3

Beyond Transaction Costs: E-Commerce and the Power of the Internet Dataspace

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The commercial Internet is now approximately six years old. But what is most remarkable is not the speed of its adoption, the remarkable expansion in the amount of data flowing through it, or even the number of new web sites coming online. Rather it has been the remarkable redirecting of talent and capital to finding ways to commercialize what had been an entirely noncommercial system. It is this wave of talent experimenting with new ways of generating and/or conserving value that is powering an enormous burst of creativity. Our modest aims are to examine a few of the current developments in what the venture capitalists term 'the Internet space' and reflect upon what these mean to the development of the current economy. As with anything written regarding such a fast-moving economic phenomenon, any predictions or observations are based upon conditions and developments that might be rapidly outdated (Kenney and Curry 1999b).

Our central orienting theoretics are Schumpeter's (1969) metaphor of new technologies opening new spaces, and De Landa's (1991) work, derived from Deleuze and Guattari, about the self-organizing impulses which arise out of complex, chaotic phenomena. Schumpeter's perspective is particularly appropriate for the Internet insofar as it is a vast new region being colonized by a variety of activities, many of which are highly novel in their approach. As an intelligent communication technology the Internet enables the creation of virtual places, which, in prosaic terms, are only places in computers. Collectively, these new places constitute a vast virtual space

which is the profound creative product of a process of machine mediated social interaction. Moreover, as Batty (1997) so brilliantly points out, these new cyber places are now beginning to reorient the world of physical places.

De Landa emphasizes the points (singularities) at which order begins to arise out of chaos, rendering previously random individual elements into a higher order, and more powerful, whole (mechanic phylum). This sort of thing is witnessed in the natural world when random air molecules and temperature variations exhibit self-organized coherence, for example to produce a storm. Taken at the individual level, the Internet can be viewed as a collection of individual processes interacting randomly) At this level of analysis one might regard the Internet mainly as a sophisticated communications medium that radically reduces transaction costs between individual nodes (like the telephone). However, if one considers the virtual space of the Internet as a process resulting from the complex interaction of millions of intelligent nodes, it is entirely possible, indeed highly likely, that new processes will emerge from the medium itself. However, for us this emergence, rather than a 'natural' process, is one sparked by an entrepreneur. This is concretized in 'new ways of using the Internet' or when new e-commerce business models are 'invented' or 'discovered' and implemented in code (a new software program).

The power of the Internet belies its simplicity. At first glance the Internet is merely a medium for connections able to transmit anything digitized and a medium which allows for infinite interconnections. Unlike prior communication systems, such as telephony, which established a dedicated connection between two (or sometimes more) nodes, the Internet allows the simultaneous exchange of information in digital form among an unlimited number of nodes, each with its own computing power. The protocols used to transmit data across the Internet are standardized and readable by a multiplicity of platforms. Added to this is the innovation of hypertext, that is, the ability to almost effortlessly move from node to node at a whim – a feature that is only possible because the information has been separated from its physical carrier medium such as paper, celluloid, or plastic. The information content of the Internet is almost completely dephysicalized or dematerialized. It is reduced in its physical essence to the most abstract possible formulation: ls and Os carried by laser light or electromagnetic waves and stored by electrons or magnetic charges. Multi-platform accessible standards, hypertext, and dematerialization are forcing and combining with a remarkable increase in the capacity of global telecommunications systems to rapidly reduce the costs of communicating digital data – notice the reduction-in-cost dynamic itself constantly creates new opportunities. The extreme flexibility of digital representations permit their representing an almost infinite number of activities as diverse as booking airline flights, purchasing items, playing games, viewing pictures, listening to music, or accessing public information. Moreover, once objects, either physical or mental are reduced to digital (i.e. mathematical) representations, they become uniquely malleable and observable, in ways that are not possible with physical or mental objects.

As powerful as all this is, a finer power is derived from the fact that the Internet space is a collection of interconnected intelligent machines. Unlike a simple communications device like a telephone, which is merely a conduit for data, the nodes connected to the Internet are all capable of storing, retrieving, and manipulating data at constantly increasing levels of sophistication. While it is possible to use a telephone to interact

with a computer – with touch tone-based menuing systems for example – it functions essentially as a dumb machine, merely transmitting pulses entered directly by the user which trigger intelligent functions in the computer located at the other end of the line. While at one level the Internet is just a communications system, at a more important level it is a communications system mediated at all its nodes by powerful computers. Each personal computer connected to the Internet is far more than a dumb terminal connected to a mainframe. Thus while it is clearly the case that much of the usage of the Internet is predicated on a broadcast model (i.e. information downloaded for user consumption), there will be a cascade of applications which will either utilize the individual user's computer or storage power in some novel and innovative way, or in some way utilize the collective computing power of the Internet as a whole. In other words, there will be applications that will emerge that are not the proverbial economist's network externalities, but rather network internalities.

Taken together, the intelligent nodes of the Internet (each with their own data and processing power) and their connective links constitute a vast, continuously growing and evolving dataspace.[2] Separated from its material basis, the Internet consists of nothing more than data of two types: code, that is, the data that instruct the machines how to perform (computer programs), and the data on which the code-instructed machines work (see, for example, Lessig 1999). These data are constantly in motion, directed and utilized by intelligent machines that are directly or indirectly in the service of their biological masters. Far from being an inert mass of digitized information stored on metal or silicon, or a virtual simulation of something else, the Internet dataspace is its own reality, sui generis, governed by its own social and technological logics. Thus, the real power of commerce, or anything else, on the Internet derives not merely from the efficiencies of a new communications medium, but from the creative singularities that emerge out of the complex chaos of the Internet dataspace. Put another way, with the interlinked intelligent nodes of the Internet, the sum is greater than the whole of the parts and even the network externalities.

There can be no doubt that the Internet is transforming the very substance of economic activity. This chapter aims to explore some aspects of this transformation by speculating upon the meaning of some of the tendencies that are appearing in the economy due to the influence of the Internet. It begins with a brief discussion of the difficulties contemporary social sciences have in explaining the Internet and its effects. The next three sections consist of a general examination of the development and capabilities of the Internet as they relate to commerce, a more focused discussion of the capabilities of the web for enhancing customer service, and a general examination of the economic and organizational impacts of web-based commerce. This is followed by three sections which examine exemplary areas in which the commercial application of the Internet is leading to new approaches to doing business, or otherwise having a major impact on the way business is already conducted. These factors underlie the current push for the development of web 'portal' sites, the direct marketing model of personal computer assembly and sales, and the use of the Internet to streamline interfirm transactions. The penultimate section addresses the advantages of being first to exploit a particular niche or opportunity. Finally, in the conclusion, we raise the question as to whether the Internet will lead to the proliferation of numerous niche businesses, or whether certain technological and economic exigencies will lead to domination by a small number of very large content aggregators or product marketers.

