

**ELECTRONIC COMMERCE: IMPLICATIONS OF THE INTERNET FOR
BUSINESS PRACTICE AND STRATEGY**

by

Ajit Kambil

STERN #IS-95-22

**ELECTRONIC COMMERCE: IMPLICATIONS OF THE INTERNET FOR
BUSINESS PRACTICE AND STRATEGY**

Information Systems Department
NYU Stern School of Business
44 West 4th Street,
New York, NY 10012
tel: 212-998-0843
fax: 212-995-4228
akambil@stern.nyu.edu

© Ajit Kambil, August 1995
(forthcoming Business Economics)

Working Paper Series
Stern #IS-95-22

ELECTRONIC COMMERCE: IMPLICATIONS OF THE INTERNET FOR BUSINESS PRACTICE AND STRATEGY

Abstract

The Internet and the emerging global infostructure pose new opportunities and threats to businesses. This paper looks at the implications of these emerging low cost communications infrastructures on business practice and strategy. I examine how firms are using the Internet to improve innovation, production, sales, and service processes and I consider the effects of lower communications and coordination costs on business practices and strategies. Specifically, I propose that widespread use of the Internet and related technologies will dramatically reduce transaction costs, leading to a growth in electronic commerce and productivity. At the same time, the reduction in transactions and coordination costs will reduce the profit opportunities of inefficient firms, requiring them to re-focus their strategies. This paper identifies foci for strategic responses to the above challenges.

1.0 Introduction

Advances in information technologies and electronics have resulted in two simultaneous shifts: a dramatic expansion of computing hardware and software capabilities and a dramatic fall in the unit cost of information technologies. This has led to the widespread adoption of desktop computers and communications equipment, creating the building blocks of a global information infrastructure.

Today the Internet is the prototype of the global information infrastructure. This paper looks at the implications of the Internet and new low cost data communications infrastructures on business practice and strategy. Specifically I consider the effects of these technologies on four fundamental firm processes: innovation, production, exchange and service. Next I consider the effects of ubiquitous and inexpensive communications on business practice and strategy. I identify suitable firm responses to take advantage of and respond to opportunities and threats presented by this new infostructure.

This paper is presented in six sections. Section 2 provides an introduction to the Internet as a global information infrastructure (infostructure) and outlines its key features. Section 3 examines how businesses are using the Internet to improve innovation, production, sales and service. Section 4 examines the implications of ubiquitous communications and lower transaction costs on firm management and profits. Section 5, identifies strategic responses available to firms that seek to realize superior profits in environments characterized by low transaction costs. Section 6 presents conclusions.

2.0 The Internet as a Prototype of the Global Information Infrastructure

The Internet is a collection of computer networks that interconnect computers all over the world. Computers on the "Internet" are able to communicate with each other because they use the internet protocol (IP -- see the glossary of technical terms) as a common protocol for routing and transferring messages across computers. The Internet emerged from its predecessor the Arpanet which was created in the 1970s by the Advanced

Research Projects Agency to support the exchange of information between researchers, academics, the defense departments and related industries. In the 1980s the Arpanet was decommissioned and became part of the Internet. The Internet backbone networks in the United States were then subsidized by the National Science Foundation till April 1995 when NSF subsidies for the backbone network ended and the networks were privatized.

Users of computers on the Internet have access to a variety of electronic communication, information retrieval and interaction capabilities. The basic functions of the Internet include support for:

- electronic mail and news services to send or broadcast messages to other users,
- file transfer to access and retrieve files from remote computers,
- telnet -- the ability to use and connect to remote computers.

As hardware and software technologies advanced to client-server computing, new advanced functions have become available on the Internet. These include wide area information services, which allow users to search for and retrieve text information distributed over multiple computer servers on the Internet, and the world wide web (WWW) services which allow users to navigate and browse multimedia documents on multiple servers using hypertext links. Of these new services the WWW services are the most important and they operate in a true client-server model. On the user desktop, a client side browser software such as Mosaic and Netscape provide the users with a graphical user interface. Using the browser, users interconnect to various servers on the Internet to access multimedia information, interact socially or undertake commercial transactions. The use of WWW is increasing rapidly due to its easy to use browser software, hypertext capabilities and access to multimedia information. It will soon surpass all other sources of traffic on the Internet[1]. Emergent services on the Internet include videoconferencing, telephony and the distribution of audio.

