

## Chapter 1: E-Commerce and the New Economy

**"IT and the Internet amplify brain power in the same way that the technologies of the industrial revolution amplified muscle power."**

Bradford DeLong, Professor of Economics, University of California, Berkeley, quoted in "The New Economy", Pam Woodall, *The Economist*, September 23, 2000, Survey p. 6.

### Prologue

Brad DeLong is a respected economic historian. What is he referring to when he talks of amplifying muscle power and brain power? The basis of the industrial revolution was the large-scale harnessing of non-animal energy for power. First steam, then electricity and oil provided the fuel for the period of mechanization that we call the industrial revolution, going far beyond what wind and water had been able to achieve in the preceding millennia.

Of course the growth of knowledge was important for the industrial revolution, which followed and coincided with a period of unprecedented scientific discoveries and technological advances. The mechanized mills that changed textile production from a literal cottage industry to the first instance of modern factory methods were powered by steam, but they could not have existed without a stream of inventions. The Jacquard loom, for example, used punch cards for the automatic weaving of patterns, foreshadowing the use of punch cards in computing a century or more later.

The pace of discovery and innovation has never slackened in the two centuries since the industrial revolution began. As a result, in much of the world, standards of living have reached levels unimaginable for almost all of human history. Industrialized economies have been transformed, with agriculture, the centerpiece of economic activity for thousands of years, reduced to a small fraction of the Gross National Product of countries such as the United States, and an even smaller fraction of employment.

Are we in the middle of a change as dramatic and far-reaching as the one we have undergone through the industrial revolution? What is the "new economy", and how does it differ from the old one? How do IT and the Internet "amplify brain power", and how does that make a difference to the economy? Can these differences be measured, and what do the data tell us? What are e-commerce and e-business, and what place do they have in the new economy? How are our lives, our communities and our laws affected by the technological and economic forces at work?

This chapter gives an overview of the broader themes that underlie the nuts and bolts of the economics and strategy of e-commerce. Read on.

## 1.1 Introduction

The purpose of this introductory chapter is to give some sense of the scope of this book, to define some of the basic terms, and to give an overview of some key ideas. In the next section, we explain how technological and legal matters interact with economics in the realm of e-commerce. These interactions are the reason for our basic surveys of technology and law in Chapters 2 and 3.

In Section 1.3, we discuss the definition of the basic terms that summarize the scope of the book: e-commerce, e-business and new economy (also called the digital economy, knowledge economy, or information economy). While the book focuses more particularly on e-commerce, the more general areas of e-business and the new economy are intertwined with e-commerce, as we explain in this section.

Section 1.4 provides some data on the size and growth of the new economy, and discusses the measured impacts of information technology on the economy as a whole, as well as some of the problems of measurement. In particular, cost savings generated by the use of information technology may not show up as measured increases in economic activity. Similarly, quality improvements, increases in variety, and better customization of products may not be adequately measured in assessing the importance and the effects of the information revolution.

Developments such as greater opportunities for customization and quality improvements are part of more general changes in the scope of business strategy that are being driven by information technology. Section 1.5 describes some of the issues that arise for businesses as information becomes more ubiquitous, both directly as a product or service, and as information *about* products and services. While the laws of economics do not change, the special characteristics of information as an economic good do matter. Similarly, the increased availability of information about all other products and services has its own impact on the functioning of markets, and of buyers and sellers within a market economy.

In Section 1.6, we discuss the broader implications of the information revolution, examining how it changes the ways on which we work and play, and how we interact in all kinds of ways. One of the most rapid and remarkable developments among those who have Internet access has been the increase in communications. Just as the telephone made one-to-one, long-distance voice conversations possible, electronic bulletin boards, electronic mail (e-mail) and instant messaging technologies have led to new forms of communications among groups, binding existing communities and creating new ones. Online entertainment, too, has developed its own new communities of game players. Job seekers, shoppers, and others all have the opportunity to exchange information online. Many of the long run changes in the economy, as it makes the continued transition from “old” to “new”, will be guided by the communication channels that arise on the Internet, just as paths in the forest that holds the UCSC campus are worn by walkers irrespective of planners’ ideas.

## 1.2 Technology, Law and Economics

Innovation has always been driven by a mix of human motives. People have a tremendous capacity for learning and discovery, and much of our technological progress has been driven simply by the internal joy we obtain from discovery. Yet we are also social creatures, and we may derive pleasure from the benefits we provide to others and from the recognition our fellow beings give us when we accomplish something never done before. Finally, material rewards are a powerful motivator of innovation.

All these motivations – self-satisfaction, altruism, recognition and material rewards – drive the process of innovation, and the current wave of innovation that information technology and the Internet exemplify is no exception. While many of the advances that have made electronic commerce possible were initiated for noneconomic motives, it does seem that the current frenetic pace of change is being propelled by the desire to strike it rich. From this perspective, economic forces drive technological change, providing one important link between technology and economics.

