Is your Business Prepared for the Evolving World of the Internet?

June 1999

JBR HELLAS LTD.
Business Consultants
A member of Horwath
Franchise Consulting Services
Group in association with Eversheds

31, Voukourestiou Street
GR 106 73 Athens, Greece

Tel. +30-210-36 05 002
Fax. +30-210-36 06 935

CONTENTS

0. EXECUTIVE SUMMARY

0.1 The Internet grew out of a communication system designed by the US military in the 1960's in order to be able to communicate after a nuclear war. The principles were simple. All the nodes in the network would be equal in status to all other notes. The messages would be divided into packets and each packet separately addressed. The particular route that the packet took would be unimportant. If big pieces of the network had been blown away the packet would still stay airborne, somewhere in the network between whatever nodes happened to survive.

0.2 In 1990 a new computer language was developed to share research data through the Internet. This language, called HTML, could be used to link documents together. The World Wide Web (WWW) or simply the Web became a special part of the Internet where computers storing HTML documents could reference each other. The process of jumping from one document to others has become known as "surfing the Web".

0.3 The explosive growth of the Web is caused by the fact that it is easy to publish information and that accessing the Web is inexpensive. Further an incredible variety of subjects have become available and new uses for the Web are being developed every day. On the other hand the main limitations at this moment are that the response times are often too slow and much content on the Web is of narrow interest, badly written and occasionally offensive.

0.4 The development in information technology does much more than making organisations more efficient. It actually changes how business is conducted. Some of these changes are already apparent and include:

- *Everything happens faster:* those organisations that learn how to find and use relevant information and to react to it will have a large advantage over competitors that don't.
- *Transactions become electronic:* the way things are bought, sold and paid for will change. This has started with credit/debit card networks, EDI and Internet shopping malls.
- *Extending the enterprise* to suppliers, customers partners and the general public. Organisations are becoming more tightly intertwined and dependent on each other.
- *Mass customization:* buyers expect products that are exactly suited to their needs, like presenting only those newspaper articles that they want to read.
- *Intense price competition:* comparison shopping on the Web is possible today.
- *Fewer middlemen:* the need for wholesale distributors is already starting to diminish, like retailers let their suppliers manage the inventory on their shelves.
- *Shrinking the globe:* a programmer in Amsterdam can compete for work in New York.

- *Targeting narrow markets:* a cybermall is able to serve the market of unusual size shoes for instance better than a normal retailer.
- *Outsourcing:* focusing on core business activities, while outsourcing IT for example.

0.5 Growth could accelerate in the coming years across all sectors of the economy, as the number of people connected to the Internet multiplies and as its commercial use grows. Four types of economic activity will drive the growth:

- *Building out the Internet*: In 1998 100 million people around the world use the Internet. Some analysts predict that one billion people may be connected to the Internet by 2005.
- *Electronic commerce among businesses*: Early users already report significant productivity improvements from using electronic networks. Growth of business to business electronic commerce is driven by lower purchasing costs, reductions in inventories, lower cycle times, more efficient and effective customer service, lower sales and marketing costs and new sales opportunities.
- *Digital delivery of goods and services*: Software programs, newspapers, and CDs can be delivered electronically over the Internet. Airline tickets and securities transactions over the Internet already occur in large numbers. Other industries such as consulting services, entertainment, banking and insurance, education and health care face some hurdles, but are also beginning to use the Internet to change the way they do business. The Internet is a natural, low cost distribution channel for these digital products, but the uncertainty of whether their products can be protected, as well as concerns about payment security, impedes growth.
- *Retail sale of tangible goods*: The Internet can also be used to order tangible goods and services that are produced, stored and physically delivered. Sales of certain products such as computers, software, cars, books and flowers are growing rapidly.

0.6 Businesses have raised three potential inhibitors to the widespread adoption of Internet Commerce:

- the lack of a predictable legal environment
- concerns that governments will overtax the Internet
- uncertainty about the Internet's performance, reliability and security.

If these public issues can be resolved and electronic commerce is allowed to flourish, the impact of the Internet on our economy and on our lives will be enormous. The question is not whether the Internet will change our lives and the way we do business, but how quickly it will do so.

0.7 The Internet lowers barriers to entry into new markets. Especially for smaller businesses the Internet presents both huge opportunities and potential threats. Those companies that understand the potential of the

Internet will be able to expand into global markets, exploit narrow market segments and keep in contact with customers.

1. INTRODUCTION

The Internet is only a few years old, but it has already had a major effect on the information technology industry, business practices, government policies and how millions of people spend their leisure time. Advancing information technology has aimed a fire hose full of information toward every professional worker. As a result, few people can now keep up with all the developments that directly impact their work. Just maintaining a basic level of understanding of the most important developments is quite a challenge.

Because the Internet is new and its uses are developing very rapidly, reliable economy-wide statistics are hard to find. However, the following examples from industry and company sources illustrate the rapid pace at which the Internet commerce is being deployed:

- Fewer than 40 million people around the world were connected to the Internet during 1996. By the end of 1997, more than 100 million people were using the internet
- By the end of 1996, about 627,000 Internet domain names had been registered. By the end of 1997, the number of domain names more than doubled to reach 1.5 million.
- At the beginning of 1995 there were approximately 10,000 web sites. At the beginning of 1999 4 million.
- Traffic on the Internet has been doubling every 100 days.
- Experts predict that by 2005 one billion people may be connected to the Internet and that by 2002, the Internet may be used for more than US$ 300 billion worth of commerce between businesses.
- Nowadays Dell Computers is selling approximately US$ 18 million of computers per day on the Internet.
- Cisco Systems closed 1996 having booked just over $100 million in sales on the Internet. By the end of 1997, its Internet sales were running at a US$ 3.2 billion annual rate.

This paper has been written for those who

- have heard a lot about the Internet, but aren't sure what it is all about
- are more interested in its impact than in technical details
- want a summary of the key issues of the Internet
- need to understand the business implications of Internet computing

2. INTERNET: NETWORK OF NETWORKS

2.1 THE HISTORY OF THE INTERNET

2.1.1 The Idea

Some thirty years ago, the RAND Corporation, America's foremost Cold War think-tank, faced a strange strategic problem. How could the US authorities successfully communicate after a nuclear war?