Since 1993 the Internet has grown at an exponential rate. Surveys of the Internet show that the number of host computers connected to the Internet increased from 1.3 million to 6.6 million between January 1993 and July 1995

[2]. The Internet also reaches over 150 countries. The NSF planted the seeds for this rapid growth by subsidizing the Internet backbone networks, and the use of the Internet in colleges and schools. However the more recent dramatic growth in the use of the Internet is driven by customer demand for inexpensive communications, the availability of interesting content, the lowering of technology costs, and the availability of useful software for Internet publishing such as the WWW servers and browsers.

The growth is also fueled by the decentralized nature of the Internet. No one firm owns or controls the Internet -- all firms who are connected to the Internet pay for their own connections to the Internet and share in the capitalization and costs of providing backbone services. This way no one firm needs to raise all the capital required to organize, implement and manage the network centrally. The Internet also has an open standards process that benefits both users and providers of Internet software and services. This decentralized planning and funding model for a telecommunications infrastructure distributes investment risks and is radically different from traditional centralized models of telecommunications planning and proprietary investments telephone companies. It permits the network to grow quickly to meet user needs.

Estimates of the number of Internet users vary widely. Current estimates (in July 1995) are approximately 30 million users. These numbers are changing rapidly as the various on-line services purchase Internet providers and upgrade their services to provide full Internet access. A user survey by the Hermes project at the University of Michigan [3] found users are well educated and affluent, making them an ideal target for marketing. This demographic survey also showed users of the Internet were primarily men with a large number of international users. However, as new and different types of information content is made available over the Internet, the demographics of Internet users is becoming more diverse to include more women, the elderly and children. Students are increasingly exposed to the Internet in the K-12 setting, and nearly all universities provide students with Internet access.

Respondents to the Hermes survey also said that they gathered purchase related information over the network, stating that convenience was more important than price for many purchase decisions. This is to be expected for an affluent user group. In addition, users stated that their gathering of purchase related information on the Internet surpassed the use and effectiveness of direct mail.

The growth in corporate use of the Internet and its usage for accessing marketing information highlight the increasing importance of the Internet as a commercial infrastructure. Today the Internet provides the largest common interactive data communications infrastructure in the world. It already provides wide access to content and a platform for dissemination to users and publishers of information. In the future this infrastructure will advance to provide real time multimedia capabilities, implemented and managed in a decentralized manner over communication networks provided by various international vendors. The business use of these capabilities and the emerging infrastructure will dramatically alter business practice and competition.

3.0 Leveraging the Emerging Global Infostructure: Business Use of the Internet

Today the cost to become an Internet publisher on the World Wide Web can be less \$3000 for hardware and software¹ and as low as \$250 a month for a 56 kbp/s line to connect to the Internet. With such a system an Internet publisher can serve thousands of users daily and publish and disseminate millions of pages. Similarly the cost of electronic mail is substantially below the cost of paper mail. The marginal costs of storage, communications and dissemination of a thirty page document can be less than a penny.

Given declining costs of using the Internet, firms have primarily used it to reduce *communications* and *publishing* costs and to improve the innovation, production, sales and service processes of the firm. For example both corporate and academic researchers extensively use the Internet to

¹ A Pentium computer with 1 GB of disk running Linux and public domain web server software

communicate research problems and results. Using newsgroups, electronic mail, list services and the WWW, individuals are able to pose questions and receive answers from their peers. As universities, firms and publishers increasingly go on-line with working papers, technical reports and journal articles, individuals have instant access to relevant materials to support research and innovation. Information about, or the innovations themselves can be distributed world wide in a matter of minutes.

