

Chapter 1: The Internet: a new environment

“There is no there, there.” *Gertrude Stein.*

“There will be no more there
We will all only be here.” *MCI television commercial.*

The Internet is like Los Angeles. Upon arriving, it seems to be no place and yet a place. Los Angeles is quintessentially American. The city of Los Angeles is a simulacrum for the Internet. The Internet sprawls; it has little or no form; no one is in charge.

What is the path to the Total Network where one can connect at any time from any place to any source of electronic information one wants or needs? Is it a series of methodical steps that will allow technologists to create a digital construct according to some master plan? No, the path to the Total Network is more like the series of events that has led to the creation of a sprawling metropolis such as Los Angeles. A vast expanse that has grown organically within a specific geographic space. The Total Network, like the Internet that is its ancestor, will evolve in the same way.

Like Los Angeles, the Total Network will be a dynamic place with good areas and bad. As new space is needed, the city fathers provide. Others make do. Luxury and affluence sit cheek-by-jowl with poverty. Somehow it works.

And millions of people use it, live in it. Like the city of Los Angeles in its early days, the Internet is a construct of America. But the Internet has ignored national boundaries and created a virtual community in an electronic environment that few recognise as a new communications medium with its own rhetoric and rules. The Internet is the first popular embodiment of the logical evolution of a single computer, to a local network of computers, to a global network of computers.

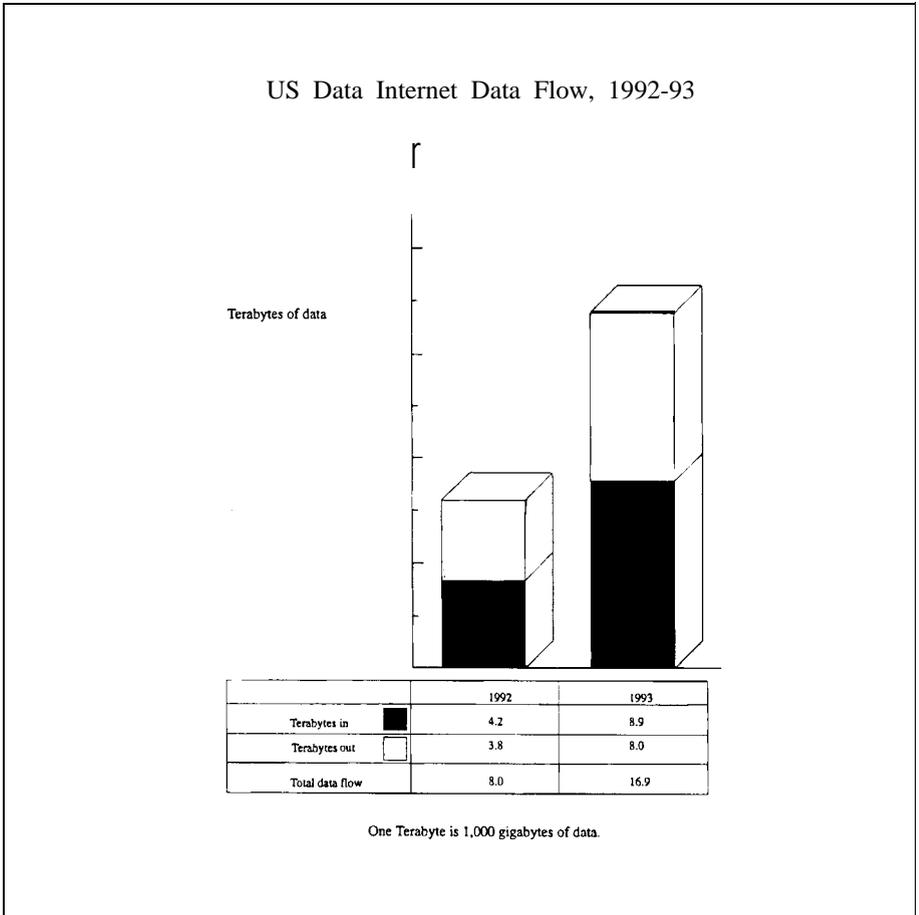
Unfortunately, the Internet has become a buzzword that subsumes different and often mutually incompatible technologies in one tidy metaphor, the ‘Information Highway’. And as quickly as night falls, the headlights of the Internet blaze into the eyes of oncoming drivers. The early 1990s marks the emergence of one information environment, a *datasphere* in which organic change, evolution and cataclysmic change comprise its natural order. From this global web of computers, the Total Network will emerge some time in the next century. Our focus is upon this new medium and challenges and opportunities it presents by the turn of the century, Year 2000. Like L.A. or automobiles, the Internet has changed the world and provided a glimpse of an electronic construct — an environment created from 1 s and 0s and millions of people interacting over data lines — of a magnitude and potential never before possible.

