



E-com Econ: The Economics of Electronic Commerce

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OVERVIEW

The **purpose** of this report is to

- Evaluate the potential of electronic commerce in terms of transaction volume and impact on businesses,
- Provide a framework and gauge for evaluating new technology and business models applied to electronic commerce, and
- Assess the collateral requirements of expected e-commerce levels.

Our findings begin with the gauge for evaluating the long-term success of e-commerce activities, which we call the “**Value Inequality:**” the resources consumed by the production, distribution and transaction processes must be less than the value provided to the buyer. This may sound obvious, but the newness of the technology and business models can easily lead observers astray if they do not stay anchored to economic fundamentals.

Our **approach** to electronic commerce is to apply economic principles to the new technologies and business models. As friction is reduced in the physical world, actual mechanical results resemble more closely the results predicted by simple physics. Similarly, we believe that reduction of frictions in the business world will make commerce more closely resemble basic economic models.

We conclude that the **greatest value creation** will be in electronic commerce that

- Reduces transactions costs
- Improves supply chain management, and
- Reduces cost via global sourcing

Although electronic commerce will continue to grow rapidly, **factors delaying** implementation include

- The need for businesses to upgrade their information technology systems
- Large upfront costs and associated risks
- Security concerns

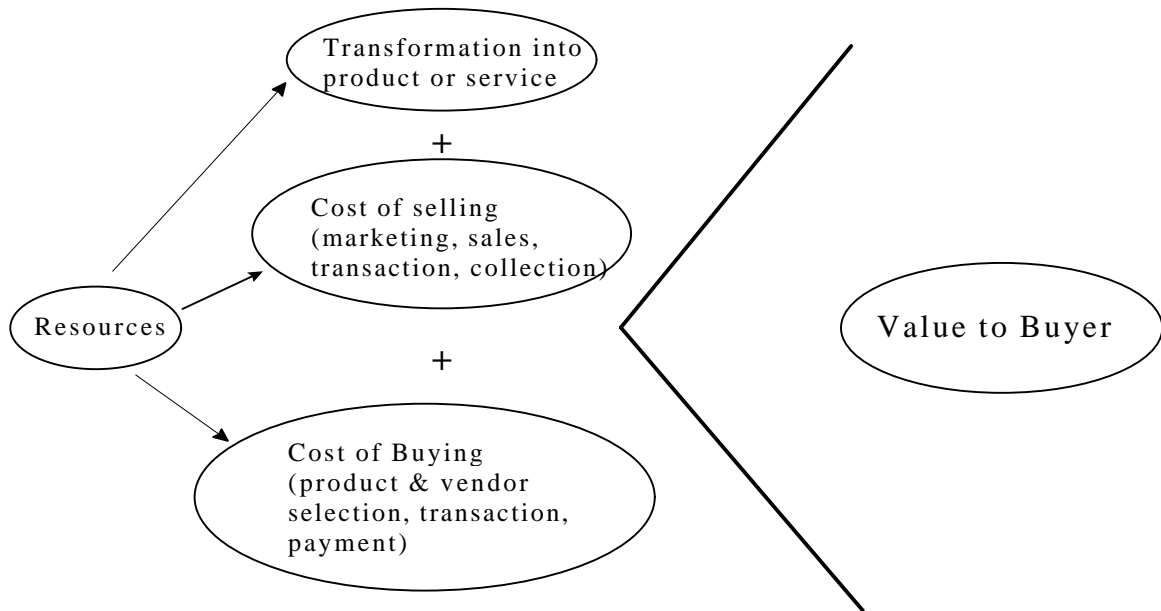
Investment opportunities derive from e-commerce itself, and from the solution to the current limitations. These include:

- E-commerce will drive demand for
 - Enterprise Resource Planning and Customer Relationship Management systems
 - Extranets
 - High level of security
- Many of these needs will be fulfilled by Application Service Providers

A FRAMEWORK FOR EVALUATING E-COMMERCE

Electronic commerce has some revolutionary elements, but the laws of economics are not repealed. “Gee whiz” technology for transactions may provide some entertainment value for early adopters, but mass adoption will have to survive the Value Inequality test. In terms of our diagram, the resources used to create and sell the product must be worth less than the value placed on the product by the buyer. Otherwise, the buyer has no motivation to participate in the transaction.

Figure 1: The Value Inequality



An enterprise succeeds when it provides value to its customers in excess of the resources required to produce that value. To change the nature of commerce, one must lower some resource usage on the left side, or increase the value to the buyer on the right side. Unless that is done, the proposed commerce mechanism is a novelty or gimmick. **All commerce must be judged against the question of how value is added to the transaction.**

Value creation from e-commerce will usually take the form of reducing costs on the left side, especially transactions costs, but also total materials acquisition costs for manufacturers. Value creation may also occur as goods or services are better tailored to the buyers' wants and needs.

The transaction mechanism must follow the same basic value creation process whether in the business-to-consumer space or the business-to-business space. The commonalities are strong enough that we will discuss commerce in general, specifying a B2C or B2B transaction only when they are uniquely significant.

THE DIMENSIONS OF COMMERCE

The basic dimensions of commerce—both traditional and electronic—are detailed in Table 1. Total commerce in the United States runs in excess of \$17 trillion dollars, to which could be added some government purchases of goods from the business sector, and some consumer-to-consumer buying. Although consumer-to-business could be included—mostly in the form of wages for labor services—we believe traditional definitions of commerce are worthwhile for interpreting the gains from e-commerce.

Chart 1: Private-Sector Commerce in the U.S.

