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## **Electronic Commerce Changes Organizational Structures**

### **Introduction**

Electronic commerce (e-commerce) is the use of computer networks, including intranets, extranets, private networks, and the Internet, to conduct business transactions. Electronic commerce started more than 20 years ago in the form of Electronic Data Interchange (EDI) and Electronic Funds Transfer (EFT), followed in the 1980s by Automated Teller Machines (ATM), telephone banking, and the extensive use of on-line credit card transactions. The most prevalent, and perhaps the oldest, example of e-commerce is the relationship between some 50,000 travel agents and the airline companies in the United States.

Use of these forms of interorganizational information systems did not spread much beyond large corporations initially. Large initial investment and maintenance costs, and crude user interfaces deterred rapid adoption by businesses.

Many of the organizational structures of today's businesses were designed more than 100 years ago when computer-based information systems were not available and information was scarce, difficult to process and communication systems were primitive. Even current business structures that emanate from 1950s management concepts were based on a paucity of information as opposed to abundance. Electronic commerce is changing all this. More than 10 years ago Peter Drucker heralded the coming of a new organizational form, an information-based organization: ". . . the typical business will be knowledge-based, an organization composed largely of specialists who direct and discipline their own performance through organized feedback from colleagues, customers, and headquarters." [Drucker, 88] He was right, but with all due respect to Drucker he, nor anyone else had any idea of the speed of change and the profound impact electronic commerce has had on organizational structures.

Information technology has changed the nature of work. Work has become more abstract than physical [Zuboff 88], more team-based and collaborative than individual, organizations flatter and more empowering, and businesses more networks of organizations rather than stand-alone firms. Information technology breaks down barriers between individuals, between organizational departments and between firms. ". . . many industries are beginning to implode as the walls between them disappear". [Tapscott, 99] The technology has lowered barriers to market entry - especially to Web-based sites for direct sales. E-commerce diminishes the difference between established, mature companies and new entrants.

Information networks are what makes teams work, and what makes e-commerce successful. Networked organizations are the opposite of the classic hierarchical organization. Networked organizations do lots of outsourcing, lots of partnering - even with competitors (alliances), and lots of fast-paced changes when necessary.

E-commerce relies on the networked organization. E-commerce allows the customer and the vendor - the buyer and the seller - to partner in a way never envisioned before. E-commerce technology will continue to cause changes in the nature of work, and we can only speculate on some of the eventual outcomes.

