Corporation, which focuses on creating and maximizing the potential of internal supply chains, evolves into e-Business communities, where distributors, suppliers, customers, and others are linked but not fully integrated. These communities then become the e-Supply chain, which requires business-process and technology synchronization across the entire chain. (Exhibit 1 depicts this progression.)

Unfortunately, much of the start-up planning for e-Commerce ventures applies old models to new enterprises. It assumes, for example, the existence of a brick-and-mortar support infrastructure for the fulfillment or the spontaneous development of that infrastructure. Like it or not, most e-Commerce retailers place their initial emphasis on the “exciting” areas: Web product development, traffic generation, dynamic or customized Web pages, transactions, and so on. Often, e-Commerce retailers give little thought to order fulfillment and distribution—a capability critical to the success or failure of Web commerce. Our research shows that the lack of an

integrated supply chain infrastructure or weaknesses in integrating multiparty logistics components can undermine the benefits of e-Commerce and hinder innovative responses to the competition.

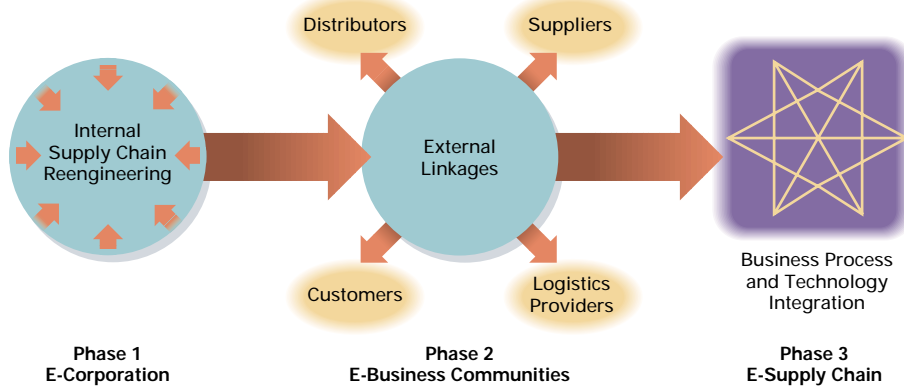
The e-Fulfillment Opportunity

The Internet offers a rich new opportunity for direct consumer access, but it also raises new challenges. Web retailers find product fulfillment—picking and packing in very small quantities and shipping via parcel carriers—a particularly difficult activity. It often requires relying on third-party fulfillment vendors (a concept discussed later in this article) to do the job. But collaboration in fulfillment chains is no longer confined to conventional two-company alliances, such as between shipper and a logistics services provider. Today, groups of enterprises are banding together for a common purpose—to satisfy customer demand. A new form of competition is emerging: e-Supply chain vs. e-Supply chain. In the Internet book retailing war, for example, the competition is not only between Amazon.com and Barnes & Noble but also among groups of companies that make up the e-Supply chain anchored by each company.

An e-Supply chain is, in effect, a virtual organiza-

EXHIBIT 1

Evolution of the Network Economy



tion that encompasses a group of trading companies, all working together to slash costs and share profits. By optimizing not only their internal processes but also their mutual interactions, they realize the benefits of a truly integrated supply chain. This concept—business-process and supply chain synchronization—lays the basis for the next revolution in supply chain management. It takes supply chain integration to a new level of efficiency by requiring companies to focus on synchronizing business processes around standard interface points and upgrading these points as the industry evolves. Synchronization of these “touch points” eliminates costs associated with inefficient movement of goods, redundant processes, and excess inventory. In doing so, it promotes a dedicated collaboration of all supply chain trading partners—suppliers, manufacturers, distributors, wholesalers, third-party providers, transportation companies, and retailers.

Through e-Commerce, redundant processes among trading partners (such as multiple accuracy audits, receiving-dock appointments, and inventory planning activities) can be eliminated. The immediacy and availability of the Internet, once security and data cleansing issues are worked out, fulfills the promise of true synchronization. To take just a few examples, if vendors can gain access to a publicly available schedule on the Internet and book their own receiving appointments, they no longer need to send requests for appointments and wait for responses. Retailers would not need to research late payments if their customers could download payment status directly from the retailer’s Web site. (At least two major retailers have already begun this

process.) Vendors could work within specified routing guidelines and still tender for trucks online in conjunction with other geographically close vendors to get full-truckload rates.

