Ross School of Business at the University of Michigan

Independent Study Project Report

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PROFESSOR **: Michael Gordon**

STUDENT **: Cordell Hines**

TITLE **: Information Technology Business Trends**

Independent Study Evaluation

Cordell Hines approached me with a proposal for an independent study worth 1.5 credits. As Cordell's research area related to internet markets, I asked Ted Hanss, an adjunct lecturer at the School, to work with Cordell under my supervision. Ted's other University responsibilities are in internet technologies research and development.

Cordell's research focus was on establishing a model for successful entry into the internet market. His objective was to understand the development of the internet, the introduction of commercial opportunities, and the current status of various internet players (software developers, telecommunications firms, internet service providers, etc.). From that, he would recommend a market entry strategy for a new firm looking for a profitable business opportunity.

Cordell drew up an outline for his research. Upon approval, he proceeded to present drafts of various sections of his paper, documenting his research efforts. Cordell met in person and over the phone several times with Ted as they discussed various approaches to Cordell's research, issues that needed further exploration, and places to look to for more information.

The result is a well-written paper that comprehensively lays out an analysis of this fairly new but complex and rapidly growing market space---the internet. Cordell did a thorough job of understanding the current players and how they have positioned themselves. He then evaluated the current and potential growth areas.

Cordell focused very clearly and accurately on the distinguishing features of this emerging area: essentially zero distribution costs, the incredible pace at which firms deliver new and enhanced products, and the ability to create customer markets of one, rather than current mass market models.

Cordell drew factual data from several sources and then, through his analysis, projected the maturity of various industry components, opening up opportunities for new players. His analysis is sound. Various commercial segments will mature at different rates. Awareness of this is key to understanding opportunities. Cordell also described the competition and what this means for new entries.

Cordell's grade for this independent study is Excellent.

Michael Gordon,
Supervising Professor
with Ted Hanss

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PART I: INTRODUCTION

This report will explore current information technology trends that lend themselves to mass commercialization. In examining this issue, we will first identify a general need for information technology due to the fact that firms face a need for becoming more responsive to increased customer demands as well as to increased levels of competition.

We will then reason that the Internet is a logical choice for allowing companies to achieve many of their business objectives as this medium provides an ideal mechanism for mainstreaming a product within the Digital Economy.

Next, we will target specific market segments that will ensure that Information Technology providers are successful in their business efforts. Finally, we will use this choice as a basis for recommending specific strategies that a provider should make use of when conducting business within the selected market segments.

PART II: MORE FOR LESS: THE NEED FOR RESPONSIVENESS

In a world of increasing customer sophistication, firms are experiencing additional demands to complement their existing core products and/or service offerings with a higher level of value-added. This trend has, in turn, created a necessity for companies to work more closely with their customers to achieve such ends as mass customization, where the concept of the "market-segment of one" comes to life. Further, trends toward increasing commoditization have prompted many firms to seek out creative strategies

for differentiation as a means of ensuring success in today's highly competitive market-place.

Cognizant of the changing business environment, leading edge firms have worked to create more responsive, customer oriented organizations that adapt to or even anticipate what customers need[1]. In such a context, firms are embarking upon a number of initiatives including re-engineering, outsourcing, and sharing information to a greater extent than ever before.

Re-engineering. As a means of bringing decision making closer to the customer, firms are flattening their organizations as traditional hierarchical corporate structures are too slow to respond to windows of opportunity that quickly open and close in a turbulent business environment[2]. Accordingly, organizational structures are becoming more decentralized with fewer layers of management. Facilitating-networks, promoting closeness, are replacing bureaucracies in order to speed up decision making processes for the purposes of adaptability and flexibility[3].

Such organizational restructuring recognizes that responsiveness means reacting to the pace of the situation, as opposed to the pace of the organization's planning ritual. The resulting flexibility allows companies to capitalize on "the benefits of serendipity" as well as to the identification of and reaction to basic opportunities[4].

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[1] Coulson-Thomas, C., "The responsive organization", Journal of General Management, Vol. 15 No. 4, summer 1990, pp. 21-31.

[2] Daugherty, Patricia, J., Ellinger, Alexander, E., Rogers, Dale, S., "Information Accessibility", International Journal of Physical Distribution and Logistics Management, Vol. 25 No. 1, pp. 4-17.

[3] Coulson-Thomas, C., "The responsive organization", Journal of General Management, Vol. 15 No. 4, summer 1990, pp. 21-31.

[4] Rosenberg, L.J. and Schewe, C.D., "Strategic planning: fulfilling the promise", Business Horizons, July/August 1985, pp. 52.

Outsourcing. Outsourcing represents the purchase of a service or good from an outside firm, as opposed to creating it in-house. The practice allows for increased flexibility in responding to changing market needs[5]. Outsourcing capital intensive or complex technological activities can help a firm become more flexible in adapting its practices to meet marketplace changes that occur as a result of competition, customer needs, or the economy[6]. If needed expertise and equipment are more readily available externally, a strategy of outsourcing to secure the required product or service can provide the most rapid form of response, while allowing the firm to concentrate on what it does best. A down-side is the outsourcing firm may not know your line of business and, in fact, limits your flexibility.

Information Sharing. The third means of achieving responsiveness, and by far the most important, is the firm's ability to share information. It is critical to responsiveness whether or not a firm is involved in re-engineering and/or outsourcing. Sharing information makes a firm more responsive to customer requests and builds greater customer loyalty and better customer-firm relations[7]. Further, a systematic, operational information exchange enables trading partners to gain important reaction time advantages and operating efficiencies as well as the ability to cement the interdependent nature of their relationship. → With computer networks, information exchange can be instantaneous

Because of this, many firms are entering into "infopartnerships" as a means of delivering improved customer service resulting in higher sales, better control of inventories, substantial logistics savings, and greater

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[5] MacDonald, M., "Outsourcing: a megatrend waiting to happen", Traffic Management, Vol. 30, February, 1991, pp. 41-45.

[6] Coyle, J.J., Bardi, E.J. and Langley, C.J. Jr., The Management of Business Logistics, West Publishing, St. Paul, 1976.

[7] Stock, J.R., "Managing computer, communication and information technology strategically: opportunities and challenges for warehousing", The Logistics and transportation Review, Vol. 26 No. 2, 1990, pp. 133-148.

financial flexibility[8]. These benefits are the catalysts for the adoption of responsiveness strategies that support synergistic buyer-seller relationships.

The Role of Information Technology

Computers and information technology have allowed firms to make considerable strides in coordinating and controlling business operations, particularly in the areas of logistics and channel relations[9]. A recent study underscores this fact by demonstrating that responsive firms have leveraged information through the use of IT to improve operating performance and efficiency[10]. Thus, while enabling firms to achieve higher levels of efficiency, information technology, has been successful in allowing such firms to increase their responsiveness.

Within this context, electronic commerce has become a necessity for doing business in the 90's. As such, this report will explore the emerging business opportunities for providers of information technology applications, while providing a framework for establishing a business development plan for the successful deployment of such technologies over the next several years.

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[8] Martin, A.J., Infopartnering,: The Ultimate Strategy for Achieving Efficient Consumer Response, Oliver Wight Publications, Essex Junction, VT, 1994.

[9] Mentzer, J.T., "Managing channel relations in the 21st century", Journal of business Logistics, Vol. 14 No. 1, 1993, pp. 27-42.

[10] Daugherty, Patricia, J., Ellinger, Alexander, E., Rogers, Dale, S., "Information Accessibility", International Journal of Physical Distribution and Logistics Management, Vol. 25 No. 1, pp. 4-17.

PART III: DIGITAL ECONOMICS

In *The Road Ahead*, software industrialist turned-author Bill Gates, expounds on what he calls "friction-free capitalism," a fast-moving, networked business model that could act as the "invisible hand" guiding world markets[11]. In an ideally networked world, he explains, everyone has unlimited access to information, moving closer to Adam Smith's theory that if every buyer knew every seller's price, and every seller knew what every buyer was willing to pay, everyone in the market would be able to make fully informed decisions, and society's resources would be distributed efficiently[12].

Gates' description of frictionless capitalism is rough-cut in that it would require a system with zero production and distribution costs, as well as unlimited resources. Still, in many ways, this idea offers some valuable lessons in how to do business in the Information Age. It does this by providing insight into a new business reality called Digital or Inverse Economics[13]. While not yet formalized, an understanding of these new economic principles is the secret to success in the Information Age.