Post nuclear America would need a command-and-control network, linked from city to city, state to state, base to base. But no matter how thoroughly that network was armored or protected, its switches and wiring would always be vulnerable to the impact of atomic bombs. A nuclear attack would reduce any conceivable network to tatters.

And how would the network itself be commanded and controlled? Any central authority, any network central citadel, would be an obvious and immediate target for an enemy missile. The center of the network would be the very first place to go. RAND mulled over this grim puzzle in deep military secrecy, and arrived at a daring solution. The RAND proposal (the brainchild of RAND employee Paul Baran) was made public in 1964. In the first place, the network would "have no central authority." Furthermore, it would be "designed from the beginning to operate while in tatters."

The principles were simple. All the nodes in the network would be equal in status to all other nodes, each node with its own authority to originate, pass, and receive messages. The messages themselves would be divided into packets, each packet separately addressed. Each packet would begin at some specified source node, and end at some other specified destination node. Each packet would wind its way through the network on an individual basis.

The particular route that the packet took would be unimportant. Only final results would count. Basically, the packet would be tossed like a hot potato from node to node to node, more or less in the direction of its destination, until it ended up in the proper place. If big pieces of the network had been blown away, that simply wouldn't matter; the packets would still stay airborne, wildly across the field by whatever nodes happened to survive. This rather haphazard delivery system might be "inefficient" in the usual sense (especially compared to, say, the telephone system) -- but it would be extremely rugged.

During the 60s, this intriguing concept of a decentralized, blast proof, packet-switching network was kicked around by RAND, MIT and UCLA. The National Physical Laboratory in Great Britain set up the first test network on these principles in 1968.

Shortly afterward, the Pentagon's Advanced Research Projects Agency (ARPA) decided to fund a larger, more ambitious project in the USA. The nodes of the network were to be high-speed supercomputers (or what passed for supercomputers at the time).

These were rare and valuable machines, which were in real need of good solid networking, for the sake of national research-and-development projects.

2.1.2 APRANET

In fall 1969, the first such node was installed in UCLA. By December 1969, there were four nodes on the infant network, which was named ARPANET, after its Pentagon sponsor. The four computers could transfer data on dedicated high-speed transmission lines. They could even be programmed remotely from the other nodes. Thanks to ARPANET, scientists and researchers could share one another's computer facilities by long-distance. This was a very handy service, for computer-time was precious in the early '70s. In 1971 there were fifteen nodes in ARPANET; by 1972, thirty-seven nodes.

By the second year of operation, however, an odd fact became clear. ARPANET's users had warped the computer-sharing network into a dedicated, high-speed, federally subsidized electronic post- office. The main traffic on ARPANET was not long-distance computing.

Not only were they using ARPANET for person-to-person communication, but they were very enthusiastic about this particular service -- far more enthusiastic than they were about long-distance computation. It wasn't long before the invention of the mailing list, an ARPANET broadcasting technique in which an identical message could be sent automatically to large numbers of network subscribers. Interestingly, one of the first really big mailing lists was "SF- LOVERS," for science fiction fans.

Throughout the '70s, ARPA's network grew. Its decentralized structure made expansion easy. Unlike standard corporate computer networks, the ARPA network could accommodate many different kinds of machine. As long as individual machines could speak the packet-switching lingua franca of the new, anarchic network, their brand names, and their content, and even their ownership were irrelevant.

The ARPA's original standard for communication was known as NCP, "Network Control Protocol," but as time passed and the technique advanced, NCP was superceded by a higher-level, more sophisticated standard known as TCP/IP. TCP, or "Transmission Control Protocol," converts messages into streams of packets at the source, then reassembles them back into messages at the destination. IP, or "Internet Protocol," handles the addressing, seeing to it that packets are routed across multiple nodes and even across multiple networks

with multiple standards -- not only ARPA's pioneering NCP standard, but others like Ethernet, FDDI, and X.25.

As early as 1977, TCP/IP was being used by other networks to link to ARPANET. ARPANET itself remained fairly tightly controlled, at least until 1983, when its military segment broke off and became MILNET. But TCP/IP linked them all. And ARPANET itself, though it was growing, became a smaller and smaller neighborhood amid the vastly growing galaxy of other linked machines.

2.1.3 The Internet

As the '70s and '80s advanced, many very different social groups found themselves in possession of powerful computers. It was fairly easy to link these computers to the growing network-of- networks. As the use of TCP/IP became more common, entire other networks fell into the digital embrace of the Internet, and messily adhered. Since the software called TCP/IP was public-domain, and the basic technology was decentralized and rather anarchic by its very nature, it was difficult to stop people from barging in and linking up somewhere-or-other. In point of fact, nobody "wanted" to stop them from joining this branching complex of networks, which came to be known as the "Internet."

In 1984 the National Science Foundation got into the act, through its Office of Advanced Scientific Computing. The new NSFNET set a blistering pace for technical advancement, linking newer, faster, shinier supercomputers, through thicker, faster links, upgraded and expanded, again and again, in 1986, 1988, and 1990. And other government agencies leapt in: NASA, the National Institutes of Health, the Department of Energy, each of them maintaining a digital satrapy in the Internet confederation.

The nodes in this growing network-of-networks were divvied up into basic varieties. Foreign computers, and a few American ones, chose to be denoted by their geographical locations. The others were grouped by the six basic Internet "domains": gov, mil, edu, com, org and net. (Graceless abbreviations such as this are a standard feature of the TCP/IP protocols.) Gov, Mil, and Edu denoted governmental, military and educational institutions, which were, of course, the pioneers, since ARPANET had begun as a high-tech research exercise in national security. Com, however, stood for "commercial" institutions, which were soon bursting into the network like rodeo bulls, surrounded by a dust-cloud of eager nonprofit "orgs." (The "net" computers served as gateways between networks.)

ARPANET itself formally expired in 1989, a happy victim of its own overwhelming success. Its users scarcely noticed, for ARPANET's functions not only continued but steadily improved. The use of TCP/IP standards for computer networking is now global. In 1971, mere twenty-one years ago, there were only four nodes in the ARPANET

network. Today there are tens of thousands of nodes in the Internet, scattered over forty-two countries, with more coming on-line every day, with millions of users.

2.1.4 The Web

In 1990 a computer scientist named Tim Berners-Lee developed an innovative new way to share research data through the Internet. He developed a new computer language called Hyper Text Markup Language or HTML that could be used to link documents together. HTML was revolutionary because the linked documents could exist on a number of computers.

