CHAPTER

Chapter 13

CHALLENGES TO IMPLEMENTATION[MODULE 4: MANAGERIAL IMPLEMENTATION ISSUES AND OPPORTUNITIES]

UNDERSTANDING NE IMPLEMENTATION CHALLENGES

The dominant drivers behind NE re likely to be irresistible over time. Yet there are many obstacles to the full realization of the vision. What are the reasons that Net-enablement is impeded and/or resisted? There are at least six majors technical areas that have been identified in the literature and there are many other social reasons that make sense. How should managers understand and deal with these impediments? Being able to workaround these impediments is critical for advancing the firm's interests. Other impediments are organizational in nature or emerging from the environment. An example would be lack of trust in the e-Vendor, which is often paired with lack of trust in the e-consumer. Once again, managers need to find solutions to NE implementation bottlenecks and push for its adoption. Otherwise, the benefits from NE will be retarded for years beyondwhat is necessary for full deployment.

LEARNING OBJECTIVES FOR THIS CHAPTER

c ***CASE STUDY 1-1***

GOOGLE.COM

INTRODUCTION

NE facilitates or creates the opportunities for a vast number of new commercial ventures. These need to be seen as order of magnitude opportunities,[1] meaning that we are on a completely different plane inintensity of activity than with traditional businesses. If your business has been communicating with millions of consumers previous to NE, the potentials customer base is now in the hundreds of millions. At some point in the not-too-distant future, it will be in the billions.

The picture is not entirely rosy, though. While the growth of the Internet has been impressive, to say the least, the dot.com bust has spawned an atmosphere of doubt in which fewer investments in new ventures are currently being made. In the long run, this may lead to entrepreneurial activities that are more sustainable. But in the early years of the 21st millennium, it has led to significant hurdles for innovation.

This chapter deals with challenges. These challenges are either technical in nature, that is, they are built into the way the Internet, the WWW, or current applications on the Internet function, or they are social. Social challenges have to do with the way society (citizens, and in their buying role, consumers), business, and government interact. It has to do with what they believe (true or not) and how they consciously or unconsciously act in dealing with the Internet.

TECHNICAL AND SOCIAL CHALLENGES TO IMPLEMENTATION

Technical challenges to the acceptance and full use of the Internet have been studied in the scientific literature.[2] Much of the material in this chapter, in fact, is adapted directly from the work by Rose, Khoo, and colleague.[3] As commented on throughout the book, it is vastly better for managers to base their best practices on what has been discovered by real-world oriented research. This work may ultimately be proven to be true (or not) in the firm's experience, but it offers a fresh, relatively objective perspective for change in a world of vested interests, salespersonship, and entrenched positions.

It is also important to note here at the beginning of this chapter that while technical limits have been researched holistically, this is not so with respect to social limits. Social, legal, regulatory, and business hurdles also affect the adoption of Net-enabled business practices. These social challenges are organizational or environmental in nature. Table 13.1 shows the hurdles under both categories.

Table 13.1 Technical and Social Challenges to NE Implementation

[1]Watson and Straub (2002).
[2]Rose et al. (1999).
[3]Permission to liberally use material granted by the Association of Information Systems. Thanks to my co-authors, Dr. Greg Rose and Huoy Khoo for their cooperation.

	Nature of Challenge
Tech-1	Security weaknesses
Tech-2	Download delays
Tech-3	Search problems
Tech-4	Inadequate measurement of Web site success
Tech-5	Limitations of the interface
Tech-6	Lack of Internet standards
Social-1	Fear of consumers in buying or transacting business over the Web
Social-2	Lack of brand awareness--significant penetration of the total market for specific products by companies
Social-3	Management/cultural problems in instituting e-business practices and ideas
Social-4	Lack of firm experience in doing e-business
Social-5	Organizational fear of doing business over the Internet
Social-6	Migrating to Internet computer-to-computer linkages from more familiar EDI
Social-7	Lack of well accepted or understood e-cash on the part of consumers or organizations
Social-8	Ambiguous or hostile legal or regulatory environment for NE

Figure 1.1

Both types of challenge present large and complex management problems for NEOs. Some can be solved through intelligent application of best practice and thorough understanding of the challenge. Later, we discuss many cases where managers can make decisions that reduce the negative effects of an obstacle, or even completely mitigate it. As we shall see, there are ways to deal with the fact that your customers may not have high speed connections to the Internet and your current Web pages take an inordinately long time to download. Redesign and customer interface options are some of the remedies proposed.

Others are beyond the firm's control, for the most part. Whereas individual firms may try to impact the Internet standards picture, and to improve these standards for the benefit of all, this is a consensual evolution and, strictly speaking, beyond the firm's control. Colloquia of Internet Society representatives, provider and supplier industry representatives, and societal groups will lead to buy-in on standards. Firms should definitely cooperate with these influential groups and do what they can to influence desirable outcomes, however.

What Makes Obstacles to Internet Adoption so Different?

Why has the firm lost control to influence adoption in the Internet environment? A primary reason is that sellers provided or controlled key methods for access in the past. Consider the following historical situations (Table13.2) where organizations were more in charge:

Table 13.2 Underlying Changes in Ownership of Access

Medium	Ownership of Access
Telephone	Public Telephone and Telegraph (PT&T) services
Cinema	Distributor-owned movie houses
Electric/gas	Infrastructure provided by monopolies
Cable	Coax and fiber owned to the residence/ business
Retail	Retailer storefronts

Figure 2.2

What is so different in the modern era is that half or more of the Internet access tools are now owned by the end users, whether they are individuals or businesses. Contrast this to a situation where the telephone companies owned all the technology, when even telephones were leased. While that we have never experienced settings where some access tools like TVs were leased from broadcasters, for instance, it is still true that control over the presentation of the programming was basically in the hands of the content providers.

The Internet has opened this up. Most content on the Web is provided free-of-charge, today, but without guarantees as to accuracy or levels of service. One can pick and choose which content to access and when to access it. Other than nodes on the Internet, which are still leased by the majority of users, the equipment or software of access is locally-owned. The Internet is a highly distributed and decentralized operating model. Business customers and individuals are in control of their own access tools, from the local area networks that batch requests, to printers, to PCs, laptops, workstations, PDAs, and cell phones for reaching out to the Internet.

This difference in ownership in infrastructure tools changes things dramatically for firms wishing to do business via the Internet. And it poses some thorny technical challenges.

TECHNOLOGICAL CHALLENGES

Internet technologies were responsible for enabling networked enterprises and their connections to customers, and they, in part, disenable it. The highly decentralized nature of the Internet is both responsible for its success and for its limitations.

It is important to remember that the Internet is essentially a client/server network, as we have pointed out many times in this book. The Web runs on the Internet as do email and file transfer protocols. Many other applications beyond these can and sometime in the future will use the Internet as their infrastructure.

Why are there built-in limitations to the applications that run over the Internet? Partly, this is due to historical evolution. Because the original infrastructure of the Internet was used for information sharing in government and academic, security and payment were not high on the agenda of the developers. Also, since the early applications like email were primarily asychronous (lag times between sending and receiving not being very important), the Internet had not been optimized for the later multimedia applications that came on board.

Commercial needs differ greatly from the more straight-forward information sharing needs of government officials and academics. So when the US National Science Foundation released the Internet for commercial use in 1994, it became immediately clear that some of the features of the Internet that made it so attractive for unrestricted information sharing were drawbacks in the commercial arena.

The second main characteristic of the Internet that made the transition to commercial use troublesome was that its original charter was non-profit. Changing the mentality of users so they were ready to pay for valuable services, and to accept security and other restrictions that would make it a viable exchange medium for a buying and selling milieu required time.

There is every reason to believe that the growth in the Internet can be measured with the most sensitivity by measuring the extent to which the challenges discussed in this chapter are met. Simply adding new nodes, new Web pages, new users at astonishing rates is not the issue. For the Internet to become entrenched in the commercial fabric of the world will require the solution, in part at least, of the impediments discussed below.

Implementing NE has enough deployment challenges without the negative impacts of impediments that come from the very utilization of NE technologies themselves. What are technical, rather than managerial/behavioral impediments to the development of NE? To make sure we know what a technical obstacle is, let’s take a clear example and examine it briefly.

Web pages take time to download. These times are not lengthy if the user has a high bandwidth connection. However, the vast majority of households and even small and medium-sized enterprises (SMEs) not only in the US, but around the world operate at slow speeds like 28.8 kilobits per second (or what is known as the baud rate). At these speeds, a Web page that has a lot of images and animated gifs, for instance, takes considerable time to download, irrespective of the internal capabilities of the client machine and software. Many Web sites could take over a minute to completely download.

What is the impact of such slow downloads on customers? They become impatient and basically bail out of Websites.[4] Sites that have fast-to-download Web pages experience more positive attitudes toward products and a greater inclination to purchase. Numerous scientific studies have made these discoveries.[5]

Managers are confronted with a difficult scenario. Given that many of their potential customers are operating with limited bandwidth, what should they do? The impediment is technical and cannot be remedied by higher processer capacity on the server side, nor can it be remedied with a wider transmission channel. Until the customer buys greater transmission capacity, the e-vendor or e-supply manager has to figure out how to deal with this obstacle.