Internet start-ups have the luxury of starting from scratch and defining their fulfillment infrastructure specifically for the products being offered online. This is not the case for established companies like catalog companies or store-based retailers such as Wal-Mart,

Borders, and JCPenney. These companies already have fulfillment and distribution networks designed to ship a variety of products in bulk quantities to hundreds of stores. They realize that they cannot layer home delivery on the existing infrastructure. The established companies must decide whether to extend their existing facilities for consumer-direct e-Commerce or build a new set of fulfillment facilities tailored to low volumes and high-variety product mixes. The enlightened ones realize that they need to invent a new customer-driven fulfillment model that can extract enough costs out of the current model to justify home delivery costs.

That new model, we believe, is an intercompany order-fulfillment and replenishment model. It utilizes business process synchronization to eliminate redundant processes among supply chain trading companies and to improve information sharing—doing away with excess labor, inventory, and holding costs.

The design and implementation of such a coordinated and synchronized fulfillment infrastructure poses a major managerial problem. To shed light on this problem and provide a prescriptive roadmap, we address the following questions:

- What is the impact of current customer-direct business models on fulfillment strategies? What is the definition of consumer-direct fulfillment logistics? Why is having a consumer-direct model so important?
- What types of fulfillment strategies are currently employed in e-Commerce?
- What strategic business-process reengineering and synchronization steps can managers take when designing a consumer-direct fulfillment logistics strategy?

The Logistics of Consumer-Direct Fulfillment

Three forces are converging to create an explosion in consumer-direct business models: technology forces are making it possible, market forces are making it viable, and social forces are making it inevitable. Keep in mind, though, that consumers demand more than an interactive experience. They want delivery convenience and lower fulfillment costs. They need to be assured of fast and reliable delivery. The value the consumer places on timely delivery can affect the logistics network design significantly. “Time is money,” and digital consumers of the 21st century don’t have the same tolerance levels as their analog-world ancestors. Today’s consumers are yearning for instant gratification as never before. Partners in the supply chain must improve their efficiencies—from order capture to fulfillment—to provide that gratification.

The goal of consumer-direct business models is to let customers select and configure products and services interactively, get a price quote, and receive a committed delivery date online. Companies serious about satisfying customers online must substantially change their process to make consumer-direct retailing and manufacturing attractive to the consumer. Companies must re-evaluate the complete fulfillment business model—promotions, merchandising, product selection, pricing, supplier relations, technical management, distribution, returns, and post-sale service. Each of these areas demands new processes, skills, and approaches.

To satisfy a consumer-driven marketplace, companies must move beyond the singular mentality of intracompany optimization. Instead, they must focus on how intercompany business process synchronization can transform consumer demands into consumer satisfaction. As with a single company, core competencies of each component of the virtual organization must be evaluated objectively to eliminate inefficiencies. Managers of that virtual organization will continue to reengineer best practices, while at the same time:

- Building replenishment programs based on consumers “pulling” the product through the supply chain from the manufacturer.
- Employing new forecasting methods that reflect total pipeline visibility.
- Investing collectively in technology and equipment to capitalize on market opportunities.

The success of consumer direct fulfillment logistics models depends on the successful integration of

four key elements: order-fulfillment planning, product execution, distribution management, and cross-application integration.