1. An American creation

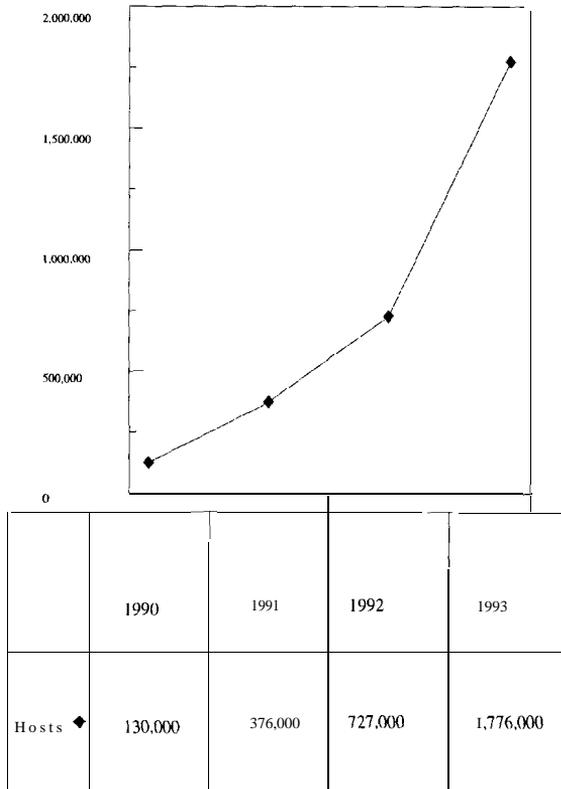
The Internet is a product of the American economic system, part planned and part unexpected. It has its roots deep in the military-industrial complex of the Cold War era. For 30 years, the principal users of the various networks that collectively form the Internet were scientists and engineers. This homogeneous user community gradually expanded into the broader academic community. Today the Internet has reached a global audience, something its designers never envisaged. A phase transition has occurred. The Internet, in the words of nuclear physicists, has 'gone critical'. In that change from one state to another, the Internet has become something that is easily mistaken for just another electronic medium. It is not.

To a first-time user, the highway is an apt comparison. The infrastructure of large highways and smaller roads bears some resemblance to a schematic of the cables, wires, hubs, routers and other technical arcana of a global telecommunications system. One enters the Internet via an on-ramp and with a few keystrokes, goes places.

But extending the metaphor is painful and somewhat misleading. Electronic data



Worldwide Internet Hosts, 1990-93



Source : Mark Lottor mkl@nisc.sri.com

packets do not behave like automobile and truck traffic. The pace of technological change is painfully slow for a physical run of highway. The ease and speed of change on electronic highways is continuous and rapid. The speed and surprise of constant change is perhaps the most powerful reminder that the 'Internet' behaves in a quite different way from macadam roadways.

Because the Internet is not a single entity, no one is in charge. The committee approach — perhaps more correctly phrased as the technical feudal chieftains' system, or the wizard technologists' management technique — worked when the Internet served its comparatively homogeneous community of users.

For commercial, technical, social and practical reasons, millions of users discovered electronic information with a twist. Unlike the commercial information services, the Internet was almost free. For many users affiliated with an organisation conducting government work or with some type of academic affiliation, the Internet *was* free. The only cost of access was the computer and modem.

With the advent of the Clinton Administration, the Internet became a cause *célèbre*. The issue put miles on the Clinton-Gore political odometer. Invoking the super-highway image reminded Americans of the automobile and the freedoms it alleg-

edly has brought and will continue to bring. Perhaps more importantly, the information superhighway provides a convenient way to evoke the landscape of a digital utopia, the so-called convergence of television, telephony, computers, software and the entertainment industries.

The Internet has become a code word for making education available to everyone, providing instant access to the most recent films from the television set, a way for American businesses to regain their competitive advantage and a litany of benefits that baffles and bedazzles.