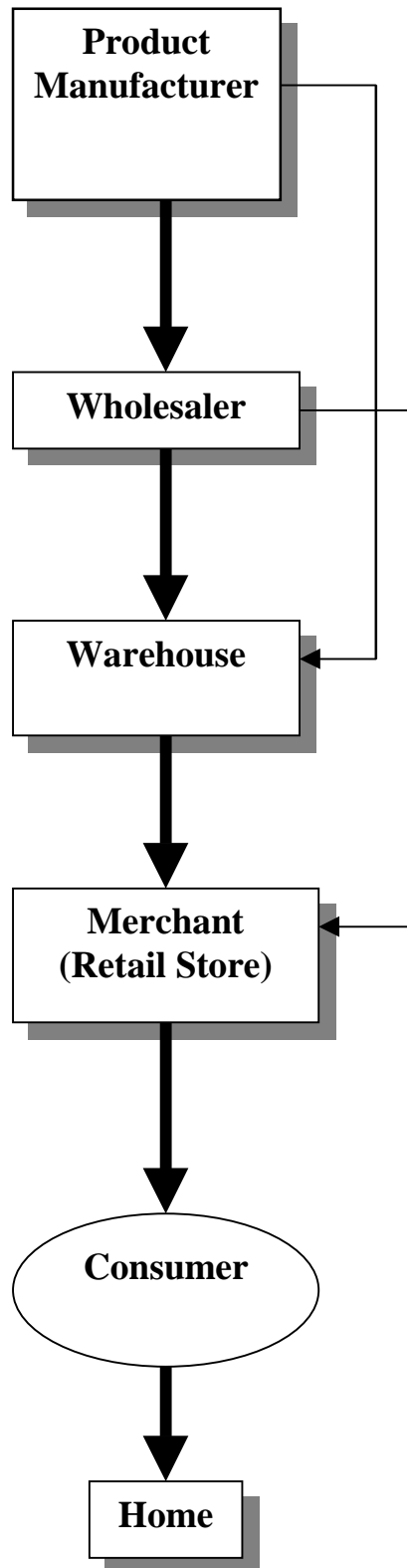
### **Web-Based Consumer E-commerce**

About 32% of Americans are shopping online, and about 11% of those are actually making purchases via the Internet. [King, 3-D,1999] The popularity and success of the Internet as a commercial vehicle has given e-commerce a great boost. This low-cost, ubiquitous network affords an opportunity for e-commerce on a global scale, not previously envisioned, and perhaps more importantly allows for the participation of virtually the smallest of businesses along side the very largest.

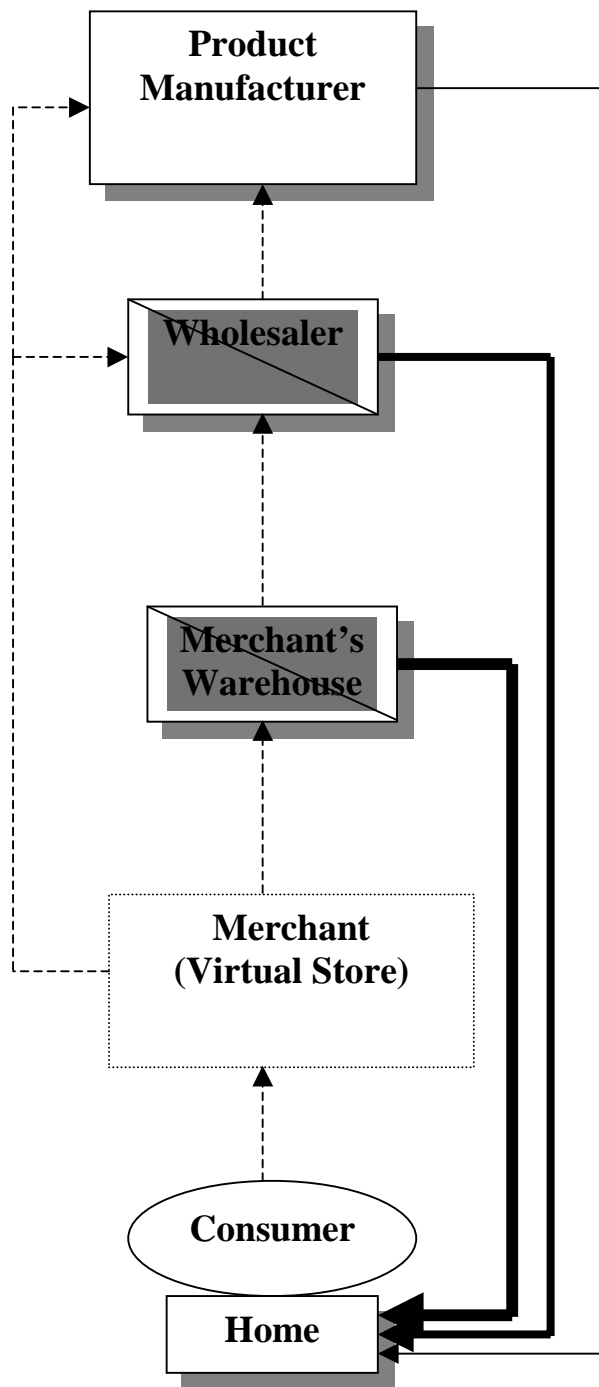
Recently much has been recorded about the structure of electronic markets versus traditional markets, with the emphasize primarily on Web based commerce. These studies and analyses focus on consumer purchases via the Web, which represents a major change in the supply chain and a profound change in retailing.

Figure 1 describes the traditional consumer purchase scenario via retail stores, and Figure 2 describes the change to a Web-based model.