There are workarounds. And, in the long run, such problems will be solved by the dissemination of broadband. For the time being, though, the prudent manager will take whatever measures will suffice. These we will cover in this chapter.

Relative Importance of Technological Impediments

With respect to the technologies that power the Internet, how important are each of the technical hurdles listed in Table 13.1? Scientific work is highly suggestive that they should be considered in the order in which they appear in Table 13.3 below. Possible solutions to the problems which are also enumerated will be discussed in the appropriate sections below.

Table 13.3 Prioritizing and Coping with Impediments to B2C e-Commerce

Impediment	Design Choices that Minimize Impact	Workarounds	Emerging Solutions
Tech-1 Security	Encrypt sensitive information; stress internal security on Website; fully activate firewalls	Offer bail-out parachutes for patrons, i.e., toll-free numbers, Faxes, mail; promote the fact that one's Website is secure	Improved firewalls; better intrusion detection software from deeper understanding of hacker psychology;better virus software
Tech-2 Download delay	More and speedier servers; client give-aways; text only-options	Push technologies working during lax-times	Bandwidth improvements; Internet II; faster CPUs

Figure 3.3

[4]Rose and Straub (2001).
[5]Rose et al. (2002); Rose et al. (2000)

Impediment	Design Choices that Minimize Impact	Workarounds	Emerging Solutions
Tech-3 Search Problems	Purchase company intuitive domain name at almost any cost	Buy related domain names; spiral branding; buy portal links	Intelligent agents
Tech-4 Inadequate metrics	Cookies	Nielsen opinion surveys (physical or electronic)	Pentium ID tracking or equivalent (if ever approved)
Tech-5 Interface Limitations	Animation; VRML	Mail physical samples of products	New sensory-capturing and -sending devices; advanced virtual reality
Tech-6 Lack of Internet standards	Drop down one generational level onWebsite; use lowest common denominators	Mail consumers plug-ins	New browsers able to workwith different generations of technology

Figure 3.3

Tech-1. Security has been and will probably continue to be the most serious problem for firms wishing to do more and more business over the Internet. Well publicized security break-ins and attacks on NEOs only hint at the extent of the problem. An orchestrated denial of service (DOS) attack by hackers on major content aggregators like eBay, yahoo, and amazon a few years ago showed just how vulnerable e-Firms can be. Some of these sites were closed down for many hours, and loss of business and customer confidence is incalculable.

Unfortunately, there are few studies that reveal the depth of the problem. Nevertheless, we can be certain that hackers and other anti-social individuals will continue to disrupt the process of online business unless security is taken on as a high priority management goal.

Tech-2. Second only to security is download delay. As we shall see, there is a huge variance in bandwidths in current use. Firms are in a tricky position since they cannot assume that their customers are operating at low or high speeds, since the true answer is that they are using both! At low speeds, many interactive Internet applications like "click-to-talk" or multimedia advertisements work poorly and turn off customers. [footnote-cite greggie].

Tech-3. If users cannot find out where and how they want to shop online, they will not do so. There is a critical need for search engines to become sophisticated to the point where users get exactly the information they need, and not more than they need or can process. Locking down intuitively obvious domain names is only one of the many ways firms can deal with this problem. The point is that it is a problem.

Tech-4. Being able to measure success is surely one of the most central tasks of managers. Without good information on performance, for instance, there is no feedback against which to measure management initiatives. Did such-and-such an investment work or not? The effects of change are also unknown.

Metrics are important, and it is only because we have some previous measures from traditional business settings that it is not even higher on the agenda. Which traditional metrics work and which are no longer applicable to NEOs? That is the rub.

Tech-5. Sensory limitations of the interface constrain the levels at which customers can be reached, but these are not terribly different from other common media. Other than face-to-face meetings, most media lose richness in one dimension or another.[6] Email, for example, is an extremely limited communication channel. Its impact is restricted to visual textual symbols. But in this regard it is no different than print media (without illustrations). "Click-to-talk" increases the richness with its auditory channel, but does not generally have an accompanying visual channel, which would augment richness. Again, this makes it no more or less limited than the radio.

Tech-6. Standards drive the rate of technological innovation and when standards are non-existent or not evolving to keep pace with change, they can impede progress. While there are task forces that work to develop Internet standards, some changes have been slow in coming. Standardization on the browser interface is just one example of an area where complete standards have not yet emerged. Yet, it is clear that the Internet is functioning. Consumers order goods, make payments, business customers engage in electronic trades, and firms move sensitive data across VPNs.

In that the standards currently governing the Internet are presently functioning, the reason that standards deserve attention is to allow aggressive movement forward in the future. Among the technical factors, this is important, but not of immediate critical concern.

Tech-1: SECURITY WEAKNESSES

While hackers take advantage of holes in Internet technology to press their advantage, counter technologies like encryption can protect the transmission itself. The possibility of hackers or other anti-socials intercepting transmissions, decrypting and reading them, substituting in parameters, and reaping financial benefits are remote if available security counter measures are implemented.

Even with enryption, there are security issues since end points of the transmission are extremely vulnerable, and breaches at either end are much more dangerous than breaches in the middle. The ends are uncertain since the Internet is such an open system, with the overall security of the entire network being no more secure than the weakest link. If one node has been compromised, then entities on that node can masquerade as others by

[6]Daft and Lengel (1984).

adopting their IP. This technique is known as IP-spoofing. Please note that it is not the transmission that has been compromised, but the end, the node.

The ways in which the Internet is insecure are primarily managerial in nature. Within acceptable levels of risk, there are technologies that can control access to PCs, sites and servers. If managers are serious about security, they can institute security controls and have a relatively secure site. And they can institute managerial controls, for example, that require that their business partners are relatively secure.

Some of these are designed to identify the originator. "Conversations" are transmitted across a variety of links for each packet sent. Furthermore, these packets may be relayed via some unscrupulous or poorly protected nodes. On the Internet, messages are being passed in a shared domain. Anyone with access to that domain can simply view all messages being sent through. Under these conditions, it is best to assume that unauthorized people are able to view any packet transmitted. Therefore, nodes which seek privacy need to speak in a fashion analogous to using code words. As long as any eavesdroppers do not know the secret code, they can listen in, but cannot understand. Internet technology is no better or worse than telephone technology in guaranteeing that the person on the other end of the line is who they claim to be.

Short of having a guarantor analogous to a thumb print or a signature, one cannot be sure with whom one is dealing. To secure Internet computing, technology was created to conceal messages and guarantee the identity of people on each end of the transmission. Digital signatures, Secure Electronic Transaction (SET), and similar technologies can act as guarantors for the transaction, assuring interested parties that the signatories involved currently exist and are who they claim to be.

With regard to concealing messages, two primary techniques are available. The first is to send non-text files. The other is to send text files which are jumbled via cryptography. Unencrypted "plain text" files are terribly insecure. Users sending text messages across the Internet should consider them to be no more secure than a post card. Anyone with access at any routing node can "listen in" to a text fragment and read that fragment without special software.

By contrast, a non-text file such as a picture file or an application data file (e.g., a MSExcel document) requires picture readers or other applications to interpret them. Typically speaking, files which require an application to interpret cannot be read without the intact file. Furthermore, it is not necessarily clear which application is needed to read the file even if it can be captured. As a result, multiple hurdles stand between a would-be spy and confidential information.

While picture and application files are somewhat more difficult to read and interpret, they are far from entirely secure. A motivated snoop can still capture the entire data stream and analyze the files to find which application (typically off the shelf) is needed to interpret them. By contrast, encrypted messages, when used correctly, are far better protection against all but the most highly motivated criminal interceptor.

As noted in chapter 5, encryption technology uses cryptography to scramble messages. Different strategies are available which can secure either or both ends of a data transmission. Furthermore, digital signatures use the same technology to assure that one is dealing with only the individuals one wants to be dealing with. Digital signatures are assigned by a certifiedd Internet authority. Unique passcodes of digital signatures identify individuals in much the same way as a physicalsignature or password. Of course, digital identities can be physically stolen.

However, mechanisms are available which make identity-theft extremely difficult. Examples include having identities hard coded onto a smart card and using biometrics such as retina scanners to confirm identities prior to authorization of use.

Using such technologies, transactions across the Internet can be more secure than many traditional transaction processes. If current technologies are in use, the biggest dangers to security occur before or after data is transferred. Security threats exist even if a legitimate e-Consumer sends data to a legitimate e-Retailer without that data being intercepted.

Threats to Security from the Physical World and Hackers

Getting the transaction to the recipient can be made safe, but the transaction information is less safe once it reaches the destination. Clearly, within organizations, there are threats which exist in the intra-organizational electronic and physical worlds from rogue employees. Security on the Internet cannot prevent abuse within corporations any more than a secure phone line can prevent someone with access privileges at the telephone company from retrieving and publishing an unlisted number residing on the customer database. The security of the transactional communication medium in that case is not the issue. Threats occur from the wrong people accessing corporate databases from within, not on the way to the company.