1. Order-Fulfillment Planning. Rising customer expectations and short fulfillment deadlines call for effective planning that breaks artificial boundaries and bridges the gaps between the consumer and the other players in the supply chain. Fulfillment planning must consider the entire planning process—from manufacturing, through distribution and transportation—within a single integrated model. Fulfillment planning involves evaluation of multiple planning strategies such as:

E*stablishing a sustainable e-Commerce position is as much about using the right order-fulfillment strategies as it is about having the right product at the right price.*

- Profitable-to-promise: *Should I take the customer order at this time?*
- Available-to-promise: *Is inventory available to fulfill the order?*
- Capable-to-promise: *Does manufacturing capacity allow order commitment?*

Select the plan that best meets the desired customer-service levels considering transportation and manufacturing constraints. It’s important to plan backwards from customer priorities and fulfillment deadlines. Thus, to generate a feasible plan, the fulfillment-planning process needs to consider all supply chain constraints simultaneously. These include transportation constraints such as truck capacity and weight, use of alternate modes, and availability of downstream resources such as loading docks.¹

2. Production Execution. With the advent of modular designs, more and more production functions are being performed at dedicated warehouses and distribution centers. The typical activities include light subassembly and sequencing, kitting, merging, consolidation, packaging, and labeling. Timing of the final assembly often drives the production plan for subassemblies. The process starts with the master production schedule for the finished product. An MRP (Manufacturing Resource Planning) system explodes this schedule to derive when, where, and in what quantities various subassemblies and components are required to make each product. Production also includes component-replenishment strategies that minimize the amount of inventory in the pipeline and coordinate product

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hand-offs between the various parties involved. Timely replenishment of warehouses is critical because customers will no longer tolerate out-of-stock situations.

3. Distribution Management. Distribution management encompasses the entire process of transporting goods from manufacturer to distribution centers and then to final consumption point. The process also may include packing, document preparation, customs brokerage, and inventory and warehouse management. One of the most important innovations here is the integration of distribution with transportation planning and scheduling through a comprehensive supply



chain execution solution. Transportation-management software spans the life cycle of the shipment and allows customers to view all of their shipments across a network of multimodal transportation providers. Distribution management also means providing users with easy access to shipping, tracking, and delivery data.

Reverse logistics is another function of distribution management. Faster product obsolescence and more generous warranties have escalated the number of returns. Reverse logistics not only encompasses damaged or returned goods but also products designed for remanufacture, hazardous materials, and reusable packaging.

4. Cross-Application Integration. To be effective, companies need to seamlessly integrate the three elements of fulfillment logistics described above. At present, this rarely happens. Most Web servers only have a sporadic connection to the Enterprise Resource Planning (ERP) system like SAP's R/3, which controls accounting, production, materials management, and distribution. Thus, when the user wants to know when a product will be delivered, the Web application often cannot tell that user what inventory is available in the ERP system or at the third-party warehouse. These are precisely the kinds of problems that business-process synchronization

can address by utilizing standardized information formats and communication points between trading partners.

Distribution center inventory has to be integrated effectively with the customer contact system. In high-velocity retail settings like the Web, customers quickly become unhappy if the seller is out of stock for what is advertised as in stock. Accurate distribution center inventory, updated frequently, is essential to running an effective online business.

A Framework for e-Commerce Fulfillment Strategies

In the face of increasing competition, absence of pricing power, and shrinking operating margins, companies will succeed or fail based on the efficiency of their fulfillment strategies. Business analysts often focus on the number of orders a company generates on the Web as an indicator of its competitive strength. But a more accurate measure may be the company's process for rapidly and efficiently translating the orders into

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fill-rates that satisfy and exceed customer expectations. This section presents a framework of evolving fulfillment strategies. It then illustrates that framework with a wide array of examples and derives implications and guidelines for management.

The framework is based on two dimensions: the structure and the operation of fulfillment strategies. On the structure dimension, the strategies are classified as either centralized or distributed. In a centralized structure, all warehousing, pickup, packing, and shipping are operated in a central site, usually a distribution or logistics center. In a distributed structure, warehousing, pickup, packing, and shipping or delivery are located at different sites. On the operation dimension, the fulfillment strategies are either self-operated if the fulfillment process is operated by the company itself or outsourced if it is done by third parties or partners. All of these strategies, discussed below, have trade-offs regarding investment, inventory costs, and operational complexity.