The fact is that the *Internet* is now a catchphrase. The term is applied as an all-purpose word when commentators want to discuss television, databases and telephone companies in one breath. The media attention has indeed served a useful purpose. For more than 30 years, commercial online information services have tried to catch the imagination of 'consumers' and, in general, have done a miserable job of marketing. The user communities of a professional online service such as those offered by West Publishing, Dialog Information Services, STN, or the Japan Information Centre for Science and Technology, number their worldwide users in the tens or, at best, hundreds of thousands. Even a commercial service such as CompuServe, arguably the grandfather of 'consumer' online services, is only now approaching a million passwords -not daily users, just passwords after almost 20 years of effort.

2. Explosive growth

Within the last year, Internet has surged to more than 20 million users, although no one knows if one password represents a single person, a group of people, or simply an unused address sitting in a node half a world away. Based upon data from the Network Information Centre, double digit growth is taking place throughout the system, on every yardstick, and in more than 60 countries. The Internet, as a mechanism for linking users with remote computers, has done what no commercial service did: the Internet created a new global market. And that market is going to be exploited, first in the United States where commercialisation is moving forward at full throttle, and, somewhat later, in other developed countries. What the Internet will become by the Year 2000 is a digital construct of incredible magnitude. Virtually all research, academic and commercial organisations will be connected. Remote computing will be the norm. IBM's planners once estimated that the world would not need more than a handful of computers. What the world wants, it seems, is just one computer comprised of every computer connected together. Data will ripple and flow with little heed of time or space. Nothing quite like the Internet has ever existed before.

In conducting the interviews for this study and reading thousands of items posted on the Internet, it became obvious that the Internet is something new. It is like an unexplored territory that invites the hardy settlers (the early technologists, for example), then attracts wave after wave of commercial interests (the entrepreneurs who are trying to make a dollar, pound, or franc from the electronic real estate), and finally the mass users who care not one whit for the underpinnings of the Internet. (In Clinton-speak these people are 'consumers in a free market economy').

One may wish to keep in mind that the more advanced Internet applications are limited to a handful of users who have access to the fastest telecommunication links and the most advanced hardware and software. Technically, live video can be transmitted over the Internet, but it is likely to be several years in the future before the home television will be a widely-available suitable 'on-ramp' to the Infobahn in the most advanced countries. It may well be after 2000, if ever, before the average citizen connects. Despite the rose-coloured Californian dreamscape reached via the information highway, a cheap, set-top converter may not have the horsepower to do much more than let the customer order a video or buy a jar of face cream from the interactive shopping store.

This does not mean that opportunities do not exist. They do. The keys to success will be found by those who recognise the characteristics of the new medium called 'the Internet' and develop usable applications that people need and want.

3. Principal uses of the Internet

On the surface, the principal uses of the Internet are electronic mail and data transfer. The Internet provides them as lowest common denominator services; that is, Internet connections support messaging and copying files from location to location. The driver for the explosion of data packets — the smallest unit of information that the Network Information Centre tracks — is cost. Using the Internet in the United States is less expensive than using commercial services with similar functionality. Outside the United States, commercial services may not exist, so the Internet connection becomes the lifeline for computer-literate people who want to talk to colleagues throughout the world. Because messages can be posted in open discussion groups as well as sent as private communications, the Internet fosters collaborative communications. A question or a comment can evoke numerous responses. Thus people pool their ideas and the collective individual resources are enormous. Instead of one person thinking in isolation, the Internet thrives on interactive and collaborative interaction. The users become participants in a digital thought process that is only now beginning to be recognised as an 'invention' as revolutionary as was printing centuries ago.

Without the considerable historical support of the Internet by the US government, the Internet phenomenon would not be present. This begs the question, "What happens when the US government funding is reduced or cut off?" A further question: "How will under-developed nations build the telecommunications infrastructure, train citizens, and equip them with the computers and software necessary to use the Internet without government funding?"

The answer in the United States is, 'Free market forces.' The answer for under-developed countries is, 'Not for a long time.' Countries falling between the US and the poorest countries in the world fall on a continuum which will blend government funding with private sources of capital in a way appropriate to each society.

Thus, the surge of usage in the US will be followed by successive waves of new users as funds and infrastructure become available in different countries. The end result will be a foundation for a Total Network. When connectivity is achieved, the

promise of the Internet will be realised. It is difficult to visualise such an information construct or estimate exactly when it will be achieved.

