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B2B E-Commerce: Why the New Economy Lives

In an ideal market economy, perfect competition delivers peak performance. For perfect competition to exist, not only are many buyers and sellers needed for each particular good, but perfect information about products (for example, availability, quality and specifications), demand, prices and delivery schedules is also required. As business-to-business (B2B) commerce shifts to the Internet and secure business intranets, better information will move markets closer to the textbook model of perfect competition.

By improving the flow, accuracy and timeliness of information, secure Internet-enabled systems provide greater transparency and efficiency at all points along the supply chain. Simply put, the Internet is a continuation of technological improvements that deliver information faster and cheaper, reduce search and transaction costs in online markets and improve the management of transporting and inventorying products. These savings come from both cheaper information (through lower agency and intermediary costs) and cheaper inputs (through increased supplier competition).

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Census Data Show the Economy Matters

The U.S. Census Bureau recently completed the 2000 census. The effort was gargantuan, involving more than 3 million workers, over 20 million maps and almost 100 million questionnaires.[1] The results show dramatic population movements within the United States and equally dramatic international migration into the country.

In terms of national and international affairs, the decennial count has three main effects. First, the federal government distributes about $200 billion each year according to state population, so an accurate census ensures that fast-growing states will have the financial resources to meet burgeoning demand for government services.[2] Second, the census is used to reapportion seats in the House of Representatives, giving increased political clout to fast-growing states and ensuring that all U.S. citizens have equal weight in electing their representatives. Finally, the census gives government officials the infor-

(Continued on page 6)

This article explores how new online marketplaces and supply-chain management practices will change transaction processing and business relationships. As B2B electronic commerce (e-commerce) boosts productivity and reduces costs, the long-run beneficiaries will be consumers.

The greatest long-term beneficiaries of B2B e-commerce will be consumers, who will enjoy lower prices and higher living standards.

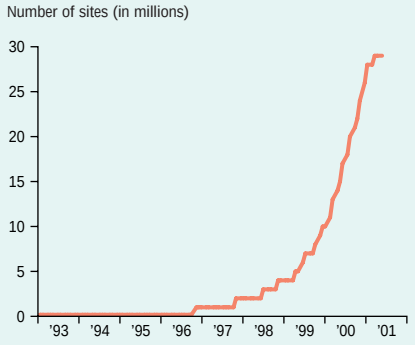
The Birth of B2B E-Commerce

Although the Internet originated more than 30 years ago, its commercial viability and significant impact on U.S. productivity really began with the creation of the World Wide Web a decade ago. The web enables documents, sound, video, images and other information forms to be instantly viewed and inexpensively accessed from anywhere in the world. The number of web sites has grown from 10,000 in January 1995 to over 29 million today (*Chart 1*). There are currently more than 2.7 billion pages on the web, and the number is rising by 5 million every day.[1]

While e-commerce forecasts vary, researchers agree it is growing fast and that its greatest economic impact will come from B2B e-commerce (which constitutes 90 percent of the total).[2] As defined here, B2B e-commerce includes the creation of Internet-enabled marketplaces for trading goods and services online and business process improvements from transferring information and transactions from the physical world to secure business intranets. Jupiter Communications (2000) estimates that B2B e-commerce in the United States was $336 billion in 2000, representing 3 percent of total B2B trade. Jupiter expects the proportion of online B2B trade to grow to 42 percent by 2005. Forecasts by Forrester Research predict $2.7 trillion in B2B e-commerce sales by 2004 (*Table 1*).

Chart 1

Number of Internet Sites Surges at End of Decade



SOURCE: Netcraft (http://www.netcraft.com/survey/).