**Figure 1: Traditional Consumer Purchases**



**Figure 2: E-commerce Consumer Purchases**



The impact of consumer e-commerce sales includes:

- many retail stores disappear
- many wholesalers & warehouses disappear
- consumers make fewer shopping trips
- manufacturers/wholesalers make fewer deliveries
- many more small package deliveries to homes
- more phone calls & Internet connections
- higher packing & shipping costs per product
- use of electronic payment; no cash, checks
- loss of pleasure of the shopping experience
- sales tax implication?

It is in a company's best interest to get customers to want to use e-commerce - to make it easy, maybe even fun. You are transferring the work from the vendor's staff to the buyer/customer, just what the use of ATMs has done for many years. These are self-service applications, which include tasks such as;

- ask the customer to enter his or her own order(s) - on-line order entry
- let the customer track the status of the production order
- allow the customer to track the status of the delivery
- require the customer to pay electronically.

Internet-based e-commerce reduces costs, results in faster service, and perhaps most importantly, increases customer satisfaction. All this is possible if companies can reduce human interaction to handling information exceptions. Some cost savings have been documented: An airline ticket sold over the Internet is almost 75% cheaper than one sold via a travel agent: America West; \$6 versus \$23. A paper-based purchase transaction costs an average of \$45, versus an EDI order of \$2.50, (more than a 90% saving), and an Internet-based EDI of only \$1.25. [Internet Business, 1998]

With the use of intelligent systems and multimedia, virtually any product can be described by picture, motion, sound and a virtual reality experience, thereby affording the consumer a Web-based shopping experience. Real estate, insurance, securities, auto purchasing, and retail in general are now being transformed by web-based transactions. Even the giant brokerage Merrill Lynch & Co., faced with major competition and a clear trend, recently announced it is going on-line thereby causing pain for its 15,000 brokers. Few products or services can resist e-commerce.

### **Business-to-Business E-commerce**

Forrester Research estimated that business-to-business e-commerce via the Internet in 1998 would amount to \$17 billion, which is some 78% of the total dollar value of all Internet transactions. In 1999, Forrester calculated that figure to be \$48 billion instead, almost three times as large as originally forecast, and now projects business-to-business e-commerce to be \$1.3 trillion in 2003. [Leibovich, 1999]

About 90% of the Fortune 500 companies use private EDI, but only 6% of the remaining 10 million U.S. companies do so. [Adam, 1999] By pressuring vendors to implement EDI, large companies have been successful in expanding the use of EDI, but perhaps at the expense of competition. Just as when Just-In-Time inventory management was adopted, one of EDI's long term effects has been to reduce competition and hence keep prices up negating the full impact of the cost savings anticipated from e-commerce.

In contrast, use of the Internet for e-commerce allows virtually all small-to-medium sized businesses to participate, while still allowing EDI integration. E-commerce via the Internet has the attendant disadvantages of low security and limited quality and network functionality.

Implementing e-commerce is often interrelated to business process reengineering: Whether e-commerce is the effect of a reengineering or reengineering the effect of an e-commerce implementation is not clear. Certainly both scenarios are possible.

Large manufacturers are forcing vendors and subcontractors into use of interorganizational information systems, but the pace at which this is happening is unexpected. Earlier this year both Boeing Co. and Motorola Inc. told their suppliers it's e-commerce or no commerce. [Mihaly, 1999]