THE ROLE OF THE INTERNET IN THE FORMATION OF A NEW ECONOMIC SPACE

The Internet is a key aspect of the ongoing transformation of the economy to a form in which materiality becomes subordinate to information and knowledge creation. One way of thinking about this is that in the USA during the 1960s through 1980s there was one computer per 10 persons, in the PC era this had changed to 10 computers per person. In the late 1990s there were 100 computers per person, and some predict that it will soon be 1000 computers per person (Khosla 2000). This seems unbelievable, until one considers that increasingly not only automobiles, but nearly every consumer appliance now contains a computer of some type. Moreover, telecommunications networks have enormous numbers of computers, which are called routers and switches. Already, many of these computers are connected to the Internet, in the next decade all will be.

The Internet is a computer network that connects computers to computers through computers. It is an interactive communications medium through which the user accesses information that would have previously taken much time and physical effort to find.[3] The web is remarkable because the user has the sensation of traveling, though in reality the user is only electronically reaching out and retrieving data to be visualized on a computer monitor. Because of the nature of computer networks, even the path and information search are logged and therefore converted into information that may be of potential value. Moreover, this entire situation must be seen dynamically in that technical components of the system are dropping exponentially in cost; that is, what costs x today will cost half as much in 18 months. The cost of bandwidth is asymptotically approaching zero. So what appears expensive (or nearly impossible to deliver), for example a 3-megabyte data file, will have its cost of delivery halved in 18 months.

With the cost of processing power, bandwidth, and connection continuously declining, it is reasonable to assume that anything that can be digitized will be. **In** the commercial realm this means that all standardized activities, which have a separable information component will likely have that separated and handled electronically. Even though there is no certainty about the ultimate configuration of Internet-related commerce at maturity, businesses with standardized products such as securities, insurance, music, video, stamps, and tickets will have much of their business conducted online. Of course, sales activities can also be moved online at tremendous savings, because of the removal of paper and individuals handling paper from the value chain. Cyberspace allows the emergence of online communications and trading platforms, where economic actors can conduct businesses.

Prior to the Internet (electronic data interchange **(EDI)** was so costly and limited in its capabilities that the interactions were quite limited), the cost and time necessary to evaluate information were so great that physical and **EDI** interaction between the various parties had to be limited. In other words one normally interacted with only a small number of potential transaction partners. The Internet rapidly decreased the costs and other entry barriers dramatically increasing the potential market size. For example, in the consumer-to-consumer (C-to-C) area eBay has created the world's largest garage sale, and made it continuous (24/7), convenient, and inexpensive.

Similarly, in the business-to-business (B-to-B) area, markets are being built (i.e. the code is being written), which can become platforms on which entire industries can trade. Forrester Research estimates that over half of all B-to-B e-commerce will be marketplace based instead of direct trade between partners (Industry Standard 2000a). Finally, virtual stores (B-to-C) have been created with inventories, i.e., entries in gigantic databases, which are dramatically larger than any physical store, and also are easier to access from any computer. Smart data collection and marketing technologies enable e-store customization all the way down to the individual level, and have precipitated a major debate about the privacy rights of consumers in cyberspace. Ease of access is becoming even greater as the Internet is extended to wireless, enabling a new wave of e-commerce potential.

The increasing dematerialization of communication, i.e. its separation from paper or sound waves, would seem to argue that space no longer matters. But, in fact, it does except in new ways. It is in the transport and warehousing functions where the physical world is manifested. Some dot-corns have embarked on major building campaigns. For example, in 1999 the Internet grocer Webvan embarked on a $1 billion project to build 26 warehouses to serve the major US cities. With these warehouses, Webvan hopes to completely reorganize the way groceries and other products are delivered. In other words, it is their intention to move purchasing out of supermarkets and shopping malls by offering convenient delivery. Another major development is the shifting of product delivery from bulk long-haul trucks, which are used to deliver products to traditional stores to the less-than-load delivery industry exemplified by UPS, the USA Postal Service, and Federal Express. Since the customer base is now global, these delivery services must also become global. Finally, the Internet has made it possible for these delivery services to offer the customers the ability to track their packages online.

The stampede to invest in Internet-related businesses, in the USA nearly $20 billion in 1999 (an increase of nearly 500 percent over the previous year), has created a situation in which company valuations seem to have departed from all reasonable standards (Industry Standard 2000b). The curious economics of the Internet are exemplified by Yahoo! which is valued at over $40 billion, even though it generates a limited amount of income. And yet, it offers a plethora of services including e-mail, Internet access to a massive web database, a search engine, stock tracking, file storage, a appointment calendar, chat, a messaging service, travel booking services, news and weather, all for free. Like America On Line (AOL) and other web user aggregators, Yahoo!'s high market valuation is predicated on the vast future potential represented by its online users.

The existence of free content provided by for-profit enterprises goes far beyond simple notions of a loss leader. For example, with the drop in cost of bandwidth, if the current movement towards voice-over-IP continues, the charge for telephone calls globally might just become a monthly fee. There will be no reason to bill for the minutes themselves. From the perspective of traditional economics, giving products away for free or for a single monthly rate appears foolhardy and even perverse.[4] The economics of a product whose cost is asymptotically approaching zero can only be expected to be unusual. Moreover, once landline and wireless telephony follow a more Internet-like pricing model, new value-added services can be marketed over the network. This has caused some economists and business theorists to begin rethinking

traditional economic concepts to better account for the value-added from knowledge creation and the `winner-take-all' aspects of capturing or becoming standards in information- and communication-intensive industries (Arthur 1994; David 1986; Shapiro and Varian 1999). The efficiencies and synergies being generated in the electronics and telecommunications realms are driving the discussion of the New Economy.

Economic puzzles like these are only the tip of the iceberg; there are other phenomena pressing beyond the boundaries of traditional social sciences. This is the case where value creation through machine-augmented interaction gives rise to new forms of value creation in both an economic and social sense. Web site user communities actually are an integral component of the value of many commercial and noncommercial sites. The user community creates value in a profoundly social sense. For example, reader's reviews are posted at Internet bookseller Amazon.com (Hagel and Armstrong 1997). In this way Amazon becomes more than a mere bookseller leveraging the disintermediative capabilities of the Internet. Users can, and often do, utilize Amazon's site as a research tool, without buying anything; a sort of hyperlinked, constantly evolving *Books in Print* and *Kirkus Reviews* all rolled into one. The social (community) interaction process, and its concomitant communication of information and opinion, and the comprehensive nature of the Amazon site creates its value (K otha 1998). The significant lesson from both Yahoo! and Amazon is how they provide multiple reasons for the users' continued patronage. Put differently, they enmesh the user.