At Morgan Stanley, an international investment bank, Internet technologies are being used to create the company's electronic office. The routine reports, forms and documents used within the firm are distributed on world wide web servers within the company. These servers on the company's internal internet, are protected from external break-ins with firewalls and proxy servers that prevent external and unauthorized access to information. Information on the internal servers may include mundane information such as telephone directories, to more critical information such as equity analysis reports, or even SEC filings retrieved from the global Internet external to the firm. As security and authentication issues are resolved more communications with clients will occur on the Internet. Internet technologies were chosen as a platform for the electronic office for many reasons including: the flexibility of the technology to scale upwards, the open non-proprietary standards and the lower costs in comparison to alternate technologies. In the first 18 months of operation, Morgan Stanley estimates that use of WWW technologies has saved the company over \$1 million in paper handling and storage costs incurred in the daily production work of the bank [4].

Other firms are using the Internet primarily for sales and service by advertising and providing customers with relevant information about a product or service. For example, General Motors' Saturn division publishes information about their products, dealers, and prices for consumers over the Internet [5]. They also advertise at major sites on the Internet so that users are aware of their product. In contrast, General Electric's Plastics division implemented a series of world wide web pages that are targeted to their industrial customers with detailed information about their products [6]. These include technical specifications, as well as process information for the

effective use of the products. The customers of GE Plastics receive Internet software that allows them to connect directly to GE's home page when they dial into the Internet. GE Plastic's Internet site is effective as it reduces the costs of customer support, and provides their prospective or existing customers with rich value added information to service and effectively use the products they buy from GE.

To date, the Internet is mainly used to displace communications and publishing costs in product and service firms. These applications do not directly affect the revenues of the firm. Substantial revenue growth from the Internet for firms will require more widespread use of direct electronic transactions and innovative revenue enhancing customer services. This will require advances in three key infrastructures: software agent technologies, lower cost settlement and payment processes, and transaction templates.

Software agents are pieces of code that can be customized by a user to perform an information search or processing function. Software agent technologies promise to enable lowest price search for a good, or enable users to search for alternative suppliers at very low costs.

Efficient and widespread adoption of paper-less payment and settlement systems is the second infrastructure necessary for extensive direct transactions. Various systems currently exist such as Netbill, Digital Cash, First Virtual, Netteque, etc. All of these systems promise to dramatically lower the transaction costs of payment and settlement. While some current systems charge at a comparable rate to credit cards - over time the costs of these systems can be expected to drop substantially closer to a few pennies per transaction. The Netbill system is already designed to cost a few pennies per transaction although it is limited in use for the sale of information products².

Transaction templates are the third infrastructure necessary for widespread electronic commerce. Transaction templates provide standardized ways of describing products as well as transactions. Standardized message formats are important as they provide well agreed upon models for users to specify

²Interviewed Professor Marvin Sirbu, at Carnegie Mellon University inventor of the Netbill system.

products, as well as receive information on quality, price, and other features of the product. The Electronic Data Interchange (EDI) community has developed some standardized templates for message exchange customized to different industry sectors. However, more needs to be done to establish standards for describing consumer goods (in terms of features and quality attributes) and to port EDI systems and standards onto the Internet. Transaction templates will make it easier for software agents to search and compare products and should accelerate the growth of electronic commerce.

As software agents, inexpensive settlement and payment systems, and transaction templates are implemented over a low cost communications infrastructure, both consumers and firms can expect dramatically lower transactions' costs in purchasing goods and services. Below I consider the impact of lower transaction costs on firm profitability, strategies and managerial practice.

4.0 Implications of the Internet for managerial practice and business profits

The key managerial challenge of the emerging global infostructure will be to reconfigure organizations to create and maintain high profits in a low transaction cost environment. Transaction costs are the various costs incurred in the purchase or sale of a good or service. These costs include those of searching for and identifying products, drafting, negotiating and safeguarding the terms of a sale or purchase, payment and settlement, and the costs incurred to enforce contracts or to correct and resolve contract disagreements [7, 8]. As communication becomes inexpensive, and software agents technology and transaction templates are better defined, the transaction costs incurred by firms and individuals will fall. This in turn will make markets much more efficient [9].

Companies that exploited market inefficiencies arising from information asymmetries between buyers and sellers, or those companies that leveraged transaction cost advantages by locating close to customers to reduce the customers' search and purchase costs will find their profit margins and competitive advantage erode. Indeed most distribution and retailing

functions will find increasing pressure on margins as market efficiency increases and transaction costs fall.