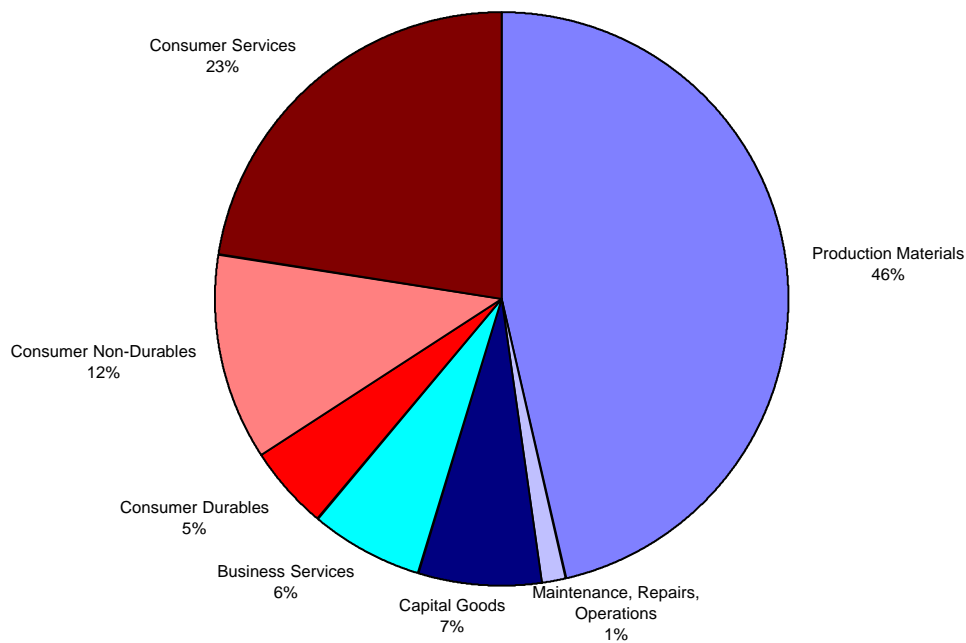


Table 1: The Dimensions of Commerce, U.S.

<u>Business-to-Business</u>	<u>(trillions)</u>
Production materials	\$8.0
Maintenance, repairs, operations	0.25
Capital goods	1.2
Services	1.1
Total	<hr/> \$10.6
 <u>Business-to-Consumer</u>	
Durables	\$0.8
Non-durables	2.0
Services	3.9
Total	<hr/> \$6.7

The Internet allows many products and services to be sourced globally, but the world lacks a database as detailed as that available for the United States. Although the rest of the work certainly looks different from the U.S., we can make a first approximation by increasing the U.S. figures in proportion to world GDP. That implies that B2B globally might be in the area of \$50 trillion, with B2C around \$30 trillion.

These figures argue powerfully for two concepts:

- **The diversity of commerce is very large**

Most generalizations have numerous exceptions. In a \$50 trillion space, a small exception can total many hundreds of billion dollars. Thus, it's a mistake to pick one single business model as appropriate to B2B, or to B2C. There is probably a market to fit even the craziest business model. The key to evaluating the business model is whether it's right for the particular segment targeted, not whether it applies to the total marketplace.

- **International transactions are a growing part of commerce**

Although it is easier for American business managers to think in terms of American markets, the U.S. accounts for only 22 percent of world GDP. Even if many foreign consumers lack Internet access, many foreign businesses are wired. Thus, global perspectives are important now for sourcing issues, and will become more important for sales issues.

THE TECHNOLOGICAL ENVIRONMENT FOR E-COMMERCE

We expect that in the coming years, Internet usage and applications will become easy to use, cheap and ubiquitous. Easy to use contrasts markedly with the current experience. Heavy Internet users often don't realize how daunting an experience others have when trying to use the Internet. Fear and uncertainty—do I single click or double click?—pervade. Electronic commerce will grow 1) as more users become comfortable with the current technology, and 2) more importantly, as the technology become more user friendly. User friendly requires fast downloads, meaning both broadband and fast servers.

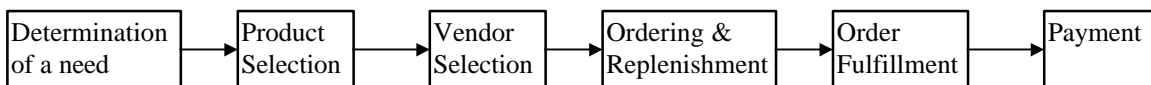
Cheap Internet service is not so much about fees to ISPs, but rather the cost of buying and maintaining the appliance. Personal computers are pretty expensive if all that they do is facilitate light email and web browsing. The low-cost web appliance is necessary for Internet usage to be ubiquitous. Embedded Internet appliances will also be available at low cost.

Easy and cheap are coming, and they will lead to broad Internet usage. This means not only the number of users, but the amount of usage per person. The ultimate end is probably for a household to have as many Internet terminals as it now has telephones. A small appliance in the kitchen, perhaps doubling as a television, enables grocery shopping and a quick check of the weather forecast. An inexpensive appliance embedded in a farmer's irrigation system control panel could adjust water usage for actual and predicted rainfall, and consult with the power company on the best timing of the electrical load. We expect all of these to be coming, and to be coming fast. They will enable a new and vastly larger volume of electronic commerce.

PURCHASING BASICS

There are several basic functions within the purchasing process, which apply to business-to-consumer and business-to-business:

Figure 2: Purchasing Functions



The importance of these functions vary widely across industries, products and market segments, but some element of these functions exists in all markets (except that replenishing does not occur in all cases). Money can be made in each of these functions, so long as value is created: by providing something a buyer is willing to pay extra for, or by reducing the seller's costs. There are no generalities about which functions offer the greatest profit opportunities, because these functions vary so much. In one area, assisting with vendor selection may create tremendous value, whereas in another payment processing may offer the greatest value creation potential.

Marketing textbooks divide buying into three types, two of which apply to both B2C and B2B, as shown in Table 2. The buying types take place in both traditional and electronic form. As a courtesy to our business colleagues, we pretend that B2B purchases are never made on impulse.

Table 2: Types of Buying

Type of Buying	Examples			
	Business to Consumer		Business to Business	
	Traditional	Electronic	Traditional	Electronic
Impulse	Candy at checkout	Click on banner ad		
Habitual	Groceries	HomeGrocer, WebVan	Production goods	Production goods via EDI
Consumption problem solving	Visit car lot	Auto web sites	Listen to sales reps	Search vertical portal

This segmentation of buying helps to understand the factors that might add value to the transaction. Adding value to habitual transactions can come from reducing the buyer’s cost of order entry. Consumption problem solving transactions are sensitive to research costs. In all cases, price improvement will add value, though buyers and sellers may differ on what direction prices have to move to be considered improvement. However, if real costs can be eliminated, then gains can be shared to deliver lower total cost of acquisition to buyers, and higher net revenue to sellers.