THE INTERNET AND COMMERCE

By the early 1990s the Internet hosted a collection of useful information and downloadable software. However, the tools for accessing this information were complicated and required a certain amount of expertise and system knowledge on the part of the user. IT was by no means plug-and-play. Most of the innovations were designed to make the Internet more useful to academics and computer scientists. The breakthrough came with the World Wide Web (WWW) and Hypertext Mark-up Language (HTML) protocols, which were developed by researchers at the European Laboratory for Particle Physics (CERN) in Switzerland in order to facilitate information exchange among physicists. The next step was the development of special software, the browser, which made these and other protocols invisible to the user. A number of different browsers were developed, some more functional than others, and were distributed freely over the net. One of the early browsers, Mosaic, developed at the National Center for Supercomputing Applications (NCSA) at the University of Illinois Urbana-Champaign became wildly popular with millions of copies downloaded in a few short months after its release. This was perhaps the first instance in which the unique characteristics of the Internet dataspace were leveraged on their own terms, in this case for the purpose of extremely rapid market penetration. Soon, the venture capitalists would develop the term 'viral' to describe products or ideas whose adoption curve could be measured in days and weeks. This confronts business with a treacherous situation in which competition can literally derail a well-planned marketing strategy overnight.

The Internet confronts businesses with four unique characteristics: ubiquity, interactivity, speed, and intelligence. The first three relate to what might be considered the extensive development phase of the Internet. The fourth, intelligence, relates to the capacity for intensive development of the Internet based on its distributed independent processing power. Those firms who wish to succeed in Internet commerce have had to confront and manage these four characteristics.

The first is ubiquity. By this we mean that all 'places' on the Internet are accessible to the user on what is essentially an unlimited and equal basis. The user can go anywhere on the net with a minimum of effort; there is no inherent technological reason for the user to start at a particular point. Only five years ago, most users had only one entry point to the WWW, either their corporate network or the proprietary network services predating the rise of the WWW in the mid-1990s, such as AOL, Prodigy, and CompuServe. Beginning in the late 1980s, most, if not all of the services provided by these network services was available at either free or subscription stand-alone web sites. Now access and availability of content and other services is increasingly available to all over a variety of media including telephone lines, television cable, and, soon, wireless. Emblematic of this ubiquity is the near universal recognition of the meaning of `www.xxxx.com.'

The second important characteristic of the Internet is interactivity. The Internet itself was developed through a remarkable process of interaction by researchers located around the world. Commercial publishers who wish to succeed on the Internet must offer more to customers than that which is ordinarily available in print or from some other media. One of the more successful web publishers has been the *Wall Street Journal*, which has seen steady growth in its paid subscription base since it began collecting fees about two years ago. The *Journal's* site offers not only standard print content but also a wide range of content and services not found in the print edition. These include articles from other Dow Jones publications, past article search and retrieval, customized stock quotes, job finding information, a database of company background information, interactive discussion of various current news topics, a news audio feed, the ability to customize the Web page to the user's interest, and numerous other features. The *Journal* site serves both as a substitute for those with limited access to the print version, such as overseas readers, and as a complement to print subscribers who wish to access additional services such as company and stock tracking from a brand name they know and trust.

The interactive nature of the Internet also gives rise to new forms of collaborative activity. Some software firms place nearly completed software (beta releases) at a web site and encourage computer aficionados and IT professionals to install the software and test it for bugs, functionality, and features. Consumers actually participate in the knowledge-creation process by using a new product and communicating the results back to the company. Numerous software producers leverage the communitarian power of the Internet by prereleasing unfinished 'beta' versions of new software products over the Internet, where a large number of interested users can locate problems and offer suggestions for product refinements. This diminishes some of the costly burdens of in-house testing and decreases the distance between software creators and customers by creating an information feedback loop. Moreover, integrating a subset of customers directly into the product development process also accelerates

the creation of demand for the finished product. The open source 'movement', best exemplified by the Linux operating system and Apache web-server software programs, takes this logic to an even higher level. These, and other programs, are downloadable for free, and have relied on the Internet for both their dissemination and their continuing technological evolution. Open source has emerged as an important software development strategy and has been embraced by numerous startups, and in the case of Linux, even by **IBM (Di** Bona *et al*. 1999).

The third important characteristic of the commercial Internet is speed (Davis and Meyer 1998; Kenney and Curry 1999b). Because the Internet is an ubiquitous, interactive system based on a multipurpose digital computing platform, changes such as system software upgrades, new standards and protocols, and new publications (content) can be developed and disseminated very rapidly. The availability of out-of-the-box network and network server hardware and easily adaptable software applications such as credit card billing systems and searchable relational databases enables the rapid development of commercial systems at very low cost. Moreover, many Internet-based businesses have been developed as overlays on existing infrastructure, which further reduces startup costs and time of deployment. The rapidity at which businesses can be established on the Internet places a great deal of emphasis on being the first in a particular market category. An interesting case in point is Amazon.com, an Internet bookseller based in Seattle. By relying on existing systems of distribution as a sort of retailing adjunct to them, Amazon was able to start operations quickly and efficiently (Bianco 1997). By purchasing advertising link space for itself on the Internet from frequently visited sites such as Netscape's, Amazon developed a high volume business in a very short time (Southwick 1996). Founded in 1995, Amazon had over $116 million in net sales during the second quarter of 1998, an increase of 316 percent over net sales of $27.9 million for the second quarter of 1997 (Amazon.com 1998). Barnes & Noble, an important innovator of large, high variety bookstores, has only recently recognized and introduced bookselling on the Internet as a logical extension of its own large-scale distribution and inventory-tracking system (Martial 1997). But, being a late entrant in the Internet book sales arena, Barnes & Noble is having great difficulty catching Amazon.

The final important characteristic of the Internet is ultimately the most powerful of all. The previous three characteristics represent an extensive historical evolution of telecommunications technology, i.e. bigger, faster, and better. The fourth, intelligence, i.e. the ability, distributed throughout the Internet, to retrieve, store, and process information, renders each node something far more than a passive information conduit, and the Internet itself something far more profound than a mere communications system. The machine intelligence (i.e. processor power and code) embedded in each node (both client and server) enables a more intensive mode of development based on the potential of the Internet as a complex, technology-mediated, social relation. Business models and strategies rooted in old notions of marketing developed in the era of one-way broadcast media have met with only limited success at best. Those strategies which in some way attempt to utilize the Internet on its own terms, as a synergistic whole, understanding in McLuhan's famous words that 'the medium is the message' have been more successful.

The individual machine-based intelligence of the Internet has two aspects: node-

based and net-based. Node-based intelligence refers to the systems, which, while they are net-oriented, reside primarily in servers and/or clients. This is hardware and code which make the Internet much more than a mere communications medium-extending interaction between individuals to interaction between individuals augmented by intelligent machines and, ultimately, machine-to-machine interaction. In this classification are all the functions which power the Internet beyond basic communications (like e-mail): streaming media, user-searchable databases, targeted marketing/advertising, the various tools provided by portals and other service sites, e-retail functions/sites, and all the other machine-augmented Internet interactivity. Net-based refers to the synergistic development that arises out of the Internet as a whole as a consequence of interactive machine intelligence.