The decrease in transaction costs also provides new opportunities to managers. Firms will be able to outsource for more inputs and functions, and take advantage of economies of scale in production available to external vendors³. In this model the Internet and the emerging infostructure provide firms with the monitoring and information processing capabilities to effectively manage the sourcing of inputs. This will lower production costs of firms but any comparative advantage from outsourcing will diminish as competitors imitate similar practices.

A second major challenge to managers and individuals is the need to be alert, correctly interpret, evaluate and respond to information and issues that arise in the electronic space. Managers and individuals will find they must process and respond to new issues in an accelerated time period. For example, when a flaw was discovered in Intel's Pentium processor it was originally transmitted on the Internet, as was the software to determine if there was an error. Intel initially played down the error as insignificant and not likely to affect most users. However, discussions on the Internet created substantial consumer pressure that led Intel to change policy and permit users to replace flawed chips at no charge.

Inexpensive Internet publishing allows individuals to disseminate favorable or unfavorable reports on products and services to a wide audience. Both managers and individuals need to be vigilant of rumors and managers must address them clearly before it adversely affects products sales. Today individuals, public action groups, companies and politicians are also using the Internet to further or promote different political agendas. For example the Bell Operating Companies maintain a WWW page [10] to provide individuals with information on latest telecommunications bills, and the Bell Companies positions on these bills. Managers and individuals will find it harder to discern the specific biases and political agendas as more information is published in this new media creating an "information overload".

³External vendors can realize economies of scale advantages not available to a single firm by aggregating demand of multiple firms for a product or service.

In summary the key managerial challenge of the late 1990s will be to reposition the firm to thrive in electronic market spaces characterized by low transaction costs. The lowering of transaction costs, will have a major impact on profitability of firms that are inefficient in terms of production or distribution of products and services. Managers must also formulate strategies to effectively interpret and respond to information in this infostructure, and develop clear and effective corporate communications in this media.

5.0 Reconfiguring Firm Strategy and Organization

Firms will have to reconfigure their strategies and organization to respond to inexpensive communications, lower transaction costs and reductions in profit opportunities from market inefficiencies in the emerging global infostructure. As management and economics researchers have noted successful firms focus their strategies along a few salient dimensions for competitive advantage. Porter [11]proposes three generic strategies: cost leadership, differentiation and niche. Treacy and Wiersema [12]similarly identify three strategies: low cost, innovation and customer intimacy as ways of creating value for customers and sustaining market leadership. Industrial organization economists identify economies of scale, scope ,externalities and innovation as sources of market power and higher or monopoly returns on investments [13]. Adapting the prior work, I identify the following strategic foci for re-organizing firm strategy to adapt to a world of increased market efficiency. These strategic foci do not necessarily require the use of the emerging infostructure, but identify ways of enhancing market power to realize superior profits in the new environment.

The strategic choices managers confront in responding to the emerging global infostructure are to:

- establish market leadership by leveraging economies of scale, scope or externalities.
- establish market leadership through innovation
- establish market leadership though focus on superior customer service
- enhance brand identity

- exit from an industry segment

Each of the above strategies are discussed below.

Economies of scale, scope or externalities

Economies of scale or scope can permit firms to lower their costs and increase margins. For example, in the retailing industry, organizations such as Walmart, and Federated have realized economies of scale through acquisitions or expansion and lowered unit costs in merchandise procurement and distribution. As firms transact over the Internet it will be easier to compare the prices and services of firms that sell similar undifferentiated products. For example consider a vendor who opens an electronic storefront to sell computer equipment, and the product (e.g., a Pentium desktop computer). If the products and services are undifferentiated and not substantially different across firms, customers will choose the lowest price option. For the vendor to realize substantial profits in the electronic market he or she must have sufficient scale to negotiate lower prices from the suppliers of computers and a high turnover in product to realize substantial net profit. Thus achieving scale economies is one strategy for effective competition in the electronic space.

Firms can also realize market power from positive consumption externalities or weak interdependencies between customers. For example the dominant WWW browser, Netscape is provided virtually for free and has established a large market share. Netscape is constantly enhancing its browser to provide new features that rely on its proprietary server. As more users use the Netscape browsers, other firms that develop innovative features on the WWW are licensing their technologies to Netscape, giving Netscape a market advantage in the markets for server and browser software. This in turn creates a bandwagon effect, leading more users to adopt Netscape technologies and greater dominance of Netscape products in the marketplace.