VALUE IMPROVEMENT

The basic opportunities for value improvement are shown on Table 3. Value improvement opportunities are divided between methods that achieve lower pricing of the goods purchased, and methods that lower the total cost of materials acquisition. This distinction makes sense only for a first round of change. As companies generally find that they can lower their total costs through better supply chain management, the lower costs will be passed along to buyers in the form of lower prices. We expect the advantages in the B2B space will eventually be passed on to consumers in the form of lower prices.

Now we look at the price improvement opportunities in more detail.

Figure 2: The Value Prism

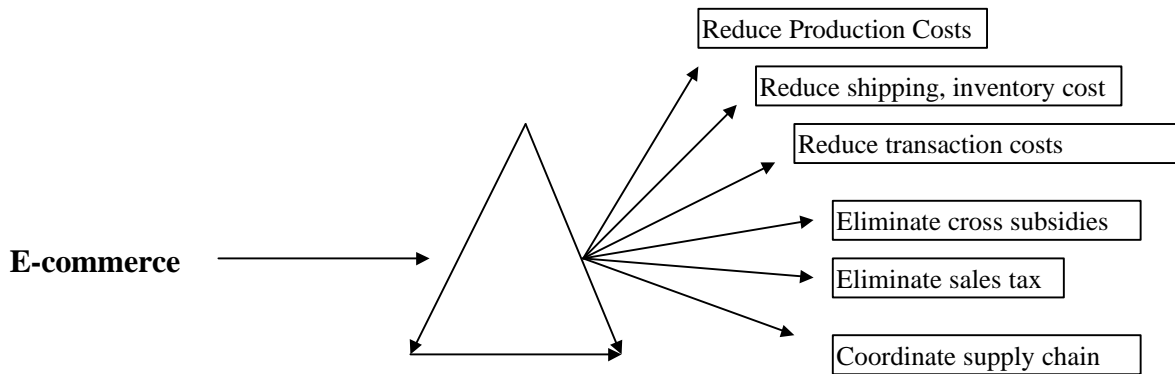


Table 3: Opportunities for Value Improvement

	Potential Value Improvement	
	B to C	B to B
Lower pricing requires one or more of the following:		
Reduce production costs or profit margin	Likely from better supply chain coordination; see section below.	Global sourcing causes temporary reductions (lasting 3-5 years?) where effective capacity increased
Reduce shipping or inventory costs	Reduced inventory costs on some unusual items; may be able to optimize shipping.	
Reduce seller's transaction costs	Very likely	Likely, especially in MRO.
Eliminate cross subsidies (lowers prices for some, raises for others)	Requires customer database that identifies total cost of serving different customers; likely significant gains, though at the expense of those who had been subsidized.	
<u>Lower total cost of materials acquisition can be achieved by lower pricing and/or:</u>		
Eliminate sales tax	Very likely	Difficult with use tax requirements, except for small business
Better coordination of supply chain (getting needed materials, when needed; reduce unneeded materials, late deliveries, rush orders)	Some possibilities (less spoilage, fewer special trips to store). Ability to generate value net of costs in home delivery depends on dense routes.	Excellent opportunities, especially given growing popularity of build-to-order, mass customization, rapid new product development techniques
Reducing buyer's transaction costs	Ease of purchase coming w/ broadband; Researching "consumption problem solving" purchases; Contextual buying opportunities	Likely, especially in MRO. Researching "consumption problem solving" Some contextual opportunities

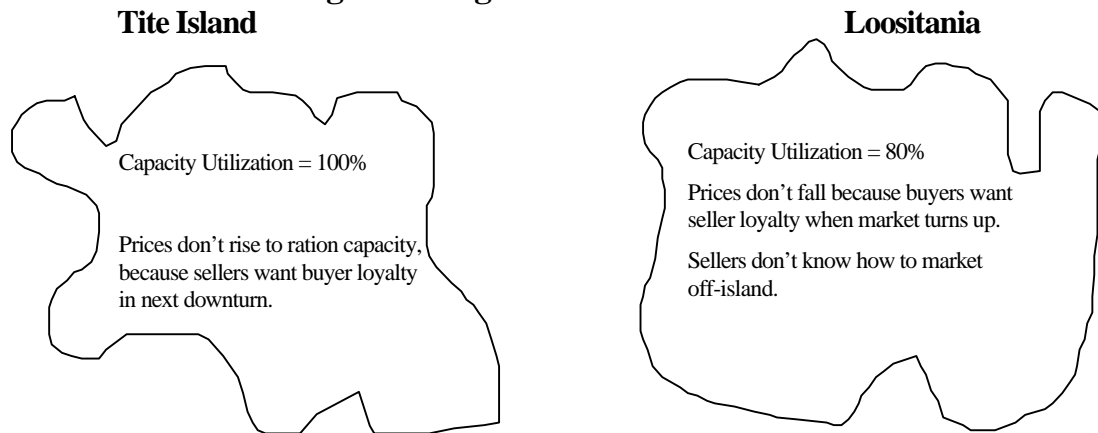
Reduce production costs or profit margin: We are pessimistic about the potential for e-commerce to generally reduce production costs, with two important exceptions. One is the benefits from improved supply chain coordination, to be discussed below. The other is the temporary glut of capacity caused by global sourcing, also discussed below.

Otherwise, we are skeptical of some of the extreme claims for lowered prices due to heightened competition. We see suppliers in general as having production costs that have been reduced by competition, both domestic and global. Since the days of Boone Pickens's corporate raiding, managers have been focused on cost cutting. The downsizings of the 1990s show that companies will pursue even unpleasant steps to reduce costs. In this environment, we do not think that merely dialing up competitive pressures will have much additional effect, except perhaps in some isolated sectors.