The World Wide Web (WWW) or simply the Web became a special part of the Internet where computers storing HTML documents could reference each other. The process of jumping from one document to others and thus from one computer to another has become known as "surfing the Web".

A further breakthrough in 1993 provided the key to turning the Web into a mass medium. Marc Andreesen, a 23-year-old computer science student, invented Mosaic, a graphical interface for HTML screens. Since his work was underwritten by a government grant, the software needed to make Mosaic run was provided free via Internet.

Mosaic made the Web very simple to use. News spreads quickly in the electronic world of the Internet and soon a race was on to create Web sites and link data on them to each other. A number of services sprang up such Yahoo, a web site that contains information about other web sites and helps surfers find what they are looking for.

Entrepreneurs also began to see vast potential in the Web including Jim Clark, founder of Silicon Graphics. He started a new venture called Netscape Communications and brought in Marc Andreesen to develop an improved version of Mosaic, which was named Netscape Navigator. Software programs that interface with the Web are called browsers. Netscape was able to rapidly take over 70% of the browser market.

2.2 WHY IS THE WEB SO IMPORTANT?

A number of factors are causing the explosive growth of the Web:

- It is easy to create HTML documents and link them to others.
- Useful information on an incredible variety of subjects has become available, making the Web one of the best research tools in the world.
- Most browsers are free available and run on almost any computer
- Using the Web is surprisingly inexpensive
- Surfing the Web can be both useful and fun

- Innovative new uses for the Web are being developed every day

As exciting as the Web is today, it currently has some serious limitations:

- Response times can vary wildly. Popular sites are sometimes unreachable
- Too few controls and security are in place for many types of applications
- Much content is of narrow interest, badly written, and occasionally offensive.
- Most information is in the form of text and still images
- Employees can easily abuse access to the Web and waste time and money

3. IMPACT ON ORGANISATIONS AND INDIVIDUALS

In the business world of the mid - 1990s most organisations are focused on building closer relationships with their customers, controlling costs, concentrating on what they do best and communicating better with suppliers and other partners, Information technology is playing an increasingly important role in al these areas.

Information technology has enabled many major changes in recent years in the management of organisations. Such changes include flatter reporting structures, less middle management, smaller staffs, the reengineering of basic business processes and tight control of spending. The merging of computer intelligence and communications through standards developed for the Internet will accelerate these trends.

3.1 WHAT TO DO

As no one really knows what will happen next it is a difficult time to make effective decisions. Some things to consider:

- *Pay careful attention*: The worst mistakes are likely to be made by those unaware of what is happening. The Internet itself provides excellent ways of keeping track of what others are doing.
- *Experiment*: Every organization should look for low cost, limited risk ways to experiment with network technology. A simple way to start is to setup a Web page. Don't expect high impact instantly, however. The greatest value will come through being able to see and to act on major opportunities when they arise.
- *Move quickly*: A major characteristic of effective organisations in the new era will be the ability to make decisions and to take action quickly. Waiting for perfect information or for others to be the pioneers is not likely to be the best strategy.
- *Consider an intranet*: A growing number of organisations have discovered that Internet technology can be very effective when used on internal, private networks often called intranets. Establishing such a system can be an excellent first step.
- *Keep an open mind*: Don't let short term limitations cloud your vision as to what is possible. The greatest success stories revolve more around imagination than the use of the most advanced technology.
- *Follow developments within your industry*: Within almost every industry there are groups working on ways to change the dynamics of the industry through network technology. It is better to be among the change agents or at least aware of their actions, than to be surprised.

3.2 THE EFFECT ON BUSINESSES

The development in information technology does much more than making organisations more efficient. It actually changes how business is conducted. Some of these changes are already apparent, including:

- *Everything happens faster*: The pace of change in every industry will continue to accelerate due to the rapid availability of information. Innovative ideas will tend to be documented and spread around the world rapidly. Those organisations that learn how to find and use relevant information and to react to it quickly will have a large advantage over competitors that don't.
- *Transactions become electronic*: The way things are bought, sold and paid for will change as more of the process moves into the network. This has started with credit/debit card networks, EDI, and Internet shopping malls.
- *Extending the enterprise*: Internal computer networks have been commonplace for many years. What is changing is the way these networks are being extended outward to include suppliers, customers, partners, and even the general public. Organisations are becoming more tightly intertwined and dependent on each other.
- *Mass customization*: Buyers will come to expect products that are exactly suited to their needs: clothing that fits perfectly, vehicles with exactly the set of options they want, and newspapers containing only articles and advertisements of interest to them.
- *Intense price competition*: When vendors can easily publish their pricing and terms to all potential buyers, it will become very difficult for anyone to charge an unwarranted premium.
- *Fewer middlemen*: Network technology is already starting to revolutionize the way products are distributed. The need for wholesale distributors is already starting to diminish. Many large retailers now require their suppliers to manage the inventory on their shelves, only paying for goods that actually sell.
- *Shrinking the globe*: Networks are unaware of international borders. It is no longer necessary to go to Hong Kong to have custom clothing made there. Computer programmers in Amsterdam can compete for work in New York.
- *Targeting narrow markets*: Intelligent access to massive amounts of information allows nimble businesses to identify sub-market opportunities that previously would have been ignored, such as the market for very wide shoes. Few retail stores can afford to stock unusual size shoes today. A cybermall, however, can help those of us with duck-width feet find shoes that fit and have them delivered rapidly.

- *Outsourcing*: Organisations will tend to focus on what they do best and let others handle the rest. This will include entire business functions such as benefits administration as well as information processing.
- *Industry cooperation*: Individual industries will agree on standard ways to exchange information so that new services can be created, such as a national database of real estate listings. Existing examples include airline reservation systems, ATM's, and the exchange of criminal data between police departments

3.3 THE OPPORTUNITY FOR SMALL BUSINESSES

The new era in information technology that the Internet has triggered represents both a huge opportunity and a potential threat to smaller businesses. Just understanding the choices available will be difficult chore for organisations that cannot afford a large computer department. Those that do figure out the technology and apply it successfully will be able to do things like:

- *Expand into global markets*: The ability to offer products to customers in remote locations without local offices will enable many smaller organisations to grow dramatically.
- *Exploit narrow market segments*: Network technology makes it possible to find customers for highly specialized products, such as beds for very tall people.
- *Keep in contact with customers*: Keeping customers informed and finding out what they are thinking is becoming much easier and more affordable.