Threats from rogue employees exist regardless of whether the retailer is conducting business on the Internet or not. However, unlike non-Internet commerce, e-Commerce has many millions more people with potential access to those corporate databases. Hackers are a clear security threat to e-Retailer servers, for instance. Because many corporations store data which is accessible online, any hacker on the Internet has the opportunity to steal data from corporate databases.

While sophisticated firewalls and other security measures exist, hackers appear to be one step ahead of available security. Risks are real and worrisome in their scope. For instance, one survey of 1,700 corporate and government Web sites found over 60 percent had "serious potential security vulnerabilities."[7] In addition, examples of successful computer hack-ins show just how potentially damaging these security breaches can be. In one instance alone, a hacker broke into a database of a San Diego ISP and stole 100,000 credit card numbers using well known hacking techniques.[8]

[7]Lohr (1997).
[8]Gurnon (1997).

Besides inadequate utilization of available firewall features, a major technological limitation of most firewalls is that they must be equipped to identify a line as belonging to a particular IP address. If not, IP-spoofing can allow hackers access to internal networks.

Apparent Threats to Net-Enablement

Transaction security is a technical problem for NEOS because the Internet has so many places where hackers can penetrate. Moreover, managers do not recognize the solutions available to them, nor do they apply them . Retail customers are not yet comfortable with sending personal information across the Internet. The irony is that the Internet can be at least, if not more secure than a phone transaction so long as encryption is used, the caveat being that a transaction is only secure if appropriate technologies are used. This issue extends beyond technology and represents a failure in the human and managerial domain. The real threats to security lie outside the transaction. To some extent, threats exist because people are not utilizing the existing technologies. If people conduct business transactions with unscrupulous vendors or if sensitive information is stored on unsecured databases, security threats exist even where data is perfectly secure in transmission.

Whereas hackers can attack servers and steal sensitive data from outside the organization, client-side vulnerabilities are limited for the present. Currently, clients seldom have permanent IP addresses because these are dynamically assigned at the node or by the ISP. The threat of hackers will only grow worse when e-Consumers begin to have Internet clients with permanent IP addresses. Sensitive data will then be vulnerable to attack from the client side as well as the server side.

In spite of existing technologies, millions have been victims of e-Commerce fraud or related credit-card misuse. What percentage of these problems could be eliminated simply by utilizing existing security technologies is not clear. What is clear is that security is a serious problem for NE. Transactional security is mostly a managerial rather than a technological problem. However, such areas as firewall vulnerabilities, simplistic intrusion detection software, and server flooding problems remain as technical issues.

Designs and Workarounds-Security

Designs and workarounds allow managers to deal with this impediment, even if the organization's systems are not set up to accommodate security. Table 13.2 highlights these solutions for security and the other impediments.

In the case of security, for example, customers can be offered bail-out parachutes like call centers or FAX communications if they do not wish to trust their credit card data or other sensitive information to the Internet. Moreover, organizations need to promote safety features of their Website even if the site has not been thoroughly secured. If customers are willing to transact business with the organization even though they have been informed as to those features which have been activated (and, implicitly, therefore, those which have not), then they may be legitimately construed as giving informed consumer consent.

One design tactic, for example, that can minimize actual security violations is encryption, which is Secure Socket Layer (SSL) encryption embedded in the browsers or through Secure Electronic Transmission (SET) now being promoted by a consortium of credit card firms. Encryption, if used, should essentially eliminate all hacker interpretation of the transmission itself. Managers also need to ensure that the firewalls they now have protecting their internal systems are fully functioning and robust to attack. If they are not, greater attention needs to be placed in this area.

Technologies on the horizon will solve some of the current security problems. Firewalls are being given more and more intelligence and will eventually be able to duplicate many of the enlightened security decisions of a human monitor. Virus software is likewise improving and available as a Web service, although it has proven to be hard to keep pace with the insidious inventiveness of hackers.

Finally, we need deeper insights into hacker psychology to improve technological solutions. Such insights can emerge from academic researchers with sufficient funding from sources like government and corporations and the deeper knowledge this research will produce can assist us in designing technology that prevents and detects computer abuse. This kind of software, called intrusion detection, will, no doubt, advance from its current, relatively primitive state to a level of greater sophistication through deeper understanding of hacker motivation and behavior.

Tech-2: DOWNLOAD DELAYS

Download time is the amount of time it takes for a Web client machine to receive and display a data file submitted by a Web server after that file was requested by the client. Download delays impede the development and use of Internet applications such as multimedia for B2C commerce. For example, technology exists to show a television ad on a Web page. However, the amount of wait time required before such an ad can be downloaded and run is prohibitive, and, thus, is not often used. Download delays are responsible for the virtual absence of television-style 30-second audio and video advertising over the Web. For the most part, practical limits of multimedia use are established by what users think is acceptable download time. Under normal computing conditions, end-users find it objectionable to wait more than a few seconds between computer processing cycles (such as the amount of time it takes to load a Web page upon requesting it). Waiting more than half a minute is considered intolerable. As a result, there are limits to the use of multimedia communication which require long download times.

Download time is primarily a function of: (1) the size of the data files being transmitted; and (2) the technological configuration of nodes, the network infrastructure, and the bandwidth connection between nodes and infrastructure. Compared to simple HTML pages (typically 1-10 Kb in size), many existing Internet multimedia technologies require relatively large data files to be transmitted and displayed. Examples of these types of media include: (1) video or pictures (which vary in size between 10 Kb and several Mb), especially those in color and especially those with a wide color spectrum, (2) video or picture

files with a large display area, (3) sound files, and (4) files which contain applications or applets.

In addition, traditional desktop application data files, such as MSWord or MSExcel files are often shared in Internet client/server computing and can often be larger than 1 Mb in size. As a result, many of these types of communications become impractical on the Web, depending, of course, on the technological configuration. Furthermore, when considering the combination of multiple data files for use in one hyperdocument, compromises between optimal communication and reasonable download time need to be considered.

Download time differences can be significant for even small file sizes. Table 13.4 shows tests of delay data obtained for loading a 10.5 Kb file and a 6.3Mb file. The baud rate is a bits per second transmission rate.

Table 13.4 Download Time at Different Communication Speeds

Communication Speed	10.5 KB file (Source: Netmechanic.com, 1998)	6.3MB file (Source: Ozer, 1999)
14.4 K baud	7.83 seconds	
56 K baud	3.84 seconds	23 minutes, 13 seconds
128 K baud (ISDN line)	2.66 seconds	16 minutes, 17 seconds
1.5 M baud (T1)	2.06 seconds	
500 K baud (Cable)		1 minute, 34 seconds
1.5 M baud (DSL)		45 seconds

Figure 4.4

Clearly, a delay over 23 minutes at 56 K baud would be considered excessive by most people. Interface design requiring files of this size have to be carried out with this delay in mind.

Technological Conditions Which Increase Download Time

As stated above, many multimedia technologies require prohibitively long download times depending on the node or infrastructural technologies in used to request, transmit, and display the files. A file that would be considered quite large under one set of conditions could be considered completely practical (i.e., sufficiently small) in another. Therefore, file size in and of itself is not an impediment to Internet computing. However, the technological conditions that increase download time are impediments. Delays in download time can occur at the server side, in transmission, or at the client side. Potential for bottlenecks in each of these areas are shown in Figure 13.1.

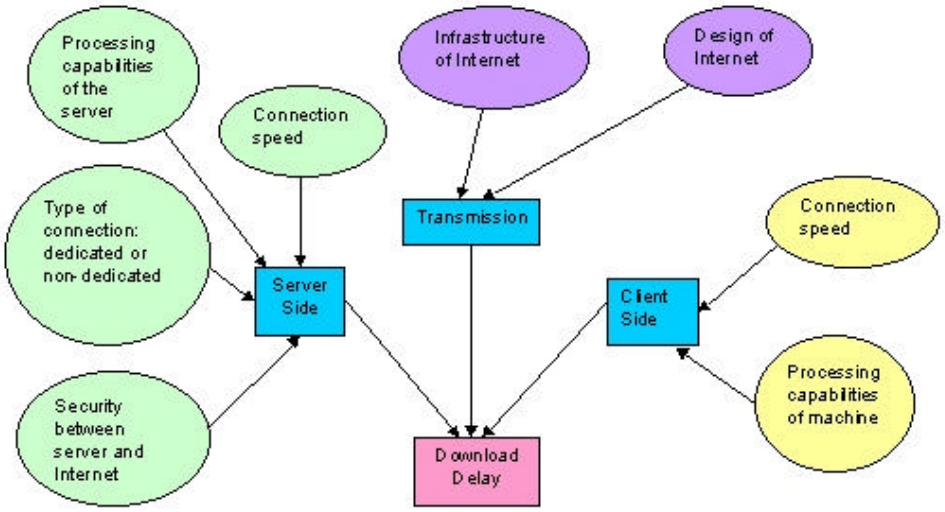

Figure 13.1 Elements of Download Delay

Server Side Download Time

Assuming that a request for hypermedia was sent via a URL to its appropriate server, the technological configuration of that server can increase download time in three ways: (1) in the connection between the server and the Internet, (2) in the processing capacity of the server itself, and (3) in the security system between the Internet gateway and the server that is processing requests and retrieving files.