Digital economics do adhere to certain more traditional principles: driving prices to commodity levels, setting standards at nanosecond intervals, and targeting special interest groups by appealing to tribalism[14]. However, as electronic commerce becomes a more impending reality, all businesses will have to learn the principles of frictionless capitalism. We are moving beyond

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[11] Gates, B. The Road Ahead. New York: Viking Press, 1995

[12] Smith, Adam

[13] Lewis, T., "Surviving in the software economy", Upside Publishing, Vol. 8, No. 3, pp. 66-78

[14] Ibid.

the Industrial Age, even beyond the Postindustrial Age, into the Information Age, where traditional rules of economics don't always apply.

In this age, inverse economics make products continually better, yet cheaper by applying learning curve theory to mainstream a product. Information Technology providers expecting to compete in this environment won't survive without mastery of these concepts.

Monopoly Gamesmanship

It is a fairly well-known fact that Microsoft's great success in the world of personal computers stemmed from its strategy of capitalizing on its installed base. It did this by getting started before its competition did, and exploiting a positive feedback mechanism that accelerated revenue growth. As a result, the more market share the company achieved, the more market share it was able to achieve.

As an example, Gates explains how Microsoft beat out two other operating systems when the IBM PC first appeared. By ignoring the cost of development, packaging and marketing, Microsoft emphasized the accelerated revenue growth of a large market[15]. In so doing, Gates adopted a strategy of "monopoly gamesmanship," and priced MS-DOS as if it had already captured the majority of IBM PC buyers. Microsoft's competitors, by contrast, adopted a "pay-as-you-go" marketing strategy and charged higher prices for their software, and thereby limited widespread adoption.

As MS-DOS became widespread, it became more entrenched. Microsoft made a good situation better when it built Windows applications to run on top of the MS-DOS platform. It then plowed-back licensing profits into

[15] Gates, B. The Road Ahead. New York: Viking Press, 1995.

research and development as a means of enhancing the level of product value added.

Such a strategy allowed the company to move more rapidly down the learning curve and cement its hold on the industry. The more market share Microsoft obtained, the cheaper its products became, and the more people demanded them. This resulted in a powerful feedback force responsible for mainstreaming MS-DOS.

This is a classical example of a learning curve application. The idea originated in the 1930s to explain efficiencies in airplane manufacturing[16]. Aerospace engineers noticed a thirty percent decline in production cost when production volume was doubled[17]. They reasoned that such a productivity increase could not be fully accounted for by traditional economies of scale. Instead, the engineers realized that while some improvement came from pouring in more resources and working longer and harder, working smarter also had its rewards. That is, improvements in ingenuity, experience and training also play a role in reducing production costs. The learning curve is a measure of this increased ingenuity.

Today, learning curve theory is used in the semiconductor industry with resounding success[18]. It has been quantified by Gordon Moore, chairman of Intel. "Moore's Law," as it is called, predicts that the semiconductor industry learns enough to double processor performance every 18 months, such that if

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[16] Lewis, T., "Surviving in the software economy", Upside Publishing, Vol. 8, No. 3, pp. 66-78

[17] Ibid.

[18] Ibid.

processor performance is held constant, the model predicts a declining cost structure[19].

Have you read The Fifth Discipline? It's about learning organizations

Mainstreaming

In traditional economic terms, decreasing prices lead to more consumption, which in turn leads to greater market penetration. In general, the lessons of frictionless capitalism's positive feedback mechanism, and the corresponding mainstreaming effect, dictate that Information Technology providers thrive when they learn at a higher rate than their competitors. Within this context, success in the new economy depends on how fast a company progresses down various learning curves, and thereby moving more quickly toward mainstreaming than its competitors. This reasoning is the basis for the emerging digital economy.

Within its microprocessor business, Intel is able to adhere to Moore's Law by relentlessly pursuing a strategy of being the first to render its own products obsolete[20]. Likewise, Microsoft doubles the functionality of Microsoft Office while lowering its price faster than competitors. Further, Netscape evolves Web standards faster than the standards committee is able to agree on the next version of HTML. Other companies, such as Adobe Systems Inc., Mountain View, Calif., and Symantec Corp., Cupertino, Calif., all stay out front through strategic mergers and acquisitions[21]. These are all examples of learning curves applications, which rely on increasing install base to catapult a product, service or standard into the mainstream. If one

Are there diminishing returns here? The products getting so complex they aren't usable and/or the cost of development & maintenance gets too high.

[19] Ibid.

[20] Ibid.

[21] Ibid.

accepts the positive feedback forces of frictionless capitalism, once a product achieves mainstream status, it is very difficult to dislodge.

"Give It Away, Now![22]"

Under the principles of the digitally networked economy, technology providers quickly rise to positions of leadership within their markets by making idealistic assumptions that may appear absurd to business traditionalists. For example, Netscape is building a business on the basis of distributing free software products, such as its Navigator freeware, as a means of propelling the company to 70 percent market share. At $250,000 per license, Sun Microsystems Inc. is practically giving away Java; potentially, the company's most important technological contribution of the decade[23]. And the list of examples goes on.

These companies can give their products away and still remain profitable due to the fact that the Future Business model assumes that demand effortlessly follows production. In a sense, the economics assume zero production and distribution costs, and seek to mainstream rather than to balance supply and demand. If production and distribution are free, there is no need to conserve on supply. This leads to a radically different approach to conducting business. A company either mainstreams or dies.

These strategies conflict with traditional economics, where the production level is set equal to demand. In such a world, the manufacturer initially estimates demand, sets a price, and then produces the product or

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[22] The Red Hot Chili Peppers, Blood Sugar Sex Magik, Warner Brothers, 1991.

[23] Lewis, T., "Surviving in the software economy", Upside Publishing, Vol. 8, No. 3, pp. 66-78

service. At some later time, market feedback is used to adjust demand estimates. If, for example, the warehouse is overstocked, the perception is that demand has diminished, so the manufacturer lowers the price level to clear out excess inventory, and production is scaled back so as to decrease supply. Conversely, if the level of demand is high, production and prices are increased to balance supply with demand[24].

This approach works, but it takes time as manufacturers must wait for feedback information on whether demand has risen or fallen before adjusting production. This Machine Age delay introduces uncertainty into old-style markets.

The Future Businesses, on the other hand, apply the learning curve rule to boost supply and lower the price. This, in turn, drives up demand, assuming demand varies inversely with price. In this world, production is constantly forced upward until market saturation and a mainstreaming are achieved. While demand and price work together in the old model, they work in opposite directions in the new model. Such inverse economics are fundamental to the Information Age, where inverse economics are applied as fast and as cheaply as possible, to rapidly increase market share.

Do All software products (code + information) share the same elasticity?

Netscape applied this technique in the extreme by giving away its Web browser as a means of obtaining mainstream status. "Free" is a very compelling price which allowed the company to plunge its Web browser learning curve into the basement, and consequently become an overnight success. Further, once consumers are hooked, the company will of course, levy upgrade fees.

Also, Netscape's largest revenue comes not from individuals but from corporations that buy large ($) site licenses as they can't avoid browser proliferation.

[24] Ibid.

While commodity pricing is crucial for success in the digital economy it is just one of several principles that Future Businesses will have to follow to effectively compete. They must also set the pace of obsolescence through the process of innovation[25].

Another principle is that of the "market-of-one." IT providers must succeed in "narrow-casting," rather than in broadcasting, their marketing messages to targeted market groups. The mass society is dead, as is mass-marketing, which both fail when they do not recognize the power of the niche market[26].

Such marketing power is tapped when IT providers make use of the related principle of tribalism. That is, providers are successful when they target as their niche market those individuals from whom they can elicit an emotional commitment to using their product or service. Likewise, products that achieve a certain cult status also lend themselves to tribalism. Macintosh users, for example, belong to a different tribe than Windows users.

The Body Electronic

In the context of electronic commerce, this entire discussion implies that successful technology providers will supply their customers with solutions that facilitate information sharing. Such solutions will lend themselves to a large-scale install base, while simultaneously meeting the conflicting requirements for mass customization. This, in turn, implies that such companies must make use of distribution infrastructure that allows them to inexpensively reach large numbers of customers, while maintaining

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[25] Ibid.

[26] Ibid.

sufficient adaptability to be quickly tailored to individual needs. Further, the infrastructure should minimize transaction costs associated with relationship-specific investments so as to facilitate friction free capitalism.

These issues are critical in moving toward a network economy where increased competition forces firms to adopt greater levels of specialization. Within this model individual companies will draw together forming cooperative relationships with other independent specialists[27]. Such networks will possess the capability to expand rapidly by adding new partners; but perhaps even more important, they can disband quickly and with minimal costs when the job is done. At that point, the individual firms simply go their separate ways and enter new relationships in pursuit of other opportunities[28].