Businesses (and consumers as well) are increasingly able to use their node-based intelligence to both create and utilize the collective information creation and storage capabilities of the Internet. For example, MicroStrategy builds 'data mining' and `decision support' software, which is meant to enable the nascent B-to-B revolution. The term 'data mining' is somewhat of a misnomer conveying the impression of something along the lines of database management software for 'data warehouses', i.e. very large databases. MicroStrategy goes far beyond this, as it develops software enabling companies to make use of the Internet to make business decisions about marketing, production, and logistics, based on data 'mined' from the Internet. MicroStrategy's applications are not mere stand-alone database applications, which utilize the Internet, but rather applications that allow users to effectively and interactively utilize the vast and constantly growing Internet dataspace. In the same way that the Internet becomes a ubiquitously accessible hypermall, the Internet dataspace becomes a hyperdatabase requiring users to create metadata, i.e. distilled data such as those generated by search engines or shopping aggregators like C-Net, to effectively utilize it.

There are already numerous examples of all this, and undoubtedly there will be many more in the near future. Whispernumbers.com uses automated search technology to sweep the Internet for rumors, opinions, individual estimates, hard data, etc. on company earnings. These data are analyzed to produce earnings estimates that have been observed to be more accurate than those produced by professional analysts (Gimein 2000). Whispernumbers.com thus uses its node-based machine intelligence to access the 'group mind' of the Internet, leveraging, and going beyond, ubiquity, interactivity, and speed.

Other examples use the distributed computer power of the Internet to develop unique approaches to content distribution and work sharing, in effect, using the Internet itself as an exploitable resource. Napster is a software program that is downloaded to the hard drive where it creates a file folder in which MP3 files are inserted to make them available to Napster users anywhere in the world[5] Unlike one of its counterparts in the MP3 space, M P3.com, which serves MP3 files to its clients out on the web, Napster.com does not store any music; it merely matches up the downloader and the provider. Napster transcends the standard client/server logic in which web surfing 'clients' access the data collected, created, or repackaged by web `content providers', instead making every Napster user a content provider (Figure 3.1).[6] Another interesting example is the Seti at Home project based at the University of California, Berkeley. Seti at Home is a screen saver program that downloads and

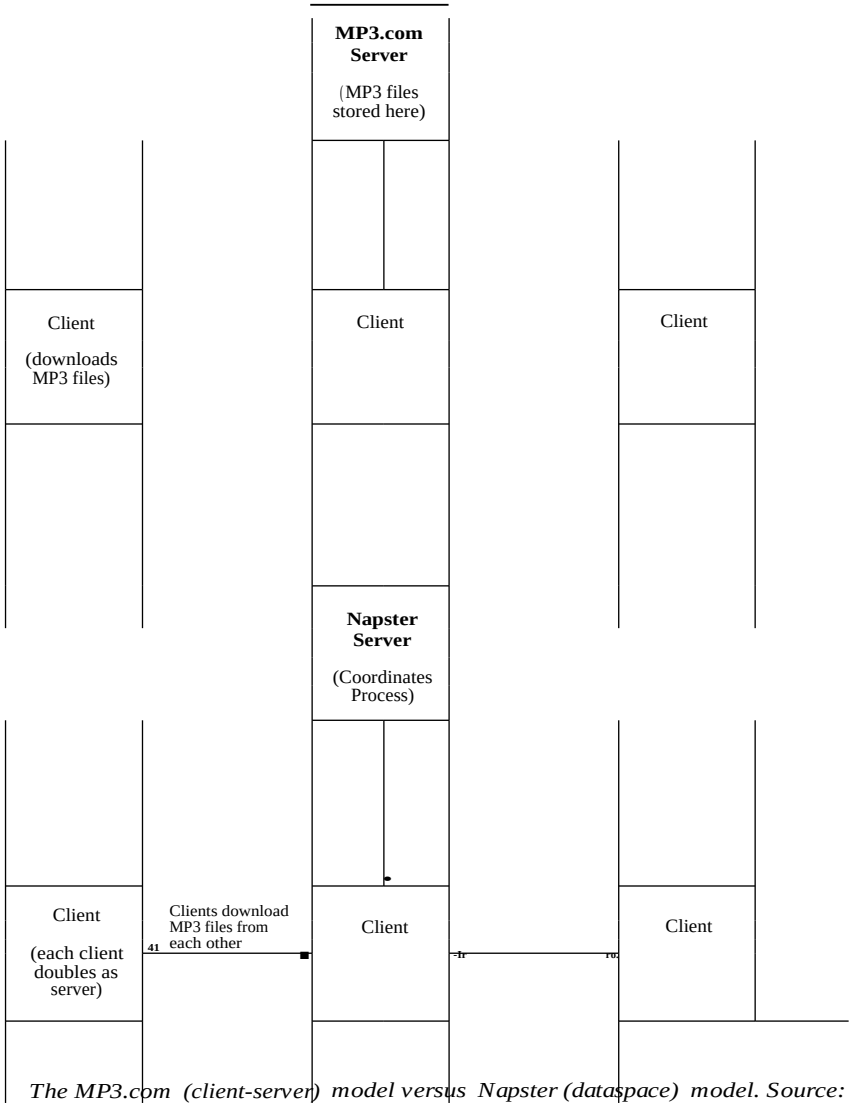

Figure 3.1 The MP3.com (client-server) model versus Napster (dataspace) model. Source: Kenney and Curry

analyzes radio telescope data, searching for signs of extraterrestrial intelligence. The Seti at Home project radically reduces research costs by utilizing the collective computer power of over a million users to perform analysis which would normally require enormous amounts of expensive supercomputer time. How unusual is the current conjuncture? Napster was created by a 19-year-old college freshman at Northeastern University majoring in computer science (Brown 2000; Rosenberg 2000). There are already improved versions emerging, even while Napster.com is working with universities to improve its current bandwidth-hogging characteristics. We believe Napster is only the beginning of this lashing together of computers.

BUSINESS-TO-CONSUMER E-COMMERCE

Customer service functions have always been a time-consuming person-to-person activity; however, most of the interactions are highly routinized. An important recent step in automating customer service was telephone call processing, but this was a slow system with very low bandwidth. **In** other words, an excessively long menu of choices leads to consumer disconnection and difficulties in creating user-friendly branching systems. More sophisticated nonhuman intermediated customer service would have to wait until the consumer had a device able to handle greater amounts of information, i.e. the PC and the computer modem. When the installed base grew and the technology was sufficiently mature it became possible to place information on a server open to customers. This redefined customer service by increasing the level of provision while decreasing the cost. This was possible because most interactions are entirely standard. For example, many customer questions are for routine information such as store hours and directions. Answers to such questions can be codified, indexed, and stored on a server to be accessed online and downloaded. For simple questions such as directions, the Internet can download a map, whereas on the telephone error-prone verbal instructions were necessary. Essentially, customers can access the information they need to find and create value for themselves from the provider's web site at practically no cost except the initial startup costs.