(1) Server and the Internet Connection

A server can be set up as either dedicated or non-dedicated and with a low or high throughput connection. If a server is not available to receive Internet requests at all times (i.e., it is a non-dedicated connection), responses from the server will clearly be delayed until the server can be accessed. If a server has a narrow bandwidth connection (such as a 56 K modem connected to a phone line), it can serve only a few client requests at a time and will have a difficult time transmitting very quickly even one request for files larger than a few kilobytes. Therefore, a server with a non-dedicated connection at 56 K will exhibit extremely high download times. By contrast, a dedicated T1 connection at 1.5 M baud can theoretically transmit over fifty times more data than a dedicated 56 K modem and has the capacity tohandle many requests for files many MB in size.

(2) Processing Capacity of the Server Itself

Even if the Internet connection can transfer 1.5 Mbps, sufficient numbers of requests, each only 1 Kb, can overwhelm the processing capacity of a server. Although a relatively small amount of bandwidth capacity would be used in this condition, the server would be unable to respond to any more requests and download time would be increased for all subsequent

requests. Therefore, depending on the volume of individual requests, a higher capacity server or even multiple, parallel servers may be needed to meet demand.

(3) Security Systems between the Internet Gateway and the Server
This delay is by design. Security software and hardware can be set up as a firewall between a server and the outside world to restrict access to those clients or file transfers deemed acceptable. The very nature of this security process is to have the computer check requests, user domains, passwords and so forth. As a result, processing time is required to check these users and files against a specified list of acceptable users, nodes, or processes. As the number of requests increases, the amount of processing time also increases both for processing a user (to confirm their requests are acceptable and to provide the data requested) and for processing all subsequent users. Any one of these three technical points related to servers has the potential to be a data transmission bottleneck and, therefore, a contributor to increaseddownload time.

Transmission Download Time
The network infrastructure lies between the client and the server and carries the communication between them. Transmission delays, or limitations with regard to this infrastructural element, increase the download time of an Internet communication.

There are limitations in the infrastructure of the Internet itself. Average download times for corporate sites vary drastically between certain cities and certain weeks of the year. Much of this variation is caused by infrastructure delays.

The public tends to assume that technological systems are perfect when they are not. The Internet infrastructure is generally considered to be robust and reliable-and it is expected to improve as router technology improves. However, shutdowns do occur, albeit rarely. Much as an occasional power or telephone disruption, regional sections of the infrastructure have shut down (Wagner, 1997; Wagner and Gaudin, 1997).

Slow transmission across the Internet may be a product of its design. Especially when dealing with large files, the very nature of the Internet can lead to communication difficulties. By design, the Internet and TCP/IP breaks up large data into small packets. Individual packets do occasionally get delayed (and, less frequently, lost). Naturally, the larger the file, the greater the number of packets. A consequence of having many packets is that the larger the file, the greater the chance of having one piece of the total file delayed or lost in transmission. This limitation in the infrastructure for handling very large data transmissions in fact, inspired the creation of Internet 2. Internet 2 is a project to develop a parallel Internet which would allow for high speed transmission of extremely large data files. Examples of data files of this size would be corporate databases, virtual reality video, video conferencing, and television-style broadcasts or movies. Internet 2 is being projected as a pay-as-you-use system for business. This approach differs from the Internet where no charge is levied for transmission of data packets between destinations within the US.

Currently, the only charges for e-Retailers and e-Consumers are for transmitting the message to and from the Internet itself. Paying for Internet transmission will change the nature of Internet client/server computing but will allow for dependable and fast large file transfer.

Client Side Download Time

The client side of Internet computing suffers from the same two basic limitations as the server side: the connection and the processor. With regard to the connection, client machines in a typical residential computing environment in the United States consists of a 14.4 Kbps - 56.6 Kbps modem connection via the telephone. As a result, even if data is transferred out of the server through a T3 line (45 Mbps) and across the Internet at a brisk pace, these data cannot be accepted by the client machine any faster than what the modem being used allows. Consequently, client side connection bandwidth is often seen as the biggest source of download time in Internet computing.

In addition to bandwidth, plain old telephone service (POTS) is generally acknowledged to provide unreliable connection (Snyder, 1997). Problems can include busy and no answer signals, as well as failure with modem connections once the call goes through. Connection problems can also be an issue when the client has a dedicated line. Anecdotal evidence indicates that cable services are disrupted with some regularity.

In spite of these limitations and the availability of such higher speed connection alternatives as cable modems, dial-up modem computing is the norm in North American households at present. Average residential users are extremely price sensitive. Dial-up access has fairly inexpensive monthly costs with no startup costs beyond the modem in the US. Costs are low because existing phone lines can be used at no additional charge and modems are very inexpensive (USD 25 - 100). In contrast, high-speed alternatives can cost several hundreds of dollars more initially, and ten to forty dollars more each month, than dial-up computing.

Even if high-speed alternatives were the same cost as slower dial-up connections, these alternatives will not be universally available in the near term. In 1999, cable modems were available to only 20% of the US. Likewise, DSL connections were available to less than 8%. Further, only 60% of the US is projected to have either available by 2004. Therefore, 40% of US households will not have these broadband alternatives available to them at any cost. While in theory satellite connection is available to the remaining users, this service is currently available only to those with clear southern exposure and is seen as a lesser alternative even where available. Satellite is currently recognized to have more limited capabilities and drastically slower data transfer speeds than DSL or cable.

Regardless of price, however, the demand for high-speed access is not universal. A survey of users who are currently on-line found that fewer than half are very interested in having a high-speed connection. In addition, e-Consumers may be wary of using dedicated Internet connection for security reasons. Unlike dial-up connections, dedicated connections assign permanent Internet addresses to client machines. As a result, clients with dedicated

lines are significantly more vulnerable to computer hackers. Appropriate firewall software costs approximately USD 500 and cannot guarantee freedom from attack.

Whatever the reason, broadband penetration in the U.S. is not expected to be universal anytime soon. In 1999, fewer than 4% of households with access to cable modems and 1% of those with access to DSL used those services (Greene, 1999). Furthermore, only 20% of Internet users in the US are predicted to adopt a broadband connection by 2002. As a result, slow connection speeds for client-side computing at the residential level will very likely persist in the near term and beyond. In addition to slow connection speed client side processing , limitations can increase download time. Older and slower machines do not have the processing capabilities or memory capacities to interpret and display large graphical or application files rapidly. Furthermore, under-configured machines may find it particularly difficult to open hyperdocuments while multiple browsers or other desktop applications are running. Clearly, the slower the computer. processor, the lower the memory capacity, and the larger the number of concurrent applications being run, the longer the download time.

Apparent Threats to Net-Enablement

Threats with regard to download time are most apparent on the client side in B2C e-Commerce. Server side download time limitations are completely within the control of the party that owns the server. With enough money and prudent server administration, there is no reason why the server side would have to be a bottleneck in B2C e-Commerce. Impediments to improved server delay are basically economic. A firm can make decisions on how to overcome these delays at a known cost. The decision, if made rationally, is affected by the estimate of the increase in business that faster response time would bring. It is also unlikely that the Internet infrastructure will be the primary bottleneck in B2C e-Commerce in the near future. Improved routers and the forthcoming Internet2 may eliminate much infrastructure delay. Even with the traditional Internet, it is unlikely that a typical B2C e-Commerce application will have its primary download time difficulties occur within the Internet infrastructure itself. However, some predict that if broadband computing leads to larger files being transferred, the Internet infrastructure will become the source of significant download time. But until broadband is universally adopted, the bottleneck should occur primarily at the client end.

Unfortunately, there is no way for a retailer to control the hardware configuration being used at the client side, short of buying equipment and connection bandwidth for customers. Since customers will vary in processing and bandwidth capabilities, it is difficult for retailers to accommodate every user effectively. For example, one test of high-speed connections across the US showed that cable, DSL and satellite connections were 4 to 30 times faster than 56K modems[9] downloading the same files. Moreover, telecommunications infrastructures and computer technologies are less robust outside the United States, especially in the developing world. If a retailer is trying to reach e-Consumers across global markets, the differences in download time may be even larger.

[9] Freed and Durfler (1999).

Currently, Web user connection speeds are disparate, but fairly slow. One survey of Web users found a wide distribution across a sample of 7000+ people in the US (Figure 13.2). Respondents were asked about the speed of their primary connection to the Internet. Because the survey did not discriminate between home or work connections (where employers may restrict Internet use to business activities), the data may not be representative of typical connections. Presumably, actual connections would be slower for home than for work connections.