These principles are on the loose across the Internet where the idea of using the medium to pummel prices is no longer a secret. The abundance of free software, free product information, and other kinds of free content are clear indicators that mainstreaming is alive and well on the Internet. Additionally, the Internet lends itself to exploiting market-of-one opportunities to serve highly individualized and personalized markets. Finally, because of the low cost of adopting the technology, the Internet offers ideal transaction cost benefits to users who will compete within the context of a network economy.

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[27] Johnston, R., Lawrence, P., "Beyond Vertical Integration-the Rise of the Value-Adding Partnership," Harvard Business Review, July-August 1988.

[28] Kensinger, J., Martin, D., "Financing Network Organizations," The New Corporate Finance: Where Theory Meets Practice, McGraw Hill, New York, 1993, pp. 561-571.

PART IV: THE INTERNET

An Historical Perspective

> "The Internet is a world-wide network of networks with gateways linking organizations in North and South America, Europe, The Pacific Basin, and other countries. No one owns the Internet; it is a shared resource that grows more useful as more networks are added. It is administered by a number of independent organizations, who by working together, have created what to a user appears to be a single virtual network that spans the globe.
>
> The Internet has no beginning and no end; as networks are added or removed, or as failures occur in parts of the system, the rest of the Internet continues to operate. The networks all use a common suite of networking protocols, TCP/IP (Transmission Control Protocol/ Internet Protocol). It is because of this commonalty of protocols, network functionality, and interoperability, that the networks appear to provide an integrated, seamless virtual network, regardless of the underlying computer hardware or communications transport[29]."

During the late 1960's, the Department of Defense's Advanced Research Projects Agency (ARPA) initiated a study to develop a nation-wide communications network that would maintain functionality even if a nuclear attack destroyed telecommunications lines. This project, known as ARPANet, was highly experimental, yet prompted the number of organizations seeking network connectivity to grow rapidly[30].

As additional host computers were added to the network, differences in networking capabilities made it essential to devise a software-based protocol that allowed the various systems to interconnect. By the mid-1970's Vint Cerf and Bob Kahn developed TCP/IP to meet this need[31].

While most of the funding for the ARPANet came from military sources, the project was largely developed at universities and research-

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[29] Meeker, M., DePuy, C., Morgan Stanley: The Internet Report, Harper Business Press, New York, 1996.

[30] Ibid.

[31] Ibid.

oriented, government contractors[32]. Thus, while some aspect of the network remained classified, most of it had to remain open to ensure that it was stable and robust. By the late 1970's the network had accumulated a large academic and research installed base. Eventually, the Department of Energy and NASA went on-line.

By this time, most of the applications developed for the Internet were developed by non-commercial interests who posted their programs on the Internet as freeware or shareware[33]. Yet the term "Internet" was not officially coined until the mid-1980's, when the National Science Foundation initiated NSFNet[34]. By 1988, the NSF selected Merit, at the University of Michigan, to lead a contract with IBM and MCI to develop a "backbone" connection upgrade[35].

Inconsistent with NSF policies, the Internet became more commercial by the early 1990's. As a result, the NSF began planning to withdraw funding for commercial traffic. To allow commercial network connections the Commercial Internet Exchange (CIX) was developed to act as a universal commercial connection point to the Internet[36].

As recently as 1994, most of those on the Internet were university users or computer-related corporations. Today, demographics have shifted due to the availability of graphical user interfaces, such as Mosaic. As a result,

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[32] Ibid.

[33] Ibid.

[34] Ibid.

[35] Ibid.

[36] Ibid.

Internet users now range from young, educated males to educational organizations and commercial enterprises.

According to Morgan Stanley, Internet users are doubling annually or at a rate of about 0.19% per day. Additionally, many analysts expect that in the near future, the Internet could become as ubiquitous as telephone service, and that it will more closely reflect the society in which we live, complete with retailers, manufacturers, consultants, advertisers, and people of types.

The Internet And The Digital Economy

In terms of usage trends, no one truly knows how heavily the Internet is being used. Morgan Stanley estimates that since 1968 the number of Internet hosts has grown from almost zero to just under seven million in 1995, with the last three years alone accounting for more than 85% of that growth[37] (See Exhibits 1, 2, and 3). Likewise, Morgan Stanley reports the number of Internet users to have grown from just over zero in 1968 to more than 40 million in 1995, with the last three years accounting for more than 50% of that growth[38].

However, according to a survey conducted by O'Reilly and Associates, a California based on-line research group, there were only 5.8 million Internet users in 1995[39]. Further, Volpe, Welty and Company estimated the number of users at 30 million in 1995[40]. While these firms disagree over the number of

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[37] Ibid.

[38] Ibid.

[39] Williams, Martyn. "Survey Counts 5.8 Million Internet Users." Newsbytes News Network. October 1995.

[40] APT Data Services Ltd., "Internet Users Will Reach 550 million by the Year 2000." Computergram International. May 1995.

users, they all expect the number to experience a compound annual growth rate of more than 40% by the year 2000.

Thus, while significant measurement variability does exist, the Internet, nevertheless, represents a fantastic mechanism for reaching vast numbers of users. As a result, it presents itself as a fantastic mechanism for employing the principles of mainstreaming.

Such explosive growth over the last few years coincides with the advent of "killer applications" such as Mosaic's graphical user interface and improved search engines such Yahoo and InfoSeek. In fact as new killer applications are developed, Morgan Stanley, projects that aggregate Internet revenues will grow from $4.9 billion in 1995 to $36 billion by the year 2000[41]. This growth is expected to result from the Internet's potential convergence with television, radio, telephone and other communications media used today.

In such an environment, it becomes clear that the Internet represents a very valuable tool for mainstreaming information sharing solutions. As such, it is now appropriate to discuss specific Internet market segments and the resultant business opportunities they present.

Internet Market Segments

As shown in Exhibit 4, the various Internet markets can be subdivided into four main categories. The first is *direct infrastructure* which includes data networking equipment, Internet security and software, and Internet service providers. Exhibit 4 demonstrates that this group is expected to experience a 45% compound anual growth rate by the year 2000.

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[41] Meeker, M., DePuy, C., Morgan Stanley: The Internet Report, Harper Business Press, New York, 1996.

The next group, *indirect infrastructure*, includes personal computers and semiconductors, telecommunications and related services, and telecommunications equipment. While this group is not solely Internet - specific, it will, nevertheless, benefit greatly from the Internet's growth. The third group, *software and services*, will account for about 40% of the Internet's growth by the year 2000. This group consists of applications software, enterprise and networking software, Internet/on-line services and consulting and development.

The fourth Internet market segment is that of *content and aggregation.* It is made up of organization/aggregation companies, information companies, interactive and static publications, and commerce/transaction processing companies.

Direct Infrastructure

Data Networking Equipment consist of server and client side equipment comprised of routers, switches (bridges), and call aggregators (hubs). This equipment is used by Internet Service Providers (ISP) and On-line Service Providers (OSP) to build Points of Presence (POP's), which, in turn, provide subscribers with local access to their ISP or OSP network.

The dominant players are not particularly capital-intensive, and possess a near monopoly on the market. These firms include Cisco, Ascend, Cascade and U.S. Robotics. Cisco's routers comprise an estimated 80% of the Internet backbone due to the fact that service providers are standardized on the product[42]. Further, the company's annual growth has increased by almost

[42] Ibid.

100% from 1992 to 1994[43]. Indeed, in the initial public offering prospectuses of Netcom, PSINet, and UUNet, Cisco is identified as a sole source provider in the risk section of each. Thus, in the language of digital economics, a handful of firms within this market sub-segment have successfully mainstreamed their product offerings. As a result, demand for their products is bound to increase dramatically with the rollout of new killer Internet applications.

Internet Security Equipment and Software. As pointed out in the popular press, corporate network managers are increasingly concerned with Internet security. Secure Internet systems require some degree of firewalling and/or packet filtering to minimize the risk of outside hackers accessing sensitive information. Additionally, Internet users require encryption capabilities to minimize the threat of information being intercepted as it is transmitted over the Internet.

The market for Internet security is small today but has the potential for strong growth over the next couple of years[44]. Morgan Stanley projects that this segment's future will involve trends toward consolidation as companies develop de facto Internet standards.

Internet Service Providers (ISP's) allow consumers, corporations, and other network service providers to connect to the ISP networks. The primary value an ISP provides to a customer is local-call access (for dial-up accounts) or short-distance leased-line access (for corporate or dedicated accounts).

Three types of ISP's are in the market today. They include pure-plays, such as UUNet, PSINet, Netcom, and Concentric Network, who only provide Internet access service; On-line Service Providers (OSP's), such as America

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[43] Ibid.

