

Chapter 10: Internet 2000 and the Total Network

Alice: Cheshire Puss, would you please tell me which way I ought to go from here?

The Cat: That depends on where you want to get to.

Lewis Carroll, Alice in Wonderland

“The Technology revolution is getting up to speed just in time to coincide with the arrival of the global village.”

Tom Peters, The Tom Peters Seminar, 1994

Where do users of the Internet want to get to? Is the future 500 cable television channels and Disney films on demand? Is the future a blend of powerful technologies that create new types of information products and services? Is the Internet an engine to create jobs, spark economic growth and trigger innovation? Is the Internet a pathway to a better job? A way to find a small group which shares similar interests?

Technologists would argue that a Total Network is the ability to plug into whatever computer system that has the information one needs. In a word, the goal is effortless *connectivity*. No one has to use the full resources of the Total Network at each log on. It is the capability to have access when it is needed to information germane to one's personal and professional life. A Total Network will evolve, but not by Year 2000, although pockets of connectivity will exist in certain test implementations.

The key point is that the first steps toward a Total Network have been taken. The Internet remains largely unfriendly. Nevertheless, millions of people have confronted UNIX, one of the most hostile operating systems yet invented, and liked what they found. The result is that millions of people understand Internet as a new way of interacting. In that process of discovery, they have invented a new medium. The impact of this discovery will have a profound affect on people throughout the world. The Internet is not a thing, it is now an idea. And it is an idea that will not soon lose its appeal.

We now expect routine advances in computer, software and telecommunication technology. Each advancement virtually guarantees that network capabilities over time will increase. By the start of the new millennium, network applications that are beyond the reach of individuals and small organisations will become cheaper and more widely available. Instead of saturating demand, these services will fuel it. With each advance across a spectrum of enabling technologies, new uses for the Internet-type of network will be found.

1. Likely scenarios

Because the Internet represents a new medium, there is an understandable curiosity about its stability, reliability, durability, even survivability. The business climate in many countries is volatile. Economists have begun to warm to the idea that business processes are interacting on a scale and at a speed that makes prediction risky indeed because the behaviour of economies is complex. Complex behaviour embraces chaos and phase transitions more easily than tidy formulae. The science of chaos suggests that prediction can operate only when certain conditions are met. When the conditions change, the systems behave chaotically and predictability becomes difficult. One does not know when the transition from stability to chaos will occur nor what will happen in the new state.

However, the Internet is too important to ignore. The Internet has arrived and must be reckoned with. Describing the Internet as it is at this moment is impossible for reasons anchored in its size, the built-in mechanisms that ensure technological change, and number of people and organisations cultivating new ventures within its environment.

Three scenarios warrant brief examination. The Internet in 2000 is likely to reflect none of these circumstances of course, but bits of each scenario will be found mixed in with some elements that we cannot predict.

1.1 Scenario One: *Commercialisation*

If one accepts the premises of the free market, the Internet will evolve from a no-cost, low-cost public information service to a for-fee public utility.

In this scenario, the US government provides network access only to a limited number of organisations, primarily those engaged in government contract work, certain research institutes and selected academic institutions. The US government role in networking becomes almost identical to the one it played in the 1960s and 1970s.

Technically the Internet Protocols and connections remain in place. Passwords and various security techniques allow authorised users to move from the secure network to the public network as required. However, public access to the secure network is not permitted.

Within the public network arena, the Internet becomes a mechanism for various telecommunication, information and entertainment companies to move data around, with connections from hard-wire networks such as those owned and operated by TeleCommunications, Inc. and other cable television companies. Setting aside wireless communications, networks with massive bandwidth and smarter software for a moment, Internet users in the United States will have to pay for access and for many services now provided without charge.

In other countries, the desire to commercialise information services and privatise state-owned and operated telecommunication companies will vary. Government subsidies will continue to play an important role where use of the Internet coincides

with the government's industrial policy or its other agendas. Many countries may not permit unlimited access to the Internet or other public networks because such access diverts funds needed elsewhere or poses some real or perceived threat to the government itself.