While we will, in places, touch on the issue of economics as a determinant of innovation, the focus of this book is more limited, but no less exciting. The range of technological advances that have given us the Internet also change the scope of what we can and cannot do in the economic sphere. Hence the main focus of the book is really on how the Internet and associated technological innovations affect economic activity. While we mostly experience this technological change in a particular, limited way – surfing the World Wide Web for news, chat, entertainment, and shopping opportunities – the range and sophistication of the technologies that underlie this process is increasing at a mind-boggling rate.

If we are going to understand how the economy may change as we tap in to unprecedented levels of information and opportunities for communication, we must have some sense of what the enabling technologies are. Of course there are many technical treatments, and we do not try to match those. Chapter 2, instead, provides a totally nontechnical, reasonably comprehensive overview of the technologies that make electronic commerce possible, from the basics of computing, the Internet and the World Wide Web, through a description of how some of the features we now take for granted (animations, audio and video) are achieved, to a discussion of issues of security and management of traffic and storage. Technically knowledgeable readers will be able to skip or skim this overview of technologies.

The second noneconomic area that impinges significantly, if less obviously than technology, on the economics of electronic commerce is law. Modern market economies rely very heavily on the existence of an appropriate legal framework, that defines and effectively enforces property rights. It is well recognized that production and exchange in a market economy both require clear and enforceable property rights. How does the Internet change this? At one level, nothing changes. The Internet is simply a more efficient communications medium. Electronic commerce may save us getting out of our chairs to shop, but the principles of ownership and markets are unaffected.

However, two major changes are occurring that focus attention on legal issues. First, knowledge is apparently becoming increasingly important as a driver of economic activity and economic growth. If knowledge is to play this role, it must be part of the system of economic incentives. Knowledge can be legally characterized as intellectual property, but this is fundamentally different from physical property, and requires its own system of legal definitions and rights. Thus, information technology and the Internet amplify not only brain power, but also the importance of the legal system that governs the economic rewards to brain power. The characteristics of this system, and the potential challenges it faces, are outlined simply in Chapter 3. Aside from the general issue of the increased importance of knowledge, technological advances that make copying and sharing of information of all kinds incredibly quick and inexpensive are having a major impact on legal issues relating to intellectual property.

Chapter 3 deals with another aspect of law that becomes more salient in the Internet age. Here also, the nature of electronic communications is a direct factor in the legal issues. For centuries, if not millennia, we have used writing on paper as a means of defining and preserving the information that governs economic exchanges, through contracts, identification methods, and so on. Electronic commerce requires the development of alternative legal definitions for what is acceptable and binding in contracting and identification. The technologies for this are described in Chapter 2, while the legal implementation is covered in Chapter 3.

While the basic technological and legal conditions are important for understanding the economics of electronic commerce, general economic principles themselves are indispensable. As Carl Shapiro and Hal Varian stated so succinctly in their pathbreaking book, *Information Rules*, “Technology changes. Economic laws do not.” Shapiro and Varian also note that, “You don’t need a brand new economics. You just need to see the really cool stuff, the material they didn’t get to when you studied economics.” The goal of Chapter 4 is to review the not-so-cool stuff, as well as to link it to the cool stuff, some of which is covered in Chapter 4, and some of which is developed at appropriate points throughout the book. At the risk of seeming immodest, our goal has been to follow Shapiro and Varian’s lead, but provide a much more complete treatment of the economic principles that are important for analyzing electronic commerce.

Understanding some basics of technology, law and economics is therefore the foundation for analyzing the economics and strategy of electronic commerce. Knowledgeable or impatient readers can browse or bypass Chapters 2, 3 and 4, returning to them if and when necessary. We hope that the habit of clicking around the World Wide Web will make readers comfortable with hopping around this book. Printed pages cannot (yet) handle hyperlinks, but we have tried to alert readers whenever we build on the background material in the next three overview chapters.

### **1.3 E-Commerce, E-Business and the New Economy**

So, what exactly is **electronic commerce**, or **e-commerce**? E-commerce is buying a book on Amazon.com, paying for it by providing your credit card information

online. E-commerce is downloading a piece of software like RealPlayer, again paying for it (if you get more than the basic version) online. E-commerce is checking the news, weather and movie reviews on Yahoo!, “paying” for these services with your attention to online advertisements. E-commerce is checking out eBay’s auction web site, to find the Pez dispenser missing from your collection. E-commerce is paying \$20 a month for AOL membership, so you can go online and chat there with your friends, or with anyone else you care to meet in cyberspace.

Here is a much more formal definition of e-commerce:

“Electronic commerce refers generally to all forms of transactions relating to commercial activities, including both organisations and individuals, that are based upon the processing and transmission of digitised data, including text, sound and visual images.”