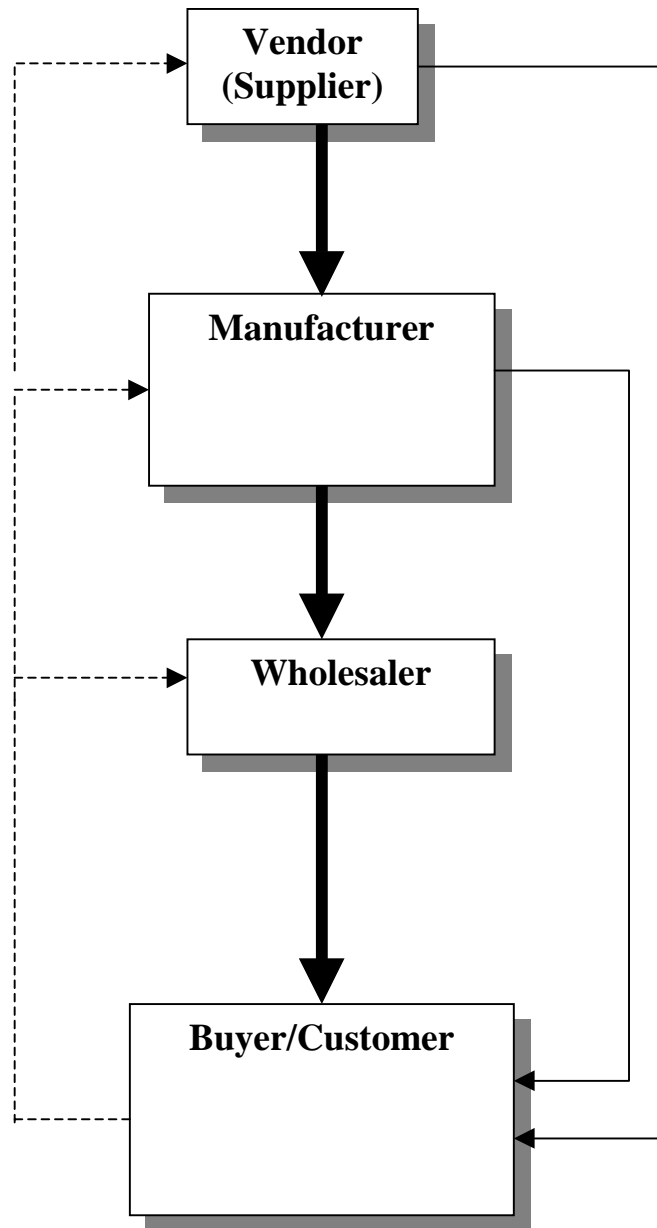
E-commerce saves money. United Technologies Corporation's early experience with Web-based e-commerce was to conduct a bidding competition for vendors through a firm called *Free Markets*. In seven lots of orders they saved 1/3 of the previous cost of the same items through Internet bids. And DaimlerCrysler is using the Internet for vendor purchases and reports saving \$1.3 million annually for every 2,000 suppliers that convert to on-line purchasing. [Smart, 1999] Long-term relationships, reluctant customers, some laws and recalcitrant management can delay the move into e-commerce but it is inevitable. Traditional distribution channels are no longer useful.

Cost becomes a key issue in choosing vendor specific e-commerce software versus systems which are based on open systems or Internet-based standards. The Web application certainly makes it easier for all customers and vendors to transact business. Proprietary interorganizational software, while costly (\$300,000 - \$1 million for large organizations) offers a much higher level of functionality and security.

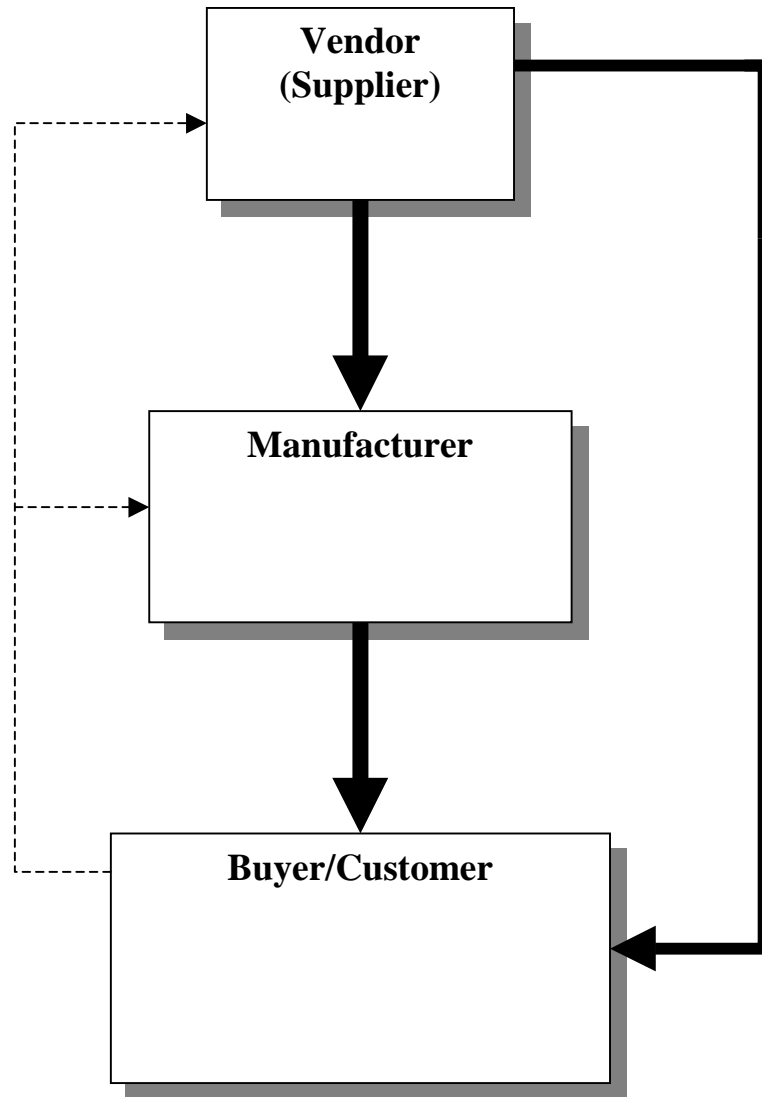
Figure 3 describes the traditional business-to-business sales model, and Figure 4 describes the change to an e-commerce scenario. Some of the known impacts of business-to-business e-commerce are:

- buyer purchases trigger the supply chain
- reduction in administrative and purchasing staff
- many warehouses & wholesalers disappear
- fewer large deliveries are needed
- many more small deliveries are made
- less inventory; lower inventory costs result
- higher packaging & shipping costs are incurred

**Figure 3: Traditional Business-to-Business Sales**



**Figure 4: E-commerce Business-to-Business Sales**



Direct vendor delivery means that products are shipped directly from the manufacturer to the customer upon an order received by the selling organization, thus bypassing unnecessary storage and an extra shipment step. Direct vendor delivery obviously reduces inventory levels, order and shipping times and costs, and facilitates just-in-time manufacturing by making the vendor responsible for delivery. Direct vendor delivery is *not* beneficial in those cases where value-added is provided to products sold by the reseller.

Creating the business case for e-commerce is difficult. Not only is the quantification of benefits difficult, but the very nature of the network-based commerce introduces change throughout an organization which is difficult to track. For example inventory and stores are now in databases, which one can hold in a hand, not in warehouses that are acres in size. Global networks allow small businesses - even one-person businesses - to connect globally and obtain information previously reserved for big organizations, while still preserving the qualities of small, flexible, innovative, entrepreneurial. Metrics for these effects is illusive.

### **Focus on Customer Service**

If all products can now be sold as commodities with easy price comparisons, brand loyalty, location, and delivery are no longer relevant. Customer service becomes the distinguishing factor in e-commerce sales. Businesses must focus on the human activities and processes that need to occur to satisfy a customer's needs aided by technology, rather than be driven by technology. E-commerce allows a company to identify and serve the individual needs of each customer. This is not only great customer service, this is great marketing.

More now than ever before, "if you're not serving the customer you better be serving some one who is", is so true. The employee who is on-line with the customer/supplier/business partner may have to make key decisions and develop the strategy as to how the organization should/must operate. These first-line employees must see themselves as the custodian of the customers' needs. Businesses need to develop new kinds of skills, behaviors and attitudes on the part of workers in an e-commerce oriented firm to insure that everyone in an organization is responsible for customer satisfaction.

New software agents, "bots", serve as personal assistants to consumers. These agents are action-oriented software entities that operate autonomously on behalf of the user without constant user intervention. For example: a prompt to remind you to email a birthday greeting; buy or sell a stock when the price falls to a certain level; find any/all new articles on a given subject; search for the lowest price for a product, etc. The customer is invited to participate with ease by using these new tools.

## **Impact on Organizational Structures**

Increasingly business-to-business electronic commerce is having an even greater impact on how businesses are organized and managed. Interorganizational information systems are rapidly becoming the reason for major changes in business and government organizations. This form of electronic commerce can dramatically improve corporate communications, and transform an entire organization into a different mode of operations. Many large corporations will no longer do business with suppliers who are not linked to them through electronic data interchange, the most automated form of interorganizational information systems.