The new technologies are available to everyone. Those that move too slowly face the risk that more aggressive competitors will use technology to invade their space.

3.4 IMPACT ON INDIVIDUALS

The wired digital, networked world that is rapidly inventing itself will be paradise to some and hell for others. Which it is will depend on each particular person's skills, attitude and luck. Those that choose to view the changes that are occurring as an exciting opportunity are more likely to find ways to grow personally and professionally.

Even a positive attitude will not prevent many people from being forced to change jobs or move to new locations. Any number of industries will go the way of buggy whips and slide rules as a result of rapidly changing technology. Some very talented people will inevitably be caught up and forced to make unwanted changes as a result.

On the other hand, there has never been a better time for individuals to succeed. There will be many more Marc Andreesen stories (the

inventor of Mosaic and one of the founders of Netscape) where a brilliant idea will become worth hundreds of millions of dollars within few years. Millions of individuals around the world will become very wealthy during the next decade while tens of millions of others will not know what hit them as skills that were highly valued for decades are no longer needed.

Much of the media attention has been focused on how technology will impact entertainment, especially television. Speculation abounds about how long it will be before we have 500 channels to watch or have video on demand. Entertainment will certainly be an important use of the much greater bandwidth that is coming, but its impact will go well beyond avoiding the need to drive to the video store. The more important changes will come with the evolution of entire new forms of interactive entertainment rather than fine-tuning of broadcast television and movies.

The convergence of computer intelligence and high-speed communications will have its greatest impact on education. It is no mistake that the age of network computing started with the Internet, a mechanism for sharing academic information. People that have learned how to learn through the Internet already have an advantage over those slower to catch on. The advantage will grow as the information available through public networks explodes.

3.5 THE RE-INVENTION OF COMPUTING

The role of IS (Information Systems) is changing because the way information technology is being used is undergoing massive changes. Significant trends include:

1. Everything becomes intelligent and interconnected
2. Processing and data storage move into the network
3. PC's become Personal Communicators
4. Applications take on a new style
5. More data gets saved and analyzed, Information overload becomes a concern

Ad1: Everything becomes intelligent and interconnected

The combination of air, gasoline and a spark is explosive. In a similar way three different information technology advances are combining to produce quite a bang:

- As microprocessors become smaller and less expensive, computer intelligence appears everywhere.
- Technologies like fiber optics are making communication at very high speed affordable. Very high-speed local networks are already commonplace.

- The Internet provides standard interfaces and, when needed, shared transmission facilities.

The explosive synergy between these three converging developments has just begun. It will grow in intensity for some time. Only a little imagination is needed to see the possibilities.

One interesting outcome will be the need for people to adjust to exchanging messages with things. For example, a person doing business in Sidney might turn on their garden watering system in Athens from a laptop. The garden computer might respond by suggesting waiting a few hours to see if it rains since the latest local forecast calls for showers in the area.

Ad2: Processing moves into the network

As bandwidth grows, it will become practical to move an increasing percentage of processing and data storage into the network. This does not spell the end of PC's and local servers. If anything, they will continue to grow in capacity over time. The center of gravity will, however, shift away from end nodes and back into the network.

In the long run there will be less need for large scale data centers as more organisations buy computing capacity from network based service providers. Before that happens, very high-speed communications will be needed, probably based on fiber cables.

Improvements in storage technology have made it less expensive to store data within the network than on paper. Networks will be able to archive vast amounts of data indefinitely at very low cost. Less frequently accessed data will be stored on low cost media, such as optical systems, and then transferred back to faster media when needed.

In anticipation of the era of mass data storage, organisations need to look at what they are saving. A great deal of potentially valuable electronic data is not being saved today because of storage costs. Many organisations will regret not saving more historical information, especially about their customers.

Ad3: PC's become personal communicators

PC has always stood for Personal Computer. It would be more accurate to now call it Personal Communicator. The PC's new role is to be the interface to a network of intelligent devices filled with useful information. This is more important than its ability to perform logic on data stored internally.

In an ideal future world, users will not need to think about whether particular data or applications are physically stored on the device they are using or somewhere in the network. The key to getting users to accept moving data into the network will be to create the illusion that everything is happening within the local device.

Network computing also holds out the hope of controlling some of the other problems that the proliferation of PC's has created, like

- The constant need to upgrade hardware and software
- Too much time spent managing the technology versus using it
- Overly complex applications that are hard to learn and understand
- Frequent visits to computer hell

As the capabilities of networks increases, it will not always be necessary for local devices to be full function PC's. A number of hardware vendors have concluded that there will be an important place in the market for less expensive, lower function devices, and a race has started to bring them to the market. These devices are called network computers, netstations, and even surfboards.

Whatever the name is, they are inexpensive workstations designed to interface with the Internet. They will include a display, keyboard/mouse and a microprocessor based control unit. There will be a limited need for local storage since data and applications will come from the network. These devices will manage the local display device, run some logic and include Web browsing capabilities.

Ad4: A new style for applications

Most computers applications follow one of the three styles: batch, interactive or client/server. A new fourth style is now in the process of inventing itself: Web applications.

A number of things are starting to become clear. The first is that users love the structure and simplicity of the Web. It is not necessary to go to a training course or become computer literate to surf the Web. Learning to use a browser is much simpler than using a new operating system or office suite. The first element of Web applications is thus an interface based on Web browsing.

An example of a Web application is the applet concept, based on a programming language called Java. Applets are small programs that can run under the control of Web browsers. They are downloaded to the user's PC or workstation from Web servers within the network. Applets are different from other Web pages because they are working computer programs that contain data and program logic. Unlike client/server applications, applets do not have to be stored on the PC. Like Web pages, any applet can link to many others, which can be located anywhere in the network.

A typical Web application might work as follows. A stock market analyst, possibly working from home, signs onto the network and starts checking e-mail. One e-mail message is a press release from a company about to make a public stock offering. Clicking on a link in the press release causes an applet to be downloaded that can compare

the financial data of this company with that of similar ones whose stock increased after going public. The analysis applet might in turn offer direct links to hundreds of other applets to perform functions such as providing background on specific industries, checking current stock prices etc.