[44] Ibid.

On-line, CompuServe, and Microsoft Network, that offer Internet access through their existing proprietary networks; and existing telecom companies, such as AT&T, MCI, Sprint, and the Regional Bell Operating Companies. Additionally, efforts are underway to provide cable-based Internet connections

The larger pure-plays, Netcom, UUNet, and PSINet, share a common financial model of building nation-wide or global networks faster than their competitors[45]. Over the next 2 to 3 years the ISP market will be characterized by relatively low barriers to entry, implying a relatively high threat of new entrants. There is strong competitive rivalry among existing firms in the industry as the absence of significant sign-up fees, allows customers to easily switch providers. Additionally, ISP's face strong bargaining power from suppliers of direct infrastructure.

The issues surrounding competition involve proprietary versus non-proprietary content and networks, billing methods, faster network access and ubiquitous network access. The strategic implications for players within this segment will be whether users prefer the ISP-based system where all dial-ins occur through a single service provider, as in the model of the traditional telecommunications provider, or whether they prefer the OSP-based system where multiple dial-ins occur to various proprietary content providers who also provide access to other systems such as the Internet. In the short-term, it is likely that the ISP-based system will prevail, as providers compete for installed base. After that, it is likely that proprietary content will become mainstreamed, and will consequently command premium pricing. Yet by

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[45] Ibid.

that time, it is also likely that network dial-in access will be provided using standardized access methods.

Indirect Infrastructure

PC's Servers and Semiconductors. Anyone who wants to communicate digitally needs a communications device in the form of a PC, pager or a set-top box. Providers of such equipment, Compaq, Hewlett-Packard, Sun Microsystems, and Intel have all indicated that sales have picked up due to the Internet[46]. Nevertheless, as this market continues to mature, commoditization will continue to threaten hardware vendors. Thus, this is another area of fierce competition.

Telecommunications and Related Services. Without the use of the traditional telecommunications services' infrastructure, the Internet could not exist. Value-added service providers, such as ISP's and OSP's, lease telecommunications lines and send data over them. In effect ISP's and OSP's are value added resellers of the services provided by the interexchange carriers (IXC's), competitive access providers (CAP's), and to a lesser extent, the regional Bell operating companies (RBOC's)[47].

Long-distance companies (the IXC's), such as AT&T, MCI, and Sprint, have historically provided the majority of the underlying Internet infrastructure. Increasingly, the major IXC's are expanding their role from providing transmission to directly providing value-added services to the end-user. In particular, AT&T and MCI have made substantial investments in establishing their own portfolios of Internet and on-line services.

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[46] Ibid., pp. 1.15.

[47] Ibid., pp. 11.24.

Local telephone companies, also called LEC's or RBOC's, provide the actual connection to customer premises and carry telecommunications traffic within a specific region. Historically, LEC's have been prevented by law from providing services across regions. Consequently, RBOC's have been somewhat reluctant to provide Internet services on a large scale. Now, however, with the impending regulatory changes combined with the explosive growth of the Internet, RBOC's are likely to develop a significant Internet presence.

Cable television companies have substantial networks that connect up to two-thirds of U.S. homes[48]. Although these networks currently do not support Internet Protocol data applications, they present a tremendous opportunity because they possess bandwidth capabilities of 10Mbps as opposed to today's typical 28.8Kbps or a 128 Kbps ISDN line.

Further, a new breed of telecommunications company, Competitive Access Providers (CAP's), is in the process of constructing networks and leasing existing facilities to provide alternative local access to end-users and IXC's. The larger CAP's, such as MFS and Teleport, have nationwide fiber-optic networks capable of providing backbone service equivalent to that of the IXC's.

Telecommunications Equipment companies currently provide analog phone lines and some high-speed data infrastructure between local ISP or OSP networks. In the future, such infrastructure will be composed exclusively of high speed lines exploiting value added services technologies such as Frame Relay, T3 lines, and Asynchronous Transfer Mode (ATM). Additionally, for non-traditional carriers such as the cable multi-service

[48] Ibid.

operators (MSO's) and wireless/PCS operators to enter the market, hybrid fiber-coax (HFC) and digital cable products will be needed[49].

This market segment has benefited significantly with increased levels of Internet activity. Because most of the Internet's allure stems from its heavy use of graphics and sound, high-speed digital connections are becoming more and more essential for connecting ISP's points of presence to their subscribers. This will be necessary to avoid potential bandwidth bottlenecks that are likely to occur using slower connections.

Compare growth in # of users with data rate growth per application + there's a lot of telecom opportunity out there.

Software and Services

Application Software. The Internet application software market has developed into two market segments: client application software and server application software[50]. The market for application software has grown into one of the largest portions of the overall software market, with a large number of players.

In general, client application software has been developed to access information on Internet servers. Such software includes Web browsers and FTP clients[51]. Client software also assists in viewing information from servers. This includes Postscript viewers and Acrobat viewers. Further, client application software allows content developers to place home pages on the Web. Finally, client application software allows client-to-client communications, such as e-mail, chat services, and Internet telephony.

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[49] Ibid., pp. 10.5.

[50] Ibid., pp. 11.30.

[51] File Transfer Protocol. An Internet utility program to obtain files from another system or to move files between systems.

Server application software has been developed to allow computers, which are permanently connected to the Internet, to grant access for retrieval to client computers upon request. Examples include Web servers and e-mail servers (which store e-mail messages sent from one client to another until retrieved).

According to Morgan Stanley, the key to owning this market is the Internet server platform[52]. This strategy is similar to Microsoft's strategy of owning the PC operating system market. While there is technically no one Internet operating system, server software will be the basic building block, with which all other presumably must be compatible. It is also likely that only a few key players will dominate this market as operating-system standards become mainstreamed.

Enterprise and Networking Software. The Internet's potential for fundamentally restructuring the computing industry is most apparent in the enterprise market. This market represents the next application development/authoring platform and ubiquitous access to applications regardless of location. This translates into a battle among applications developers. As with past platform shifts (mainframe to mini to PC), the impact upon developers will be significant[53].

With well defined cross-platform programming standards, universal access to the Web, and a uniform desktop environment in the form of Web browsers, the emerging volume market for developers is tremendous[54].

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[52] Meeker, M., DePuy, C., Morgan Stanley: The Internet Report, Harper Business Press, New York, 1996, pp. 10.6.

[53] Ibid., pp. 1.17.

[54] Ibid.

HTML, Java and other related families of development tools based on these standards represent a chance to break away from Microsoft's stronghold and still reach the Windows market. Enhanced scripting language with sophisticated logical constructs that complement HTML will emerge from a new generation of tool companies. Likewise, many existing development tools vendors will license Java and incorporate HTML generation into their current tool set.

Microsoft will likely revert to its proven strategy of creating proprietary extensions and programming interfaces tied to Windows. However, every other company in the computing industry wants to see the Internet become the platform standard as it reduces the role of the desktop, and consequently weakens Microsoft.

Further, the enterprise use of the Internet doesn't require a major cultural shift in consumer behavior, nor does it require infrastructure upgrades. Enterprise users already have the problem of remote and mobile access, and the Internet simply represents a better solution. Thus one near term use of the Internet could be to provide users with an increased ability to tie into their office environments. A natural extension of this thinking suggests that suppliers, customers, and other networked stakeholders will be able to more easily access enterprise networks. This will result in a system that allows network organizations to cost effectively engage in commerce while simultaneously allowing for easier connections and disconnections.

Internet/On-line Consulting. Internet consultants provide services to companies that are using or attempting to use the Internet. Typically there are two types of consultants: 1) pure consultants that bill by the hour or by the job; and 2) companies that offer products that must be coupled with a service,

such as auditing[55]. Today, Internet consultants perform one of three tasks including, general Internet guidance, Web-page building, and/or counting of Web-page usage.

Because connecting to the Internet is still fairly complicated, an obvious need exists for general Internet guidance, as well as for more specific assistance in building Web-pages and counting Web-page usage. Though software exists to automate the Web-page building process, the process of producing a "quality" Web-page is still rather technical. As a result, a new business opportunity exists for talented technicians possessing the ability to fulfill this need.

Under the current Internet business model, companies seeking to advertise on the Web often display their adds on popular Web-sites. This creates a need for independent, unbiased counting of Web-page usage, as means of measuring the effectiveness of this advertising medium. Thus, advertisers need to know how many people have visited a particular site as advertising dollars are allocated on the basis of potential number of "hits."