Strategy A. Distributed Delivery Centers

Fulfillment through distributed delivery centers is an acceptable approach for companies that are just getting online or for those that have a delivery func-

tion in their stores. This approach minimizes the up-front investment and can be set up quickly. It also facilitates strategies such as “Buy Here/Pick Up There.” This strategy allows consumers to place an order by phone or online at one store location and pick up the merchandise at another.

Though distributed delivery centers do have their advantages (like the obvious reduction in shipping costs), they also can experience certain difficulties. For one thing, controlling inventory for every center at an appropriate level may result in operational complexity and incur expensive inventory costs. In addition, in-store employees often are unfamiliar with warehouse picking and packing procedures. Further, high employee turnover can make picking and packing quality standards difficult to maintain.

Yet another problem is scheduling. To minimize conflict with customers who are shopping during the daytime, picking operations often are scheduled for off-peak shopping hours. Although this may appear to be an efficient use of resources, the delayed picking may force an additional day into the delivery cycle, since carrier pickups may take place before the completion of the current day’s picking and packing activities.

Strategy B. Partner Fulfillment Operations

Some online retailers are using the partner fulfillment model, which means they have no inventory, no shops, and no product brands. Fulfillment is performed entirely by partners.

This approach has clear advantages from the standpoint of inventory-carrying costs. But there are some disadvantages as well. This has been evident in the experience of Peapod, an online grocery retailer that provides online shopping and home delivery services. Peapod discovered that its initial strategy of partnering with local supermarkets for fulfillment meant charging consumers high delivery costs of up to \$16 an order. This pricing level made it virtually impossible to build a customer base. To attract more customers, the company has begun to dismantle some of its partnerships and move toward a distributed-delivery fulfillment model by establishing its own warehouses in selected markets.

The introduction of a distributed-delivery model, however, has put a strain on the company’s financial growth. Peapod management estimates that each new distribution center requires a capital expenditure of roughly \$1.5 million plus operating expenses. Peapod expects a net loss at each facility during the first 12 to 18 months of operation. In the long run, however, the new centers should give the company higher overall margins as well as greater operating efficiencies.

Companies will succeed or fail based on the efficiency of their fulfillment strategies.

Strategy C. Dedicated Fulfillment Center

Today, many online retailers have established their own dedicated fulfillment centers. These players include Amazon.com, BarnesandNoble.com, Dell Computer, Micro Warehouse, and Insight Enterprises.

This approach is well suited to the book and computer industry, where the fulfillment centers can facilitate prompt delivery. The dedicated fulfillment center model reduces delivery costs for low-margin items. Using this approach, companies can measure expected delivery time in hours—not days. The tradeoffs of this approach are:

- *Low or unpredictable sales volumes.* This will result in high inventory-carrying costs.
- *High up-front investment.* Depending upon its warehouse setup and flexibility, a distribution fulfillment center can incur high costs. It may, for example, require major systems modifications, automated warehouses, and conveyors. This option, moreover, can add operational complexity to the product and information flows. Yet even though this approach increases the up-front capital investment, it can reduce long-term operating costs.
- *Decreased flexibility.* The operation’s scalability is restricted to the existing warehouse infrastructure. This may make it difficult to meet the variability in demand inherent in some retail segments.

Strategy D. Third-Party Fulfillment Centers (“Virtual Warehousing”)

As companies struggle to manage unpredictable demand better, they are turning toward third-party fulfillment centers (3PFs), which can be thought of as virtual warehouses. Through this approach, companies can lease the skills and facilities needed for order fulfillment rather than owning them.

Third-party fulfillment companies offer flexibility in accommodating wide swings in demand over short periods. They also help facilitate inventory-reduction initiatives such as just-in-time programs. Another advantage of 3PF is the limited changes that must be made to legacy information systems. This option provides a much more robust capability than in-store fulfillment and minimizes operational impact. It also converts much of fulfillment into a variable cost offset by eliminating warehouse and

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store costs associated with the sale of the product. This strategy allows retailers to leverage their buying power and extend product selection into lines not currently offered in their stores.