In addition to seeking routine information, customers are also attracted to sites that provide detailed information about products or services. A potential customer can browse several competitors' sites, as well as third party sites, which discuss the product in question, compare prices and features, gather general information about a particular product or type of product, taking as much time as desired before making a purchase. A recent study by the Fuqua School of Business at Duke University found that consumers were more likely to buy products from sites that provided comprehensive information than from sites that had slightly lower prices but little in the way of useful information (Bransten 1998). The point is that the user can select the desired amount of information, removing the need for the information provider to make decisions based on an 'average' consumer.

The types of customer service provided online depend upon the firm's product or service. For example, software companies make available various software patches, add-ons to current products, and/or demos. Increasingly, software programs such as Norton Antivirus or Netscape Communicator have the ability, upon a prompt from the user, to automatically check for updates and then download and install them. Delivery through the Internet is essentially without cost and has the added benefit of developing a connection with the customer. In other cases, service bulletins or product-related information are placed on company web sites for informational purposes. These relatively straightforward applications replace or augment previous product upgrading or information dissemination techniques.

Global logistics firms, such as **DHL,** UPS, and Federal Express, have taken the potential for customer service much further. Federal Express, one of the aggressive first-movers, has opened the tracking portion of its computer system to Internet users. The initial effort of Federal Express on the Internet was a one-way information provision service that customers could use to receive information about the location of

the shipment and its arrival time (Lappin 1996; Grant 1997). The success of this initial effort spurred Federal Express to use the Internet in other ways. Based on its experience with the tracking service, a web site was developed to permit customers to use the Internet for all their shipping functions. The features now available include scheduling pick-ups, detailed maps of all drop-off locations, rate charts, and other information regarding international customs regulations. Moreover, the site offers free downloadable software that speeds the processing of shipments, allows the user to store addresses in an address book, maintains a shipping history in a log, and creates and prints labels (Fedex.com 1998). Many shipping office functions have been transferred onto software and into data communications networks. Human intermediaries and physical documents were replaced by software. Not only is it less expensive than previous methods, but it also provides the mechanism for creating new ways for firms and their customers to interact. Most critical, the information provided through the server gives the customer the resources to create value from the site.

The potential for e-commerce is illustrated in the highly simplified Figure 3.2. **In** Panel 1 we illustrate the conventional system in which products moved from supplier to the customer through the various intermediaries, and information moved the other direction physicalized in the form of paper. The important thing to understand here is that almost invariably product was pushed through the supply chain before the customer purchased the product. The information in paper form took a long time to move back to the supplier. Within the system there was the constant threat of waste in the form of production that the customer did not want. For example, in the auto industry there was on average 60 days of inventory in the channel from the producer to the customer, this is product that is simply tying up capital and losing value. Similarly, the relationship between an assembler and suppliers was driven by information on paper and, unless operated on a just-in-time basis had the same problem of push versus pull. **In** Panels 2a and 2b we schematically show how EDI or electronic service industries operated. In Panel 2a it is plain that paper has now been eliminated from the intermediary through to the supplier. However, we should note that the **EDI** systems were proprietary and quite costly to implement. Moreover, they were usually very inflexible and not open to outsiders due to their high cost and proprietary protocols. In services such as brokerages that could be reduced to electronic impulses the brokerage houses had already implemented telephone touch pad systems. In other cases, such as travel agents, the customer phoned the travel agent and made requests that the travel agent typed into the computer system. **In** this case the travel agent had access to the computer, but really was, for simple transactions, merely a data entry operator.

The power of the Internet is exemplified in Panels 3a and 3b. Not only is there now the ability to connect every node in the value chain, but also there is the possibility of new intermediaries joining. The point is that in a value chain that is completely networked by the Internet all the paper can be removed from the system. Moreover, if it becomes a true pull system, then risk and inventory can be driven out of the system making the entire system more efficient. The ideal example of this is Dell's management of the personal computer value chain (Curry and Kenney 1999).

The Internet provides the potential for entirely new intermediaries. These new possibilities are illustrated in the differences between Panel 1 and Panel 3a in Figure 3.2. Notice that there is the potential for entirely new intermediaries to enter the value

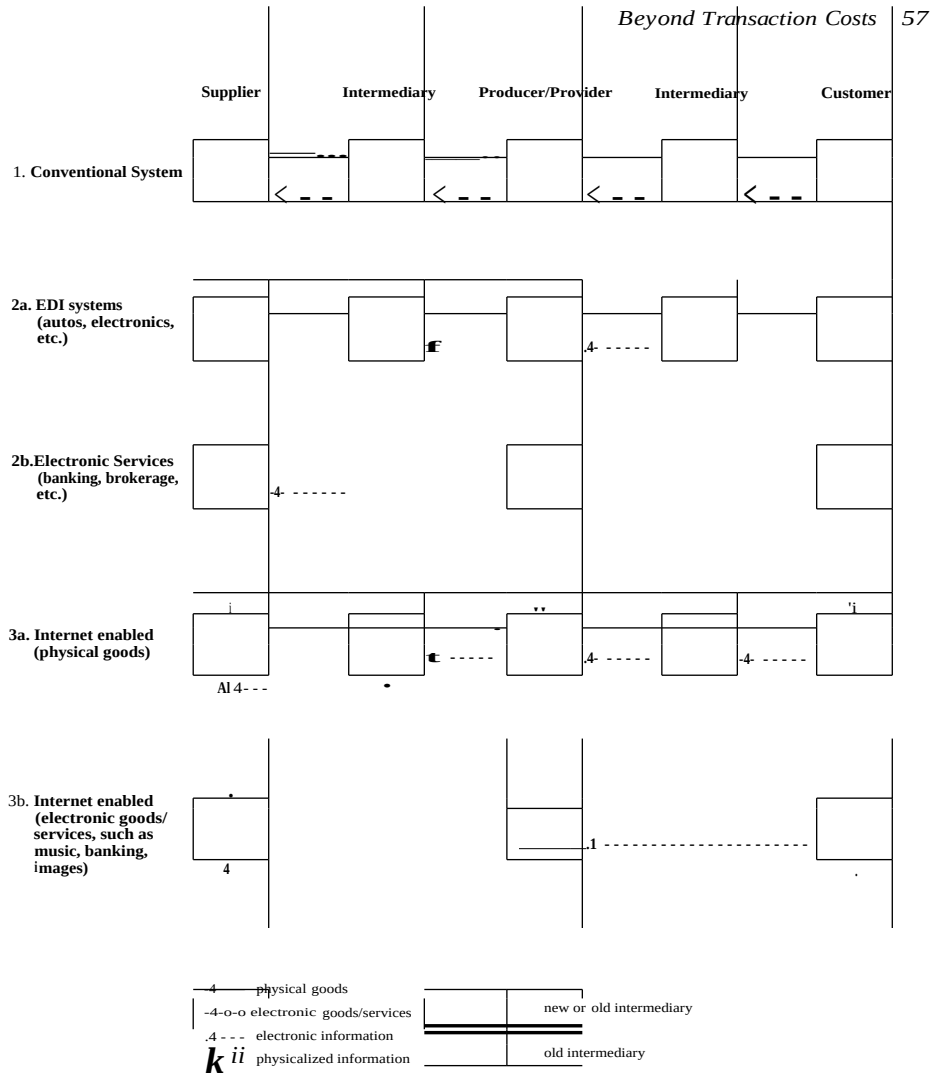

Figure 3.2 *Evolution of value chains into the Internet era: Source: Kenney 1999*