(OECD, 1997)

Note that all the examples we gave in the first paragraph were related to possible individual experiences of electronic commerce. In fact, the bulk of e-commerce takes place between businesses, the main type of organization encapsulated in the OECD definition. Here is how the US Department of Commerce puts it:

“In ever greater numbers, people are shopping, looking for jobs, and researching medical problems online. Businesses are moving their supply networks online, participating in and developing online marketplaces, and expanding their use of networked systems to improve a host of business processes. And new products and services are being created and integrated into the networked world.”

(*Digital Economy*, 2000, p. 7)

As far as the industrialized world goes, it seems like everybody’s doing it. Even activities that are not “commercial” in the usual sense are moving online. If I file my US federal tax return electronically with the IRS, it is not a commercial transaction in the narrow sense, but it certainly is an economic activity that takes place electronically, so we may well include it as e-commerce. See the Illustration Box for yet other possible definitions.

In practice, of course, many people are not “wired”. Either they choose not to be, or they cannot afford it, or other barriers exist. Yet this will change over time, and probably more rapidly than seemed possible just a few years ago. When poor villagers in India can use the World Wide Web to get weather and crop price information, or to check on village land ownership records from a state government web site, it is clear that a major shift in ways of “doing business” is occurring.

<b>Illustration Box</b>
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### What is Electronic Commerce?

Here is a very spare, abstract, but general definition:

“Electronic commerce is the carrying out of business activities that lead to an exchange of value across telecommunications networks.”

(EITO, 1997)

This one adds a little bit more:

“Electronic commerce supports an entire range of activities – product design, manufacturing, advertising, commercial transactions, settlement of accounts – using a variety of kinds of computer networks.”

(ECOM, 1996)

How computer networks and telecommunications networks are related is described in Chapter 2.

Finally, this definition gives even more examples:

“Electronic commerce is about doing business electronically. It is based on the electronic processing and transmission of data, including text, sound and video. It encompasses many diverse activities including electronic trading of goods and services, online delivery of digital content, electronic fund transfers, electronic share trading, electronic bills of lading, commercial auctions, collaborative design and engineering, online sourcing, public procurement, direct consumer marketing, and after-sales service. It involves both products (e.g. consumer goods, specialised medical equipment) and services (e.g. information services, financial and legal services); traditional activities (e.g. healthcare, education) and new activities (e.g. virtual malls.”

(European Commission, 1997)

No wonder so many people are excited about e-commerce!

Source: *Measuring Electronic Commerce*, Committee for Information, Computer and Communications Policy, Organisation for Economic Co-operation and Development, 1997, p. 6.

Whatever the precise definition, we can agree that e-commerce involves a range of online transactions and interactions that are connected to some economic motive. Is that the same as **e-business**? We might think of e-commerce as being broader than e-business. If individuals transact directly online, so that no business firm is involved, then that might qualify as e-commerce, but not e-business. However, such economic transactions do not seem to be of major significance. If we include government-individual transactions in e-commerce but not in e-business, then again we might consider e-commerce to be the broader category.

On the other hand, there is a case for defining e-business as being more general than e-commerce. While e-commerce includes all transactions across firms or individuals, what about all the activities that take place within the boundaries of a business, but do not cross them. Internal accounting, inventory control and other forms of record-keeping have been electronic for quite some time, especially in larger

businesses. The power of information technology, harnessed by corporations, was the basis of IBM's huge success long before the Internet and e-commerce came along. Thus we can define e-business as "doing business electronically", both within the boundaries of organizations as well as across them, with only the latter showing up as e-commerce. It should be noted that business-to-business e-commerce is still much older than the Internet. As we shall note in Chapter 2 and subsequently, electronic methods of data interchange across firms predated the technologies of the Internet and the World Wide Web.

To some extent, these semantic distinctions are just that – semantics. In fact, one of the remarkable developments that we are observing with the rise of the Internet and e-commerce is the blurring of the boundaries of the firm, as information flows more freely across firms as well as within them. In particular, one of the problems with pre-Internet electronic business networks was their rigidity, and the flexibility and openness of the Internet – along with all kinds of other developments in ease of use and speed of transmission – permits a much greater and widespread use of electronic communications and transactions for businesses.

The final term in our trio is the broadest of all. We have used the term "**new economy**", which plays off the historical perspective summarized in the chapter prologue. Synonyms for this term give a greater feel for what the new economy is about: knowledge economy, information economy, and digital economy. Take your pick. The last of these emphasizes the fundamental technology that drives everything: the conversion of information to digital form (see Chapter 2 for what this means), or "digitised data", as stated in our first definition of e-commerce, above.