Web applications will thus be created on the fly by users navigating from one applet to another in the same manner as surfing through documents on the Web. The difference is that applets gather data and perform logic along the way. All that will be needed is a local processor powerful enough to run a browser and a network connection with sufficient bandwidth.

Ad5: Information overload

The most obvious negative side effect of the growth of computer networking has been information overload. Organisations that for years suffered from too little information now have more than they can deal with. Those that invest heavily in networking find that their executives often receive hundreds of voice and email messages per day as well as dozens of pages of important reading material. There are not enough hours in a day to understand and deal with the data now available to most professional workers.

The rise of network computing has thus multiplied the number of documents that slosh around within organisations. These documents come in many forms - paper, faxes, email, computer generated reports, downloaded web pages, video tapes, PC diskettes, links etc. It is inevitable that special software is needed to tackle the problem. A category of software called "GroupWare" might be a solution. Web technologies can be used as an interface mechanism. However, it goes beyond the scope of this report to discuss this subject further.

4. E-COMMERCE: THE DIGITAL ECONOMY

The digital revolution is just beginning. Growth could accelerate in the coming years not only in the IT sector itself, but across all sectors of the economy as the number of people connected to the Internet multiplies and as its commercial use grows. Four types of economic activity will drive the growth:

- ***Building out the Internet***: In 1994, three million people, most of them in the United States, used the Internet. In 1998, 100 million people around the world use the Internet. Some experts believe that one billion people may be connected to the Internet by 2005. This expansion is driving dramatic increases in computer, software, services and communications investments.
- ***Electronic commerce among businesses***: Businesses began using the Internet for commercial transactions with their business partners about two years ago. Early users already report significant productivity improvements from using electronic networks to create, buy, distribute, sell, and service products and services. By 2002, the Internet may be used for more than $300 billion worth of commerce between businesses.
- ***Digital delivery of goods and services***: Software programs, newspapers, and music CDs no longer need to be packaged and delivered to stores, homes or news kiosks. They can be delivered electronically over the Internet. Airline tickets and securities transactions over the Internet already occur in large numbers. Other industries such as consulting services, entertainment, banking and insurance, education and health care face some hurdles, but are also beginning to use the Internet to change the way they do business. Over time, the sale and transmission of goods and services electronically is likely to be the largest and most visible driver of the new digital economy.
- ***Retail sale of tangible goods***: The Internet can also be used to order tangible goods and services that are produced, stored and physically delivered. Sales of certain products such as computers, software, cars, books and flowers are growing rapidly.

4.1 BUILDING OUT THE INTERNET

In January 1995, just over 27,000 top-level commercial (.com) domain names were assigned. Most businesses used them for little more than posting product and company descriptions, store locations, annual reports and information about how to contact corporate headquarters. Two and a half years later, commercial domain names number 764,000. Static brochures and bulletin boards are giving way to full-fledged businesses offering financial services, news and information,

manufactured goods, and travel and entertainment to individuals and businesses.

To meet this increased demand, consumer electronics companies, media giants, phone companies, computer companies, software firms, satellite builders, cell phone businesses, Internet service providers, television cable companies are aggressively investing to build out the Internet. The increase of speed is one of the most important items.

The following example shows the time to download 3.5-minute video clip using different technologies:

	Transfer Time
28.8 KBPS modem	46 minutes
128 KBPS ISDN	10 minutes
4 MBPS cable modem	20 seconds
8 MBPS ADSL	10 seconds
10 MBPS cable modem	8 seconds

Soon we will be using televisions to access the Internet. Present in nearly every household, TVs are easy to operate and require little or no maintenance. Digital broadcasting services (high-definition television, or HDTV) will be available and broadcasters are expected to make the transition to digital broadcasting by 2006.

With digital broadcasting, TV viewers will be able to interact with their televisions and surf the Web, pay bills, plan a weekend trip, or make dinner reservations. Already, satellite dishes and signals carried over cable television lines enable consumers to receive data from the Internet through their TVs and television programming through their personal computers.

People will also access the Internet away from their homes or offices. Cellular telephones and portable digital assistants (PDAs) have become very sophisticated devices capable of sending faxes, receiving e-mail and electronic pages, and now, accessing the Internet.

Technology already exists to enable many appliances and consumer electronics devices to transmit and receive data. The first products to link home appliances with PCs should become available this year. Entering a simple message into a computer on a desk will be able to turn off the television or pre-heat the oven for dinner.

4.2 ELECTRONIC COMMERCE AMONG BUSINESSES

Internet commerce is growing fastest among businesses. It is used for coordination between the purchasing operations of a company and its suppliers; the logistics planners in a company and the transportation companies that warehouse and move its products; the sales organizations and the wholesalers or retailers that sell its products; and the customer service and maintenance operations and the company's final customers.

The Internet makes electronic commerce affordable to even the smallest home office. Companies of all sizes can now communicate with each other electronically, through the public Internet, networks for company-use only (intranets) or for use by a company and its business partners (extranets), and private value-added networks (VAN).

Although still in an embryonic stage, analysts predict businesses will trade as much as US$300 billion annually over the Internet in the next five years. Some believe the volume of Internet commerce will be much higher.

4.2.1 Main drives of growth

Growth of business-to-business electronic commerce is being driven by

- **lower purchasing costs**

  Companies lower procurement costs by consolidating purchases and developing relationships with key suppliers to benefit from volume discounts and tighter integration in the manufacturing process. They also cast a wide net for lower-cost sources of supply.

  Large companies have been using EDI (Electronic Data Interchange) over private networks to reduce labor, printing and mailing costs in the procurement process. Automating routine procurement means the procurement staff has more time to focus on negotiating better prices and building supplier relationships.

  The Internet has the potential to further reduce procurement costs. Large companies benefit from lower transmission costs versus private networks. The Internet also opens the door to doing business electronically with new suppliers and with small and medium-sized suppliers who formerly communicated only via fax or phone. Small companies also benefit. The Internet reduces processing costs and opens up new sales opportunities from potential buyers that post requests for bids on the Internet.

- **reductions in inventories**

  The longer it takes for production schedules to reach suppliers, the more inventory a company has to hold to account for delays and errors, and the less quickly it can react to changes in demand.