4. What the Internet is

The Internet is real, very real indeed. Its 'realness' is quite different from any other type of electronic information medium that has previously existed. To be sure, there are easily recognised ancestor to the Internet; for example, the Arpanet, the original defence network linking experts in a handful of research laboratories at prestigious US universities. The databases on the Internet have the familiar characteristics associated with digital information on commercial online services. Its electronic messaging features are neither better nor worse than those available from MCI, AT&T, Prodigy, Minitel and dozens of other providers. Privately-operated networks can move very large files from point to point in a matter of seconds. The list of individual attributes can be extended easily. The point is, however, that only the Internet blends all of them into a single, low-cost *environment*.

The Internet operates like an ecosystem. Checks and balances are inherent in the dynamics of the interaction of millions of entities, thousands of pieces of hardware and an unknowable number of lines of code. The Internet is a new type of communications medium and is as little understood as were radio and television when they first appeared.

It shares characteristics with many more tangible media; for example, it is possible to use the built-in microphones in Sun Microsystems computers linked to the Internet and carry on a voice conversation. Television images can be transferred from one or more computers so students in Virginia can collaborate with their peers in a small school in Germany. Scientists can seek advice from colleagues scattered throughout the world.

If one strips away the technical jargon of the Internet, it has these characteristics:

- It is self-organising. No single person or group is in charge. Therefore, the data structures, services, technologies evolve to become 'good enough' or 'workable.' Over time, the Internet has defined non-proprietary ways to handle a wide range of network-related tasks economically, without the proprietary constraints routinely imposed by commercial organisations upon their clients, and by a process of gradual, incremental improvement throughout the system. As a result, the innovative power of the Internet has been overlooked. Crossfile searching, natural language searching and image-enabled graphical interfaces are three examples of the software emerging from the Internet.
- The Internet is big. No one knows how big, but it is perhaps 20 times larger than CompuServe which has about one million passwords. The Internet is growing about 12 percent per month. Growth curves for the number of computers, the amount of data transferred, the number of data packets look like vapour trails from F- 16 aircraft.

- The Internet is magnetic. Whether the media hype, its low cost or the amount of data is the key factor, is not ascertainable. The irrefutable fact is that the electronic information available on the Internet, regardless of its form, acts as a giant magnet. Users are drawn toward the data pools in such numbers that certain servers are unable to keep up with the demand and must limit access to the data on their node. Each additional computer connection becomes a database producer and an information consumer. Thus, the potential of the overall system expands.
- The Internet is anchored in advanced technology. The main transmission lines or backbones are among the most capacious available anywhere outside of transmission testbeds or research laboratories. There is no massive upgrading across the entire system. Instead there is continual enhancement of bits and pieces. The overall effect is what the Japanese call *kaizen*, or continuous improvement. The processes operate on software, nodes, everything within the Internet. Think of the changes as a process of engineering an increasingly robust and healthy ecology. The behaviour of the technology, its users, and the applications of the system, becomes more complex, diverse and capable over time.
- The Internet provides a mechanism for collaborative communication. Most telephone conversations are dialogues. Interaction among people on the Internet is richer, involving many voices. Furthermore the collaboration can be time-shifted. People in different time zones or from different countries can interact when they wish. Collaborative communication will be enriched with audio and image information in time. But the characteristic of the Internet is interaction on a hitherto impossible scale. The result is an information engine that operates like a hive rather than a Boolean equation.
- The Internet is organic. George Gilder, a popular American futurist, argues that computers linked in networks amplify the power of the computer's user exponentially. The Internet's expansion of information, however, expands in several dimensions. For example, a single computer linked to the Internet is a user of existing information on the network, a trigger or catalyst for the production of information by other users, and a publisher of information. Consider that a single message can trigger a flood of responses. The overt marketing of immigration legal services on several thousand discussion groups triggered more than 30,000 responses (mostly angry) in less than 24 hours.
- The Internet spawns virtual communities. Individuals who exist only as electronic personae form special interest groups, fight, argue, love, hate and even get married. Often the 'voices' are only glowing characters on a CRT. Woe to the person or organisation who does not understand the power and force of these virtual communities. Nations are simply not prepared to cope with the actions of virtual special interest groups such as those that supported revolt in China and the former Soviet Union with

Term	Comment
Data highway	Synonym for information highway
Data superhighway	Variant of information superhighway
Data interstate	Interstate is an Americanism for a major roadway
Digital highway	Variant of information highway
Infobahn	Coinage to make the phrase 'information highway' more compact
Information Highway or Info highway	Used as a generic term to include broadcast, telephony and telecommunications that blurs into one seamless flow of information
Information superhighway	Often used to describe high-capacity or wide bandwidth networks
Internet or internet	Used as a synonym for all computer-accessible services or as an all-purpose term to describe private and public networks using TCP/IP
National Information Highway (NIH)	Synonym for the NII
National Information Infrastructure (NII)	US government catch phrase for electronic information; may refer to a single technology such as telecommunications, or a cluster of technologies

messages, tips and moral support. Traditional notions of copyright and security find little purchase in the digital terrain.