At $100 million the current market for Internet consulting is relatively small. Historically, this market posed an opportunity for small groups of consultants, not sizable enough for public investment[56]. However, as more companies embrace the Internet as a means of doing business, demand for consultants should increase. Indeed Morgan Stanley estimates 43% compound annual growth by the year 2000 to $600 million[57]. As this trend

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[55] Ibid., pp. 11.46.

[56] Ibid., 10.7.

[57] Ibid., 1.12.

takes place, it is likely that large consulting and computer services companies such as EDS will address this need.

Content and Aggregation

"Thanks to a broadening reach, low cost, and easy-to-use Internet access, near-zero-cost publishing has arrived[58]." For example, e-mail newsletters can be distributed to millions of users worldwide for no more than the cost of a $5 to $10 monthly membership.

Given such low barriers to entering the publishing and information distribution markets, new companies are entering markets traditionally dominated by paper-based publishing companies. Thus, due to the large volume of information on the Internet, businesses that can organize, aggregate and filter information, and companies that provide information and news feeds are finding lots of opportunities on the Internet.

Organization and Aggregation companies allow users to rapidly obtain information about a particular subject, or allow a user to go to a certain place easily. Businesses currently engaged in this need include ISP's and Internet search services. While firms such as Yahoo have been rather successful, as measured by their heavy Web traffic, a clear need still exists for improved search engines. Current engines merely assist in mining the useful from the useless information.

OSP's have an advantage over search engines in that the information they provide has already been filtered[59]. Additionally, these providers are well-known for easy-to-use services which gives them a clear advantage.

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[58] Ibid., pp. 11.50

[59] Ibid., pp. 10.8.

Nonetheless, even with such advantages, Web-navigation still has a long way to go. Software agents, highly sophisticated search engines which allow finer search resolution, are currently under development (in beta), and will help to resolve this problem.

The competitive landscape of this market segment is rather turbulent and therefore difficult to forecast. First, as mentioned previously, with virtually no barriers to entry, the threat of new entrants is incredibly high. Next, the OSP's and search engines present themselves as substitutes for one another. Consequently, the threat of substitutes is high. This is compounded by the fact that more useful search tools are likely to be developed in the future. In terms of supplier bargaining power, OSP's have a distinct disadvantage due to the fact that they deal with many dominant suppliers, many of which are sole-source providers. Because customers can easily switch from one system to another, they possess significant bargaining power. Finally, rivalry among existing firms is strong, however, the common threat from Microsoft has resulted in some cooperation among leading suppliers[60].

Information providers. There are few pure-play information providers dedicated solely to the Internet. As such this market, while small at $100 million in 1995, is wide open. Opportunities are likely to be exploited by traditional information providers, such as newspapers and magazines, that seek to maintain their threatened market share. If they can be creative enough, + not tied to tradition.

Static publications describe information that remains constant or static. They do not change after initial publication or on-line posting. This includes on-line magazines and newsletters

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[60] Ibid.

Interactive publications on the other hand can be altered by a reader or user's actions. These sites, often with highly original, specialized publications, offer rich content and will likely evolve into on-line multiplayer gaming.

Transaction Processing and Financial Services. As a necessary precursor to commerce on the Internet, financial solutions and financial services are necessary to enable secure transactions. Generally, there are two types of companies involved in secure Internet commerce. These firms specialize in transferring money over the Internet, while ensuring that such transfers of funds cannot be successfully redirected or intercepted. First, there are technology companies that develop encryption solutions to enable secure data transmissions across the Internet. Second, there are financial services companies: traditional credit card companies and banks with new or repackaged offerings, in addition to new companies that enable electronic cash-equivalents

Currently all of these companies, DigiCash, CyberCash, and First Virtual, possess very little "mindshare." At this time they are all in the race to become the de facto standard. Likewise, the public has not yet caught on to the use of traditional credit cards over the Internet. According to a survey cited by Morgan Stanley, only about 8% of Internet users made on-line purchases during October of 1995[61]. Thus, while there may appear to be substantial room for growth within this segment, mainstreaming will quickly come about due to the number of potentially dominant players, like First Data Corporation, poised to quickly take over this market. Once mainstreaming of this sort occurs, it is unlikely that there will be room for many competitors.

[61] Meeker, M., DePuy, C., Morgan Stanley: The Internet Report, Harper Business Press, New York, 1996, pp. 10.10.

Right, people don't want to pay for items with unique payment systems for each business.

Commerce. Widespread commerce is still in its early stages of development. As ease of Internet use improves, with infrastructure and software upgrades, more users will come to on-board. Moreover, as encryption and public trust come up to speed, widespread commerce will become more of a reality. Once, we reach that point, content and aggregation providers, who now obtain revenues based on advertising and usage charges, will be able to perform billing on a transactional basis[62]. Again software agents represent promising tools to facilitate this trend in that they possess the ability to search out one another and carryout transactions based on pre set search criteria.

PART V: PUTTING ALL TOGETHER

As evidenced by the above discussion, many of the Internet's various market segments are still largely under development. In some cases, such as in the evolution of Indirect Infrastructure, this development will take place very rapidly, while in other cases, such as with the acceptance of encryption technology, development will happen more slowly.

This section will begin by taking a look at the critical milestones required for bringing the Internet fully up to speed. The issues will then be explored in the context of the digital economy, and will provide a basis for a business strategy aimed at successfully exploiting the critical segments of the Internet market.

The Critical Path

[62] Lewis, T., "Surviving in the software economy", Upside Publishing, Vol. 8, No. 3, pp. 66-78.

The Internet holds the potential to provide a mechanism for supporting a broad-based culture of electronic commerce, capable of reaching business to business markets and linking suppliers to consumers as well as to corporate customers. Achieving such revolutionary progress will require a make-over for many of Internet business segments,

However, progress will not depend upon each of these segments coming up to speed simultaneously. Instead, developments within the industry will follow a successive evolution beginning with improvements in direct and indirect infrastructure, followed by the acceptance of security standards, and then the full-scale deployment of software and content allowing for next-generation Internet applications. Not until these developments have taken place will the 'Net truly achieve mainstream status.

Exhibit 5 presents a conceptual framework for predicting when the various developments will take place. Along the Y-axis is the level of usage or penetration among Internet customer groups; the X-axis tracks time, and shows key milestones that will take place. For example, sometime after 1996, bandwidth bottlenecks will be resolved. By that time it is likely that service providers will have made the necessary investments in high speed lines from the desktop to backbone allowing for the support of increased content complexity; while equipment vendors will provide increased processor capacity and improved connections devices.

Assuming that manufacturing can keep up with demand for fiber optic cable, for example.

Because of the critical role of bandwidth, it is likely that such infrastructure developments will be the first to take place. The reasoning for this assertion lies within the fact that the patience threshold for retrieving information is estimated at 10 to 30 seconds[63]. Further, because the Internet's

[63] Meeker, M., DePuy, C., Morgan Stanley: The Internet Report, Harper Business Press, New York, 1996, pp. 9.1.

allure lies within its potential to provide rich graphics, audio, and interactivity, the demand for applications making use of these features is likely to be strong, and will, as a result, drive the development of client-side bandwidth solutions in the near term.

The next development to take place will be the acceptance of standards for security equipment and software as well as software enabling secure commerce and transaction processing. The diagram depicts these activities as being accepted more slowly than the infrastructure market segments. This is due to the fact that while feasible solutions may exist, they are unlikely to be adopted until the market is ready for them. As a consequence, security standards will not cross the adoption saturation level until they achieve a high degree of customer trust and acceptance.

Once security providers prove themselves trustworthy, and once the necessary infrastructure is in place, the Internet will be very close to becoming a technological medium capable of going mainstream. The next development that will take place, and allow for the full-scale use of the 'Net, will be that of deploying more sophisticated Internet applications. This will involve the evolution of software and services as well as content and aggregation. Exhibit 5 shows the penetration level of Internet applications building gradually over time, until security standards have been widely adopted. Prior to that point, innovative applications will only provide incremental benefits to Internet users demanding a high level of utility from their technology resources. However, once the security issues are ironed out, the growth rate within these segments is likely to increase far more rapidly as next generation applications are brought on-line. Agree

The above reasoning suggests that the likely critical path to the full-scale development of the Internet will be that of bandwidth-security-applications development. This insight provides an important basis for developing a successful Internet business strategy, especially for companies that currently do not have a presence within the market.

Business Strategy Implications

For organizations planning to enter the Internet market place, it would be wise to pursue a strategy that takes into account the timing of the various industry developments. Doing so will allow the firm to develop its business in a way that is consistent with the digital economy. Too early can be as bad as / too late.