The other two terms focus on what is being digitized. Information is perhaps more accurate here, in that it connotes something that can be put into concrete form before digitization. Information is also, in a sense, more general than knowledge. A popular song is information as far as information technology is concerned. It can be reduced to a digital form that can be stored, transmitted and processed by various kinds of computers. Yet we might not think of this song as knowledge, in the same way that the ability to write computer programs that allow users all over the world to share songs is knowledge.

Again, there is some danger of semantic hairsplitting, yet we may still find it useful to distinguish between information and knowledge. Some of the same distinction comes up in the differences between copyright and patent law, protecting different kinds of intellectual property rights (see Chapter 3). Another possible way of thinking about the distinction is in economic terms: knowledge is more of an input, whereas information is an output.<sup>1</sup> In any case, digitization (embodied in IT generally and the Internet in particular) amplifies the benefits of knowledge, and makes the spread of information

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<sup>1</sup> Though, going back to our earlier discussion of innovation, knowledge is the output when innovation-oriented activities such as research and development are involved.

easier. This is the basis of the new economy. How new it really is depends on what we are actually measuring, and we turn to this next.

#### 1.4 Size and Growth of the New Economy

Two popular statistics that are often used to gauge the growth of the new economy are the number of people with Internet access, and the number of unique Web pages. The US Department of Commerce, in its latest report on e-commerce (*Digital Economy 2000*), reports that the number of people “online” in the US and Canada crossed 136 by March 2000<sup>2</sup>, while the worldwide figure was 304 million. These figures were up from 97 million and 171 million a year earlier. With the exception of the US and a few European countries, these numbers are still relatively low, reflecting generally lower levels of income in much of the world. The number of unique World Wide Web pages was reported to be more than one billion by January 2000, up from just 100 million in October 1997.<sup>3</sup>

Of course, these numbers give us no idea of how much time people actually spend online, and how that time impacts economic activity. There are problems with standard measures of economic activity, such as the failure to account for the value of time used in non-market transactions, or in activities that affect market transactions. For example, do-it-yourself labor is not valued in national accounts. Neither is time spent in gathering information that affects purchase decisions. In the latter example, shifts in this activity from traditional, physical methods (such as browsing print media, telephoning, and driving around to stores) to online search will not show up in the data, except as changes in business spending (from magazine ads to Web ads), or even *reductions* in economic activity (less spending on magazines by consumers).

Having said this, official methods of calculating economic activity are the best we have. In particular, they are designed to capture market-based economic activity relatively well, and to avoid problems such as double-counting. An example of the latter mistake would be if we add the revenues of Intel and Dell, not allowing for the fact that part of Intel’s revenue from microprocessors is a cost to Dell, which buys them, and which recovers that cost in its own revenues. This is a general problem with some estimates of e-commerce that simply add up revenues from a variety of firms.

One case where the problem of double-counting is avoided is in final sales to consumers. Business-to-consumer (**B2C**) e-commerce seemed to hold out great potential in 1999 and the early part of 2000, resulting in a rather frenzied burst of entrepreneurial activity backed by eager venture capitalists. This fever has cooled somewhat, but no doubt economic potential remains. The US Bureau of the Census estimated electronic retail (**e-tail**) sales in the fourth quarter of 1999 to be \$5.3 billion. This certainly sounds impressive. Yet it was only 0.64 percent (that is, less than 1/150th) of all US retail sales.

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<sup>2</sup> The original source of these figures is reported as *Nua Internet Surveys*, at [www.nua.ie](http://www.nua.ie).

<sup>3</sup> The original sources are Inktomi, “Inktomi WebMap”, Press Release, January 2000 ([www.inktomi.com/webmap](http://www.inktomi.com/webmap)) and David Peterschmidt, President of Inktomi, quoted by Yahoo, “Internet Volume is Doubling Every 90 Days,” October 3, 1997 ([www.nua.ie](http://www.nua.ie)).



Does this relatively small percentage mean that the importance of e-commerce is exaggerated? Besides the issues of nonmeasured activities, such as consumer search, and the potential for substantial growth, the main reason we can answer this question with a “no” is the existence of business-to-business e-commerce.

Business-to-business (B2B) transactions may involve products that are indistinguishable from consumer products (computers and office supplies, for example). The only difference is that they are sold to businesses rather than to households or consumers. However, a large segment of B2B transactions involve raw materials and intermediate products, as well as services that are specific to businesses (for example, accounting, human resource management, and, increasingly, information technology services). While estimates of B2B e-commerce vary widely, it is widely agreed that the numbers are much more substantial than for B2C e-commerce. The reasons have to do chiefly with the historical scale of information technology, possibly compounded by the cost-saving incentives of businesses in competitive markets. As a simple illustration, large firms invested in mainframe computers at a time when the idea of a household actually having a computer was practically unimaginable. Similarly, electronic communications require physical networks of wires and switching equipment. Before the Internet, large firms typically leased expensive telecommunications lines to carry their business communications, something that was again beyond the reach of households.