Internet guide books often use the analogy of the map or the explorer navigating unknown waters as a means of giving the Internet environment substance. The concept of a territory or an environment is closer to what the Internet 'is'.

The Internet Can Be.. .

In a way, the Internet is the logical outcome of the openness and individual licence of the American system. Traditional commercial online vendors such as Dialog Information Services or Mead Data Central are tidy Swiss hamlets. The Internet is Los Angeles. It supports the dreams, hyperbole and exaggeration so necessary to galvanise conservative businesses into spending massive sums of money to develop the uninhabitable into profitable developments. The Internet as the Land of UNIX worshippers is succumbing to entrepreneurs, commercial interests, government regulation and the strengths and weaknesses of the electronic equivalent of digital urbanisation.

This similarity to Los Angeles has some truth in it, the ecology of the Internet will be stressed by the sharp increase in usage. Already signs of tension are evident between Netziens (good citizens of the datasphere) and Newbies, (the Internaut's derisive term for those unfamiliar with the UNIX world).

[1] This list of synonyms for the Information Highway appeared in Nelson King, 'Data Highway under Construction,' *Computer User: Office Technology for the 90s*, March 1994, page 30 and 31. *Computer User* is published MSP Communications, 220 S. 6th Street, Suite 500, Pillsbury Center-South Tower, Minneapolis, Minnesota 55402-4507.

5. What the Internet is not

As the Internet environment evolves, the Year 2000 will bring few surprises. Unlike those who believe that an information highway will permit different and technologically incompatible businesses to converge, the Internet will:

- Not be a data superhighway accessible to everyone equally. Use of the Internet will remain the purview of the educated and affluent. No matter how ubiquitous online access becomes, no matter how easy software is to use, no matter how many gigabits of data can flow down cable television connections, the uneducated and poor will not be active participants in the electronic environment. Information flows stratify societies and erode large-scale structures. A ‘market of one’ is possible only in an Internet environment.
- Not converge telephones, televisions, computers, entertainment and publishing into one megabusiness. The discrete technologies will become increasingly facile at exchanging certain types of data. But the Internet will not subsume other types of information and communication. A blending of several colours into an infinite number of shades is closer to what will actually happen. When red and blue are mixed in different proportions, a large number of ‘in between’ results. Red and blue do not disappear. Different technologies will blend in the same way. The Internet fosters innovation; it does not simplify.
- Not drive commercial services out of business. The Internet represents one way for different computers to communicate transparently despite the differences in their architectures and digital language. Commercial services will fail; others will rise. The Internet may weaken some organisations. But the Internet is no cut-throat competitor.
- Not transform business. There is a perception among many in the software and publishing business that the Internet will alter certain fundamental businesses. The Internet is a new medium, and it is not well understood. There are few signposts to success or failure. The Internet phenomenon underscores the hunger among certain individuals and organisations for a collaborative information environment. Books will still be printed; software will be distributed in carefully controlled ways; motion picture studios will manage the release of blockbusters. The Internet will offer new options within the present context.

The emergence of network publishing will be one of the most important consequences of the Internet and the Total Network. New types of information products will emerge from the collaborative process. On-demand printing technology matches well with Internet-accessible data warehouses. Intelligent software will create new information constructs from data flows. The ‘products’ or ‘deliverables’ from these processes will have value and open new revenue streams for authors and information ‘creators’.

The interest shown in the Internet is an important message in itself. Traditional communications media do not satisfy certain needs that particular markets have. The Internet will facilitate change and innovation because it is a new medium with new capabilities. A new option does not wipe the slate clean. Traditional media will persist, and some will flourish in the datasphere.

It does trigger ‘vectors of change.’ This term refers to developments that move in a particular direction, seemingly of their own accord. They move because hundreds or thousands of people make similar decisions and collaborate to make their wishes real. In the course of this Briefing, six vectors of change unleashed by the Internet will serve as touchstones on the path to the Total Network.

