

How Electronic Commerce Is Transforming Business Processes

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It wasn't too long ago that the idea of a company outsourcing its data processing was considered a revolutionary stroke of genius. Outsourcing allowed the company not only to cut costs and prune assets, but to rent time on its own applications. In the world of Internet-based computing, this innovation will quickly evolve to the next step, in which companies will outsource not only the computer running the transaction process, but the process itself. Now that one company's production planning system can be seamlessly merged with another company's inventory management system, and both systems can be managed by a third entity charging transaction fees to both of them, it is easy to see the next model: companies with no „physical“ presence in the world except for the desks that host the „minders“ (and even these might be spread across the planet, reflecting the work habits and lifestyles of the individuals involved). E-Trade, the Internet stock trading company, is an early prototype of this type of venture. Over the next decade other models will emerge that will stretch current notions of the enterprise and radically challenge such basic concepts as ownership, markets, and – most certainly – competition.

How will all these transformations unroll and what factors in the global business environment will accelerate or impede them? Most certainly there will be a „pull“ from the big players. Already, many companies are making supply chain integration capabilities a prerequisite for doing business with them. At the same time, major players in some businesses are forming consortiums within which they all run their basic, noncompetitive processes in a shared-services mode that would have been unthinkable to the cutthroat competitive entrepreneurs of the past. The Internet and other forms of virtual private networking are the facilitators for these developments.

Manufacturers want the ability to see into their distributors' sales pipelines in real time. Distributors want real-time access into manufacturers' production schedules – and the ability to influence them. Manufacturers in many industries are already being enticed into purchasing basic materials and components over the Internet in worldwide, bareknuckle auctions where the only selling advantages are low bids and accelerated delivery schedules. These auctions are quickly leveling the playing field in industrial purchasing, making it possible for both small and distant companies to participate in large-scale procurement contracts that several years ago would have been beyond their reach. But the major winners in all these transformations will be buyers and consumers the world over.

Already almost half a million companies have added „corn“ to their business addresses, instantly making them global players and potential members of the seamless sales, manufacturing, and supply-chain fraternity that is slowly but inexorably emerging on the Internet. In the following pages we explore specific ways in which electronic commerce and the Internet are transforming four key business processes: product development, manufacturing, supply chain management, and customer service. There are important lessons here. To paraphrase the marketing slogan of E-Trade, „Someday all business will be done this way.“

Product Development

„Wired“ product development – product development based on digital media – will be much faster than conventional product development, and it will permit involvement across a much broader geographic scope. Perhaps more importantly, it will support radically new techniques for design, development, and engineering, as well as new kinds of interactions – not only among functions across the enterprise but with vendors, customers, and other partners throughout the „extended enterprise.“

The result will be processes that are radically – almost unrecognizably – different from product development processes today and that exist only in the world of this new medium. Precursors of these processes are beginning to appear today.

Qualitatively Different Subprocesses. Motorola's substitution of computer simulation for experimental design and testing of its cellular phones is a good example of how digital media can transform an important product development subprocess. Computer-animated „videos“ of simulated drop testing of Motorola phones provide very fast, low-cost „X-ray“ visualization of the mechanical, thermal, and electrical behavior of the phone when dropped – insights not obtainable from conventional physical testing.

Highly Cross-Functional and Networked Processes. Boeing's computer-based development system exemplifies a revolutionary product development process with no counterpart in the pre-digital world. First employed to develop the 777 aircraft, this approach reduced the development cycle from 3 to 5 years to 18 months. The key is an online electronic prototype, on which Boeing's R&D organization, manufacturing unit, suppliers, and customers can all operate at once. The result is a greatly accelerated, highly parallel development process that uses no physical mock-ups or paper drawings. Of course, developers can print all the drawings they want; they just don't „count.“ The „real“ prototype is in the computer.

„Co-evolution“ of Product Development with Other Processes. One of the most striking transformations of wired product development is the replacement of slow, bureaucratic, highly-structured stage-gated product development processes with highly parallel and super-fast „co-evolving“ processes, in which product development operates simultaneously with other processes, such as sales or supply. For example, Netscape and some other software vendors employ extremely rapid co-evolving product development and sales processes that exploit the speed of online beta testing with lead customers. Beta testing with selected customers is not new, of course, but the speed of Net-based dissemination makes interactive cycles of software development and market testing so short that, in effect, the product development and sales processes become parallel. More recently, Netscape has begun to distribute source code online – utter heresy in the software business. Now Netscape’s lead customers not only provide market data and help find bugs, they also alter and augment the software themselves, creating a new „free“ global development engine.

In summary, the application of digital media to product development results in transformationally different success practices – the most striking of which have no counterpart in the pre-digital world. This transformation is taking place at all levels of product development, from individual sub-processes, to complete cross-enterprise development processes, to super-fast co-evolving processes.