The part of B2B e-commerce expected to grow the fastest is electronic marketplaces (e-marketplaces), which use vast amounts of information and bring together multiple sellers and buyers online. According to Gartner Group, the number of B2B e-marketplaces has grown from about 30 in January 1999 to more than 1,400 today. Forrester Research expects that a consolidation and shakeout in B2B e-marketplaces will reduce the number to fewer than 200 by 2004. Nevertheless, the firm also predicts B2B e-marketplace trade will total $1.4 trillion by 2004, or 53 percent of the value of total B2B e-commerce sales.[3]

Despite the recent dot-com implosion, B2B e-commerce is still growing. Many companies are working together to build secure online B2B exchanges that will allow buyers and sellers to transact business and share information through e-marketplaces and supply chains. B2B e-commerce addresses many of the imperfections found in traditional market structures and moves markets closer to perfect competition. These imperfections include the transaction costs of gathering and analyzing information about buyers, sellers and products, as well as the costs of putting resources to their most productive use.

The Nature of the Firm

Nobel Prize-winning economist Ronald Coase published an article titled "The Nature of the Firm," explaining the basic economics of the business enterprise. Coase (1937) outlined the subtle logic of how firms pursue efficiency in a complicated world. He argued that transaction costs may prevent the free market system's invisible hand from directing resources to their best use.[4]

In Coase's view, the desire to reduce transaction costs led to the emergence of the firm. Firms exist because information (transaction and coordination) costs are too high for each buyer to feasibly employ each production input and then coordinate the production of the desired good or service. But as information costs fall, several things happen. First, more

transactions are shifted to the marketplace. As a result, some consumers now buy online directly from the manufacturer. Second, there is less need for firms to be vertically integrated. This results in more firms with greater specialization and focus. Third, there may be a decreased need for many firms to produce a particular type of good. This could arise from greater economies of scale associated with less need for local sellers, better marketing information about what sells in comparable local markets, better supply chain management and so on.

Chart 2 shows that businesses encounter these information costs all along the supply chain. They incur costs in procuring the resources for production and in moving and storing products in the supply chain that connects suppliers, manufacturers, warehouses and distribution centers, and retail outlets. Like earlier technological advancements such as the telephone and fax machine but perhaps to an even greater extent, the Internet reduces such costs by increasing access to information. Better-informed market participants and supply-chain managers can ensure that resources are allocated to their most productive use.

To show this, Garicano and Kaplan (2000) use detailed internal data from one B2B e-commerce firm to find that process improvements and marketplace benefits are potentially large.[5] Litan and Rivlin (2001) estimate that the Internet will bring total annual cost savings to the U.S. economy of $100 billion to $230 billion, which over five years translates into an annual contribution to productivity growth of 0.2 to 0.4 percent above what it would otherwise have been.

Similarly, Lucking-Reiley and Spulber (2001) argue that B2B e-commerce substitutes capital—in the form of computer data processing and Internet communications—for labor services, thereby increasing the speed and efficiency of economic transactions. They divide potential productivity gains from B2B e-commerce into four areas: automation of transactions, new market intermediaries, consolidation of demand and supply through organized exchanges, and changes in the extent of vertical integration. They conclude that even small enhancements in the efficiency of transactions will eventually produce large overall savings.

Table 1

U.S. B2B E-Commerce Forecasts by Industry

Industry	2000	2004
	(billions of dollars)	
Computing and electronics	230	593
Motor vehicles	35	412
Petrochemicals	27	299
Utilities	30	266
Paper and office products	14	235
Consumer goods	13	217
Food and agriculture	23	211
Construction	6	141
Pharmaceutical and medical products	4	124
Industrial equipment and supplies	7	70
Shipping and warehousing	5	68
Aerospace and defense	9	33
Heavy industries	3	27
Total	406	2,696

SOURCE: Forrester Research, February 2000.