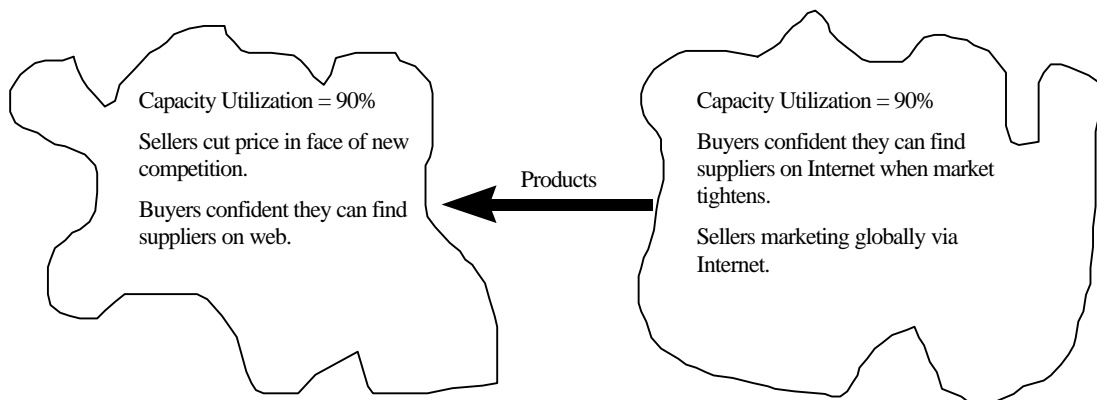
Effective capacity increases due to global sourcing: Although producers of most manufactured components have been under heavy pressure to reduce prices, reports from some of the early Internet auction sites indicate substantial cost savings achieved by purchasers. This is a paradox that is not resolved simply by asserting stronger competition. In many cases, these products had been sold in a very competitive environment. Profit margins of the producers are not large, and costs had been cut to the bone. How did the large costs savings arise, or are they merely part of the B2B hype that is not to be believed?

Pre-Internet

Figure 3: Tight & Loose Markets



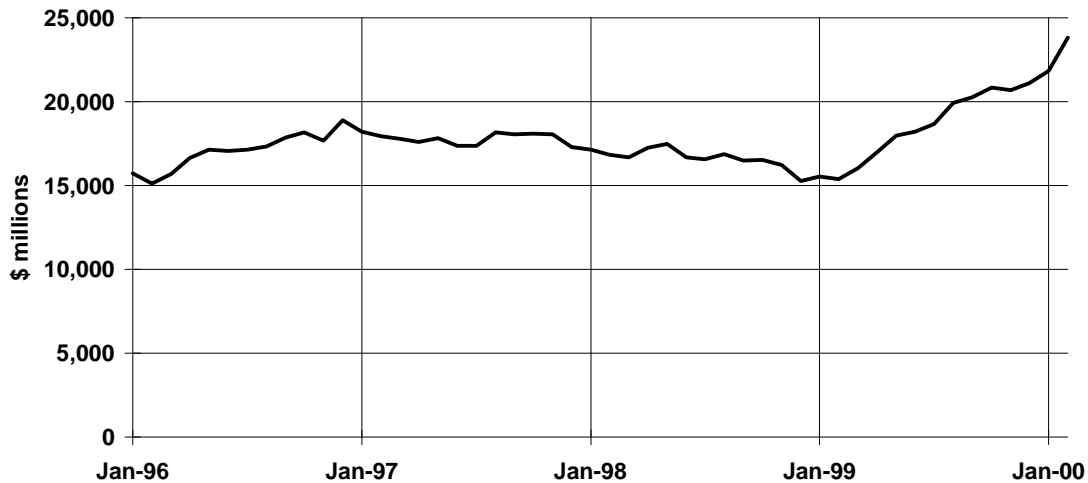
With Internet (but before much further growth)



Our conversations with purchasing managers lead us to conclude that those savings are real, but not permanent. Manufacturers have typically sourced inputs near their factories, partly for ease of transportation, partly due to long-standing relationships, and partly because they were unaware of the opportunities for sourcing outside the region. As a result, the Federal Reserve Board's capacity utilization statistics often show peak usage of capacity at 85% to 92%. These figures seem surprisingly low for a peak, until one considers that a national average of 90% capacity utilization would mean some regions running at 100% (and deferring routine maintenance to achieve such utilization) while others run at only 80%. The suppliers in the 80% regions don't lower their prices to draw more business in because 1) they don't have the capability or knowledge to market to the regions with tight supply, and 2) they don't want word filtering back to their local customers that they are willing to cut prices. With the Internet, though, it will be easier for suppliers with excess capacity to seek additional business.

Foreign suppliers, too, are using the Internet to sell to American companies. In recent years, more purchasing managers have been buying products overseas. We have heard reports of cost savings in the 40% range as companies turn to global sourcing. These anecdotes and the rising use of the Internet correlate with the strong increases of U.S. imports of industrial commodities, as shown on Chart 2.

Chart 2: U.S. Imports of Industrial Commodities



source: U.S. Commerce Department

The increase in effective capacity has the same results as any overcapacity: price declines toward variable costs. The effect is most pronounced in capital intensive industries (because variable costs are low relative to capital costs). Remember what happens to airline ticket prices when there are too many airplanes in service. The fares are cut to keep the planes flying until demand grows enough to fit the capacity.

Similarly with industrial goods, we expect that pricing for many industrial products will be abnormally low—and unsustainably low—until world demand grows enough to fit the current effective capacity. That may take three to five years, after which time prices will again reflect full costs, including a market return on invested capital. In the meantime, buyers can benefit from global sourcing.

The purchasing managers we have consulted lead us to believe that the greatest opportunities will be in custom fabricated products, both metal and plastic. Standard production items, such as fasteners or chemicals, have been marketed globally for some time. Markets around the world have not been fully integrated, but they have been more integrated than in custom fab. The Internet allows specifications for custom fabricated products to be emailed to suppliers located anywhere. The advances in CAD-CAM may mean that it is easier for an American company to get a quotation for a custom made part

from Malaysia today, than it was for that company to get a quotation from another American supplier five years ago.

Investment Opportunity: We believe that there is a substantial business to be built helping companies source custom fabricated products overseas. The price advantage is strong and CAD files are easily transmitted to potential suppliers. E-commerce facilitators can add value by assessing the product quality, reliability and credit quality of potential suppliers. In addition, companies unfamiliar with importing goods need help with the basics of customs and international payments. We see companies specializing in helping buyers find sources for custom fabricated products, while the broader e-commerce firms are also offering such capabilities.