  The more inventory a company hold, the higher its operating costs, and the lower its profits. Carrying more inventory does not ensure better customer service, either. Shelves weighed down with size-10 running shoes do not help the customer who wears a size 8. When a customer enters a furniture showroom looking for an armchair with green and white stripes and is told it's on back-order for 12 weeks, he may drive across town to a competitor rather than wait.

  Managing inventory properly results in better service for the customer and lower operating costs for the company. Increasing the

frequency of inventory "turns" (the number of times inventory in existing warehouse or store space is sold or used for production each year) reduces inventory-related interest, handling and storage costs. Reducing inventory levels also means that existing manufacturing capacity is more efficiently utilized. More efficient production can reduce or eliminate the need for additional investments in plant and equipment.

IBM's Personal Systems Group provides an illustration of how the Internet and private networks are helping companies keep stocks of inventory smaller, yet more targeted on likely consumer needs.

Each month, the group's marketing departments report information on how many PCs they think will be sold. The production planning departments identify manufacturing and materials capacity in each factory. Armed with inputs from across the company on demand and supply, production schedules are assigned to each factory. The procurement staff uses the same information to negotiate with suppliers. As new information comes in each week, the process is repeated and the production schedule fine-tuned.

Electronic communication between factories, marketing and purchasing departments have made this quick response possible. Problems are communicated as they arise and the appropriate adjustments are made. If demand suddenly rises or if one factory cannot meet its production schedule, IBM is aware of it in time to increase production at another factory.

The Personal Systems Group has been phasing in this Advanced Planning System (APS) since 1996 and already reports significant results. During the first year of APS, inventory turns increased 40 percent over the previous year, and sales volumes increased by 30 percent. The group anticipates another 50 percent increase in turns and a 20 percent increase in sales volume in 1997. By better utilizing its existing manufacturing capacity, IBM has avoided having to make additional investments to meet the increased volume requirements. The lower investment and operating costs due to improved inventory turns have resulted in savings of $500 million.

- **lower cycle times**

  Cycle time is the total time it takes to build a product. There are certain fixed costs associated with building any product that do not vary with the amount of production, but rather are time dependent. These "fixed" costs include depreciation of equipment, most utility and building costs, and most managerial and supervisory time. If the time to build a product can be reduced to seven days instead of ten, then the fixed costs per product are lower since less time was needed. Electronic commerce allows "cycle times" to be shortened, allowing more to be produced for the same or lower costs.

In the 1980s, the lower cycles times realized by Japanese companies presented American and European companies with a serious competitive challenge. They responded by breaking down organizational barriers that had grown up between design, manufacturing and sales divisions and improving communications with external partners.

Establishing electronic links with their large suppliers and customers enabled companies to transmit and receive purchase orders, invoices and shipping notifications with much shorter lead times than previously. Some also began to share product specifications and drawings over value-added networks to speed product design and development.

The Internet will permit even further reductions by broadening the network of businesses connected electronically and by facilitating collaboration on projects across work teams and geographic locations

- **more efficient and effective customer service**

Companies are beginning to use the Internet for customer service. Having product descriptions, technical support and order status information online not only saves money by freeing up a company's own customer service staff to handle more complicated questions and manage customer relations, it can also lead to more satisfied customers.

Companies have long gathered and stored information about customers and products in databases that only certain authorized employees can access. Innovative businesses are finding ways to tap the potential of that information, making it available to those who need it most—whether it's a customer service representative answering a phone call or a customer looking for account information or technical support online.

Few things are more frustrating to a customer than uncertainty about when an important purchase will arrive. Too often, phone calls to a supplier result in a series of transfers from one department to another and an eventual promise to check on the status of the order and to call the customer back. This pattern consumes time and money for the customer and the seller.

Delivery companies are helping their business partners solve this problem via the Internet. A customer can go to the company's Web site, enter his order number, and find out that the product is already on a FedEx or a UPS truck and is expected to arrive the next morning. This information can be retrieved from the company's Web site in less than a minute.

- **lower sales and marketing costs**

  An individual sales person can support as many customer accounts as he can physically visit or contact by telephone. Therefore, as the number of accounts increases, so does the size of the sales force. Even direct marketing companies increase staffing as telephone order volume increases. By contrast, a Web business can add new customers with little or no additional cost. Because its sales function is housed in a computer server rather than physical store locations or sales people, its reach is bounded only by the capacity of the servers to respond to inquiries and orders.

  The Internet can also make traditional sales organizations, layered distribution channels, catalog sales and advertising more efficient. With automated ordering capabilities, sales representatives no longer have to prepare time-consuming manual orders. Instead, they can spend time building and maintaining customer relationships. Electronic catalogs present far more information and options than their paper counterparts. Direct marketing online can shorten repurchase cycles and increase the ability to sell additional items.

- **new sales opportunities**

  The Internet operates around the clock and around the world. As a result, businesses on the Web can reach new markets they could not reach effectively with an in-person sales force or advertising campaigns.

4.2.2 The future

For a business to feel comfortable about using the Internet in communications with its suppliers and customers, it needs to be sure of the identity of the party at the other end of the transaction and that any agreement made electronically is binding.

Today, a business verifies identities with passwords, electronic signatures and Internet Protocol (IP) addresses. Initiatives are currently underway to develop a more effective system of digital certification and authentication. Governments are promoting the development of an international convention to legally recognize digital authentication.

Companies are also concerned about the potential for excessive taxation of the Internet. The U.S. Government believes that no new discriminatory taxes should be imposed on Internet commerce. It also believes that no customs duties should be imposed on electronic transmissions. The application of existing taxation on commerce conducted over the Internet should be consistent with the established principles of international taxation, should be neutral with respect to other forms of commerce, should avoid inconsistent national tax

jurisdictions and double taxation, and should be simple to administer and easy to understand.

Some companies express concern about the Internet's current technical limitations. Those who conduct EDI transactions over VANs have the confidence and experience that important information will arrive at its destination, on schedule, intact. If any problems do arise, a single network service provider is accountable and responsible for resolving them.

Companies expecting this level of service worry that the Internet offers no such guarantees. Because it is a public network that connects many smaller, interconnected networks and service providers, there is no single entity responsible for ensuring that a message leaves one point and arrives, intact, at another. And, because companies have a need to transmit confidential information, they want assurance that it remains secure.