The Old Economy Is Born-Again

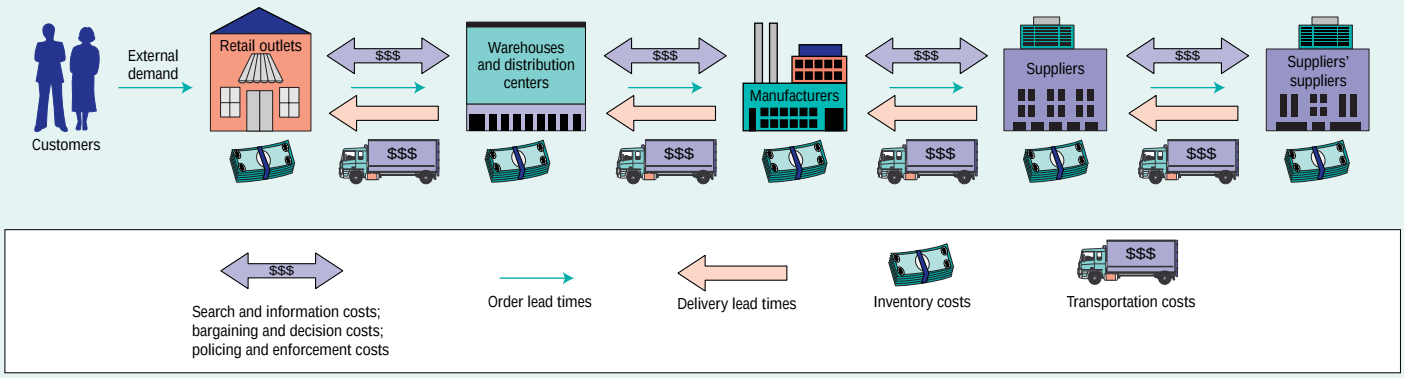
While more than 100 B2B e-marketplaces have been shuttered since the Nasdaq stock index peaked in March 2000, it is not the end of the B2B e-commerce story. B2B e-commerce will help companies—most notably the stalwarts of the Old Economy—collaborate with suppliers and better manage industry supply chains.

E-Marketplace Improvements. Probably the most visible area where firms can benefit from B2B e-commerce is through participation in an online exchange to buy or sell goods and services. With the Internet, buyers and sellers connect more efficiently.[6] E-marketplaces provide participants with greater knowledge of prices, availability, supplier capacities and abilities, and alternative products. It is less expensive to search for products and compare prices through e-marketplaces than to hunt through catalogs and make phone calls. British Telecom estimates that moving procurement functions to the Internet has reduced costs from $113 to $8 per transaction.[7] MasterCard estimates that the internal cost of processing its purchase orders has fallen from $125 to $40, with the time cut from four days to 1.25 days.[8]

Brookes and Wahhaj (2000) estimate that moving purchasing activities onto the Internet will provide various indus-

Chart 2

The Supply Chain



tries with input-cost savings of 2 to 39 percent (*Table 2*). The average initial B2B e-marketplace cost savings in 36 U.S. industries (representing 24 percent of GDP) is 5.4 percent. The greatest savings are expected in the electronic components, computing, forest products, freight transport and life science industries.

The authors use an input–output framework to further determine the aggregate inflation effect. Since most companies produce both inputs and final outputs, less expensive inputs in one industry lead to cheaper inputs for other industries. Brookes and Wahhaj trace the impact of a decline in the price of one input on output prices and on input prices in other industries. They find that shifting procurement onto the Internet could have long-term inflation benefits.

They conclude that the use of B2B e-marketplaces by about one-third of U.S. industries could reduce aggregate prices by 3.4 percent. The long-run economic impact of B2B e-commerce includes higher growth as well as lower prices. The study predicts that B2B e-marketplaces will boost economic growth by an average 0.2 percent in each of the next 10 years, with GDP ultimately 4.4 percent higher than it would otherwise have been.

Improved Supply Chain Management. Companies will also benefit from B2B e-commerce by overhauling their corporate structures and workflow processes to exploit the fast and cheap information-sharing capabilities available through Internet-enabled systems. Both private networks and industry-established online exchanges can help participants better manage production schedules and inventory levels.

Lucking-Reiley and Spulber point out that as market transaction costs fall with the maturation of B2B e-commerce, outsourcing and vertical disintegration will occur and ultimately result in more independent entities along the supply chain. As firms in the supply chain specialize in doing what they do best, more companies will outsource the management of internal activities. The result will be more reliance on coordination through markets and less reliance on vertical integration.