Reduce shipping or inventory costs, or middleman's profit margins: As with production costs, we do not anticipate a reduction in profit margins. Wholesaling and distribution has been a competitive business; there is little room for reduction in ROE in the sector.

However, we believe that many middlemen will be able to reduce their costs and bring those savings to customers. Those who don't reduce their costs will go out of business. Inventories can easily be cut through e-commerce, especially for goods that are not time sensitive. Inventory management consists of juggling three variables:

- the cost of holding inventory,
- the distribution of sales (e.g., mean and standard deviation of the number of items sold per day),
- the cost of shipping and restocking.

An online-merchant with one central distribution center can serve a customer base with lower inventory than a retail chain can. For an example, let's assume that in each of 100 geographic regions, the average daily demand for the Britney Spears CD is 10 units, with a standard deviation of 3 units. Let's also assume that the company's inventory goal is to accommodate all customers 95% of the time. That implies a target inventory of average sales plus 1.65 times the standard deviation. Demand can be served with one store in each region, or from a central distribution center. Let's look at how the inventory demands stack up:

Table 4: Hypothetical Retail Inventory

	Retail Chain		E-tailer
	per store	total	dist. center
Average Sales	10	1000	1000
Standard Deviation	3	30	30
Target Inventory (avg + 1.65 * std. dev.)	15	1500	1050

The key to the e-tailer's lower inventory need is the Law of Large Numbers: some of the variation in sales from region to region will average out across the country. Thus the standard deviation of sales goes from 3 to 30 when the 100 regions are aggregated, rather than from 3 to 300. Furthermore, restocking is easier in a warehouse setting. Instead of sending a few copies of a book to the local store, the warehouse opens a case of books.

Although inventory costs are not huge at most companies, inventory selection can be greater when serving a larger market, which is another way to add value. An attempt to purchase (visit to store or distributor, telephone call or web visit) that fails due to lack of the specific item requested will discourage further purchase attempts. Any buyer is more likely to try the purchase at the outlet most likely to carry the item, all things being equal.

Wide inventory holdings can also help buyers make decisions when involved in a problem-solving purchase. A buyer, especially a consumer, may not know which product best fits his needs. Consider an example from our personal experience. The parent faced with coaching a youth soccer team for the first time wants a general book of advice. He passes a small bookstore, finds that it carries three books about coaching soccer, but isn't sure than any of these are right for him. He stops by a large chain bookstore, such as Borders or Barnes and Noble, and finds 20 books. Some of these are clearly for younger players, some for advanced players, some with lots of charts, some with checklists. The buyer is confident that he has found the one best book for him, and buys it. That book might well have been one of the three offered at the small bookstore, but the wide selection helped convince the buyer that he was making the right choice. Although this example focuses on the "big box" retailers, it also applies the electronic commerce sites, which can offer a much larger number of selections. An Amazon.com search turned up 184 book titles and 6 video tapes on "coaching soccer."

Investment opportunity: We believe that e-commerce sites will thrive in areas where buyers value a wide range of choices. That is part of Amazon's success, as well as Grainger's in the B2B space. The trick is to 1) identify where wide choice is helpful rather than confusing, 2) provide enough information for the buyer to make a decision, and 3) keep it all simple and easy to use. The first issue is being found by trial and error. The second issue, describing the product, is a popular

area for failure. Descriptions seem to work best where multiple types of information are used: product specifications, product reviews published in magazines or trade journals, reviews from individual users, etc. The third issue, ease of use, isn't really being done well in very many places, though Amazon's 1-Clicksm is indicative of the direction.

Shipping costs may be reduced in some areas, but not universally. For some items, the shipment from manufacturer to distributor to end-user or retailer may constitute unnecessary handling. However, small items may be more efficiently shipped in larger quantities to a regional location, to be consolidated with other goods similarly shipped. In other words, it does make sense for the tomatoes and milk and bread to be shipped to one location where the consumer's grocery bag is filled. The new sofa, however, might be sent directly to the home at lower cost than via a furniture store. (These B2C examples have B2B counterparts, of course.)

We expect that home and business delivery offers substantial potential for value creation. On the consumer side, it saves precious time for stressed-out families. On the business side, it protects the trained workforce from having to run errands. The downside to delivery, however, is that someone has to drive the truck, and that person is not cheap. The key to making the deliveries inexpensive is to increase density on the routes. Density is increased partly by growing the number of customers in a neighborhood, and partly by growing the number of goods delivered per customer. Home grocery services are planning to deliver non-grocery items as well. The marginal cost of adding a book to a grocery delivery is nearly zero; the marginal cost of delivering a book without groceries to the house next door to a grocery delivery is also low. The key to success here is to think outside of the normal range of industries and sectors. For example, there may be substantial overlap of customers and geography between an office supplies firm and an industrial products firm.

Reduce Seller's Transaction Costs: The cost of transactions can be very high. B2B discussions often focus on the high cost of purchasing (which can be as high as \$150 per transaction, not including the actual cost of the goods, according the National Association of Purchasing Managers.) However, the cost of selling is similarly high. Electronic order entry is a large cost saver here, as stores have learned when they implemented scanning. Many industrial sales, even for small ticket items, are still entered manually. On the retail side, it is common to see various signs of inefficiency: clerks without customers, or clerks with too many customers. If the customers can be channeled to a single location, the law of large numbers once again helps to make the service needs more predictable.

Sellers may find it tempting to dismiss e-commerce as inappropriate to their customer base. However, when a seller of small ticket items can induce the buyers to use electronic channels, that seller has a strong competitive advantage over the late adopters.

Investment Opportunity: We see a strong business opportunity in taking technology down to less sophisticated customers. For example, a distributor of

groceries to small convenience stores might want to install a scanner at the stores; the cost savings to the wholesaler from electronic order entry may very well pay for the scanner, as well as lead to greater customer loyalty. We see this type of business opportunity wherever there are unsophisticated customers engaging in numerous transactions.