Innovations

A second source of market leadership and superior returns arises from innovation in production, product or service. When innovations are proprietary and protected by patent, copyright or trade secret, they can give the

firm market leadership and superior returns on investment. Examples of firms that base their strategy around innovation in products and production include Merck and 3M.

Innovations in the emerging infostructure include supporting tools for electronic communications and commerce such as new WWW server software and security protocols and mechanisms.

Superior Service

A third source of market leadership and the ability to generate superior rents arises from providing superior service. The emerging infostructure is especially suited to supporting this strategy by enabling specialized or learning relationships with the customer. For example a customer can specify in advance various purchasing preferences and needs to a vendor or to a vendor's specialized software agent. The vendor's software can then identify a select set of product options for the customer. The software can also remember prior purchases to suggest to the customer new purchases that build on prior purchases. Such a system reduces the customer's search costs and memory costs, but requires precise and sometimes private information from the customer. The Internet and similar networks make the cost of collecting such specialized customer information much lower for firms. Firms that collect this information and maintain it for their own use can then enter into a repeated service relationship with their customer leveraging and growing information assets to improve the service relationship and thus generate greater revenues. Firms can also use the Internet to provide specialized information to the customer to enhance the service relationship.

An example of a firm using such tools is Individual Inc., which provides a customizable news filtering service to clients. A firm enhancing customer relations through the Internet is Federal Express which allows users to track exact status of any package sent over Federal Express services.

Enhancing Brand Identities:

It is imperative for firms to establish recognized and valued brands in the global infostructure. While communications networks and software agents will enable individuals and firms to incur lower costs in searching for

products, both individuals and managers will confront greater amounts of published information to interpret in order to determine the quality of goods available to them over the network. One way of reducing the "information overload" and processing required of managers or customers is to establish a brand identity. A brand identity typically associates a number of valued characteristics with the branded product and reduces the information processing required of the customer to value the product. A brand establishes a reputation for the seller and a promise between the seller and customer, that the seller will honor the commitments associated with the brand identity.

Brands established over other media do not automatically transfer to the Internet and the new media. The Internet provides a media with low cost entry for talented individuals to bypass traditional brand management efforts, and to become opinion leaders in the establishment of brands. Examples of opinion leaders in the Internet include the editors of Wired magazine and its HOTWIRED [14] site on the WWW, the individuals who developed the Yahoo server at Stanford to point to interesting sites on the Internet, or Professor Wayne Marr of Clemson University who rates business schools and their presence on the Internet. Managers must develop brand management strategies that adapt to the new opinion leaders in this media.

Exit:

Inefficient firms that are unable to refocus their strategy to the models outlined above can also choose to exit from an industry segment. Early exits are likely to realize higher value than later exits when operating margins and earnings decline.

In summary firms will have to refocus their strategies. Successful firms will avoid the price wars enabled by software agents undertaking lowest price searches. If the firm has a cost leadership strategy it must ensure sufficient scale to turnover large transaction volumes on standard products, and internal efficiencies to generate a small margin but large profits based on the volume. If a firm competes on the basis of innovation, it must acquire and maintain the resources and environments supportive of innovation, and if a firm competes on superior service it has to invest in information, training

and other assets to sustain such a strategy. Hence firms will have to refocus and organize around a fundamental source of competitive advantage arising from economies of scale, scope, externalities or proprietary advantages from innovation or service to realize higher profits. If they are unable to transform their strategies, these firms should exit those businesses which will be rendered unprofitable by the Internet or similar communication infrastructures. Finally managers will have to restore and enhance their brand strategies to overcome the information overload confronted by customers in this media.

6.0 Conclusions

To date the use of the Internet for electronic commerce has been limited to publication of information, advertising and communications among individuals. Yet the Internet holds the possibility of transforming commerce by enabling electronic transactions. As technical problems in security systems, payment and settlement architectures and basic Internet access are resolved I expect the accelerated diffusion and use of the Internet. As new software agents and transaction templates are developed we expect an increasing growth of commercial transactions on the Internet and similar networks.