We will detail the history and subsequent developments of electronic communications in the next chapter, as well as at other points in the book, but it is worth summarizing this economic perspective on Internet-based e-commerce: it represents the impact of cost reductions expanding the size of the communications network, and hence the market, from large firms to small ones, and to households.

We have noted the problem with measuring B2B transactions: because they involve intermediate products and services, aggregating revenues across businesses (Intel’s sales to Dell, Dell’s sales to Wal-Mart) will involve double counting. Still, one can use the numbers, and changes in them, to get some idea of the importance of B2B e-commerce. While the US Census Bureau does not yet estimate B2B e-commerce, private forecasters do. Table 1.1 presents a range of estimates and forecasts, based on a combination of surveys and guesswork. While the numbers vary quite a bit, reflecting differences in who was surveyed, and possibly how e-commerce is defined, they are all of similar orders of magnitude, and all project substantial growth.

One area where differences in estimates can arise is with respect to non-Internet e-commerce – what is known as Electronic Data Interchange (EDI). EDI is described in more detail in Chapter 2. Here we may note that it involves using private networks (typically, lines leased from telecommunications companies) and proprietary software, and has been restricted to larger firms. The Boston Consulting Group did estimate EDI for 1998 at \$571 billion, dwarfing Internet-based B2B e-commerce. At the same time, they projected EDI to grow only slowly, to \$780 billion in 2003. Again, the cost

advantages of using the Internet<sup>4</sup>, plus the benefits of being part of a larger network, are expected to cause this relative shift to the Internet. Small businesses, in particular, can use Internet-based e-commerce where EDI would not be economical. Furthermore, electronic marketplaces are potentially economically viable using the Internet, but unlikely to be so with traditional EDI.

**Table 1.1: US B2B E-commerce Estimates (\$ billion)**

Source	1999 (survey estimate)	2003 (forecast)
Boston Consulting Group	92*	2,000
Forrester Research	109	1,800
Gartner Group**	145	3,900
Goldman Sachs	155	1,100
IDC	50	1,100

\* 1998; \*\* Worldwide transactions estimate

Source: Stacy Lawrence, "Behind the Numbers: The Mystery of B2B Forecasts Revealed," *The Industry Standard*, February 21, 2000 ([www.thestandard.com/research/metrics/display/0,2799,11300,00.html](http://www.thestandard.com/research/metrics/display/0,2799,11300,00.html))

One final category of e-commerce is consumer-to-consumer (C2C). While firms such as eBay have entered the popular imagination through their electronic auctions for collectible or unique items, the value of C2C transactions is quite small. In fact, eBay now handles B2C and B2B transactions as well. While its own revenues are still in the millions, these revenues represent only its commissions on transactions, which are therefore considerably larger in volume. Again, the total value of a transaction does not represent the economic value added of an activity. If a used item is bought and sold through a dealer, the dealer's profit is a better measure of the value created in the overall transaction, and this is what is measured in the national accounts. On the other hand, a used item sold privately (say, in a flea market) will not show up at all in that official accounting.

While e-commerce represents only a small fraction of the US Gross Domestic Product (GDP) of 8.6 trillion dollars in 1999, overall spending on information technology (IT) is substantial. While IT is more than just e-commerce, increasingly the boundaries are getting fuzzy. Networks exist within corporate walls and simultaneously are part of the larger network of the Internet. Telecommunications infrastructure that

<sup>4</sup> For example, giant retailer Sears Roebuck, one of the pioneers of EDI, has an EDI system that costs it about \$150 per hour. Internet-based exchange with its suppliers could reduce this figure to as little as \$1 an hour. See Sandra Guy, "Sears, French Giant in Online Venture," *Chicago Sun-Times*, February 29, 2000.

carries telephone conversations is also used for World Wide Web data. Total IT spending in the US (without any double counting) now makes up over 8% of GDP, or over 680 billion dollars. This includes hardware, software, services and telecommunications spending. Of course, this means that there is still a substantial part of economic activity that is not directly related to information technology. However, it is a reasonable forecast that the 8% figure will increase over the next few decades.

One factor working against an increase in IT as a proportion of GDP is the fall in the costs of IT. The empirical regularity observed by Intel co-founder Gordon Moore, and famously enshrined as Moore's Law, says that the number of transistors per microprocessor (see Chapter 2 for brief explanations of these and other technological terms) doubles every 18 months. This ability to pack more and more circuitry on tiny wafers of silicon keeps on reducing the cost of processing power. Similar factors are at work in storage and communication of information, resulting in enormous reductions in the overall cost of computing (see Table 1.2). To the extent that we measure only expenditures when we calculate economic activity, some of the impact of the digital economy is being missed. For a simple example, a \$3,000 home computer is many, many times faster than a \$3,000 home computer available five years ago; it has much more storage capacity; and it can communicate much faster with other computers than was possible just half a decade ago. Even if we neglect adjustments for inflation (which would mean that the \$3,000 computer now is cheaper in real, or general purchasing power terms), the same amount of money spent now allows one to work more quickly and effectively, or to enjoy one's leisure more.