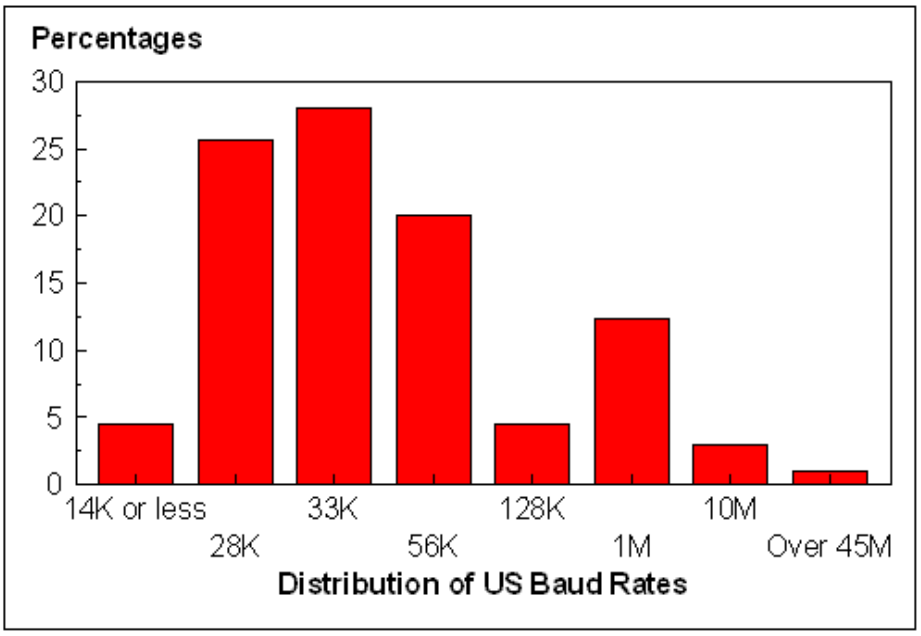

Figure 13.2 Slow Average Baud Rates for US Internet Usage

As a result of disparities in download times among customers, retailers need to be careful in devising their NE strategy. Hypermedia development needs to have the right balance of content and file size to communicate effectively to all e-Consumers without excessive delay. In addition, user-selectable versions of the same messages should be created to accommodate different capacities. For example, some users. may choose to reduce their own download time by selecting a text-only version of the hyperdocument transmission.

Currently, few retailers appear to be utilizing the preferential option. However, some companies have adopted this dual strategy. Among non-profits, ISWorld.org, the Web site for IS professors, offers a text-only site, presumably for faculty with slower connections.

Designs and Workarounds-Download Delay

What are possible solutions? Table 13.2 highlights these. On the server side, organization-scan ensure that there are minimal delays in node access to the server and retransmission

of Web pages. If processing on the server is called for, then delay can be minimized with sufficient investment in powerful server hardware, software, and telecomm gateways. More and speedier servers are the obvious solution to the server side of the problem.

The solution on the client side is complex. If consumers are not willing to rent or buy cable modems, purchase faster client s/w and h/w, or download and install the latest generation of browser software, then companies are hamstrung. Text-only options will reduce download delay on the client side, certainly, and this option should be made available on the e-Firm's home page. Web pages can also be split up, as demonstated in Figure 13.3.

Figure 13.3 Cutting Content to Speed Downloads (www.washingtonpost.com, 16-09-1999)

The only other immediately obvious solutions are client giveaways. Giving away PCs or NCs (network computers) may be an economically justifiable solution. Forward-looking firms have been doing this over the years, under the assumption that free computers will generate enough Web business to more than cover the expense. Clients that are given away can be configured for minimal download delays and for automatically receiving new upgrades on-line as they become available. These qualities can be hard-wired so that users cannot reconfigure the units. While this sales technique has not been a gigantic success to date, these firms are strategically correct in assuming that this is the only way to truly control the user end.

There are also workarounds that can reduce download delays. If consumers/ customers consent, push software can send information to them during off hours. These specialized circumstances apply to regular customers but not to the random Web-surfing consumer.

Over time, some download delays will be solved by wider bandwidth availability, such as Internet2, cable modems, etc. Faster CPUs will also reduce delay. But, ironically, as bandwidths increase, so do the requirements of Web applications. More and more firms will

opt for livening up their Web pages with multimedia and with applets, animated gifs, etc., in such a way that added bandwidth may be absorbed as fast as it is created.

Tech-3: SEARCH PROBLEMS

Creation of content and ability to transmit that content are not in and of themselves enough to communicate a message. Assuming limitations to hyperdocument content development and delivery can be overcome, communication will not occur without e-Consumers finding those documents. Current technological limits in Internet technology hinder requests for hypermedia.

Hypermedia are requested by Web clients through the use of URLs. URLs are typically invoked three ways: (1) by manually typing in the URL; (2) by recalling a URL from a list of bookmarks stored on the client machine; and (3) via hyperlinks.

Hyperlinks are either hard coded into a hyperdocument or are generated dynamically from user input. Search engines such as Yahoo and Alta Vista are examples of user input creating a dynamic page of hyperlinks. Bookmarks and manually typed addresses require that a user previously visited a page or recalled a Web address. Limitations affecting how people can hear about a Web address are mostly not technological in nature. Word of mouth or promotional strategies create an awareness of URLs. Hyperlinking to invoke URLs, however, is often a product of existing technologies. As a result, limitations in these technologies can lead to a restricted ability to find appropriate URLs.

So there are technological difficulties in finding URLs both with regard to hard coded hyperlinks and with dynamically created hyperlinks. When a URL is hard coded into a Web page, there are technological problems dealing with the persistence or existence of these links. Since the hyperlinks are static and written in HTML code, they can become outdated. As Web pages move, are replaced or deleted, the hard coded URLs can point to incorrect or non-existing content. This problem is chronic across banking Web sites. While technology such as client-pull exists for forwarding browsers to new links from the original addresses, implementation of this strategy may become impractical for all but a few links such as those found on home pages.

Technology for finding outdated links across the Internet is not currently available. Thousands upon thousands of Web pages pointing to obsolete addresses reside currently on servers around the world. In addition, even if all of these outdated links could be found, they could not be updated by any single individual or organization. Servers where a user does not have security access would not allow outsiders to update resident HTML files. Because technological security measures can themselves impede the maintenance necessary for maintaining accurate URL links, the ability of content providers to have their messages found is impacted by current Internet technologies. Even without such security and managerial limitations, however, the problem would still exist. Under the best of current conditions, with dynamic link creation and search engines, the task of updating Web links is untenable. Automated search engine robots with the power to scan the entire Internet, even those with security clearance, chronically suffer from inaccurate link data.

With search engines such as Alta Vista, dynamic links are created from databases of Web page locations. Large search engine databases are updated on a regular basis by search agent "know-bots," programs designed to find and report on the contents of Web pages. Intelligent search agents scour the Internet discovering Web pages and collecting content and corresponding URLs. Data about page content and address are stored in large databases. When a search is requested, the address in the database is used to create a hyperlink on a dynamic page.

By using search agents, existing pages can be reconfirmed periodically and data about those pages can be updated. As a result, a dynamically created page of hyperlinks will be typically more accurate than a static page of links. While this solution overcomes many of the limitations created by static Web pages, it is not without its own limitations. Each year, millions of new host Internet computers are being added to those already registered. As a result, hundreds of millions of pages exist at any given time. Computing technology to date finds it impossible to collect and maintain a perfect database of Web page addresses and content for such a huge population. Unfortunately, even if a perfect database could be created and maintained, the sheer number of pages make it difficult for client-side users to find appropriate pages. Even with the improvments in search engine technology represented by engiens like google.com, search engine queries are not yet sophisticated enough to be entirely effective. There are still too many false hits.

Current search queries are based on keyword searches. Keyword queries consist of a user entering a list of key words. The search engine uses this query in its database to search for pages containing those words. Often these searches result in hundreds of thousands of matching pages-far too many to be useful in finding specific information sought. Worse still, unknown thousands of other pages which could be applicable to the user are missed because they do not contain the particular keywords chosen by the users, but only synonyms of the keywords requested. In short, current search engine technology provides both too much and too little information. While it does aid in helping users find specific hypermedia, it is still severely limited.

One way to avoid difficulty with search engines is to acquire an intuitive URL. Web pages such as www.microsoft.com make it easy to find Microsoft without a search engine. Pages with less intuitive URLs are presumably at a disadvantage. Further difficulty comes from organizations that own URLs which would seem to be logical addresses for another organization, sites such as www.delta.com. This Web page once belonged to deltaComm Development, not Delta Airlines, as apparently 15,000 people per day believed. Consumer confusion is evident in the delta.com home page which stated:

"We apologize for the lack of pretty graphics -- you'll find those within the links above. 15,000 of you per day are looking for an unrelated company, so we have been forced to make this page as sparse as possible to prevent server overload. If you are one of those, please use a search engine to find the travel company you were looking for. If you're looking for information about Telix, or our Internet services, please come on in."

While some similar name Web pages do provide links to the likely candidate page (such as www.bic.com (the Brookhaven Instruments Corporation) which gives a link to the razor manufacturer at www.bicworld.com), others like deltaComm Development would-not. Goodwill cannot be relied on.