Recall that success within this economy requires that a firm provide solutions allowing for mainstreaming, mass customization and transaction cost minimization. A firm choosing to participate in the Internet market place is by default pursuing solutions that allow for mass customization and the minimization of transactions costs. This is due to the fact that the Internet as a communications medium is able to reach diverse markets, and therefore enable broad-based commerce.

Yet, simply participating within the Internet marketplace, does not guarantee a firm's success in mainstreaming. In order for that to take place, the firm must carefully choose a market that does not yet a have a dominant player, and, through a strategy of monopoly gamesmanship, the firm must obtain a dominant market share position before its competitors.

In doing so however, a firm must realize that mainstreaming is a long-term process that will yield returns only after significant investment outlays have been made. Thus, in the context of the Digital Economy, a firm must

maintain both a long-term and a short-term perspective. A short-term perspective will provide interim cash inflows to finance the long term objective of mainstreaming.

In the framework of the Internet's critical development path, over the long-term, a firm would be wise to choose a market segment that is not very far along the learning curve. Whereas, over the short run, the firm should choose a segment that will provide immediate investment returns.

Under current market conditions, the Internet segments that have not yet been mainstreamed are those pertaining to applications development. These segments include Enterprise and Networking Software, Organization and Aggregation, Interactive Publications, and Commerce. Those most likely to provide short-term investment returns include Internet Security Equipment and Software, Telecommunications Equipment, and Internet/On-Line Consulting.

As demonstrated in Exhibit 5, the maturation of the market for new applications will coincide with the maturation of the Internet as a whole. A firm capable of establishing an "early mover advantage" in this area, and increasing that advantage over time, will have firmly entrench itself as an industry standard, and will benefit greatly when the market finally matures.

Nevertheless, the current markets for applications are highly fragmented compared to the other Internet market segments. In its *Internet Report*, Morgan Stanley identifies more than 2.5 times as many software companies than any other company type, and new players are constantly entering the market[64]. Content and Aggregation vendors rank second in terms of the number of active players within the market. Such vast numbers of

[64] Ibid., pp. 11.2-11.4.

competitors are attracted to the industry because of low entry barriers and the hopes of achieving abnormal investment returns over the long term. Expectations of this sort are rooted in the strategy of attempting to become the de facto standard at an early stage in the game.

These realities are consistent with earnings and valuation data published by the various competitors. From the standpoint of growth, Exhibit 6 summarizes the data with return on equity (ROE) calculations for various industry sub-segments. At 3.8%, ROE for PC, Server and Semiconductor equipment exceeds ROE for all other market segments. Such a relatively high ROE value supports the estimates shown in Exhibit 5 by demonstrating that Indirect Infrastructure segments will reach maturity more quickly than the other market segments. Further, with ROE's of 1.04% and 1.00%, respectively, it is clear that Data Networking Equipment and Telecommunications Equipment will both yield rapid growth within the Direct Infrastructure group. At the other extreme, the low ROE values for Organization and Aggregation, Information, and Interactive Publications will grow much more slowly. This suggests that applications will not come fully up to speed for quite some time. Note that Internet service providers also appear to grow slowly, with an ROE of 0.04%. Thus, this highly competitive segment is also far from maturity, and will allow current competitors engaging in a successful mainstreaming campaign to benefit greatly in the future.

Does this change if the industry consolidates

Additionally, note that Internet/On-Line Consulting and Enterprise/ Networking Software both have relatively high ROE's at 1.13% and 1.09% respectively. Such numbers imply that each of these two segments are likely to experience rapid growth in the near term. However, over the long-term, Internet/On-Line Consulting will not necessarily provide a business with the

opportunity to mainstream. This is due to the fact that this segment will likely experience future consolidation as large specialized firms, like EDS, move into this market. Yet, both of these segments provide attractive opportunities for a business to generate short-term profits for financing longer term investment opportunities.

So then, in order to secure its future, a technology provider would be wise to pursue short-term opportunities in Internet/On-Line Consulting and/or Enterprise/ Networking Software. Whereas, over the long-term, a provider should pursue opportunities in Organization and Aggregation, Interactive Publications, and Information, and Commerce. These findings are summarized in Exhibit 8.

PART VI: RECOMMENDATIONS

At this point, it is now possible to assert recommendations concerning specific businesses tactics for ensuring success. Before doing so, however, it would be instructive to recap what's been covered so far.

First, we identified a general need for information technology due to business trends toward increased responsiveness. These trends are due to increased customer demands as well as increasingly fierce competition within the marketplace. Thus, as a means of addressing these issues, firms are, out of necessity, providing solutions that allow for mass customization and transaction cost minimization, while simultaneously allowing the provider to mainstream her product.

We then reasoned that the Internet is the logical choice for achieving these ends because of its worldwide connectivity appeal and exceptional ability to reach the customer. Further, the Internet provides an ideal medium

for mainstreaming a product within the digital economy. Finally, we targeted as the market segments of choice those sectors which allow the firm to build a core business providing short-term operating cash flows. Further, the firm should pursue a long-term strategy of mainstreaming products within those segments that have not yet experienced much growth.

In entering any of these markets, firms should bear in mind the rapidly changing nature of technology businesses and be prepared to sustain a competitive advantage through a process of on-going innovation. Such a strategy requires a shift in thinking away from the notion of building a business around a product or family of products. Instead, the business must think in terms of building a process. The process that it builds should, by default, yield innovative products that allow it to rapidly march down the learning curve.

Such a strategy hinges upon the concept of economies of scope, where a firm leverages its resources to achieve scale economies not only through mass production of a single product, but also through economies associated with becoming more adept at exploiting a technology over time. A successful strategy depends upon the deployment of seemingly unrelated products/services that are actually tied together by a common thread or "core competency," providing benefits not only today, but also in the future when the firm discovers new applications for its technology.

These strategies will enable the mainstreaming process by allowing the firm to capitalize upon its institutional know-how to provide product up-grades, add-ons, and revolutionary breakthroughs in such a way that it renders its own product offerings obsolete. In doing so, the firm should

accumulate mindshare and a solid reputation for being the best at whatever it does.

With this in mind, a promising business strategy scenario is that of pursuing, in the short-term, Enterprise/Networking Software enabling users to more easily interface with their network. Current applications are not user-friendly and seriously constrain the use of home and portable PC's to access business applications and information systems[65]. Such user friendliness could be attained by automating the process of remote access with secure, self-operating software that allows the user to access her system with minimal keyboard commands.

Shortly, thereafter, the firm could introduce client-server systems management software to automate the process of distributing software over public or private networks. Such a software package could provide a rapid return on investment through its ability to improve the overall robustness of the client-server environment while considerably reducing costs associated with administrative upkeep of highly distributed systems[66]. Big opportunity space

In the long-term such automated computing could be extended to applications making use of Intelligent Software Agents, that automate rudimentary tasks based upon pre-set parameters tailored by the user. Such software could ideally allow for the automation of all tasks associated with commerce. Whether used for purchasing a house, securities, or hiring employees, agent-assisted purchases allow the user to save time and transaction costs associated with searching for sellers. In the context of the network organization, software agents possess the ability to bid for contracts,

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[65] Dennis, Sylvia. "Remote Access Software Needed For Business." Newsbyte News Network, January 1996.

[66] APT Data Services. "Software Distribution: Cost or Economy?" Computer Finance, No. 9, Vol. 6. Feb. 1996.

while the purchaser's agent can be instructed to enter an agreement with the seller's agent possessing the lowest bid. This would in theory allow for all business to be conducted on a transactional basis with suppliers and buyers changing as business conditions change. Further, such a model would facilitate mass customization to such a degree that every transaction could be individually tailored to each party's specifications.

While the possible applications can seem endless, the list of competitors offering such software will also seem endless. Surely, the concepts of the digital economy are not proprietary, nor is the Internet's critical development path. Success will depend upon successfully orchestrating the business model of building a process.

So then, how does a firm build such a process? It begins by establishing a Moore's Law equivalent for the expected mean time between software innovations; it continues with a relentless adherence to a product introduction timetable based upon its chosen technology or competence. In the example presented above, the firm developed a competency in automated computing allowing it to proceed down the Intelligent Software Agent learning curve.

Next the firm must recognize the need for a strict quality management program that ensures a high level of quality while maintaining the product introduction timetable. Next, the firm must mainstream through fee-less distribution. That is, the firm must give its product away, until it mainstreams.