Eliminate Cross Subsidies: Cross subsidies are common, though seldom planned or desired. A bank may price its checking accounts so that, on average, it earns a market rate of return on its investment in the business. The difficulty is best illustrated with an example: Mrs. Lowe carries a low balance, takes her CDs to another institution that offers a higher interest rate, but uses the branch frequently for cashing checks and chatting with the tellers. Mr. High carries high balances, uses the bank for other services without shopping around, and prefers ATMs and direct deposits over branch visits. Although the bank may be pricing its services accurately on average, Mrs. Lowe is almost certainly an unprofitable customer, while Mr. High is a hyper-profitable customer.

The bank may not have much opportunity for cutting its cost or its profit margin, but it can still offer better pricing to Mr. High. It preserves its overall profit margin by raising prices to Mrs. Lowe (or encouraging her to migrate to another bank). Banks that fail to differentiate between the Lowes and the Highs will find that they lose the Highs to competitors tailoring better deals to profitable customers, and gain more Lowes.

Prior to the 1990s, few businesses had a way to effectively determine the cost of serving each customer, but the means to do so is now available. The tool needed is a customer database that can identify the total cost of serving each customer and the total gross profit earned on each transaction. The internal information technology needed is pretty strong, but the businesses slow to adopt will find that their most profitable customers move elsewhere, while the ranks of unprofitable customers increase.

Although this is a pre-Internet phenomenon, the net will help the Highs figure out where the best deals are. The Internet will also allow many businesses to consolidate information from far-flung operations into a central database.

Investment Opportunity: A few companies, such as NextCard, are trying to use customer information to maximize profitability. Most traditional firms, however, lack the detailed transaction information necessary to understand their customers, while e-commerce companies that have data don't have a long history. However, we believe that this opportunity will drive a good deal of spending on information technology, and will over time give an edge to the e-commerce firms that have been collecting such data.

Eliminate Sales Tax: We believe that e-merchants of big-ticket items will increasingly locate in states that allow them to ignore sales taxes, such as the five states without them. Avoiding an eight percent tax on a \$2000 computer will easily cover shipping costs. Buyers are supposed to pay a use tax in lieu of the sales tax, but consumers and small

businesses typically ignore it. Large businesses, however, will play by the rules. The sales tax probably is not large enough to drive e-commerce, but it will offset the shipping cost disadvantage that many consumers perceive from buying on-line.

Better Coordination of the Supply Chain: Poor supply chain coordination generates costs that buyers would like to avoid, including foregone production or consumption because the desired item is not available; the costs of special orders or rush shipping costs or extra trips to the store.

Consumers will find some value here. Small scanners are available now that allow a consumer to save the bar code of an item he has just used. Scan the empty milk carton, for instance, and HomeGrocer or WebVan knows that you need another quart. The units can be hand-held and synchronized later with the computerized shopping list.

Business-to-business transactions, however, will see the greatest benefit from supply chain management. Although automation of MRO purchasing is the “low hanging fruit” of B2B, supply chain management is the “killer app.”. Our conversations with manufacturers emphasized the desire for better vendor coordination. The latest trends in production include build-to-order models and mass customization, as well as rapid product development. Companies at the forefront of these trends cannot use traditional materials replenishment techniques (“send us a carload of fuses every six weeks”).

At some companies, the purchasing manager wants to send a production schedule electronically to all vendors, who will see what parts they need to deliver. They will either commit to delivery or work with the purchasing manager on an alternative plan. A manufacturer may even want to know his vendors’ delivery capabilities before bidding on additional business. This need occurs at the same time that manufacturers are more interested in using outside suppliers than producing everything themselves.

The build-to-order company is a little different. It may carry an inventory, which allows it to assemble last night’s incoming order today. But it needs nearly-instant replenishment, so that it is ready for tonight’s order. Thus it is in daily or continuous contact with its vendors. In addition, it shares production forecasts with vendors to assure reliable supply.

Business-to-business marketplaces provide only a portion of what is needed for supply chain integration, however. Supply chain management requires a company and its vendors to have databases that accurately reflect orders, production plans, inventories, etc. Many businesses today have not achieved the 1990 state of the art in enterprise resource planning (ERP) systems. The previous approach to electronic supply chain management utilized electronic data interchange (EDI), which was too costly for all but the largest companies. As a result, many small and mid-sized companies never bought sophisticated systems. The companies that did install databases a decade ago may have systems that are not flexible enough for the Internet.

Investment Opportunity: The improved supply chain management offered by the web will drive virtually every manufacturer, distributor and retailer to install a state-of-the-art ERP system. The investment opportunities begin with Oracle, which has the premier database for e-commerce. However, we believe many companies will opt to use application service providers (ASPs) for their ERP systems. In fact, we believe that the need for ERP systems will be one of the largest factors driving ASPs.

Advantages of the ASPs are lower initial outlay, shorter time to implementation, lower cost of installing software updates, and lower risk. The risk issue is not only a shifting of actual risks to the ASP (which we would expect the ASP to price for), but also a reduction of the underlying risk because of the ASPs' experience and incentives.

Investment Opportunity: Value added resellers (VARs) will use Oracle or SQL Server databases to customize applications for specific types of businesses (electronics wholesalers, vegetable packing houses, etc.). Again, some of these opportunities will lie with ASPs, both specialized firms serving a specific industry, and broader firms with modules customized for various industries.

Investment Opportunity: Middle-ware, which is software that connects legacy systems as if they were a modern system, will be the preferred near-term implementation tool for many businesses, though it seems that there is not a bright long-term future for this niche.

Investment Opportunity: Business buyers want tight relationships with vendors, but they are also price conscious. Now, they must either go to auctions for low price, or give up continuous price pressure and have the tight supply chain coordination. We expect to see business opportunities in price monitoring. For example, buyers could send electronic copies of their purchase orders to an aggregator of transaction information, who would sell analyses indicating how a company's pricing compares to the overall market. Price monitoring now is most common in the B2C space, via comparison services such as CNET Shopper. Comparison services in complex, made-to-order B2B products would be far more difficult to provide, but would much more value to the users.