**Table 1.2: Falling Costs of Computing (\$)**

<b>Costs of computing</b>	<b>1970</b>	<b>1999</b>
1 Mhz of processing power	7,601	0.17
1 megabit of storage	5,257	0.17
1 trillion bits sent	150,000	0.12

Source: Pam Woodall, "The New Economy: Survey," *The Economist*, September 23, 2000, p. 6, Chart 1.

The changes in computing go beyond simply having more capacity or saving time. We are able to do things that were impossible in the past. We can play online games, copy music, watch videos, and do all kinds of things on our home computers that were either technically infeasible or prohibitively costly just a few years ago. Again, these increased capabilities are not fully accounted for in the standard accounting of economic activity. Of course, these problems have always existed. Innovation that introduces new products or improves the quality of old products has always been difficult to account for. One might argue, however, that information technology has accelerated

innovation, and magnified the problem of underestimating the benefits of certain economic activities.

The problem of accounting for improvements in quality and variety goes beyond IT. If IT can be used to more effectively design new products, or improve the design of existing products, then its value will be greater than is simply reflected in spending on IT itself. In other words, we do not just have better, cheaper, more versatile computers today, but those improved computers make it possible to have better, cheaper, more varied cars, houses, toys and so on. This is related to what Brad DeLong is getting at when he says that IT amplifies brain power. One example of the use of IT comes from crash testing new cars. Actually crashing a car could cost something like \$60,000 each time. This is how it used to be done, with the results analyzed partly by computer. Simulating the entire crash on a computer can now instead be done for close to \$100.<sup>5</sup>

Despite the seemingly obvious benefits of IT illustrated above, one paradox that proponents of the new economy have faced has been the lack of hard evidence for these benefits in the overall GDP data, measuring economic activity. A particular problem has been that increased investment in IT did not appear to be improving productivity in any measurable way. The conclusion of skeptics has been that much of this IT spending had no real impact, simply leading to more hours spent playing Solitaire, or figuring out why the computer had crashed.

Much of the attention to productivity growth has been in the United States, which has spent the most on IT, and which had a prolonged slowdown in productivity growth in the 1970s and 1980s. Early investments in IT seemed to have no countervailing impact to reverse this slowdown. Based on studying the effects of the introduction of electric power a hundred years ago, economic historian Paul David suggested that the benefits of innovation can take decades to appear in quantifiable form. This seems to fit with what happened in the last five years of the twentieth century, when US productivity growth did increase substantially, just as the penetration of PCs into homes approached 50%, and as the Internet took off.

Another economist, Robert Gordon, remains skeptical. He notes that the increase in productivity growth is confined to a small segment of the economy (computers and durable goods). Furthermore, the productivity boost may have been entirely the result of the prolonged economic expansion in the US (productivity rises during economic booms). This skeptical view is supported by studies that find productivity gains have been low in sectors where IT investments have been high. For example, measured productivity in banking and education actually fell from 1987 to 1997, even though these were the sectors with the highest spending on IT as a proportion of output.

One possible explanation for the failure of IT investments to show up as improved productivity may be the issue of how output is measured. Time saved standing in line for a bank teller is not counted as a productivity improvement. Increased numbers of

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<sup>5</sup> Pam Woodall, "The New Economy: Survey," *The Economist*, September 23, 2000, p. 5.

research papers written by academics do not show up in the statistics. As we noted earlier, improved quality of products and, especially, services is difficult to quantify and measure. The availability of greater variety is also missing from the GDP figures and their components. Thus, some of the most important aspects of the new economy are also the ones that slip through the cracks when we are measuring economic activity. Despite this, it remains true that we need better, objective general measures of the “new economy”. Until those are available, the jury will remain out on the impact of the “IT revolution”.

### **1.5 Implications for Business Strategy**

The most basic way that the information revolution changes the economics of the marketplace is that it makes information about all kinds of products and services more freely available. While simple formal models of the market system often take it for granted that information about products and about buyers and sellers is abundant, in practice, this is not the case. In fact, one of the virtues of the competitive market system is its ability to economize on the use of information. Yet simple, textbook competitive markets cannot overcome some kinds of lack of information: for example, the quality of a product may be observable to sellers who provide it, but not to buyers. In practice, all kinds of institutions arise to overcome informational problems. Business firms themselves may be viewed partly as a response to information problems that prevent the use of markets for all transactions. The market economy can be viewed as a scene of constantly shifting attempts to create advantages over competitors, by finding opportunities for greater efficiency or satisfying wants more effectively.