Next, the firm should embark upon a full scale marketing assault that appeals to tribalism so as to obtain mindshare. Such a campaign should position the firm as a niche player to avoid head-on competition with the

multitude of software providers currently in the market. Doing so will allow the firm to build a name for itself without having its sales cannibalized by a more dominant player positioning competitive, automated computing products as the de-facto standard. As an example, a technology provider planning to enter this market could position itself as a value-added information clearinghouse that allows registered users access to automated computing resources for a subscription or usage fee. A strategy of this sort would allow a new firm the opportunity of differentiate itself from giants like Microsoft who possess monopoly power in the more commoditized software industry.

Finally, and most important, because such products will essentially be commoditized by the end of the decade, the firm must act now, before the competition reaches a critical mass[67].

A second example of business strategy model involves providing consulting support to entertainment providers who desire an Internet presence, but do not possess the technical skills to implement the process themselves. Local cable companies are currently not as far down the learning curve as Internet Service Providers and Telecommunications Companies are in their efforts to go on-line. As a result, in the short run , providing cable companies with advice on how to cash-in on the Internet's explosive growth would indeed provide adequate cash flows to finance future efforts in Organization/Aggregation and Interactive Publications.

Long term efforts could involve on-line multimedia productions such as interactive, multi-participant movies, interactive, multi-participant concerts, and other types of on-line entertainment offerings. The key here is to

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[67] Ibid., pp. 3.3.

provide products that allow for multiple users to interact in real-time regardless of their location. Such a business, if managed in a manner consistent with the Digital Economy, would allow a technology provider to prosper within the Information Age.

Well researched, well researched analysis covering history and trends and projecting opportunities. The critical issues are identified. It is not business as usual on the internet – and, despite Microsoft's obvious strengths (along with Cisco's strengths in hardware), there are plenty of opportunities in many segments.

Excellent.

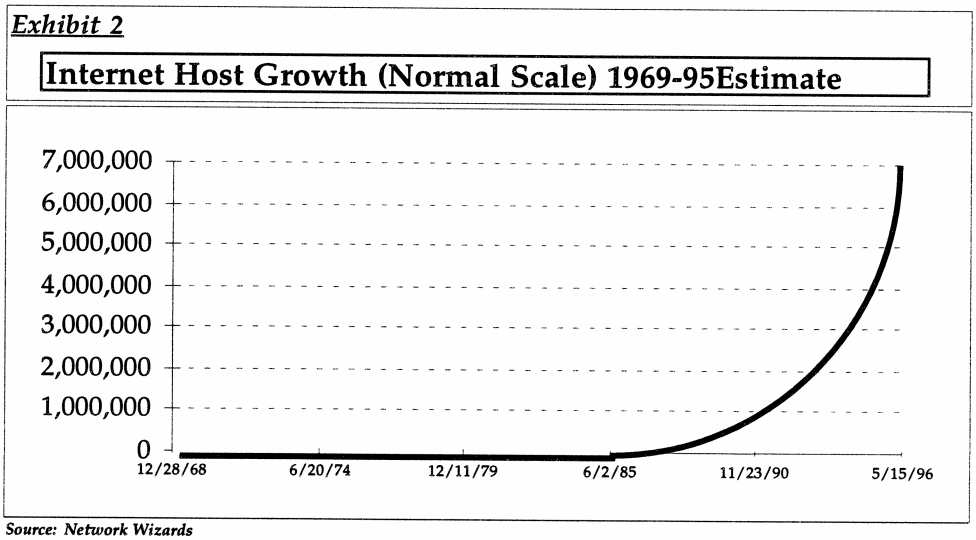
Exhibit 1

Internet Host Growth Rate 1990-1995E

Begin Date	End Date	Annual Host Growth Rate
Jul 94	Jul 95	107%
Jul 93	Jul 94	81%
Jul 92	Jul 93	79%
Jul 91	Jul 92	85%
Jul 90	Jul 91	90%+/-

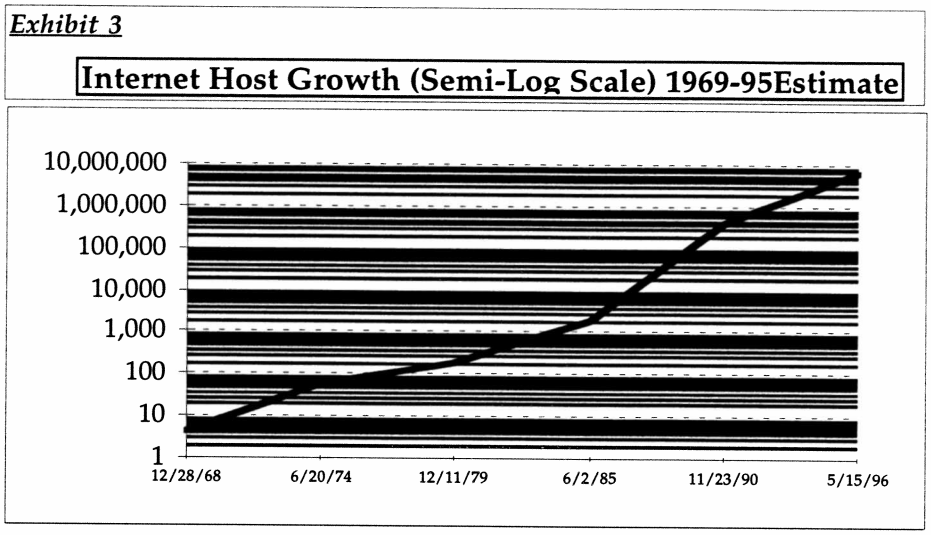
Source: Merit Networks

Exhibit 2



Source: Network Wizards

Exhibit 3



Source: Network Wizards. *Note: In the early 1980s there is an increase in the rate of growth due to the connecting of universities to the Internet.*

Exhibit 4

Estimated Internet-Related Revenue by Category
1995 - 2000

($ in millions)	1995	2000	CAGR	Revenue Sources
Direct Infrastructure	**$2,200**	**$14,000**	**45%**	
Data Networking Equipment	1,600	8,000	38%	Incremental revenues to companies to build Internet
Internet Security Equipment and Software	200	1,000	38%	Firewalls, virtual private networking, transactional/authentication enabling solution
Internet Service Providers	400	5,000	66%	Internet service providers
Indirect Infrastructure	**10,950**	**43,000**	**31%**	
PC, Server and Semiconductors	10,000	40,000	32%	PC and server companies
Telecommunications and Related Services	700	2,000	23%	Internet services
Telecommunications Equipment	250	1,000	32%	Incremantl revenues to companies to build Internet
Software and Services	**900**	**5,100**	**41%**	
Application Software	600	2,500	33%	E-mail, TCP?IP applications, browsers, authoring tools
Enterprise and Networking Software	200	2,000	58%	Enterprise/database/server software sales related to Internet
Internet/On-line Services, Consulting and Development	100	600	43%	Services and consulting
Content and Aggregation	**1,850**	**17,000**	**56%**	
Organization/Aggregation	1,500	6,000	32%	Online service providers and search engines
Information	100	5,000	119%	Incremental revenues from pay-services and advertising
Publications/Static and Publications/Interactive	50	1,000	82%	Magazines (printed and electronic) addressing the Internet
Commerce and Transaction Processing	200	5,000	90%	Incremental revenue from related Internet-based transactions
Total Revenue	**15,900**	**79,100**	**38%**	
Revenue Created by/for Internet†	**4,950**	**36,100**	**49%**	

CAGR = Compound Annual Growth Rate.

† includes Direct Infrastructure, Software and Services, and Content and Aggregation.