Reducing Buyer's Transaction Costs: In maintenance, repair and operations (MRO), reduced transaction costs will be a huge factor. A National Association of Purchasing Management study found internal processing costs of \$38 per order. Commerce One estimates that it can reduce that cost down to \$3. Even if these estimates are somewhat inaccurate, the potential savings are huge.

Investment Opportunity: As more people spend time connected to the Internet, either via PC, palm-device, cell phone, or embedded appliance, there will be more places to present them with impulse buying opportunities. As a simple example,

the person looking at statistics about John Elway's career should see a banner ad for an autographed jersey, not tickets to the opera. We believe that contextual selling has strong value, even though we have heard many claims that seem absurd. The banner ad example makes sense to us, but we're doubtful that we want our cell phone to ring every time we pass by a Starbucks (especially here in the Pacific Northwest).

Contextual selling is an old concept, as when the clothing salesman closes the sale of a suit, and then pulls out a matching shirt and tie. It has a role in B2B as well, such as selling service agreements and spare parts along with equipment.

Investment Opportunity: In a world of on-line ordering, it seems antiquated to cut a physical check for payment. Although most B2B applications have embedded payment systems, limiting independent investment opportunities, we believe that the B2C space has room for more players. The credit card is the main payment mechanism now for B2C, but other systems, such as PayPal, are likely to grow.

FORCES LIMITING, PREVENTING OR DELAYING E-COMMERCE

Several factors will limit, prevent or delay e-commerce.

<u>BUYERS</u>	<u>SELLERS</u>
Upfront expense	Upfront expense
Security	Security
Reliability/fulfillment risk	Credit risk
Long relationships w/ vendors	Cannibalize existing relationships
Fear of higher prices	Need to discount
Commoditization: loss of specificity	Commoditization: loss of margins
Internal IT system not ready	Internal IT system not ready

A few of these forces merit additional comments, and present more investment opportunities.

Upfront Expense: Buyers prefer to start with pay per transaction rather than large upfront expenditure. Because e-commerce is new and relatively untested, many participants on both sides will look for ways to minimize the risk of up-front expenses. In B2B this implies the use of ASPs rather than internal systems, and a preference for per-transaction fees over up-front fees.

Security Issues: Large e-commerce will drive need for security software and systems. Many consumers have decided that on-line credit card usage is an acceptable risk, partly because no one seems to have been burned by it. Other participants, however, have much

to fear, especially in large B2B-sized transactions. Authentication of identities and transactions—at a fast speed—is vital.

Investment Opportunity: Security of transactions will move from a feature that adds value, to a necessity whose failure could be fatal to a company engaged in e-commerce. Such security needs to be seamless: embedded within the communications, and thus easy to use.

As manufacturers put their production plans on-line for the benefit of their vendors, or the vendors put their manufacturing capabilities on-line for the benefit of the buyers, all parties will be worried about snooping by competitors. Companies will want to ensure that their data is being viewed only by legitimate partners.

Investment Opportunity: Extra-net providers will allow buyers places to securely put production plans, for example, to be viewed by vendors but not competitors. Similarly, vendors may put their schedule, showing open capacity, on-line for view by customers but not competitors.

Reliability/Fulfillment Risk: Part of the folklore of purchasing managers is the tale of how an attempt to save pennies by using a new supplier resulted in the production line being down for several days. Content to evaluate reliability of vendors (like E-Bay provides) is valuable. In the B2B space, fear of not getting needed product will delay the use of new vendors, reducing the value of e-commerce.

Consumers now favor traditional retailers who have stock on hand. Big box retailers such as Home Depot and Borders have become popular because the buyer is likely to find what he is looking for at these stores. On the web, the buyers need information about product availability and shipping dates. In addition, third-party information, such as user reviews, is valuable. In the B2C space, reliability will go up with e-commerce, especially as sites recognize the importance of providing more information.

TRUTHS OF E-COMMERCE

We are not convinced that e-commerce will evolve as many analysts expect. We explore the ideas that we believe are true vs. mythical.

Truth: Marketplaces cannot seize the gains. B2B marketplaces can offer substantial value, but we do not believe that they can take command of a significant portion of the gains from e-commerce. As e-commerce becomes more common, all businesses will build the ability to make and take orders on-line. Transactions between regular customers can take place directly, without an intermediary. Remember that production materials constitute the largest sector of commerce, and most of these transactions are continuing relations. Once both the buyer and seller have chosen to trade with one another regularly, the marketplace plays only a trivial transaction processing role.

Sellers will establish relationships with more than one marketplace. Just as retailers now take Visa, Master Card, American Express and Discover, B2B sellers will want the ability to take orders over any network. Once sellers are connected to a number of marketplaces, buyers have their choice of marketplaces. They will use 1) established, well known marketplaces, with 2) good service, and 3) low prices. The low pricing may well take the form of rebates. Think of Discover Card's cash rebates or airline mileage cards.

This is not to say that marketplaces can't be profitable. Their best opportunities lie in customer problem-solving rather than in habitual or replenishment purchases. In these areas, marketplaces can provide information about products and vendors, earning a return on the value provided by the information. That return, however, is not unlimited. E-commerce sites relying on content to justify higher transactions fees may face the same challenge faced by high-touch retail merchants. The merchants answered consumer questions and provided information, and then saw the consumer go across the street to the discount outlet—armed with the information that have been provided by the traditional merchant. Similarly, a high-content on-line site, such as Amazon, is at risk of buyers using the site for information, but not transactions. Convenience argues for buying at the same site where one received information—but buyers will accept some inconvenience if the savings are large enough. Thus, content-rich sites can attract volume, but not at significantly higher prices than other sites offer.

Truth: Auctions Will Be a Minority Pricing Mechanism. The popularity of on-line auctions, stimulated by eBay's success, has led some B2B enthusiasts to predict that all transactions will be conducted via auction. This is nonsense, though auctions do have a place in e-commerce.

The strongest trend in corporate purchasing lately has been for companies to strengthen ties with vendors. They are concentrating their business among a small number of vendors, increasing their communication about future needs, and bringing vendors in on product design issues. In some cases, they even ask vendors to locate next door or to manage inventories within the buyer's premises. This strengthening of buyer-vendor relationships flies in the face of the auction idea: the buyer will work with anyone offering the lowest price.