chain. This is now actively underway as venture capitalists fund startups intent upon displacing incumbents, creating new marketplaces (or platforms), and reorganizing value chains.[7] The use of Internet retailing will transfer an increment from traditional channels to online. No previous communications technology has allowed the customer to personally search databases of, for example, books, autos, software, airline schedules, and then complete the purchase without face-to-face interaction. Traditional commercial locations deployed a service worker (or intermediary) that communicated with a customer while interfacing with a computer and performing search and booking procedures. With Internet browser technology it is possible to remove the service worker as a translator between the analog customer and the digital database or to `disintermediate the relationship (of course, software is now the intermediary). This

makes it possible to reconceptualize activities that formerly required human service workers and directly connect customers to firms' computers. With credit card payment the entire process is electronic with the exception of delivery for some goods, such as insurance, stock certificates, and financial instruments, there is nothing but an accounting notation in a computer.

There are remarkable benefits for a retailer who can transfer sales activities to the Internet, though they vary by product or service. For many services in which there is no physical component at all it may be quite easy to move the entire process online. A general benefit is that an Internet retailer can hold far lower inventory levels than a conventional retailer who must have the items in stock, thereby tying up capital. The difference can be striking. For example, Amazon.com, the online bookseller, turned its inventory over 42 times in 1997, whereas its largest competitor, retail store-based Barnes & Noble turned over inventory only 2.1 times (Willis 1998). Moreover, a significant portion of Amazon's inventory is held by distributors who ship the items directly to the customer, although this is changing as Amazon attempts to develop a system of buying directly from publishers (Bianco 1997). Though Amazon began in books, it soon expanded to various other items including **CDs,** videocassettes, and consumer electronics, while investing in an online pharmacy and various other Internet retailers. Simultaneously, it began constructing centrally located warehouses to serve its online customers.

Internet-based retailing eliminates the costs of retail branches, thereby lowering initial entry costs and the fixed costs associated with retail stores. Moreover, the use of the Internet for sales combined with less-than-load delivery firms such as Federal Express and UPS extends the customer base from the relatively local reach of individual stores to anyone anywhere in the world having access to a PC with a modem and a credit card. So, not only can the large Amazons enter the retail market. It is also possible for small local stores anywhere in the world to join the global market by selling their product. Thus the Internet can disintermediate retailers, but it can also connect them with a much larger customer base.

The ability to build very simple graphical representations of a potential purchase allows consumers the ability to make their purchases online. Complicated sets of purchasing decisions such as booking travel and hotels can be undertaken online without the intervention of intermediaries. For example, air travel, car rental, and accommodations can be booked at an online travel site. The online travel agent can go far beyond a telephonic travel agent by providing much broader and more detailed information including textual descriptions, images, and even reviews of the various destinations. **In** effect, huge databases of information can be made available to the customer in such a way as to allow users to 'customize' their travel agenda. In essence, the customer produces a uniquely customized product from an entirely standardized set of choices.

Compare the economics of an online travel agency with that of a conventional agency. At the conventional agency a person deals directly with the customer in a situation in which the time spent with a customer on a booking is a direct cost. In essence, each interaction with the customer is a cost (Department of Commerce 1988, p. 28).[8] **In** addition, travel agents can make mistakes; however, on the Internet the customer bears full responsibility for the reservation. In the case of the conventional

travel agency, return business is dependent upon building an interpersonal relationship with the customer. The online travel agency uses the online customer community to develop relationships between the customers and with its site in the hopes of encouraging repeat business (Nagel and Armstrong 1997).

The travel agent's experience combined with a personal relationship with the traveler can be seen as a knowledge base that enabled them to make recommendations to improve the traveling experience. The travel agent was a form of expert knowledge. Customers not utilizing the travel agent's knowledge base in effect subsidized those using the knowledge. **In** an Internet-based system information on travel habits, previous travel, and other characteristics (i.e. a profile) allows the computer to search its database and match it with similar profiles to be used to offer 'personalized' services to a customer.

The success of online travel agencies is apparent (Needle 1998). For example, Microsoft's Expedia site launched in 1996 had more than $12 million in monthly sales in January 1998 and was growing quickly (Lipton 1998). As important, the US travel industry is being reorganized, not only with new entrants such as Microsoft, but also as the airlines are reducing the fees they pay to travel agents and encouraging customers to buy tickets directly through their web sites. In the process these web sites are being built into virtual places. For those desiring human contact, the offline travel agent will remain available, but increasingly they will be paid for directly by the user; witness the increasing use of service charges by the offline travel agencies (a tactic that will accelerate the movement of customers to the online agencies).

To recapitulate, the technical capacity for online retailing can be understood by seeing the two tendencies that were integrated by the Internet. First, the decreasing cost of long-distance telephony meant many customer transactions had already been centralized into call-processing centers especially for the purchase of products such as tickets, software, computers, etc. Second, the development of sophisticated database management software and the use of corporate intranets serviced by large-scale computer servers meant that the purchasing process had been largely computerized. The service worker using a networked computer to take an order was merely an intermediary between the customer and the corporate database. **On** the demand side, the increased usage of e-mail, the development of inexpensive, user-friendly browsers, personal computers with faster modems, and more persons attached to high-speed local area networks created a large installed base of potential consumers. The final step was to habituate customers to purchase items through cyberspace. As more and more consumers are online, old retail methods will be eclipsed since consumers have vastly more information at their disposal, not only about the products available, but about their prices as well. Premium list pricing will be more difficult to maintain as consumers can nearly effortlessly find the lowest-priced vendor, or go to a site that aggregates the price information of several vendors.