The automobile industry is an excellent example of this shift. In the Old Economy, firms like General Motors Corp. and Ford Motor Co. developed organizational structures with extensive vertical integration. According to Edmonds (1923), by 1920, General Motors had extended its scope so its units or subsidiaries produced not only all engines used in its cars, but a large proportion of other components—gears, axles, crankshafts, radiators, electrical equipment, roller bearings, warning signals, spark plugs, bodies, plate glass and body hardware.

Today, auto firms are reevaluating their organizations, hoping to convert internally produced activities into low-cost B2B e-commerce transactions. General Motors' spin-off of Delphi Automotive Systems in May 1999 shows how B2B e-commerce promotes vertical disintegration. Both companies are expected to become stronger and more competitive in their respective businesses.

In February 2000, General Motors, Ford and DaimlerChrysler announced plans to create the world's largest B2B online trading exchange, called Covisint. This new enterprise offers open participation to auto manufacturers around the world, as well as their suppliers, partners and dealers. Covisint is expected to reduce overall inventories, develop industry standards and boost productivity for all participants.[9] Eventually, this online exchange could be expanded to other industries. Delphi joined Covisint in June 2000 to build on Delphi's experience in online purchasing, which yielded savings of $70 million in 1999. Delphi has said it expects Covisint to yield much larger savings in the future.

The Internet also improves supply chain efficiency and management by lowering required inventory levels, reducing transportation costs and virtually eliminating order and delivery lead times. Participants throughout the supply chain can share information about forecasted demand, delivery schedules and cargo capacities as well as inventory levels, availability and locations in real time, allowing processes to be redesigned and automated. For example, lower inventory levels result in lower production costs by avoiding storage, insurance and transportation expenses and the opportunity costs of inventory investment. In this sense, inventory is simply a substitute for information.

Dell Computer Corp. has turned traditional manufacturing on its head by saying it will not build anything until it receives an order. Almost 50 percent of Dell's revenues come through its web site, which generates roughly $40 million in sales each day. With perfect information about what customers want, Dell operates with five days' inventory, down from 31 days in 1996, before the company implemented its Internet-based build-to-order system.

The moral of this story is that accurate information provided in real time through Internet-enabled systems leads to greater production efficiencies. Chart 3 shows that U.S. businesses, as a whole and along a long-term trend, are managing inventories better than in the past. This has likely helped fuel gains in U.S. productivity since 1995. The inventory-to-sales ratio has generally fallen, and the greatest declines have coincided with the rise of the World Wide Web.[10]

Table 2

Initial B2B Cost Savings by Industry

Industry	Cost savings (percent)
Aerospace	11
Chemicals	10
Coal	2
Communications	5–15
Computing	11–20
Electronic components	29–39
Food ingredients	3–5
Forest products	15–25
Freight transport	15–20
Healthcare	5
Life science	12–19
Metals	22
Media and advertising	10–15
Maintenance, repair and operating supplies	10
Oil and gas	5–15
Paper	10
Steel	11

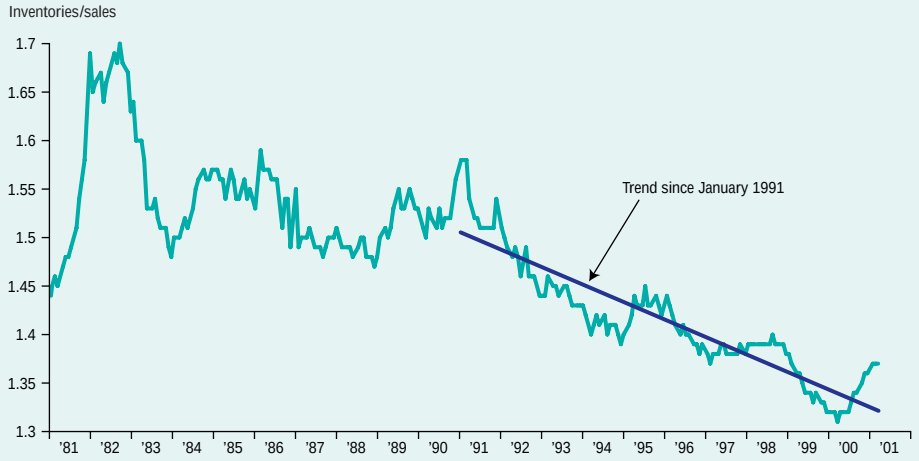
SOURCE: Martin Brookes and Zaki Wahhaj, "The 'New' Global Economy—Part II: B2B and the Internet," *Global Economic Commentary*, Goldman Sachs, February 9, 2000.