Source: Morgan Stanley Estimates

Exhibit 5

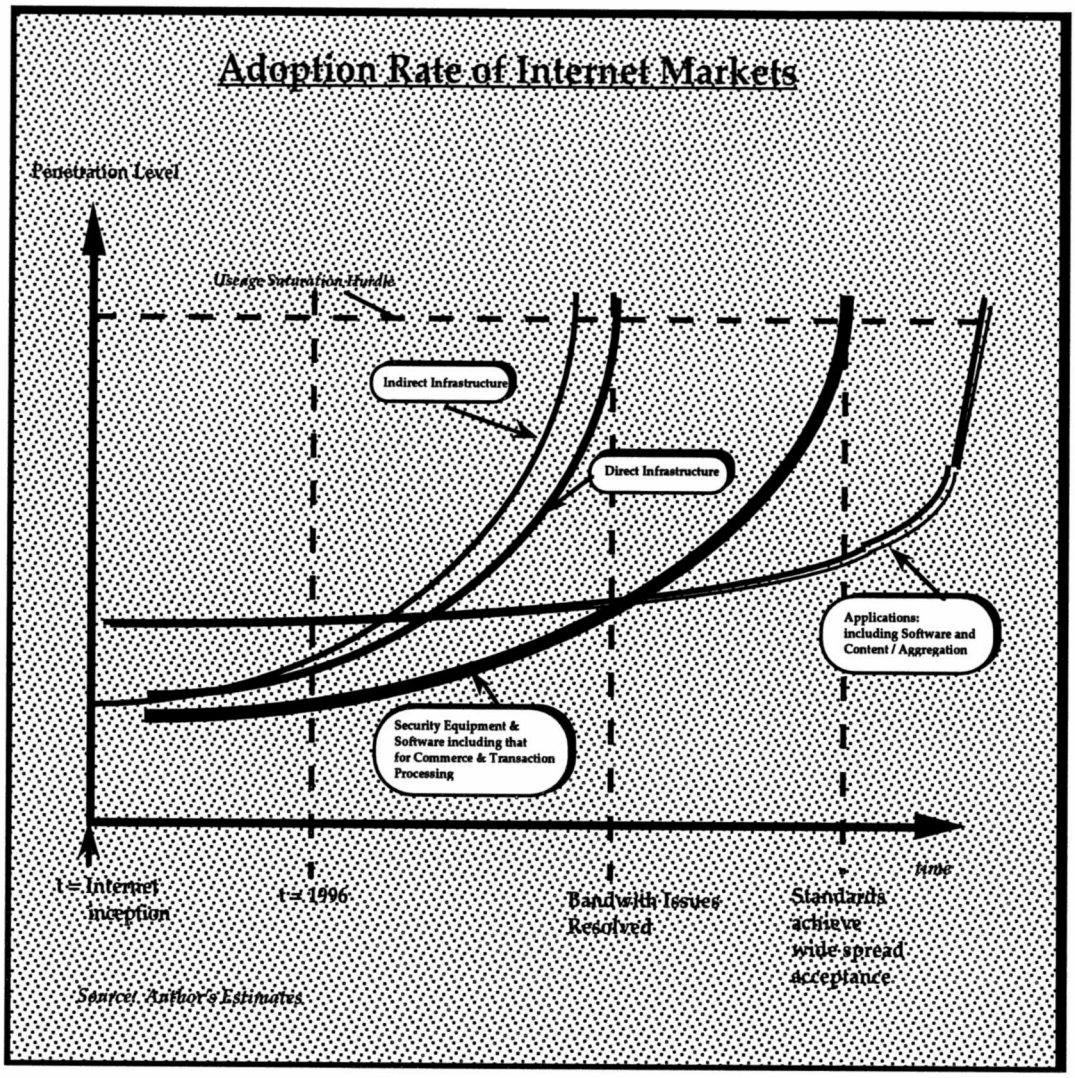

Adoption Rate of Internet Markets
Penetration Level
Usage Saturation Hurdle
Indirect Infrastructure
Direct Infrastructure
Applications: including Software and Content / Aggregation
Security Equipment & Software including that for Commerce & Transaction Processing
t = Internet inception
t = 1996
Bandwith Issues Resolved
Standards achieve wide spread acceptance
time
Source: Author's Estimates

Exhibit 6

Internet-Specific Earnings Stock Valuations (fiscal 1995)

Segment	Total Mkt Valuation ($MM)	Weighted Segment Earnings	Estimated ROE
PC, Server and Semiconductor Equipment	9,375	355,800	3.80%
Internet/On-Line Consulting	14	158	1.13%
Enterprise/Networking Software	32,364	353,056	1.09%
Data Networking Equipment	35,928	374,405	1.04%
Telecommunications Equipment	11,807	117,668	1.00%
Organization/Aggregation	8,153	50,327	0.62%
Internet Security Equipment & Software	789	1,252	0.16%
Application Software	8,062	8,553	0.11%
Internet Service Providers	2,581	1,114	0.04%
Information	341	0	0.00%
Publications Static/Interactive	105	0	0.00%

Exhibit 7
(used to build exhibt 6)

Company	Shares Outstanding (000's)	1995 Earnings (000's)	Earnings Weight	Weighted Segment Earnings
Data Networking Equipment				
Ascend	109,000	325,000	35,425,000,000	
Boca Research	8,921	9,542	85,124,182	
U.S. Robotics	41,555	95,400	3,964,347,000	
Cisco	276,858	480,379	132,996,769,182	
Global Village Communications				
Shiva CorpUS Robotics				
Xircom Inc	17,416	-14,878	-259,115,248	
Zoom Telephonies Inc	6,238	1,542	9,618,996	
Total:	**459,988**		**172,221,744,112**	**374,405**
Internet Security Equipment and Software				
Security Dynamics Tech	12,544	1,252	15,705,088	
Total:	**12,544**		**15,705,088**	**1,252**
Internet Service Providers				
BBN Corp	17,984	64,844	1,166,154,496	
Netcom	8,350	-14,064	-117,434,400	
PSINet	32,328	-13,050	-421,880,400	
UUNET Technologies	28,987	-18,257	-529,215,659	
Total:	**87,649**		**97,624,037**	**1,114**
PC, Server and Semiconductor Equipment				
Sun Microsystems	197,000	355,800	70,092,600,000	
Total:	**197,000**		**70,092,600,000**	**355,800**
Application Software				
Camelot Corp				
Firefox Communications	6,980	681	4,753,380	
FTP Software Inc	27,982	2,711	75,859,202	
Macromedia Inc	34,414	9,563	329,101,082	
Netmanage Inc	42,831	22,297	955,002,807	
Netscape Communications Corp	84,928	5,007	425,234,496	
VocalTech				
Spyglass	12,142	722		
Total:	**209,277**		**1,789,950,967**	**8,553**

Exhibit 7 Continued

Organization/Aggregation				
America Online Inc	99,788	-10,262	-1,024,024,456	
CMG Information Services				
H&R Block/CompuServe	106,197	107,259	11,390,584,023	
Total:	**205,985**		**10,366,559,567**	**50,327**
Information				
Data Broadcasting Corp				
Total: Irrelevant Contribution				
Publications Static/Interactive				
Mecklemedia Corp				
Total: Irrelevant Contribution				
Telecommunications Equipment				
ADTRAN	39,200	29,500	1,156,400,000	5,081
Cascade Communications	30,400	25,400	772,160,000	3,393
DSC Communications	118,100	192,700	22,757,870,000	99,991
StrataCom	39,900	52,500	2,094,750,000	9,204
Total:	**227,600**		**26,781,180,000**	**117,668**
Internet/On-Line Consulting				
FIND/SVP	7,900	158	1,248,200	
Enterprise/Networking Software				
Informix	139,000	105,300	14,636,700,000	
Novell	375,000	341,000	127,875,000,000	
Oracle Systems	443,000	441,000	195,363,000,000	
Total:	**957,000**		**337,874,700,000**	**353,056**

Exhibit 8

Internet Segment Recommendations

SEGMENT	OUTLOOK	RECOMMENDATION
Short-Term Opportunities		
Internet Security Equipment and Software	•High short-term growth expected •Long-term trend toward consolidation	Viable if firm Uses Private Placement Harvest-Strategy
Internet/On-line Services, Consulting and Development	•Short/Medium-Term growth Opportunities •Long-Term Trend Toward Consolidation	Viable if firm Uses Private Placement Harvest-Strategy
Telecommunications Equipment	•**Moderate Short-Term Opportunities**	Pursue where possible
Long-Term Opportunities		
Enterprise and Networking Software	•Tremendous Opportunities with Broad Range of Applications	Pursue, Especially Software Automation Solutions
Organization/Aggregation	•Potential Long-Term Growth Opportunities	Pursue as an Auxiliary Business Until Growth Begins
Information Providers	•**Services Will Offer Minimal Value Added** Relative to Other Segments •Not Suitable as a Core Business	Provide Only as a Means of Maintiaing Full Product Line
Publications/Interactive	•High Growth for Niche Marketers •Not a Large Market	Pursue Only as a Non-Core Business
Commerce and Transaction Processing	•Significantly Long-Term Growth Opport.	Pursue Only as a Non-Core Business until Growth Begins
Segments To Avoid		
PC, Server and Semiconductors	•Mature Market Undergoing Commoditization	Not a Good Business
Telecommunications and Related Services	•Mature Market with Deep-Pocketted Competitors	Not a Good Business
Application Software	•Many Firms Beginning to Mainstream •Impending Standardization Resulting in Room for only Few Players	Not a Good Business
Publications/Static	•Low Growth Expected	Not a Good Business
Data Networking Equipment	•Current Players Have Monopoly Power	Not a Good Business
Internet Service Providers	•Many Existing Competitors and Deep-Pocketted Potential Entrants •Consolidation Beginning to Take Place	Not a Good Business

Source: Author's Estimates