In this situation, the availability of greater information about products and services may upset existing institutions, changing the relative costs and benefits of current ways of doing things. Precisely how this may occur is one of the major themes of this book. How firms organize their own internal operations and transactions can change, and how they interact with consumers can also change. New kinds of firms may arise simply to manage the new possibilities for market interaction. Chapters 5 through 8, 11 and 12 deal with many of the specifics of how markets and firms can and will respond to the new levels of availability of information about products and services.

The second basic impact of the information revolution is on information itself as an economic good. The most famous example of the magnitude of this impact, repeated in several books and articles on the information economy, is what happened to the *Encyclopedia Britannica*. The *Britannica* was the Rolls Royce of encyclopedias, with thousands of pages of articles by the best in their fields. It sold for thousands of dollars too, priced to recover the cost of a well-paid direct sales force as well as the printing cost for its two dozen volumes. This business was pretty much completely destroyed by the ability to put a reasonably large amount of information on a single CD-ROM, sold for under a hundred dollars, or even bundled in “free” with a home computer system. Microsoft’s Encarta was no doubt inferior in quality, but it was “good enough” for most people, and the price was right.

The ability to store, process (including copying) and transmit large quantities of digital information at lower and lower costs is now the central characteristic of information as an economic product. A world where the marginal costs of providing information approach zero is a world where businesses that deal in information have to find new ways to provide value to consumers, ways for which they can actually charge enough to recover the costs of producing the information in the first place. Information has to be bundled, it has to be personalized, and it has to be managed within a service that creates a long-term relationship with the buyer. To the extent that other products and services have also been bundled with information in the marketplace, and that this bundling changes, firms have to create new bundles of value. For example, online retailers try to provide their customers with suggestions and ideas, based on tracking the buying and browsing patterns of individual customers and those with similar interests. This is not dissimilar to the old personalized service in the local store, but can be done at a scale that was earlier impossible.

The ability to process large quantities of information in increasingly sophisticated ways is at the heart of the information revolution, extending not only to the ability to make suggestions about existing products, but also to design products in collaboration with individual customers, and to do it at a large scale. Flexible mass customization is more than a piece of jargon: it is one of the pillars of business strategy in the information age.

The nature of information, where marginal costs of delivery are small and fixed costs of production may still be large, is often alleged to favor winner-take-all outcomes. This is reinforced by the benefits of creating and controlling large networks: consumers will presumably join the network that is already large, to get the highest benefits. Thus buyers will look on eBay, because it is the largest online auction site, while sellers will list there for the same reason. The size advantage keeps reinforcing itself. On the other hand, if individuals can simultaneously participate in more than one network, and if a smaller, competing network can offer a price break to attract them, then the advantage of the winner will be limited, and taking all may not be feasible.

Focusing on information leads to a different emphasis in terms of the economics of business strategy. Pure price competition is less important than competition along an array of different dimensions. Pricing itself becomes more complex, and is joined by advertising, product differentiation, lock-in devices, and so on. All these dimensions exist independently of the Internet and e-commerce, but they become more salient in a world where information technology operates throughout the stages of production (what business strategists call the “value chain”), as well as in the interaction of buyers and sellers in the marketplace. Chapters 13 through 17 tackle these aspects of business strategy.

## **1.6 Work, Play and Communities**

Work is a large fraction of our lives. It is useful to recognize how drastically work was altered by the industrial revolution, the introduction of factories, and the rise of

large corporations. Cottage or home production became relatively insignificant, as mechanization and economies of scale caused work to be concentrated in factories and offices. Now information technology has loosened the bonds of location, making work once again more flexible for many.

Several trends have driven the changes in work. First, the increase in the importance of services relative to manufacturing, and of the information economy in general, reduced the proportion of factory jobs. Next, the falling cost of computing power allowed many tasks to potentially be performed at home, rather than in the office. Most importantly, the Internet has removed the isolation of the home worker. Communication and collaboration can take place among workers in different locations. Physical proximity for many jobs becomes only a part-time requirement.

Some of the change is just in freedom of location. However, as we shall explore in Chapters 5 and 11, some of the change is in the nature of the firm itself, sometimes reducing the bonds that define a firm. Employees become independent contractors, with their own capital (human and physical), almost harking back to the pre-industrial era of home production.

Another change that comes from the falling cost and increasing versatility of communication over the Internet is in the global distribution of work. The customer in the US may have a telephone query answered by someone in Ireland, or even in India. Computer programming or program testing assignments may be sent over the Internet wherever people with those skills are available, to be completed and sent back the same way. The supply of some kinds of skills becomes global rather than local or national.