Conclusion

Despite the collapse of many dot-coms and the shuttering of many e-marketplaces, the fundamentals behind B2B e-commerce and its impact on the New

Chart 3

Total Business Inventory-to-Sales Ratio Declines



SOURCE: Census Bureau (http://www.census.gov/mtis/www/mtis.html).

Economy remain strong. Efficiency improvements and cost savings already achieved through B2B e-commerce have likely led to higher productivity growth, lower costs and reduced pricing power, which should allow the U.S. economy to grow faster without inflationary pressures. While most of these gains will occur between businesses, the greatest long-term beneficiaries of B2B e-commerce will be consumers, who will enjoy lower prices and higher living standards.

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Notes

[1] Laura Carr (2000), "100 Numbers You Need to Know," *The Industry Standard*, November 13, http://www.thestandard.com/article/0,1902,20128,00.html.

[2] U.S. Department of Commerce (2001), *E-Stats*, March 7, U.S. Census Bureau, Economic and Statistics Administration. Fraumeni (2001) discusses a number of e-commerce measurement challenges, including differences in methodology, coverage and general outlook.

[3] Stacy Lawrence (2000), "Behind the Numbers: The Mystery of B-to-B Forecasts Revealed," *The Industry Standard*, February 21, http://www.thestandard.com/article/0,1902,11300,00.html.

[4] Economist Adam Smith, in *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776; reprint, edited by Edwin Cannan, New York: The Modern Library, 1937, p. 423), argued that private competition free from government regulations allows for the production and distribution of wealth better than government-regulated markets. As he said, private businesses organize the economy most efficiently as if "by an invisible hand."

[5] The authors also find little evidence that informational asymmetries are more important in e-marketplaces than in physical ones.

[6] Nunes, Wilson and Kambil (2000) argue that with the Internet, companies are no longer constrained to sell in one way. This is also discussed in greater detail by Kambil, Nunes and Wilson (1999).

[7] Charles Phillips and Mary Meeker (2000), "The B2B Internet Report: Collaborative Commerce," *Equity Research*, Morgan Stanley Dean Witter, April.

[8] Scott Alaniz and Robin Roberts (1999), "E-Procurement: A Guide to Buy-Side Applications," *Stephens Inc. Internet Research*, December 27.

[9] Some experts warn that such highly efficient and large exchanges could lead to anticompetitive practices, such as collusion among rivals to fix prices and the exclusion of certain industry players from e-marketplaces. They worry that market power could occur without rival firms ever speaking to each other, as market participants see pricing information faster. See Labaton (2000) and *The Economist* (2000). In contrast, others argue that competition between exchanges should create incentives to avoid the exercise of market power as exchanges compete for increased volume by attracting greater numbers of buyers and sellers. In September 2000, the Federal Trade Commission concluded an investigation of Covisint for potential antitrust concerns, opening the way for the automotive industry's planned B2B e-marketplace to become operational.

[10] Baily and Lawrence (2001) argue that fundamental differences in the economy that have taken place in the recent expansion have not disappeared with the dot-com collapse. Supply chain management innovations were already in progress before the Internet's explosive growth, as companies developed their own internal networks (that is, intranets) for sharing information.

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