E-MALLS AND PORTALS

When entrepreneurs began exploring the use of the Internet for e-commerce, the question was how to attract customers. This was a thorny question because the chaotic

unplanned topology of the Internet made it difficult for customers to find the vendors (Watson *et al.* 1998). One experiment was to aggregate commercial web sites at an e-mall, which was the analog of the physical world's shopping mall *(Economist* 1997). Here, the idea was that a web site developer would build a web site at which a number of vendors would create virtual stores. The aim was for the vendors to pay rent in terms of a fee or a percentage of sales for their site. The developer would be responsible for advertising the site and bringing in the web surfers. The more creative of these actually generated small buildings that the customer could click on to enter. This business model built on the suburban shopping mall seemed entirely plausible. However, the difficulties became obvious rather quickly. The shopping mall provides a centralized place for consumers, who had moved away from traditional downtown shopping districts to the suburbs. Prior to the automobile, the downtown had been served by public transit such as streetcars and subways, so commerce clustered at its nodes. The fatal flaw with e-malls was that there were no reasons such as convenience, less traffic, or crime that would impel 'shoppers' to visit the mall rather than go 'downtown'. Moreover, the cost barriers to starting an e-store were never high enough for merchants to 'locate' in an e-mall rather than building their own site.

Another problem related to the relatively slow acceptance of the e-mall idea is advertising. Many commercially oriented sites rely on advertising as either a full or partial source of revenue. The proprietary online services such as Prodigy, MSN, or AOL serve as excellent advertising vehicles since their users are forced to start with their proprietary interfaces. The rise of the ubiquitous web, however, has challenged the proprietary online service models since users with 'direct' Internet connections can essentially start wherever they want. This presents a problem for those companies who seek revenue from advertising and/or linking partnerships with online vendors. Like any other medium, the more viewers you attract, the more you can charge for advertising. Thus, with the viewer free to roam, the focus shifts from getting people online, to getting people who are online to go to your site. AOL has been particularly successful with users who can, if they wish, access the Internet directly, but who feel more comfortable using AOL's proprietary interface as their 'home base' on the Internet. Part of the reason for this is that AOL has been very successful in creating a sense of community for its members, something which it emphasizes in its advertising and has worked very hard to build through its early integration and promotion of technologies such as Internet Relay Chat (IRC) and instant messaging.

In addition to individual specialized sites such as Amazon.com for books, CDNow for CDs, and Auto-by-tel for automobiles, it was the portals that were able to capture the general traffic. The portals began by attracting web users by offering search and classification services to their users. As mentioned previously, they evolved by adding numerous other utilities and resources accessible for free by Internet users. However, because of the number of individuals that utilize these services they have an enormous audience, which means that space on the portal was very valuable. Advertising on the portals had an additional benefit of offering immediate click through to the vendor. This immediate connection meant that the customers delivered were actually searching for a product.

The portals have become the one-stop shop for all the Internet needs of consumers (Rindova and Kotha 2000). Their strategy has been to integrate the consumer into

their site, thereby giving the portal an ability to deliver a habituated base of consumers to retailers and advertisers. This has led them to constantly evolve by offering more services and options: from free e-mail to free Internet access and beyond. The more a user utilizes these services, the less likely he will move to another site due to the costs involved in becoming familiar with a new interface and reentering data. It also adds ubiquity to the client side by enabling users to access their customized services, such as e-mail or appointment calendar, from any computer. It is not entirely unlikely that with the decreasing cost of bandwidth and storage capacity, most consumer computing including word processing, spreadsheets, etc. will be done through a portal. Already several startups such as Desktop.com, MylnternetDesktop.com, Launchpad.com, and iDrive, have begun to offer services such as file storage and backup and virtual desktops with everything from schedulers to purchase requisitions. The moves in this direction actualize the Sun Microsystems phrase 'the network is the computer' in new and powerful ways and will likely spark yet another new wave of innovations.

The e-mall failed because it was not a destination for anything but retailing, so it could not create synergies and, in effect, capture the web surfers' time. Portals have evolved away from the limitations of the client/server concept and toward finding ways to leverage the potential singularities of the Internet dataspace. The portals started out as web catalogs and search engines, then sought to gain audience mindshare as content aggregators and distributors, eventually reaching the current period where they are becoming useful adjuncts to users' daily life in cyberspace through their role as providers of proactive functionality. For many users, portals are net-centric PC applications as indispensable as word processors and spreadsheets. From a commercial perspective therefore, portals are in a unique position because they are central nodes in the Internet world.

BUSINESS-TO-BUSINESS E-COMMERCE

The discussions of the impacts of the Internet have focused upon disintermediation/reintermediation which, while correct, does not fully capture the significance of the Internet as a medium for the relationship between firms (Kenney and Curry 1999a). One consulting firm, the Yankee Group (1999), in one of the more conservative estimates predicts that **B-to-B** e-commerce in the USA will increase at a compound annual growth rate of 41 percent over the next five years from $138 billion in 1999 to more than $541 billion in 2003. There are two levels of B-to-B that we examine. The first level is the creation of sites upon which purchasing can occur. This can be as simple as the site Cisco developed for its customers that already has over $10 billion a year in sales. However, this is not so interesting because it simply automates the mechanical aspects of the sales function. More interesting on this level are the various auction and exchange sites, which are creating new platforms upon which business can be conducted. The second level to be discussed is the building of software machinery for automating the entire purchasing function, i.e. the relationship between a buyer and a seller.

The world of **B-to-B** commerce has traditionally been complex and paper intensive.

It was a highly routinized process with no economies of scale. Notice that this entire process creates no value, it is simply a method of keeping track of things. Max Weber celebrated the rationality of a bureaucracy that kept track of everything on paper, and certainly large-scale enterprise would have been impossible without such bureaucracies, but entire layers of workers did nothing but in a relatively mechanical fashion collect and process this information. Their jobs were not to give meaning to the information, merely to prepare it.[9] The strength of this system is it provided information necessary to make decisions; the weakness is that it demanded lengthy decision cycles.

The entire process of procurement created inefficiencies for both the buyer and seller. The ability to move all of this online already existed before the Internet, but the establishment of one simple easy-to-use protocol meant that it became much simpler to move all procurement online. The initial efficiencies are obvious and massive including moving more and more of the human beings out of the mechanical segments of the information interchange pipeline, thereby increasing reliability and speed. But this is only the initial advantage, every step in the procurement process can be monitored and optimized. There is now an ability to collect data about the data stream to offer still more opportunities for optimization.

The recreation of any marketplace often has a power dimension; it is not simply a technical question. In the **B-to-B** arena this is particularly true as the owner of the transaction platform has the potential to control the transaction conducted, both in terms of rules but also in terms of rents (Bar and Murase 1998). The simplest B-to-B arrangement is for a firm such as Intel to establish a site to which its customers go to order parts according to some established price list. This is no different from the B-to-C businesses. Intel's power and the highly oligopolized market make this a viable strategy, but few other industries have such a dominant vendor with such a standardized product. For most industries a platform, which creates a market, is highly desirable from an efficiency perspective, because information can be exchanged in real time with no time-consuming, costly paper flows. In disaggregated markets it can bring more buyers and sellers together, ensuring greater efficiency. Often commercial firms have excess stock of various commodities, currently because the market is so disaggregated the firm sells the commodity at a near-total loss to an odd lot handler, who then searches for a customer. If a market platform for such odd lots can be created, then customers and purchasers can be matched without resort to such intermediaries.