From the Delta example above, as well as the literature, it appears that e-Consumers experience difficulty in finding organizations without an intuitive URL. Retailers with URLs which cannot be guessed easily are presumed to be at an apparent disadvantage at being found because search engines are imperfect tools. Search engines, however, can be manipulated by retailers. Specifically, retailers can pay to have their pages appear closer to the top of search engine query results and in portal listings. With enough available resources, companies should be able to overcome some of these technological limitations.

To test the difficulty of finding pages for organizations with the largest financial resources, a simple, limited experiment was conducted by Rose et al. (1999). Ten Fortune 500 companies whose URLs which were not "www." + the company name + ".com". were chosen as a convenience sample. The names of the companies and their associated industries were read aloud to allow subjects to misspell the names as they would naturally do in their own searches. Industry type was provided for use both as a search criterion as well as to allow students to verify that they had found the correct organization. Subjects were asked to spend up to five minutes trying to find each home page.

Findings from this study give a glimpse into what would be the lower bound of difficulty in finding Web pages. Results of the study reinforce the belief that e-Consumers have problems in locating Web pages on the Internet. Of the 130 total pages searched for in the study (10 pages and 13 subjects), 31 pages (24%) were not found after 5 minutes of search time. Of the remaining 99 pages, an average search time of 1 minute and 37 seconds was required to find a page. Delays are known to cause anxietyand delays as little as one second are known to have significant negative impacts.[10] The results show that current technological and human search capabilities can be a threat to successful B2C NE under even the best of conditions.

Apparent Threats to Net-Enablement

The inability of clients to locate an appropriate URL is a most difficult challenge for NEOs. When seeking information, consumers and even business customers will generally stop looking for alternatives fairly quickly, i.e., after putting in a relatively limited amount of effort on each alternative.[11] If a content provider's URL is buried among 100,000 other URLs, it is unlikely that a user will be motivated enough to find a specific address. Furthermore, if users receive a message indicating that a Web page does not exist, they are quite likely to seek an alternative vendor whose URL is readily retrievable. Some vendors, knowing that they are competing for the top spots on the search engines, use techniques such as "spam-dexing." Spam-dexing is a strategy to put keywords in HTML headers which will put that page up near the top ten listing for common search strings. A side

[10] Shneiderman (1998).
[11] Capon and Burke (1980).

effect is that individuals who do not attempt to manipulate the search engines, even those which are more legitimately related to the search string, are left out. A risk is that, if caught by managers of the search engine, spam-dexers may have their Web pages removed entirely. Therefore, it is difficult to say if spam-dexing is a good managerial design strategy. Efforts to counteract these problems can be made. Strategies such as paid advertising on the Web allows vendors to pay for pages on other servers to have up-to-date hyperlinks. Because of these two limitations in Web metrics, the success rates of these advertisements is unknown.

Designs and Workarounds-Search Problems

Among possible solutions are: (1) buying intuitively clear as well as related domain names, (2) spiral branding, and (3) portal links. Originally, Delta Airlines pursued a "related name" strategy with www.delta-air.com since www.delta.com was owned by another firm, Delta Comm. However, this strategy was not as strategic as owning the intuitively obvious name, www.delta.com. So Delta Airlines purchased this domain name for its own use, and in doing so, made a good strategic move.

Another solution is spiral branding. Spiral branding is the use of alternative media to advertise a firm's URL URLs appear regularly on TV and radio as well as in print media. This approach, no doubt, has some effect on consumer's habits in accessing an URL. Portal links, costly as they may be, stake out heavily visited cyberspace and, therefore, positioning on their site is worth a good deal. Some argue that the market value of Yahoo, Excite, and even amazon.com are directly attributable to their familiarity with e-Consumers and their ability to sell that space through portaling to other sites.

Technological solutions to search engine deficiencies are being touted everyday. Perhaps the most vociferous of these claims is intelligent agents. Whenthese work well, agent technology should be able to parse a natural language user request for information and determine sites most appropriate for that request. A request for physical shoe stores in Tokyo should not have high-up listings for virtual shoe stores or for anyone who lives in Tokyo and happens to mention shoes on their personal home page. As search engines improve, agent technology is likely to be at the heart of this change.

Tech-4: INADEQUATE MEASUREMENT OF WEB SITE SUCCESS

The WWW is currently severely limited in its ability to measure and track consumer or business customers cyber-patterns. Hits are nearly as gross a measurement as Internet sales. Other than post-hoc analysis of customer-entered data, the only marginally acceptable way to design measures to determine customer navigating patterns is through cookies. When and if browsers make the "disabling" of cookies the default (rather than the current default, which is "enabling" of cookies), the problems become even more difficult. For the moment, many customers are not aware that firms are writing cookies to their hard drives and until such time as they are generally aware of this (and may rebel by disabling cookies), firms would be well advised to exploit the valuable information cookies provide.

It is currently very difficult to measure the success of a Web page or a Web site. The core issue is that we do not know what makes an appropriate metric of success for a hypermedia application. Commonly used measures, such as number of times a Web page is viewed (called "hits"), are considered to be failures. Hits are used because they are easy to capture. While easy to capture, they are very hard to interpret as a measure of success, and, therefore, are very often deemed to be inadequate. Why are hits hard to interpret? Aside from "hits" recorded by those who blunder onto the site and have no genuine interest in their content, search engines routinely add to site counters through their "know-bot" intelligent agents, discussed above. Moreover, multiple visits by individual potential consumers cannot be discriminated from separate visits by separate potential consumers. Each visit to the Web site is counted, irrespective of the client requestor.

What is even more critical, however, is the fact that viewing a site does not clearly represent a level of interest. Interest will range from no interest whatever to highly interested, but the site owner has absolutely no knowledge of the nature of the frequency distribution of interest level through this gross measures of "hits." The metric content providers should be trying to gather is best described as: "Who is looking at my content, how many times are they visiting, and for how long?" Unfortunately, current Web technology does not allow servers to obtain a clear picture of who is looking at its pages. Typically, Web servers are only aware of the Internet gateway being used by a client. For example, a server can detect that numerous hits have come from clients attached to America Online (AOL; www.aol.com), but nothing more. Furthermore, some gateway machines act as proxy servers for groups of clients. These proxies may capture a Web page once per day and show a copy of it to anyone else on the local network requesting that Internet page. In this scenario, 100,000 hits to a site would possibly be local to the proxy while indicating just one hit to the actual server where the original resides.

One final unwanted source of inaccuracy in hit data is from internal sources. Every time employees view a page for reference, maintenance, or updating, a hit is registered. Again, these hits should not be used in evaluating the success of the B2C e-Commerce implementation. The final technological limitation with regard to metrics is the inability to measure how long a client is viewing a page. Web browsing is a client/server process in which the actual viewing is done on the client machine. How long a page is viewed could only be known by monitoring the client machine, which is not an option for most content providers.

Some of these limitations can be overcome by the use of "cookies." Cookies are data files that are placed by the server on the client hard drive. These files can keep track of data that has been entered on the Web page as it is viewed by the client browser. The cookie file can then be uploaded by that Web page's server. Such cookies are being widely used to monitor user preferences and keep track of demographic information. However, Web browsers can be configured to not allow cookies to be accepted by the client machine. There is no guarantee that all e-Consumers will be able to be monitored and tracked through cookies. In addition to cookies, there is a markedly non-technological method for overcoming this technological impediment. Organizations such as Media Metrix perform sampling similar to the Nielsen Ratings for Web pages. In addition to finding out who is visiting a Web

page, they are able to find out the frequency of the visits, what parts of the page were viewed and clicked on, and times of day of the visits. These data are critical for Web advertisers who are buying ad space and time on those pages.

Apparent Threats to Net-Enablement

Limitations to measuring success are critical to those involved in NE. One reason for this is that advertising is expensive (average costs of attracting a single customer may exceed USD 30. If useful measures of success are not available, how can an organization assess gains due to advertising? Another reason is that startup and maintenance costs for Web server applications cost money. Without useful metrics, it is difficult to know how a Web-based strategy is performing relative to alternative strategies.

Alternatives to hits are feasible, although some have other disadvantages. Firms with a Web ordering capability are clearly able to measure the volume of sales generated by that Web site. Organizations that launch a Web site to develop a new line of business have an unconfounded source of metrics but those with a traditional ordering process in addition to the virtual ordering process cannot be certain whether the Web sales merely cannibalize their traditional sales process. This confounding affects many firms engaging in NE.

Alternative metrics to hits, cookies, and Web sales revenues would include measures of loyalty. Loyalty to a firm and its products and services are akin to belonging to a community. Feelings of community and attitudes can be monitored and evaluated using the Web itself if e-Retailers use the sales event as an opportunity to also gather customer opinion and demographic data. It is not necessary to gather large amounts of data during each contact. Data gathering can be accomplished in an incremental fashion that is less annoying to customers. This data allow a firm to profile customers and to determine whether the mix of customers differs in major ways from their traditional customer base. This information will, in turn, lead to new strategies to market to the changing customer profile.[12]

Designs and workarounds-Metrics

Metrics are critical business issues for all new ventures, but especially for business transformations like NE. If an organization cannot adequately measure its business benefits from a course of action, then it is extremely difficult to know how much of an investment is justified in this area. The Web is still relatively new and metrics are not as great a problem as they may be later when expenditures cannot be as easily justified on the grounds of experimentation or imitating competitors.