Design and Manufacture

In the global economy, products are no longer designed and manufactured in one plant or even on one continent. From laptop computers to jumbo airliners, today’s products are global products. Their components are designed and manufactured in many places, yet each component must fit and function with many others. And the fact that not only the people but also the computers involved in the design and manufacture of today’s products speak different languages can be a major problem.

The challenge facing global manufacturers is how to share product design and manufacturing data among organizations using dissimilar computers and software. If all the participants used the same computer aided design (CAD) systems, the proprietary product design models could be shared easily over an extranet. But that is just not very likely. Participants in the US. Air Force’s F-22 stealth fighter program, for example, used more than 40 different versions of CAD systems. As a result, essential computer designs had to be translated to paper drawings or microfilm and mailed among the participants – a costly process that can introduce errors.

A number of global companies are working together, and with the International Organization for Standardization (ISO), to meet this challenge. Industry associations began developing standards for exchanging narrow classes of product data more than 25 years ago. But, the effort to develop a comprehensive standard that addresses the spectrum of product data required for products like airplanes began only a decade ago. Led by a consortium of some 25 global companies, known as PDES, Inc., with some participation from US. government agencies, the effort gave rise to the adoption of ISO Standard 10303, the International Standard for Exchange of Product Model Data (commonly called STEP). Boeing first used STEP to share product model data about the component of the new 777 that attaches the engines to the wing. None of the three engine manufacturers – GE, Pratt & Whitney, or Rolls Royce – had the same CAD system as Boeing, but all of them could translate from their CAD systems into and out of STEP. Subsequently, other PDES, Inc., members have used the standard. Delphi Delco Electronics Systems used it to exchange design data about climate-control systems with two OEMs for whom they were a second-tier supplier. General Motors established a STEP Translation Center to transfer product designs among teams using different CAD systems. Lockheed Martin recently implemented STEP on several fighter aircraft programs, F-16, F-22, Joint Strike Fighter, and F-2. And Ford and Allied Signal demonstrated the use of STEP to exchange power train design data.

Organizations similar to PDES, inc., have been formed throughout the world and are known as STEP centers. They cooperate with each other and with ISO. STEP is being implemented in automobile, aircraft, and electronics companies throughout the world. Boeing, one of the pioneers, has demonstrated its use to facilitate concurrent engineering and manufacturing planning. Design data is shared with second- and third-tier manufacturers during the design process, so that the final design is one for which the suppliers can build the components quickly and reliably, without need for design changes during the manufacturing process. This is the future of global manufacturing: virtual teams of companies sharing product design and manufacturing data electronically, over the Internet, throughout the design, manufacturing, and product support phases of the product life cycle. The companies that learn how to do this, and soon, will be able to bring new products to the market much faster and at lower cost than their competitors.

Managing the Supply Chain at the Speed of Light

Since the 1960s, supply chain manufacturers have used electronic commerce (e-commerce) to reduce inventories and streamline transaction processing. Traditional electronic data interchange (EDI), operating through private, proprietary value-added networks (VANs), has facilitated data exchange between buyers and established suppliers for a series of routine transactions, including purchase orders, invoices, electronic funds transfers,

production schedules, and even descriptions of inventory on hand. Today VANs, as legacy systems sponsored by large companies, handle most routine transactions for business-to-business e-commerce (EC). For supply chain managers, opportunities created by EC fall into six modes of interaction: electronic requisitioning, real-time auctions, supplier identification and qualification, electronic request for quote/request for proposals, transaction processing with established suppliers, and collaborative information sharing. In each case, EC streamlines transaction processing. It also helps companies enhance their market knowledge and reduce their inventories.

The past three years have brought tremendous progress, enabling companies to buy maintenance, repair, and operational (MRO) goods and services using Internet-based electronic requisitioning and online catalogs provided by distributors, manufacturers, and other service providers. Three trends are driving this explosion in electronic MRO activity:

- Large companies spending hundreds of millions of dollars on MRO goods and services have decided that MRO represents a strategic opportunity.
- Smaller suppliers have chosen the Internet as a low-cost avenue to reach broader markets, the equivalent of placing advertisements in the „electronic yellow pages.“
- Third-party service providers have created user-friendly, „one-stop-shopping malls,“ where buyers can seek a range of MRO items from many suppliers.

In the last two years, broadly available, real-time „reverse auctions“ have captured the imaginations of purchasing managers, who are now able to orchestrate microcosmic „buyer’s markets.“ Each auction features a number of competing suppliers dynamically pricing their wares. Buyers can see all the competing bids simultaneously on a viewing screen and watch them plummet as the auction progresses. For buyers, this forum represents a quantum leap forward from the static sealed bids of old.

We anticipate even more fundamental breakthroughs in supply chain management as companies move beyond purchasing MRO and apply the tools of e-commerce to goods and services that represent direct materials, complementing what is already done via the VANs. These projected breakthroughs will catapult supply chain management from the „power drill“ era into the „laser beam“ era.