Benefits from auctions will not, in most cases, overcome the advantages of these tight relationships. In fairly efficient markets, little or no price improvement is possible from auctions. Price tag comparison over time will bring prices down to production costs plus a market return on capital.

Most significantly, though, auctions may be too much work for buyers. The consumer looking for collectibles may enjoy returning to the auction site daily or hourly. In contrast, the employee responsible for purchasing has a long to-do list and wants to check off items as fast as possible. If the buyer believes that the list price is about as good as he can get, then he'll save time by avoiding auctions.

Auctions make sense when markets are less efficient, such as in used equipment or the classic Pez container collection. They also make sense where pricing is uncertain, such as in agricultural commodities subject to fluctuations due to seasonality and weather. Hybrid auctions may also develop, along the lines of the U.S. treasury bond market, in which bidders can accept the result of the competitive auction, assuring themselves a supply of bonds at a market price.

Truth: Wholesale Distribution Plays a Necessary Role. Some have predicted the end to wholesalers, distributors and other middlemen. However, there are some basic functions that have to be performed regardless of how the transaction is structured. First, a buyer must receive the product. Where the buyer has a significant time constraint, such as in perishables or repair parts for machinery, a local inventory must be carried. Furthermore, shipping costs will sometimes—though not always—result in stronger economies for distributors. The buyer of office supplies, for example, often wants less-than-a-case quantities of goods from each of several manufacturers. Thus, it is easier to consolidate the paper and pencils from various manufacturers at a local site, than for the buyer to deal directly with each manufacturer.

In addition, some of the trouble faced by wholesalers is pre-Internet, as when big box retailers drove out independent stores and the wholesalers that supplied the independents. Now, however, a number of the wholesalers have bounced back by providing fulfillment services to on-line retailers.

Middle-men have shifted roles, too, to become inventory managers. Hospital pharmacies have actually increased their usage of wholesalers, despite the consolidation within the hospital sector that might have led to greater buying power with the drug makers. However, hospitals have outsourced inventory management to the wholesalers, believing that the benefits outweigh the wholesaler's markup.

Wholesalers will survive, but they will be engaging in e-commerce. Electronic order entry and inventory management will be necessary features of the survivors.

Truth: E-commerce Will Come to Less Sophisticated Companies. The final myth is that e-commerce won't come to the least sophisticated businesses. Right now, e-commerce hasn't fully arrived even at the most sophisticated businesses (but look for that to change soon). Some large manufacturers with nationally recognized brand names cannot do a round-trip transaction with another company electronically ("round-trip" meaning that both the ordering and the payment are done over the Internet).

One exhibit at a recent trade show, though, suggested that technology can be pushed down to less sophisticated businesses. Imagine a Palm Pilot onto which a plumbing wholesaler's catalog had been downloaded. The handheld device is given to the plumber, who would enter his needs as they arose, then transmit his order to the wholesaler. The plumber gets immediate verification that his parts are in stock, and he find his order ready

when he arrives—no more waiting at the parts counter. The wholesaler gets electronic order entry, smoother work flow, and greater customer loyalty. The message here is that clever technology can be delivered to less sophisticated businesses, with gain-sharing encouraging its use.

The consumer equivalent is the kitchen-counter bar code scanner that will link to a web-based supermarket (with delivery as Webvan, or pickup of a packed shopping bag on the buyer's way home). The current model generally requires taking the shopping list from the kitchen to the computer (located in another room), then opening a dial-up connection, linking to the web site, and finally ordering. The convenience model will be for the consumer to scan the bar codes of empty packages, and periodically look at the list on a screen and hit the "send" button. We find consumers who claim they will never use a computer, but who readily use a microwave and even program a VCR. As the technology becomes convenient, usage will mushroom.

CONCLUSION

E-commerce offers large benefits in many areas. We expect it to dominate business replenishment of production materials in a few years, with strong growth in business MRO, and moderate growth in business capital goods. We expect strong inroads in B2C replenishment of groceries and household supplies, strong growth in consumer durables of standard items (i.e., more in electronics than in furniture). Services, both business and consumer, will lag. Even here, though, the market is large enough that some good sized corners of it will move heavily to e-commerce.

The companies that make profits from e-commerce will cover a wide range of activities. We have very positive opinions of those that can extract a small fee, across a large number of transactions or other volume measure. Products and services that are inexpensive relative to the entire transaction, but crucial to the process, will have the strongest pricing power.

Some of our favorite investment opportunities are summarized in Table 5.

Table 5: Key Factors, Trends and Needs of Electronic Commerce

Factor	Trend	Need Created
1. Supply Chain Coordination	Electronic commerce can save money by having needed materials available at right time	Companies need to get their internal IT systems in order before they can reap benefits of e-commerce.
2. Global sourcing	Global sourcing creates greater effective capacity, causing a temporary (3-5 years) glut, with lower prices	Help companies find global suppliers, especially for custom fabricated products
3. MRO	On-line MRO purchasing offers opportunities for greatly reduced transaction costs	Software to connect corporate employees with vendor's catalogs
4. Price Monitoring	Companies want close relationships with vendors of production goods—but they want auction-like prices as well	Service to provide pricing information for both catalog and custom-fab parts.
5. Security	Growing volume of transactions, and rising price tags.	Greater need for security of orders, company information provided to vendors, and payments
6. Minimizing Up-front Cost & Risk	E-commerce requires substantial investment, with substantial risks: cost, time to completion, functionality	Companies looking for ways to pay per transaction or per month, with low up-front expense and risk (ASPs)
7. Extranets	Companies will want to make their production plans and capabilities accessible to vendors and buyers—but not competitors.	Extranets
8. Pushing e-commerce to less sophisticated buyers	Technology-resistant buyers will accept convenience	Convenient technology for less sophisticated buyers: e.g., kitchen counter scanners
9. Growing Internet Usage	E-commerce will grow exponentially, both in number of users and their intensity of use.	Another reason for growing Internet infrastructure needs: routers, bandwidth, computers, appliances, etc.