The primary drawback of 3PF is few existing national fulfillment companies can accommodate a wide range of products. Even more problematic, ceding control of this critical aspect of the business represents a major paradigm shift for retailers. Depending upon the service levels required by customers, multiple fulfillment centers may be necessary to minimize delivery time—and this increases costs and required stock levels.

Effective fulfillment strategy is dynamic, using multiple channels simultaneously to reach important customers.

Strategy E. Build-to-Order

The customized build-to-order model is an emerging fulfillment center strategy that extends beyond the traditional framework and adopts an integrating or boundary-spanning perspective. Companies working to coordinate build-to-order fulfillment logistics strategies need to:

- Synchronize and manage the entire flow of materials through a complex network of resources in their supply chains as opposed to simply managing inventory in warehouses.
- Turn their attention to maximizing the throughput, rather than focus on controlling fixed costs.
- Alter the material flow upstream quickly and proactively as demand and product mix change, rather than react to changes in customer demand at the end of the process.

A fundamental requirement of fulfillment logistics is the dedicated collaboration of all supply chain trading partners to eliminate the costs associated with inefficient movement of goods, redundant processes, and excess inventory. Effective collaboration not only ensures that the order flows through smoothly but also provides two crucial capabilities: the ability to adapt to increasingly frequent changes in consumer tastes and e-Commerce technology and the ability to improve processes continuously.

Designing the Right Fulfillment Strategy

Design of the fulfillment strategy is central to the overall corporate strategy. It is becoming increasing-

ly clear that customers don't just buy products; instead, they buy the "service envelope." They are looking to enter into a complex relationship with the selling company. Given the new reality, companies do not create value for customers by merely offering varieties of products. Rather, they must devise a logistics fulfillment strategy that envelops the product and meets customer needs such as convenience, reliability, and support.

The choice of a fulfillment strategy depends on whether a company elects to compete essentially on customer responsiveness or operating excellence. In either case, the fulfillment strategy must support the overall business strategy. To ensure that this happens, a company needs to complete the following steps: (1) assess the competitive environment, (2) select the fulfillment strategy, (3) achieve business-process synchronization, and (4) design and implement the necessary cross-application integration.

Importantly, the fulfillment strategy must take full advantage of new planning, warehousing, and transportation technologies that can cut order fill times dramatically.

Assess the Competitive Environment

The first step in fulfillment-logistics design is assessment—that is, identifying the opportunities, strengths, and weaknesses that will influence overall performance and viability of the fulfillment strategy. During the assessment phase, a company must gather information on the competitive environment across these strategic variables:

- *Effectiveness.* What are customers' priorities and how are they changing? How closely does the overall design address the stated and unstated requirements of customers? Consider likely changes in buying patterns, potential competitors, long-run cost pressures, and new technologies.
- *Value differentiation.* Why do my customers buy from me? What makes my value proposition unique compared to the competition? Do customers appreciate the value in my offering and can this be leveraged into differentiated pricing strategies? The first step toward value differentiation is to map your customer's entire experience with your product or service. Do this for each important customer segment.
- *Capital intensity.* Should we choose a capital-intensive, high fixed-cost strategy? Or a less capital-intensive, flexible strategy? The e-Commerce impact on working capital outlay differs from retailer to retailer. It depends on such factors as the existing logistical infrastructure (dispersion of warehouses, existing product flow, etc.), the

nature of the products carried (for example, books vs. produce), and the delivery demands of the customer.

■ *Channel extendibility.* Can the fulfillment design handle possible new products and services and incorporate new forms of customer interaction? Established companies must remain committed to a portfolio strategy of customer interaction. This is based on the belief that valuable synergies exist among online, catalog, and specialty retailing. To

cite one example, online order desks with sophisticated walk-up interfaces can be located strategically in every store so that shoppers can order products and serve themselves. With an integrated portfolio strategy, established companies can gain many new online customers from the retail outlets.