Companies are taking different approaches to address the current technical limitations. Some use the Internet to purchase lower-value, indirect materials while keeping their higher-value, direct material purchases over VANs. Some rely on extranets that limit access to a certain pre-qualified set of businesses and their partners.

Sophisticated encryption products and firewalls are being used by some companies to protect privacy and ensure the security of Internet transactions. Many others await a resolution of current export limitations on encryption software before they plan to increase their Internet business.

4.3 DIGITAL DELIVERY OF GOODS AND SERVICES

Software, CDs, magazine articles, news broadcasts, stocks, airline tickets and insurance policies are all intangible goods whose value does not rely on a physical form. Much of today's intellectual property is produced, packaged, stored somewhere and then physically delivered to its final destination. The technology exists (or soon will exist) to transfer the content of these products in digital form over the Internet.

Nearly 90 percent of Web users go online to get news and information. There, they can find obscure or limited circulation journals online as well as the top sellers. Articles limited to text and perhaps a picture in a print edition may be supplemented in the online version with video or audio clips, maps or in-depth background research.

Still somewhat difficult to navigate, the Internet's wide selection of content sites save individuals time when conducting research, and yield much more complete and up-to-date information than offline alternatives. As technology advances and search tools become easier to use, individuals can be expected to increasingly turn to the Internet's

content sites to do research, to learn about the day's news, and to be entertained.

How quickly individuals change their behavior in favor of the Internet, and away from other media, is difficult to determine. It has been reported that as use of the Internet increases, television viewing declines. However, some of today's Web businesses point out that circulation for their existing newspapers and magazines has not dropped, even while their Web audiences increase. They state that some in the online audience are also found among their most loyal print readers, but look to each medium to satisfy different purposes. For instance, *Business Week* reports that visitors to its Web site read the front page article and then use the site to research the magazine's archives and special report sections, features they do not have in the print version.

Web content businesses require a much lower capital investment than their print counterparts, lowering the barrier to entry in this online industry. With the Internet, the content of a newspaper or a magazine does not have to be printed and delivered to news stands or doorsteps across the city in order to be consumed—steps that add 30 to 40 percent to the cost of the product.

Instead, content delivered via the Internet can be entered directly into a computer, stored digitally on a server and appear directly on a reader's computer screen with a few simple commands the reader enters on the Web site. The consumer can then read the information on the screen or print it out. The publisher's distribution costs include paying off the investment in the Web servers and other technology that ensures that when someone enters the site, it responds quickly. Unlike newspaper or magazine content that gets used once, digitally stored content offers the potential for repeated repackaging and reuse. Once the content has been created and stored, there is little or no extra cost to send it to one reader or 1,000 readers. That increases the efficiency of the newspaper and magazine businesses dramatically.

However, simply establishing a presence on the Internet does not guarantee that a business will succeed. Building brand awareness through advertising and marketing is critical to success in a new and rapidly evolving market, particularly on the Internet where consumers have the choice of spending their time and money at thousands of different sites. If the Internet evolves in such a way that a limited number of sites become the "funnel" that guides a viewer through its vast content, businesses looking to appeal to mass audiences may have to pay large fees to secure "shelf space" on those sites. Or, they may be excluded altogether. In this scenario, advertising and marketing costs may become too expensive for some to bear. If, on the other hand, technology and consumer preference evolves so that consumers access and navigate the Internet using a variety of devices and tools

(perhaps personal software “agents”), then high rents might be avoided.

Statistics on Web traffic indicate that the “funnel” model is winning out today. Over time, as people begin to access the Web via their TVs, telephones and personal digital assistants, and as the Web becomes easier to navigate, this may change and lower advertising and marketing costs may result.

4.3.1 Shift of revenue sources to the Internet

Even with their lower costs of operation, content businesses on the Web do not yet generate adequate revenues. Unlike newspapers and magazines that rely on subscriptions for some of their revenue, most

businesses currently shy away from charging subscriptions in favor of building an audience and attracting advertising and direct marketing/transactions revenues. Though growing, these revenue sources are still small.

At this early stage of development, it is unclear how quickly Internet content businesses will draw readers or viewers away from traditional media sources such as newspapers, magazines and television. As it happens, advertising and subscription revenues flowing to the Internet are likely to increase. Even if the total audience for a newspaper or a TV sitcom does not decline, advertisers may shift spending to the Internet if they feel that it provides a more effective means to reach their audiences.

Current trends in classified and local advertising spending indicate a shift already taking place. Newspapers have been watching their share of classified advertising dollars shrink as real estate agents, car dealers and owners, and businesses looking to hire employees increase their advertising in niche publications, direct mail and online services.

Software companies and search engines feature city guides listing movies and restaurants, arts and music, current events, places to go, local sports, weather and news. Some broadcast and cable networks combine coverage of national news and entertainment with local news from affiliates and searchable databases of online classified ads. Directory listings and mapping services partner with newspapers, software companies and others to offer their own city guides. Telephone companies have their own directory listings and mapping services and are partnering with others for real estate listings, restaurant guides, and other local information and services.

4.3.2 The future

Most industry watchers predict that the market for the digital delivery of products and services will evolve quickly. The rate varies considerably by industry, however.

Selling travel online appears to have the fewest constraints, perhaps because computer reservations systems have been in place for years. Analysts predict rapid growth in travel services, from less than $1 billion in 1997 to close to $8 billion within three to five years.

Similarly, the financial service area is poised for quick growth, like actively trade stocks online and banking online.

Other digital products and services have significant growth potential, but their long-term success is tied to solutions for protecting copyrights and to improvements in the infrastructure. Intellectual property holders—software developers, recording artists and record companies, movie studios, authors and publishers—worry that digital copies sold or transmitted over the Internet may be prone to copyright infringement and piracy. The Internet is a natural, low-cost distribution channel for these digital products, but the uncertainty of whether their products can be protected impedes growth. Companies are working with technological solutions such as “watermarks” and “digital object identifiers” so that they can keep track of their products online. In December 1996, governments negotiated treaties at the World Intellectual Property Organization (WIPO) to address the question of how copyright should be recognized and protected in global Internet commerce.

For the multimedia industry, the question of bandwidth is crucial. Until Web users can download a video in a matter or seconds, Web sites will not create many video products to sell online and Web users will prefer to read text, watch television or use their VCR.