The Web is severely limited in its ability to measure and track consumer cyber-patterns. Hits are nearly as gross a measurement as Internet sales. Other than *post-hoc* analysis of customer-entered data, the only marginally acceptable way to design measures to determine customer navigating patterns is through cookies. When and if browsers make the "disabling" of cookies the default (rather than the current default, which is "enabling" of cookies), the problems become even more difficult. For the moment, many consumers are not aware that firms are writing cookies to their hard drives and until such time as they are

[12] Straub and Klein (2001).

generally aware of this (and may rebel by disabling cookies), firms would be well advised to exploit the valuable information cookies provide.

Tech-5: INTERFACE LIMITATIONS

Even if practical limitations could be eliminated by improved download time, there are physical limits to Internet interface technology. While Web GUIs are generally seen as attractive and easy to use, they do fall short when compared to alternative communication media. The Web browser is one of the richest electronic interfaces ever developed. It allows for full-spectrum color images, video, and stereophonic sound. However, it has serious physical limitations.

One obvious problem with all electronic communication media is that an e-Consumer can not touch and feel a product over the Web. The marketing literature indicates that lack of touch is a problem with direct marketing of all sorts, electronic or otherwise. Electronic communication also lacks a mechanism to transmit smell or taste. Both of these senses have been shown empirically to directly impact consumer buying behavior.[13] Another limitation of the interface is in three-dimensional imaging. Personal computer displays are not yet widely available commercially for holographic images, but will soon be, in all likelihood. Technologies which simulate three dimensions on a two-dimensional monitor exist. These technologies are not truly three-dimensional and are not yet commonly used in NE. Until electronic communication can replicate the five senses and produce three dimensional displays it will not be a one-for-one replacement for face-to-face communication or traditional commerce.

Apparent Threats to Net-Enablement

Interface limitations to Internet computing pose special threats to NE applications. In non-commercial applications, two interested partners are trying to share data. Toleration for problems in the interface should, therefore, be much greater than in a typical consumer/vendor relationship. A B2C online outlet cannot hope to compete against vendors in the physical world if a buyer requires a fully sensory experience in order to buy. Without a three-dimensional view, many products cannot be evaluated. Without the ability to hold an object, many products lack the ability to create an impulse purchase. Under these circumstances, technological impediments are much more incapacitating for those attempting to conduct business over the Internet than for those using the Internet for non-commercial applications such as internal communication. With regard to competition between NEOs, practical limitations in the interface create other difficulties. Since a vendor cannot hope to include a complete multimedia message within the limits of tolerable download time, some of the preferred message must be eliminated. Otherwise, the preferred message will send an additional, unintended message of delay and aggravation. In an on-line retail application, this interface problem could create a bias against one company versus a competitor or simply send an unintended message to that customer. In either case, there is a potential for confusion in the message sent. Where confusion in a non-commercial application might lead to a follow-up question via an email, confusion in a

[13] Johnson et al. (1985).

B2C application could lead to purchase of a competitor's goods and services. As a result, finding the appropriate balance between media rich hyperdocuments and tolerable. download times appear to be more difficult and important for those engaged in B2C NE.

Designs and workarounds- Interface Limitations

Solutions are rather restricted by what can be presented via the computer. Potential customers can be mailed physical samples of products in certain cases. Rudimentary devices that send impressions of touch and taste are technically feasible and should eventually reach the marketplace. Finally, advanced forms of virtual reality are also being explored by companies like Microsoft.

Even if practical limitations could be eliminated by improved download time, there are physical limits to Internet interface technology. While Web GUIs are generally seen as attractive and easy to use, they do fall short when compared to alternative communication media. The Web browser is one of the richest electronic interfaces ever developed. It allows for full-spectrum color images, video, and stereophonic sound. However, it has serious physical limitations.

Tech-6: LACK OF INTERNET STANDARDS

The final technological impediment to Internet computing results from the absence of well established and agreed-upon Internet standards. Internet standards are used as guidelines for the development of Internet software which conforms to generally accepted rules for communication between applications. For example, by conforming to standard protocols, a browser developer can know the format needed to request, receive and interpret HTML files. Using this format allows that browser to communicate with all Web servers which also conform to the same standards. Problems occur when there is either an absence of a standard or when an existing standard is augmented or added to. In the case where standards are augmented, multiple parties are often augmenting the original standard in proprietary ways to meet a new perceived need. The difficulty is that many solutions to a single problem may coexist simultaneously without an agreed-upon standard. The best illustration of this phenomenon is in extensions to HTML.

HTML went through several accepted revisions. Between revisions, however, competing browser manufacturers extended HTML to perform new functions. Past examples have included displaying different types of graphics files. At one point in time, some browsers could display graphics files of type .gif, .jpg, .bmp, while others could only display .gif or .jpg files. Content developers could create pages which included .bmp files, but could not be assured of their being able to be interpreted correctly by all browsers. As a result, content had to be developed twice (one with and one without .bmp files), developed without this type of file, or developed with .bmp files which would be displayed as an error message on certain browsers. HTML is rife with examples of extensions which followed this pattern of differences between browsers which is ultimately caused by such lack of standards. One recent troubling pattern is the seemingly purposeful divergence of certain competing standards. Netscape and Microsoft long waged a "browser war" to compete for the Internet software market. Part of the strategy in fighting this war included the creation of

proprietary standards for each browser with the goal of differentiating one browser at the expense of the other. A significant instance of differentiation was applet and applet script standards.

Microsoft has developed a set of standards (ActiveX) for running applets and applet script on its browser. ActiveX was put forth to compete with the Sun Microsystems Java language. Netscape adopted Java standards, and further extended them with a proprietary scripting language called Java Script for running on their browser. The implied and stated goals were to entice users to develop Web pages which adopted one standard over the other. Upon doing so, all clients which would communicate with those sites using that standard would need a compatible browser.

Apparent Threats to Net-Enablement

Different standards and protocols for Web computing and the Internet infrastructure exist in such areas as encryption, electronic currency, and multimedia. Netscape and Microsoft use different standards for these functions critical for NE. Purveyors of Web content for need to be aware that the browser market is ffragmented into the browsers Internet Explorer, Netscape, and proprietary browsers like that of AOL.

Customers further complicate things through the use any number of different generational versions of these browsers. Furthermore, certain browsers are not compatible with older operating systems. Many of the latest browsers which contain the most recent HTML extensions can only be run on a 32-bit operating system. A customer running a machine with MS-Windows 3.1 is limited in what HTML code can be viewed correctly on their computer. Under these conditions, it is difficult to predict which browser application or version will be interpreting an e-Retailer's Web page at any given time.

Client technology is beyond the control of the content provider. Different browser protocols and standards are used by different browsers and vary as to which files they can interpret. Therefore, developing a firm Web site readable by all customers is difficult.

Designs and Workarounds-Lack of Standards

While inability to standardize on a certain version of browser software creates, for example, inconveniences for users, its impact is perhaps the least of the six obstacles. By design, firms need to reduce the sophistication of their Web sites so that they can be interpreted by most clients. Most clients can read frames, at this point in time, but may not accept XML. Firms would be advised to keep this in mind and to seek out lower common denominators to be able to reach the majority of customers.

To work around this problem is not simple. Plug-ins can be mailed to users, either electronically or physically, but it is not clear that they want or would accept this service. Download delay for these plug-ins alone may be enough to deter customers from selecting an upgrade. As browsers and other hardware and software advance and knowledge of downloading new software becomes more widely known, some problems in this area may diminish.

SOCIAL (ORGANIZATIONAL AND ENVIRONMENTAL) CHALLENGES

While the social hurdles for a digital economy are formidable and easily imagined, there has not been as much codification or systematization of these problems in the social arena. The importance implied by the order of discussion below, which may be intuitively appealing, does not have the benefit of analysis that characterized the technical issues.[14]

For this reason, our discussion of these issues is much briefer than with the technical issues. There is no question that these issues are of critical importance. The lack of holistic, analytical reasoning in the scientific literature is why we need to be circumspect. As we learn more about their prominence and relative importance, these challenges will need to be further elaborated.

Social-1: Consumer fear in buying or transacting business over the Web

Customers fear that Internet is insecure. Whether the e-Vendor's systems are secure or not, users believe that their confidential and transactional information may not be well protected. This lack of trust in the general security of the Web and NE systems undermines usage.

As pointed out in earlier chapters, this primarily affects the payment phase of the NE value chain. There may be concerns that transactional data is vulnerable, but when credit-debit card numbers are at stake, these concerns are greatly magnified. Large-scale fraud using the Internet as the vehicle of transference remains a viable, but improbable threat when firms institute stat-of-the-art security measures. But little is being done to inform consumers about the extent of the security effort, and fear, therefore, is high even when it should not be.