■ *Infrastructure scalability.* Can the design handle multiple products and a high shipment volume? Physical distribution can be a major logistical and administrative headache. Online retailers are finding that having to adapt their existing infrastructure to handle small shipments going to millions of consumers can be time consuming, complex, and

expensive. The challenge is to keep each and every customer satisfied while protecting the bottom line from erosion resulting from waste, errors, and inefficiencies. How well do the available distribution strategies help accomplish that key objective?

Select the Fulfillment Strategy

The second step in the design process is to select an appropriate fulfillment strategy based on the findings of the competitive assessment. Each fulfillment strategy brings its own strengths, weaknesses, and trade-offs. These center on such issues as investment, effectiveness, cost efficiency, operational complexity, channel extendibility and scalability, and risks associated with the business alliances. Exhibit 2, which summarizes the key characteristics of the five

EXHIBIT 2

A Summary of Five Fulfillment Strategies

Type of Fulfillment Strategy	Distinctive Characteristics	Major Strengths	Potential Weakness	Management Challenges
Distributed delivery centers	Distributed operation sites; Self operated.	Easy start-up; Prompt delivery; Operation in control.	Complex inventory management; High inventory costs; Unfamiliar with warehousing procedures.	Establishing sophisticated inventory-management system; JIT inventory management.
Partner fulfillment operations	Distributed operation sites; Partner operated.	Minimized up-front investment; Less operational responsibility; Flexible delivery arrangement; Low shipping charge to customers.	Service limited by partnership; Low overall efficiency; High inventory costs and inventory-management complexity.	Establishing order-routing system; Maintaining strategic alliance with partners; Ensuring service quality and reliability.
Dedicated fulfillment centers	Centralized operation site; Self operated.	Avoids the higher inventory costs; Easy to manage; Fast delivery; Reduced long-term costs of operation.	High up-front investment; Decreased flexibility.	Converting traditional warehousing to consumer-direct fulfillment; JIT inventory management.
Third-party fulfillment centers (3PFs)	Centralized operation site; Third party operated.	Least investment; No learning curve; No operational complexity; Limited changes to legacy systems; Minimized operational impacts.	Few options available; Risks in strategic alliances; High operational charge.	Selecting the third party; Establishing inter-organizational information systems with the 3PF.
Build-to-order	Spans both centralized and distributed operations.	Minimum inventory; "Pulling" ensured; No stock inventory; Controlled fulfillment.	Over-customization; Costs and resources of integration.	Synchronizing entire flow of materials vs. managing inventory; Altering material flow upstream vs. customer demand downstream.

fulfillment strategies, is a managerial guide for determining which strategy is right for a company at a given situation.

Achieve Business-Process Synchronization

Intercompany business-process synchronization,

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in its purest form, gives rise to the virtual organization in which all trading companies work together as one competitive supply chain entity—the e-Supply chain. In the virtual organization, each trading company shares its information and resources, which results in better planning and more efficient product movement. In making business-process synchronization a reality, companies typically will encounter these challenges:

Today's information technology revolution does not merely support new order-fulfillment strategies, it creates them.

■ *Technology Challenge.* Intercompany business-process synchronization requires sophisticated technology applications. It can be difficult, however, to identify those systems that truly support this initiative.

■ *The Data-Sharing Challenge.* Supply chain systems not only need to communicate with one another but also to integrate their business practice knowledge into each trading company's business logic. The companies must work quickly and painlessly to integrate their trading partners' knowledge into their own business applications.

■ *The Adaptability Challenge.* All the information in the world cannot help if trading companies don't have the flexibility to alter business processes as consumer demands change. In this regard, all trading companies face similar challenges. For instance, when UPS issues a rate update, thousands of customers must implement these changes by a specified date and time. Companies need to implement business systems that can be upgraded easily to move with the market.

■ *The Standardization and Compliance Challenge.* When one major player in the supply chain decides to upgrade to a new technology or adopt a new technical functionality, the other players are challenged to synchronize accordingly. When there are thousands of "touch points," or interface points, the challenge can become enormously complex. In a perfect world, all trading partners would migrate in unison to the latest technologies to realize the maximum benefit. But it is not likely that an entire supply chain can or will do this at once. Thus, it is important to focus on synchronizing business processes around these touch points and upgrading them as the market evolves.