The governance of a B-to-B market is very important, and there are pitfalls that discourage entry. There is a path dependency issue, because once an exchange becomes dominant, all of the users incur large switching costs that block participants from exiting. This makes all of the participants vulnerable to hold-up, despite the fact that their participation in the exchange is what gives it value. Thus the decision to join such a market is fraught with risk. For the promoter of the platform, the issue is to attract desirable or lead customers and/or suppliers depending upon where the power lies. If they announce that they will only conduct purchases on a particular platform, then a market tipping might occur making the site the platform for exchanges.

In the last three years there has been a proliferation of web sites seeking to aggregate B-to-B commerce. There are many examples. One venture-capital funded startup

VerticalNet.com has established approximately 75 vertical markets in nine major groups such as food and packaging. To illustrate, under the 'food and packaging' heading the markets are bakeries, beverages, dairy, food, food ingredients, meat and poultry, and packaging. Each market has not only a transaction platform, but also an online trade magazine. The executive responsible for the market is an 'editor'. Another startup GoCargo.com allows real-time pricing for cargo container space. Prior to the advent of the Internet, the market for cargo space was extremely disaggregated and worked primarily on the friendship ties between purchasers and suppliers. The system was human-interaction intensive, but inefficient because of the high search costs. Much of the human interaction was simple information transfer; this the computers can do. The real value humans added was in nonstandard transactions or unexpected events, i.e. times in which the system went 'nonlinear'. The creation of transparency and more perfect information flow creates the enormous efficiencies. The system removes the costs of producing and transferring paper – an important gain in itself. But, most important, when economic activities become apparent, they can be manipulated or tweaked to improve them.

The politics and power dimensions of these exchanges are becoming apparent as big buyers and sellers begin to create their own exchanges. Recently, General Motors, Ford and Daimler/Chrysler announced their intention to create a unified exchange where they plan to process about $240 billion in annual purchasing. It is predicted that the purchase-order processing fees will be reduced from $100 to $10. Initially, all three companies had planned to build separate sites, which would have created duplication and made the situation difficult for suppliers who would have to operate three separate billing systems. The Big Three automakers want their suppliers to use this site for purchasing from their own second-tier suppliers. The suppliers will be expected to pay a transaction fee for the use of the site. The launching of this site will dramatically reduce the potential for independent sites to be established. However, their control of the site and access to the information about supplier behavior and even the costs of suppliers' inputs will increase the power of the Big Three. Quite possibly, the exchange will create efficiencies for the value chain as a whole even while it increases the power of the assemblers (Dalton 2000).

The move by the Big Three is not rare. Big firms across a number of competitive, but oligopolized, sectors are considering whether they should allow the VerticalNet-type startups and capture the benefits of such exchanges. Increasingly, they are concluding, as did the Big Three, that it might be better to establish their own independent exchanges in which they hold an equity interest. In this way, rather than permit interlopers to capture the benefits from becoming electronic intermediaries, the market leaders can capture the benefits through their sponsored startup. The number of large firm driven B-to-B startups is rapidly increasing, and they may be able to outmaneuver the startups. The outcome is still uncertain.

DISCUSSION

The Internet is more than just another communications device. It is a newly developed space with the power to give rise to novel forms of human social interaction in almost

any area of human endeavor, commercial or otherwise. By enabling certain types of activities, the Internet will impact consumer behavior, firm behavior, and industrial organization. The final configuration caused by the Internet is difficult to predict. This is because the features of the Internet interact in problematic and contradictory ways. Perhaps the most problematic question related to the economic impacts of the Internet regards market niche and firm formation. Will the Internet encourage the development of a vast collection of business types, marketing strategies, and market niches? Or will it lead to a small collection of mega marketers (such as portals), each dominating a particular product or service, and making the Internet seem like the proprietary online services it replaces? There are arguments to be made in favor of both possibilities.

At one level, the Internet can be conceptualized as a giant machine for reducing transaction costs. As we have seen, the Internet is being used in a myriad of ways to speed and enhance relations between consumers and firms. The Internet reduces physical and bureaucratic drag by drastically reducing the importance of location and the number of procedural steps requiring the direct intervention of firm operatives. For example, on the retail side the external costs associated with opening, maintaining, and staffing actual physical stores is reduced, and on the production/distribution side the time-related costs of generating and circulating paper is reduced. Startup costs are also greatly reduced in that all anyone really needs to begin selling things over the Internet is a connected server, or space on someone else's server. This has led to a proliferation of individuals and firms attempting to use the web for commercial purposes.

The power of the Internet, however, cannot be comprehended merely in terms of efficiency. As long as the Internet remains an essentially open platform, its ability to develop novel opportunities and novel approaches will likely remain high. It is possible that the simple dichotomy between big and small is as problematic as physical space in cyberspace. Indeed, perhaps the biggest error made by those companies who `don't get' the Internet is the assumption that it is nothing more than a giant transaction cost reducer, or in Bill Gates's terms, a tool for friction-free capitalism. The most successful enterprises of the future will be based on the Internet's own paradigm, rather than paradigms borrowed from the past. Large-scale web enterprises which seem such inevitable successes today, could, in a few years' time, be hopelessly mired in their assumptions, rendered meaningless by the collective imagination and creativity of cyber explorers who are only beginning to learn the true contours of the new world they have created.

END NOTES

1. Care must be taken with our metaphorical extension of these characteristics of physical systems.
2. It was recently estimated that the Internet dataspace is growing at a rate of nearly 2 million web pages per day. A web page is 'a collection of information or web resources, intended to be rendered simultaneously, and identified by a single uniform resource identifier, or URI'.
3. It is interesting to note that the Internet is having another effect, namely the erasure of all history prior to the Internet. For example, university students no longer feel a need to go to the library. If it is not on the Internet, it does not exist!
4. Shapiro and Varian (1999) argue this can be integrated into traditional microeconomics.

However, their proof is dubious.

5. MP3 is a data compression standard that reduces the bandwidth necessary for the transmission of high-quality sound files.
6. MP3.com itself demonstrates communitarian power of the Internet through its creation of a large community of local and regional, and amateur and professional musicians, providing them with a very inexpensive way to access a potentially large audience, bypassing the formidable barriers to entry of the current corporate-dominated music industry.
7. There are some interesting geographical components to this as many of the new entrants arc headquartered in Silicon Valley. The implications of this are a massive shift of economic power from other regions to the Silicon Valley.
8. Traditionally the travel agent retained 10 percent of the ticket cost. In late 1997 the airlines cut this to 8 percent or $50, whichever was smaller.
9. We do not underestimate the sometimes complicated task of preparing information. There clearly were nonmechanical components inherent in the activity.