When a business organizes around processes not functions, the result is inevitably the horizontal organization. Electronic commerce demands organizational change - both internally and externally. It's not technology, it's sociology. It's relationships and ease of use. Information is more valuable/credible if it comes from someone you trust, and you are more likely to trust someone you have a social bond with. There is much in the literature about the technical and business aspects of e-commerce, but very little about the organizational, behavioral and cultural impacts. These issues in e-commerce are interdisciplinary in nature and can be erroneously studied in isolation.

E-commerce and the resultant shift in business processes will cause changes in jobs. Clearly clerical, logistical and administrative staff will be reduced when e-commerce is embraced. However, additional technical staff will be required to design, install and maintain the network system, and then train staff in its use. Hopefully the net effect is a reduction in costs, one of the objectives of e-commerce.

Electronic Data Interchange, in particular, will require organizational changes. The administrators and intermediaries involved with business partners are no longer required. EDI should create closer vendor and customer relationships. This has not yet happened in a big way because network costs remain high and there is still a lack of telecommunications standards.

Extranets, the intranet extension to business partners, are having a profound effect upon organizational structures. This change can be illustrated by two recent cases.

IBM's Domino Notes Server is providing a secure extranet for capital market transactions. It brings together business and professional advisors to collaborate on multimillion-dollar transactions. All the players in a financial deal can “. . . rapidly create, distribute, review, and negotiate all the necessary documents in a safe electronic environment.” [Ogden, 1999] Administrative costs have been reduced 20-25%, and deals completed 5-10 days faster according to the initial users. The facilitating company, New York-based Intralinks, claims it has facilitated more than \$250 billion capital market deals in the past two years using this extranet. [Ogden, 1999]

Later this year the Industry Data Exchange Association, an association of electrical parts companies, will activate an EDI extranet via contract with MCI WorldCom Inc. Without any up-front installation charges, manufacturers and distributors in the electrical parts

industry can conduct business by paying a modest monthly use fee. All users on this extranet will be furnished, free, all the necessary hardware and software to conduct EDI messages through the network – a move most extranet users have not yet moved to. [King, “Extranet,1999] The association chose an independent extranet as opposed to use of the Internet for reasons of reliability and predictability.

## **Summary**

Small businesses have an intrinsic advantage over big businesses in the use of new technology such as e-commerce. It's more difficult and more expensive for a large organization to adapt to a new technology than a small player. It's not just the inherent capital invested, but the corporate culture that has to change to adopt. The culture in large organizations changes much slower than in small ones.

E-commerce allows companies to build on each other's products and services to create innovative virtual enterprises. Companies that are part of an e-commerce supply chain behave more like an open market model - the opposite of a closed trading partner model. It's been forecast that in the next three years, “. . . zero latency enterprises will exist in which buyers and suppliers are integrated into an electronic supply chain so tightly that the transactions buyers initiate result in immediate triggering of all the processes necessary to fulfill the order”. [Technology Forecast, 1999]

Initial experiences, described in the literature, tells us that e-commerce is efficient, cost saving, customer serving, and will result in changes to the structure of organizations. The anecdotal evidence thus far available does not describe how internal structure and social relationships will be changed - the one aspect of business that causes the greatest resistance to change on the part of employees.

A long-term structural change is occurring in the relationship between employees and business organizations. Many people are no longer committed to corporate loyalty, but rather to be independent consultants. E-commerce technology allows – fosters – people to work in small teams or as independents. Access to information and processing that information is the dominant task of white-collar workers.

Electronic commerce facilitates the trend away from large centralized command and control structures to very small, flexible temporary networks, or teams, of organizations and individuals. This occurs intra-organizational and inter-organizational.

E-commerce is encouraging experimentation in new and innovative organizational models which change market forces and the way we do business. A look at three cases illustrates this point.