Our industrial age leisure activities have also been shaped by scale and specialization. Sports and the performing arts have become large scale spectator or audience events. Radio and television brought broadcasting into our vocabularies, creating mass markets for entertainment while removing locational barriers. Recording technologies expanded the scope for listening to music or watching movies, while introducing greater choice into our decisions. All these developments in our leisure activities are enhanced and broadened by the Internet. Inexpensive digital recording and transmission of music and video give us a range of options unimaginable in the past.

Perhaps the greatest impact of the substitution of bandwidth for being in the same place has been in game playing. One can play traditional games, such as bridge and chess, over the Internet, with opponents and partners who may be anywhere in the world. More widespread is the enormous expansion of online game playing. Computer games become virtual worlds where individuals act out their fantasies and try out strategies. Game characters take on lives of their own, becoming valuable commodities themselves for game players who want to win any way they can. At one level, the interaction is no different from that of board games that have been played for hundreds or thousands of years, that of stylized competition. However, the complexity of such games has increased exponentially, and the Internet has demolished distance in creating the communities of game players.

Online game players, members of a project team designing a software program, people at work and play form communities based on shared goals or interests. Information technology allows these communities to be freed from the need to share a physical space. Interactions take place on computer screens instead of face-to-face, but the interactions that are possible in cyberspace are getting richer and richer, allowing more and more communities to form.

Work and play are not the only glue that binds communities. Any kind of shared interest can provide the impetus. Those suffering from a particular disease, fans of a rock star, or collectors of sports memorabilia can join together to exchange information, ideas and experiences over the Internet. These communities may provide commercial opportunities, since they provide access to that ever-scarcer commodity, “attention”, but they may also lead to more profound social changes. Political organization, in particular, takes on a new dimension, perhaps expanding the scope of democracy, while definitely changing its nature.

Perhaps the most remarkable change of all is how, in just a few short years, the majority of people in the industrialized world have come to take for granted so many possibilities that alter their lives, and may reshape the social fabric. The Internet, at its core, is a very human-centered development. This may seem somewhat paradoxical. The underlying information technology is complex and abstract. But the Internet and its associated technologies allow us to be creative, to be individuals, and to communicate and connect with other individuals in new ways and with new freedom. This extension of basic human capabilities, amplifying humanity and not just brain power, is why the Internet excites so many of us, and inspires sometimes fevered praise.

## **1.7 Conclusion**

While the fundamental social changes in work, play and communities are important, our scope in the following chapters is much more modest. We want to understand what is new about the new economy, get some insight into how it is evolving, and perhaps make some guesses about where it might be headed. Electronic commerce itself is just a part of the new economy, though the boundary lines are blurred. The goal of this book is to understand what electronic commerce is, how economic principles govern its operation, and what those economic principles imply for business strategy. Along the way, we will touch on many of the broader themes discussed in this chapter. More importantly, readers will be living the transformation at the same time they are studying this book.

## **Summary**

- Electronic commerce involves a mix of technological, legal and economic issues. The technological developments that make the information revolution possible have implications for intellectual property rights and contracts. Economic principles do not change, but the role of information as a special kind of product and as a facilitator of markets becomes more important.



- Electronic commerce, or e-commerce, can be defined in various ways, all revolving around transactions relating to commercial activities that are based upon the processing and transmission of digitized data.
- E-business can be considered as somewhat broader than e-commerce, including purely internal processes and activities of firms that are conducted electronically.
- The new (digital, information or knowledge) economy refers to the general importance of information or knowledge in the economy, including e-business as an important, but not the sole, component.
- Information technology remains a relatively small direct part of the economy, but its importance continues to grow rapidly, and it can have significant impact on other sectors of the economy.
- The overall impact of information technology on the economy still does not come out dramatically in measures of economic performance. This may partly reflect the inability of such measures to gauge quality and variety improvements, or to consider cost and time reductions as positive impacts.
- Business strategy in the information age includes greater possibilities for managing information, both as a product in its own right, and as information about other products and services. The organization of firms, as well as their interactions with consumers changes as information becomes easier and cheaper to store, process and transmit.
- Ultimately, the information revolution has profound implications for the organization of work and play, and for all kinds of “communities of interest.” In many circumstances, location is no longer a requirement for rich human interaction in the personal and political spheres, as well as the commercial one.

### Questions

1. In what ways do the terms “new economy”, “digital economy”, “information economy” and “knowledge economy” cover the same ground? What are the differences in the four concepts?
2. Give three examples of new approaches to business that have been made possible by inexpensive long-distance communications (including pre-Internet technologies such as the telephone, if you like). Explain what is or was new in each example.
3. Give three examples, not discussed in the chapter, of Internet-enabled communities. If possible, try to come up with examples that represent substantially new communities, rather than existing ones that have shifted to online presences.