Related but slightly different from security concerns is a legitimate concern about the privacy of personal data on the Web. Customers worry that they have not been informed about the intended use of their data and its being sold to others who could engage in spamming or worse.

Social-2: Lack of brand awareness--significant penetration of the total market for specific products by companies

One of the major difficulties of Internet marketing is that the first mover advantages are nearly insuperable. The ability of amazon.com to control the books plus market is one example of this. Moreover, across industries, firms that already have brand awareness are able to capitalize on this by purchasing (or having purchased) their domain name so that customers can find their online operations as easily as their physical operations.

Why is this different from the importance of brand in traditional marketing? Does this suggest that the barriers to entry of new firms are higher for entering cyberspace? It may be the case. Traditional marketers have a far larger number of venues at their disposal to

[14] Rose et al. (1999).

make customers aware of their brand. First, they can position themselves on key traffic routes, whether these are physical locations, as in retailing, or at trade conventions, as in B2B operations. The equivalent of this in the cyberworld is thought to be portals, but portals have become so crowded that it is not clear that one can get the attention of customers on a yahoo or amazon.

In traditional markets, branding can occur through a variety of media, but the Web is a "pull" medium, and customers can easily resist inducements to buy by just moving to another page or closing a "pop-up" advertisement. Consider how difficult it is to resist advertisements on TV, radio, or other "push" media while partaking of highly desirable content, such as popular TV or radio shows. The Web, thus far, does not have this kind of compelling content draw, except for specific buying purposes. The delivery of entertainment over the Web has not yet found its voice, and so the spiral branding that might occur for other Web brands is not nearly as effective as it is for traditional media.

Social-3: Management/cultural problems in instituting e-business practices and ideas

This hurdle is a classic problem. People (and managers) resist change. New ways of thinking about the customer-firm relationship, and the need to make wholesale changes in how the firm does business are anathema to many managers. A relatively small part of the population is attuned to abstraction and experimentation and this has a devastating effect on instituting new processes for NEOs.

The classic solution to this problem is to foster a climate of innovation. Reward and incentive structures need to be aligned with fulfilling this goal, so that employees are not punished for attempting innovation and failing some part of the time.

This mismatch between having the strategic vision and being unable to deploy the vision has been one of the key findings in the ongoing GSU e-Commerce studies. Managers were asked if they believed that firms that were successful in e-Commerce would also have to become far more virtual in their designs. There was a strong consensus on this issue that focusing on core competencies and contracting out noncore processes was critical. Some participants elaborated on what needed to happen for the firm to really change to becoming a NEO.

Ironically, when the followup question was asked as to whether "Your firm was becoming more virtual," the answer was generally "No."

Firms may see the need to change, but those that are actually able to accomplish this level of change are unusual. Many organizations change processes on a superficial level, and, in doing so, do not "stress out" their culture or significantly alter routines. While this may result in a conflict-free environment, the end result is likely to be a firm that falls far short of "best of breed."

Social-4: Lack of firm experience in doing e-business

There is evidence that there are sizable first mover advantages among those who have been exploiting the power of the Internet. Part of these advantages accrue from learning the unique characteristics of the Web and focusing on these. A few of these at a more macro level were highlighted in the previous chapter on e-Markets.

Firms that have not developed this experience, laden with both successes and failures, are, frankly, at a considerable disadvantage. The obstacle is in realizing that the firm is behind in the game, and mobilizing the resources to catch up and even leap frog the competition.

A good example of a CEO coming to this realization, and drastically reorganizing the firm so as not to fall even further behind is Microsoft. In the late 1990's, the CEO Bill Gates came to the conclusion that stand-alone and within firm client-server computing were not nearly as important as networked computing in the future, and he changed the entire

Social-5: Organizational fear of doing business over the Internet

Complementors. To engage in contractual relationships and partnerships is one of the heralded advantages of the Internet. Email alone is a "killer" application in its ability to link individuals within and between organizations. Group mailings serve the purpose of large scale information dissemination at an absurdly low cost.

Suppliers. An even more powerful argument for use of electronic connections in place of physical processes is for supply chain efficiencies. Sharing information up and down the chain on a need to know basis can smooth out product flows and prevent massive over- and under-supply.

In cases of either horizontal (complementor) or vertical (supplier) integration, the firm needs to be assured that the information it is sharing is not being openly shared with competitors. Theft of industrial secrets and its sale to competitors is already a world-wide problem , one that could be aggravated by widespread disclosures. In a major turn of fate, the very capability of Internet applications to share information between legitimate and approved parties is also the same vehicle that could be used for abuse.

What keeps the advantages of networked connections from being realized as soon as possible is, in many cases, the fear that data is not being held confidential. In one sense, firms, like individuals, learn to trust each other by virtue of seeing others act in trustworthy ways [footnote to Mcknight et al., gefen dissertation, and others]. This problem is being solved over time, in this way.

Other solutions are contractual solutions. Non-disclosure clauses with partners and suppliers will give the firm legal recourse in case of defalcation. This is never the preferred course of action, but may be necessary when, by happenstance or bad judgment, the firm has partnered with an untrustworthy partner. There is no doubt that this is a key hurdle to the evolution of NE in that it deeply affects the willingness of other firms to engage in electronically-oriented partnerships.

Social-6: Migrating to Internet computer-to-computer linkages from more familiar EDI

Firms have huge sunk costs in EDI. These investments have paid off well for firms like Ford (cite the ford case). Personnel who were performing the manual processes of data entry in accounts payable were replaced by computer-to-computer exchanges. Staffs were reduced by, in some cases, 95%.

The movement of these systems to XML or application formats such as MySAP will take some time because firms are still trying to recoup the benefits from these large expenditures. Transferring over to ETNs means that virtually none of the legacy systems will interface well with the data from the ETN, and, in these situations, new software and possibly new database schemas will be required.

New technology often brings with it new levels of complexity. It may mean running the Internet systems alongside EDI and other business exchange systems. And if the firm chooses to go with an ERP and to connect with suppliers and partners through these application formats, this implementation can be extremely complex.

Managers avoid launching endeavors that make their lives more complex. As indicated above, there are strong psychological factors that lead to acquiescence. Creating more work that will ultimately lead to a more efficient and effective firm takes visionary leadership, and competent followup. Not all firms do this well.

Social 7- Lack of well accepted or understood e-cash on the part of consumers or organizations

E-cash will facilitate business on the Internet by regularizing the payment process. The proper identification of buyer and seller and the exchange of electronic funds for goods or services will lead to a secure payment system that speeds delivery and assures financial fairness. Why is it not happening faster?

Electronic payment systems are just beginning to be accepted by NEOs and their customers. There are a wide variety of such systems, and so it is taking a while for the emergence of standards and development of a critical mass of customers. Even the transition from SSL to SET is taking a lot longer than originally predicted.

Part of the difficulty may be that we are dealing in a world of symbols in cyberspace, one in which there are no good physical surrogates. When paper money was introduced, it took some time before people were ready to accept it in place of specie. When the backing for paper money, the gold in repositories around the world, was abandoned as a monetary standard, the value of the paper was backed up by a trust in governments to guarantee this money as a medium of exchange.

These gradual transitions are different from e-money since we are completely divorced from a requisite physical representation. Let's take a simple case where a family banks

through an Internet bank that processes charges against their account when given a proper digital signature. The family may even be having their paychecks deposited automatically into their Internet bank account, so they never see any representation of their worth except for the online reports they request, or through statements or reconciliations.

It is not hard to see why this exchange and manipulation of symbols that constitute a family's livelihood would not be comforting to all.

Firms who are in the e-payment spectrum, and this includes banking and other financial services as well as firms specializing in e-payment software and services, need to create an atmosphere of interest in these innovations. Free training in their systems would be one obvious avenue for creating this interest, but testimonials from satisfied customers using the major media is also needed.

Social-8: Ambiguous or hostile NE legal or regulatory environment

The social environment as regulated through statutes or government agencies needs to encourage Internet business. If cyberspace is overtaxed or regulated in ways that do not increase confidence in areas of weakness, it can be counterproductive. For example, what is really crucial are international regulations that establish standards for digital signatures and third party certificate authorities. The full mechanism of global law and regulations will heighten confidence in transactions over the Internet. "Once burned, twice cautious" is not an experience that governments want to have to legislate against, so this work needs to be put in place as soon as humanly possible.

We have discussed examples of over-regulation throughout this book. In our opinion, the Internet should not be censored. Governments will be far better off in achieving conditions of moral and economic sanity for their citizenry if they educate rather than regulate. Free markets and free speech go together, and regulation of one or the other will have long term deleterious consequences.

We have also offered examples of useful regulation. Enforcement of copyrights on software is important since it not only encourages internal and direct foreign investment, but it also supports the creation of a native software industry. An example of an ambiguous regulatory environment is when countries have copyright laws on the books, but, for all intents and purposes, never enforce them. It would be better to drop the pretense of supporting the protection of intellectual property and forthrightly and honestly send a message to the international community that the government takes no position on intellectual property, rather than this ambiguous and confusing message.

SUMMARY

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