Increased bandwidth will also benefit education and health care services. Educational services will be able to use more video programming to supplement other online resources. The Web can also be a very useful tool in medical education and for the delivery of health care diagnostic services. Today’s Web users can access some information from their health plans and physicians about medical conditions, symptoms and suggested treatments. Increasingly, they will be able to schedule appointments, pay bills, and check the status of their claims online. As new equipment is developed for remote diagnosis, doctors will be able to diagnose some medical conditions and recommend treatments to patients via the Internet (state laws and regulations regarding telemedicine and licensure may limit how widely remote diagnosis is used). However, because some medical diagnostics require very high-quality images (poor resolution could give the impression of a tumor or a fracture where none exists, for instance), improvements in bandwidth, image quality and reliability will need to occur before telemedicine and remote medical diagnostics emerge as viable industries on the Internet.

Most Internet purchases are currently made by entering credit card and delivery information on a computerized form and transmitting it

electronically to the retailer. Even though consumers are accustomed to giving credit card information over the telephone, many are reluctant to give it online for fear that it will be stolen or misused. This reluctance is often cited as the largest barrier to the growth of retail sales on the Internet.

Web retailers believe that concerns about credit card security will lessen, particularly as more people shop online, have trouble-free experiences, and tell their friends and relatives about them.

Smart cards and digital cash will also be used for electronic commerce. Instead of reentering name, address and credit card information each time a purchase is made at a different Web site, information already stored on the smart card will be transmitted to the merchant electronically, saving steps for the consumer and reducing fraud by automatically validating the consumer's identity. For those consumers who wish to purchase goods or services anonymously, digital cash and stored value cards (cards worth a set amount of money) will also be available at banks and other companies for use over the network.

4.4 RETAIL SALE OF TANGIBLE GOODS

In addition to goods and services that can be delivered electronically, the Internet is also used to sell physical goods. Increasing demands on leisure time and the improvement of overnight and second-day delivery services that spurred the growth of catalog shopping in the 1980s and 1990s are now leading people to shop over the Internet.

Internet consumers report that they shop on the Web because of convenience, ease of research and good prices.

Internet retailers pursue a variety of strategies to attract customers. Just as one would find in traditional retailing, specialty retailers, large discounters and malls/marketplaces have their places online. Internet consumers may also visit online auction houses or use a "personal agent" to help with their shopping.

Most Internet stores try to make online shopping as familiar and as easy as possible. Physical products arranged on store shelves are replaced with electronic catalogs that include photographs, detailed product descriptions, pricing and size information. Third-party reviews may be available to assist the buyer in choosing between different brands or models. When ready to make a purchase, the customer clicks on the product and puts it into a virtual "shopping car," and may continue shopping or proceed directly to check out. First-time customers enter basic name and address information, along with a credit card, hit the enter key on the computer, and the transaction is completed. Recognizing that customers may want to speak with a company representative directly in some instances, many Internet retail sites offer toll-free customer service numbers.

How can virtual images on the Internet replicate the sensation of picking up a product, feeling the material and its texture or sturdiness, trying it on (in the case of clothing) or sitting down on it (in the case of a sofa) before making the decision to buy?

As described earlier, Internet retailers offer very detailed product descriptions online. Many provide toll-free numbers for customers who prefer to speak with a sales representative before making a purchase. As video and voice become more widely used, some Internet sites can be expected to give customers the choice to click on a button and speak directly with a customer service or sales representative via the Internet. As bandwidth increases, three-dimensional images that show the product from a variety of angles will supplement or replace the flat photos on most sites today. Customers visiting Internet furniture stores will be able to furnish their own homes and apartments by “dragging and dropping” furniture and accessory icons into rooms the customer has made to resemble those in his home. This feature will enable customers to gauge how well different pieces of furniture fit into a room of a given size, and which furniture styles or colors work best together.

5. CHALLENGES AHEAD

Businesses have raised three potential inhibitors to the widespread adoption of Internet Commerce: The lack of a predictable legal environment concerns that governments will overtax the Internet and uncertainty about the Internet's performance, reliability and security.

The pace of technological development and the borderless environment created by the Internet drives a new paradigm for government and private sector responsibilities. Creating the optimal conditions for the new digital economy to flourish requires a new, much less restrictive approach to the setting of rules.

- Governments must allow electronic commerce to grow up in an environment driven by markets, not burdened with extensive regulation, taxation or censorship. While government actions will not stop the growth of electronic commerce, if they are too intrusive, progress can be substantially impeded.
- Where possible rules for the Internet and electronic commerce should result from private collection action, not government regulation.
- Governments do have a role to play in supporting the creation of a predictable legal environment globally for doing business on the Internet, but must exercise this role in a non-bureaucratic fashion.
- Greater competition in telecommunications and broadcast industries should be encouraged so that high-bandwidth services are brought to homes and offices around the world and so that the new converged market place of broadcast, telephony and the Internet operate based on laws of competition and consumer choice rather than those of government regulation.
- There should be no discriminatory taxation against Internet commerce.
- The Internet should function as a seamless global marketplace with no artificial barriers erected by governments.

As with any major societal transformation, the digital economy will foster change and some upheaval. The Industrial Revolution brought great economic and social benefit, but it also brought about massive dislocations of people, increased industrial pollution, unhealthy child labor and unsafe work environments. Societies were often slow in responding to these negative side effects.

Similarly, the digital economy may bring potential invasions of privacy, easier access by children to pornographic and violent materials and hate speech, more sophisticated and far-reaching criminal activity and a host of other as-yet-unknown problems.

The private sector and government, working together, must address these problems in ways that make the Internet a safe environment while not impeding its commercial development.

Governments also have to put in place the human resource policies necessary for the digital economy. If the trends as described continue, millions of jobs will likely be created, while millions of others will be lost.

The good news is that the net economic growth anticipated by this digital revolution will likely create more jobs than those that are lost. Further, the jobs created are likely to be higher skilled and higher paying than those that will be displaced. However, it is clear that we will face great challenges in preparing the current workforce and future workers to fill the new jobs tha will be created. If we do not have a sufficient number of well-educated and trained people to fill these jobs, then the good news can turn to bad.

If these public policy issues can be resolved, and electronic commerce is allowed to flourish, the digital economy could accelerate world economic growth well into the next century.