A 21 year-old computer science student posted his software program, a crude version of the Unix operating system, on the Internet and encouraged free use, testing, comments and improvements. Thousands of programmers tested and improved the code until the resulting product, *Linux*, emerged. Linux, a product of that network of networks, the

Internet, could not possibly have happened within a corporate structure for the time and expense expended. Nor could such a product be so well perfected and received without the diversity of expertise that was applied to this development. Thousands of organizations of one responded directly and individually without any command structure or for that matter plan.[Tapscott, 1999] Linux is now being offered by Dell and Compaq as an optional installed operating system instead of Microsoft's Windows.

Federal Express, the people who essentially invented the overnight small package delivery business, wisely improved their customer service by providing telephone response to any shipper's request for information on the status of a delivery. FedEx improved its customer service another order of magnitude when in 1994 it made its intranet available on the Internet, thereby allowing customers to have the same information FedEx had internally. Now customers do their own package tracking, faster and conveniently, and incidentally save FedEx some \$2 million per year in telephone inquiries. And that's just the beginning. [Adam, 1999]

In the early 1970s in the Prato region of Italy, a family owned textile mill business was failing. The manager who inherited the business broke the firm into eight separate businesses and sold a substantial portion of the equity to key employees. He then required that the new entrepreneurs go out and obtain at least 50% of the firms' sales from new customers, which resulted in a complete turnaround for the revitalized, decentralized businesses. The concept spread to other large textile mills in the Prato area and within 20 years there were more than 15,000 small firms, with an average of less than 5 employees each, collectively tripling production despite the fact that textile production was in a decline during this period. Impannatoris serve as brokers to coordinate the efforts of these small businesses to satisfy different customer needs, and an electronic clearing house makes the dissemination of information about design and production readily available for all to use. [Tapscott, 1999]

Electronic commerce is not just another business tool: It is a whole new way of doing business and the structure of business has changed forever.

## **References**

Adam, Nabil R., Dogramaci, Oktay, Gangopadhyay, Aryya, Yesha, Yelena *Electronic Commerce: Technical, Business, and Legal Issues*. Prentice Hall PTR, Upper Saddle River, NJ, 1999.

De, Prabudda and Ferratt, Thomas W. "An Information System Involving Competing Organizations". *Communications of the ACM*, 41(12): 90-98, December 1998.

Drucker, Peter F. "The Coming of the New Organization". *Harvard Business Review* 66(1): 45-53, January 1988.

"Internet Business" Forrester Research, November 1998.

- King, Jula "Extranet Sparks Industry Savings". Computerworld, 33(23): 1125, June 7, 1999.
- King, Jula "3-D images help entice Net shoppers to buy". Computerworld (on-line), May 25, 1999.
- Leibovich, Mark, Smart, Tim and Dugan, Ianthe Jeanne "Internet's E-economy Gets Real". The Washington Post, A1, June 20, 1999.
- Macht, Joshua "Holding Pattern". Inc. Technology, (3) 1998, September 15, 1998.
- McClenahon, John S. "net gains". Industry Week 248(10): 51-58, May 17, 1999.
- Mihaly, Mary "Purchasing in the New Millennium". Industry Week 248(10): A3-A10, May 17, 1999.
- Ogden, Joan "Extranet Cuts the Deal". Global Finance, 13(6): 12, June 1999.
- Riggins, Frederick J. and Rhee, Hyeun-Suk "Towards a Unified View of Electronic Commerce". Communications of the ACM 41(10): 88-95, October 1998.
- Smart, Tim "Companies Net Big Savings Through Global Bidding". The Washington Post, E1, July 3, 1999.
- Tapscott, Don (Editor) *Creating Value in the Network Economy*. Harvard Business School Press, Cambridge, MA, 1999.
- "Technology Forecast: 1999". PriceWaterhouseCoopers Technology Centre, Menlo Park, CA, 1999.
- Tenenbaum, Jay M. "WISs and Electronic Commerce". Communications of the ACM, 41(7): 89-90, July 1998.
- Terrile, Jeanne G. "e-Commerce Virtually Here". Special Report, Merrill Lynch, Pierce, Fenner & Smith Inc. April 1999.
- Zuboff, Shoshana *In The Age Of The Smart Machine*. Basic Books, New York, NY, 1988.