Companies are already using the Internet to improve specifications and enhance their market knowledge by sending extremely detailed requests for information (RFIs) electronically to the universe of available suppliers, asking them for quality ratings, manufacturing process capabilities, procedural information, and even questions about cost structure. Ultimately, a narrowed range of suppliers are asked to respond to a request for quotation (RFQ), not only to provide pricing information, but also to evaluate the specification itself. Progressive customers seek out suppliers’ ideas to reduce overall cost by converging on specifications that meet buyer’s performance needs, but may be more economical in terms of overall life-cycle costs. Historically, this process often took months, and the associated workload was prohibitive. But now, with the Internet as an enabler, the process cycle time can be dramatically collapsed. Once suppliers are in place and proven, the increased decision-making rigor now possible gives buyers the confidence they need to create longer-term contracts and to reward winning suppliers with increased share.

In addition, collaborative information-sharing with existing suppliers via the Internet supports more productive relationships between buyers and suppliers, allowing customers to reduce inventory and streamline transaction processing.

The increasing use of Enterprise Resource Planning (ERP) software, linked with the right „hooks“ into e-commerce, sets the stage for another breakthrough in supply-chain management. Integrated ERP systems are giving companies timely access to data on their own operations that has never before been readily available. In addition to the insights this information provides, companies can share this information selectively with their suppliers, through an extranet, to give suppliers the ability to understand customer processes.

The next few years will see continued progress in all six e-commerce modes, and we expect to see creative combinations of these modes, as well as new information technology enablers for supply chain management.

Customer Service

The continuing influx of consumers and businesses to the Internet will dramatically transform the customer service process. Companies will combine the capabilities of Web technologies with their traditional call center infrastructures to create Internet-enabled „customer contact centers“ through which they can reach customers with personalized sales and responsive service, responding to inquiries via fax, e-mail, the Internet, and video devices in a single, integrated sales and support environment.

Much of the technology that will support this transformation is already in place:

- Computer-telephony integration has already made great strides in intelligently routing calls and simultaneously delivering customer-focused information to a customer service representative at call arrival by linking the call processing equipment with underlying information systems.
- Fax document management systems, automated e-mail response-generation solutions, and systems that intelligently route inbound e-mail messages to individuals, departments, or call center work groups are available today and are being increasingly refined.
- Internet access tools, intelligent agents, and sophisticated Web sites will empower customers to interact and configure their own services, reserving live interactions with customer service representatives for special situations.
- Customers' calls will be delivered to customer service representatives using voice-over-IP (Internet Protocol) and not simply over the public switched telephone network.
- As desktop videoconferencing becomes more prevalent, video calls and conferencing between customers and customer service representatives and other employees will become commonplace.

In short, integrated solutions will manage and resolve these customer inquiries from a host of media.

How will the customer service process change? Customers will be able to access information on demand, effectively providing their own customer service by using a variety of new solutions for automated inquiry resolution. And when customers choose to interact with a live customer service representative, the Internet and other new technologies will facilitate and enhance each customer's experience.

While there are simply too many new technologies to highlight all of them in this article, three new technologies are particularly exciting, since they integrate the Internet with a call center as a means of accessing and facilitating customer service (and sales).

Internet „Call-Back“ Solutions. These allow a customer browsing a company's Web site to initiate an immediate call back from a sales or customer service representative. The customer simply enters his or her telephone number on a Web page and hits a button to submit this request; a customer service representative immediately calls the customer back to answer support questions or to close a sale. This approach works for Internet customers who have two phone lines at their offices or who are accessing the Internet via a local area network (LAN) connection and have an available telephone line to receive the customer service representative's call.

Internet „Call-Through“ Solutions. These let the customer immediately talk with a company representative through the Internet connection – not through a separate phone line. This technology is more flexible than call-back, since it doesn't require a separate call; however, call-through does not always work in a business LAN environment, since voice-over-IP can be blocked at a company's firewall (sometimes inadvertently). Contrary to popular opinion, the quality of voice-over-IP calls can match that of current public switched telephone network calls (e.g., in corporate IP networks where the quality of service can be effectively managed). And with the increasing deployment of higher-speed Internet access technologies (such as ISDN, xDSL, and cable modems) for consumers and businesses, high-quality voice-over-IP will be achieved.

Web Page „Mirroring.“ This enables the customer service representative and the customer to see the same Web page. While the representative is talking with the customer (using a second phone line or voice-over-IP) the representative can coordinate the Web pages viewed by the customer in real time. Control of this capability could also be given to the customer, allowing the customer to direct the representative to certain pages. This same technology can be used for all sorts of content beyond Web pages. For example, it could be used to allow interactive presentations to multiple entities over the Internet as an effective sales and/or service tool. All three of these technologies are available today and are being deployed by early adopters.

Depending on the nature of the call center, these changes can dramatically reduce costs, increase revenues, and capture valuable customer feedback. They can also support the formation of customer communities and the exchange of value-added information and services. And as customers become accustomed to this level of service and efficient self-support, they are likely to find it highly satisfying.

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