Design and Implement Cross-Application Integration

Among the key objectives of intercompany collaboration are more sophisticated distribution services, such as frequent inventory replenishments, more customized packing of goods to reduce unpacking times, more creative packaging and labeling of goods to meet merchandising strategies, and more effective exchange of trading information in compliance with EDI standards. Achievement of these objectives demands an increased use of cross-application integration.

Superior application integration in a supply chain is central to achieving superior fulfillment productivity and speed. An effective fulfillment-management system must have the ability to integrate with:

1. Integrated enterprise applications. Included here are the ERP systems that integrate the inventory management, marketing, and financial functions.

2. Integrated interenterprise systems. These are the supply chain management systems for transportation, order management, warehouse management, and demand planning. For instance, FedEx has integrated its logistics and transportation capabilities with the SAP R/3 system. For R/3 users, the solution will simplify every related process step from order entry through shipment and tracking by tightly integrating with FedEx. For FedEx, this capability creates a competitive barrier that other carriers have to overcome.

3. Distribution center management and warehouse management systems. Included among these solutions are facility management systems. Efficient management of a distribution center operation now requires collecting information on customer orders, inbound shipments, products available on-site, storage locations, product weights and sizes, and outbound shipping data (including customer-specific shipping requirements, routing data, and carrier requirements). This information must be analyzed dynamically to determine the most efficient use of the distribution center's labor, materials-handling equipment, and shipping and receiving areas.

Acting in Unison for the Consumer

Order fulfillment and replenishment is a core business process. What makes consumer-direct e-Commerce compelling to customers is not just the online shopping experience but on-time delivery, fewer fulfillment errors, extra service, and convenience. These are the things that customers value. When companies fall short in responding to those values, they risk alienating or losing customers as a result.

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Many potential e-Commerce participants have underestimated the difficulty and importance of the fulfillment side of this market arena. They see fulfillment and distribution logistics as peripheral to their competitive strategy. Companies need to recognize that such benign neglect is risky and wastes opportunities for competitive advantage. In response to pressures from powerful market trends and technological changes, they must inspect past practices, channel commitments, and vendor relationships vigorously.

Effective fulfillment strategy is dynamic, using multiple channels simultaneously to reach important customers. Today's information technology revolution does not merely support new fulfillment strategies, it creates them. Consumers interface with technology daily, raising the bar on what is expected on the fulfillment side. Meeting these rising expectations requires a conscious shift in fulfillment strategies and a technological infrastructure that ties together every aspect of the consumer-direct "fulfillment chain."

Interenterprise business-process synchronization is a key to success in this emerging real-time marketplace. Deep information exchange among supply chain partners brings opportunities to develop interenterprise strategies that become new sources of competitive advantage. Information integration allows companies to monitor daily trends, market conditions, product acquisitions, and planning functions. To achieve operational integration, manufacturers, distributors, and retailers must exchange information effectively with other supply chain participants at key interface "touch points." Importantly, this includes providing real-time infor-

mation to customers so they know the status of their order at any given moment.

When all trading partners—including raw-material suppliers—perform all of the key supply activities in unison, they can make inventory decisions that lead to dramatically improved results. They can then share the rewards of producing the correct amount of the product, thereby lowering the cost of overproduction. Business-process synchronization also enables partners to respond quickly and easily to unplanned consumer demand for items or for personalized and enhanced products—the kinds of things today's Internet shoppers desire.

The companies that employ business-process synchronization in the development of their consumer-direct order-fulfillment strategy will fulfill these consumer desires and emerge as the big winners in the Internet economy.

Author's Note

Used as a reference for this article was a White Paper by Alan Dabbiere of Manhattan Associates titled "Business Process and Supply Chain Synchronization: Achieving Supply Chain Excellence Through Technology."

Footnote

¹Companies providing early versions of advanced planning capability include SAP's Advanced Planning and Optimization (APO) engine, i2Technologies, Manugistics, and Logility. More sophisticated systems that integrate production planning and transportation planning are under development.