The consequences of transferring more commercial activity to electronic media will be dramatic reductions in transaction costs and profits gained from exploiting differences among vendors in these costs. As transactions costs fall firms will have to rely on different and new sources of market power to realize superior profits. This will require major restructuring of business strategy and operations.

As firms prepare to undertake commercial activity in this new media managers must develop a coherent Internet strategy. This requires managers to:

- Recognize the interactive new media is different from television, and print, and users utilize the media with entirely different attention spans and behavior patterns.
- Customize promotions and organization interfaces to multiple distribution channels and media segments. The Internet enables individuals

to participate in smaller more specialized electronic interest groups. Companies and marketers need to recognize and respond to this channel fragmentation.

- Integrate marketing strategies across media. Many firms today separate the Internet activities from other promotional and selling activities of the firm missing opportunities to cross-sell.

To adapt to the new competitive realities of the global infostructure, firms will have to rebuild their strategies and re-engineer operations in terms of location, marketing and distribution. Existing assets such as warehouses etc., optimized to distributing through stores will be sub-optimal for home delivery. Existing firms may not be well positioned for electronic commerce where product information is distributed electronically and products themselves are delivered by the mail.

The strategies and steps outlined above should help the firm to better establish a presence in this new media in an environment of low transaction costs. The widespread adoption of electronic commerce should increase productivity by making transactions substantially more efficient.

References

(Many references are WWW publications for which I provide an URL)

1. T. Berners-Lee, *et al.*, *The World Wide Web*. Communications of the ACM, 1994. 37(8): p. 76-82.
2. Network-Wizards. Internet Domain Survey, July 1995.
<http://www.nw.com/>. July 1995.
3. S. Gupta. Hermes: A research project on the commercial uses of the World Wide Web. University of Michigan:
<http://www.umich.edu/~sgupta/hermes/>. 1995
4. E. Hubler, *Results are In: Morgan Stanley Saves A Million by Using the Internet*, in *Redemption Digest and Securities Industry Daily*. 1995, New York. p. 1.
5. Hal Riney .&. Partners. The Saturn Site: <http://www.saturncars.com/>
6. General Electric Plastics Division, GE Plastics Homepage:
<http://www.ge.com/gep/homepage.html>.
7. O.E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*. Journal of Law and Economics, 1979. 22: p. 233-261.
8. O.E. Williamson, *The Economic Institutions of Capitalism: Firms, Markets and Relational Contracting*. 1985, New York: Free Press.
9. T.W. Malone, J. Yates, and R.I. Benjamin, *Electronic Markets and Electronic Hierarchies*. Communications of the ACM, 1987. 30(June): p. 484-497.
10. Alliance for Competitive Communications Homepage:
<http://www.bell.com/>. August 8. 1995.1995
11. M.E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. 1980, New York: Free Press.
12. M. Treacy and F. Wiersema, *The Discipline of Market Leaders*. 1995, Reading, MA: Addison Wesley.
13. J. Tirole, *The Theory of Industrial Organization*. 1988, Cambridge, MA: MIT Press.

14. Wired Magazine Homepage: <http://www.wired.com>.

Glossary

browser - software that allows a user to connect to WWW documents and view their contents.

client-server computing: Clients are software programs that sit on the desktop providing formatting and other useful functions to the user. Servers are software that reside on remote computers that provide information to the clients to process for the end-user. This model of computing shares tasks between the client and server software modules.

HTML (Hypertext Markup Language) This is the principal language used to define documents on the World Wide Web. HTML is a markup language which allows for the creation of hypertext links between related documents or objects.

HYPertext - documents with hyperlinks - which allow users to navigate text or other types of document databases

IP (Internet Protocol) The standard protocol used to transfer data from machine to machine on the Internet.

Proxy server A server that makes a requests on behalf of a client instead of the client doing it directly. This is often required in the case of a firewalled network, where the proxy server sits on both the Internet and the secure internal network.

Netscape A company founded by Jim Clark and Marc Andreessen that produces the most popular WWW browser.

software agent - a program that processes or seeks out information on behalf of its user.

World Wide Web (WWW) The distributed, multimedia network of hypertext documents that operates on the Internet.