- *Network publishing.* The Internet facilitates any user at any point in time to disseminate information to a community. Such a communication medium has never before existed on a global scale.
- *Government publishing.* The Internet provides government at all levels with a way to put information into the hands of citizens. The governments may be the local land office or the combined data flows from a country’s administrative entities. A conduit of this type has never before been available to either citizens or government officials. Furthermore, governments are likely to give some data away for ‘free’; other governmental bodies may charge for access to information in certain forms. Professional and financial publishers will find themselves operating in a different environment. New survival skills will be needed.
- *Expanding bandwidth.* Components of the Total Network will be able to handle more types of information more easily. Sound, colour images, full motion video and three-dimensional simulations will become common-places on the Internet landscape. Today, investors speculate about the educational, medical and entertainment value of more bandwidth. As the Internet becomes more facile in moving large amounts of data around, new applications will be created because the infrastructure — that is, the environment — fosters it.
- *Copyright and security.* The concepts and practices of affording copyright protection to electronic information are still in their formative stages. Hundreds of years of copyright law have little relevance in today’s Internet environment and in tomorrow’s Total Network. The laws of print do not apply in the global electronic environment. This does not mean that intellectual property and confidentiality cannot be protected. They can, but the techniques will be developed over time and are likely to take different forms.
- *New types of companies.* Hundreds of organisations in the United States are trying to create a ‘killer application’ for the Internet. One candidate is a graphical access tool built on the Mosaic tool set. But what the Internet may do is create an environment in which new types of companies will develop. In Sebastapol, California. there is O’Reilly & Associates: a few

years ago, O'Reilly could be described as a publisher of technical books about UNIX. Today, O'Reilly gives away information, publishes the 'Global Network Navigator' software for Internet access, funds Internet Talk Radio, sells audio cassettes, and provides an online Interactive shopping service. What kind of company is O'Reilly & Associates? There is no word to describe O'Reilly because it is a new type of organisation. As the Internet expands, the number of new companies will increase sharply. Traditional publishing companies are not likely to see O'Reilly as anything other than a book publisher dabbling in online. For some, this certain blindness may prove fatal.

- *Collaborative communications.* AT&T Bell Laboratories demonstrated a video phone more than twenty years ago. The technology for delivering voice with other information objects has long been available. The video phone went into a closet. The Internet's video offerings have exploded. The Internet builds community. Collaboration, therefore, is inherent in the Internet. The interaction can be in real time or time-shifted so the discussants can read and respond when they want. In this environment, video and imaging are a natural part of the collaborative process, not a gimmick.

6. Difficult issues

Against this backdrop, the information presented in the following chapters presents only the most superficial glimpse of the complex, challenging issues the Internet raises. Today there are no easy or economical ways to upgrade certain computer networks to Internet compatibility. Copyright and security are troublesome and will remain so. In my effort to describe sophisticated technologies, I have relied upon many authors, reference books and databases. I am sure that I have omitted certain facts that area specialists would include. I have also explained points that others more knowledgeable than I would perhaps have ignored altogether. Any errors in this Briefing are a result of my efforts to approach the Internet as a new medium that will have continued influence for years to come.

But the Internet thrusts social, political and ecological issues into the spotlight:

- How can Internet access be provided to those without intellectual, technical or financial resources? It is clear that access to a public network is a strategic asset. Without that asset how can someone compete in a networked world?
- What is the role of governments in the Internet? At this time, the Internet is an American institution that has been accepted as it is by other countries. The nature of the Internet is such that it cannot easily be controlled, managed or regulated in the present environment; some users' governments have yet to address the implications of this simple fact. Furthermore, access to information may bring changes to nation states.
- Should we think about the ecology of the Internet's environment? Although a digital construct, the Internet is also a place. As more users

populate the environment, the environment will be 'impacted', to use a favourite term of the environmentalists. Will the elite, communal life of the Internet be changed into the digital equivalent of a mixed-use urban landscape?

None of these issues has been discussed thoroughly. Some of these concerns are not recognised as 'issues' at all. What is unmistakable about the Internet is that it is new. Its unspoiled environment is appealing. Like the myth of the American frontier, it seems limitless. Riches are within anyone's grasp.

We now know that frontiers have boundaries. The Internet has its limits as well. But the Internet is evolving and largely unexplored. Not surprisingly, it will take years for the maps to be completed and the flora and fauna catalogued. The Internet seems to many the New World of the next millennium. Plans are in motion, explorers are venturing into the environment, and traces of gold have been found. No one knows how the taming and husbanding process will unfold, but the following pages provide glimpses of the challenges and opportunities ahead.