Within the Internet's virtual communities, users wanting commercial information will be able to get ever-easier access to it. Individuals and companies will offer a cornucopia of services. The catch? Money is required for most activities. For those wishing to use free information services, these will be available as well and probably on a larger scale than now exist. As the number of users increases, the greater the base for special interest groups. But access fees are likely to rise as companies try to recover their investments in infrastructure and information.

In the commercialised scenario, there are some important differences that are likely to emerge:

- The marketing of goods and services on the Internet will be formalised. Conventions and etiquette of what, when and how to market will be common business school lore. Unlike the present when every marketing effort is without precedent, by 2000, grooves will be worn in the paths that seem to lead to results.
- Competition will be keen. A time span of 36 or 48 months is too short to permit one or two commercial firms to dominate a public network. Because of technology's tendency toward faster and cheaper, network bandwidth will expand. The bandwidth must be filled, and entrepreneurs will be able to seize certain opportunities faster than some larger firms. Prices will remain competitive among the largest companies in order to maintain market share. Thus, at both ends of the spectrum, price pressure will be exerted.
- Certain business segments will be forced to adapt or die. As the fever for commercialisation spreads, cost-recovery and value-based pricing will be applied to information produced by public agencies, governmental entities, even libraries. The combination of ready access and electronic debit systems will allow a city surveyor to charge a citizen for a map or survey report. Commercial companies will find that the competition from these non-commercial information companies subjects their traditional businesses to new stresses.
- The customer will have a larger array of options available. For those on tight budgets, the low-cost public access service may be appropriate. For many organisations, specifications for information will be rigidly defined and only certain firms can comply. Firms able to provide value-added services will command a premium from their customers. For those with more modest resources, the lowest-cost commercial provider will be the information source of choice. Providers who cannot cover costs or find a benefactor will struggle for real estate on the information highway.

- Bundles and packages will be routine. Strategic alliances among certain organisations will allow marketers to mix and match products and services to appeal to specific customer needs. A telecommunication company may offer sharply discounted rates for customers who use a particular for-fee information service. Other firms may provide free access to certain commercial services as an inducement to shift long distance carriers or as a way to earn bonus air travel miles.
- Regulation becomes a matter for the injured party to enforce. Copyright and standard network security procedures are not likely to be enough to protect intellectual property. Access will have a price and the fees will be situational to an increasing extent. In order to restrict access to certain information, the data offered on the commercial services may require that the user sign an agreement that limits further dissemination of the data. Technology that forces automatic deletion or permits remote tracking of digital data will become increasingly popular.

In this first scenario, the merger and acquisition activity will be frenetic. Companies with electronic market share will command premium prices. For firms with cash, buying customers and technology is cheaper, easier and smarter than reinventing the wheel. The Internet successes will, therefore, command high prices. At the start of the millennium, concentrations of ownership will become visible, particularly in the North American and Western European markets. Commercial timesharing companies will be under ever-increasing competitive pressures. Consolidation seems inevitable.

The Internet has a special culture, a mix of pioneer, social consciousness, and hacker. The commercial Internet will be transformed from unsettled, wide open spaces to an urban environment, probably the digital equivalent of Detroit or Los Angeles.

1.2'SCenario Two: Collapse

The Internet lore contains a number of anecdotes about outraged users, or net.gods, crashing a server by directing sufficient traffic at the machine to kill it. Electronic mail sent in protest slowed a machine in Phoenix, Arizona sufficiently to cause users to log off when the system did not handle tasks fast enough.

With the double-digit growth rates continuing over a span of three or four years, popular Internet sites—for example, the collection of Windows software at Indiana University — cannot keep up with the demand for access with the result that, for most users, the server is for practical purposes off the network and unavailable.

The second likely scenario argues that the Internet is a victim of its own success. The infrastructure at many different points becomes over-extended. Large numbers of tiny flaws slow response time, cause electronic mail to be lost and make certain types of large bandwidth activities too time consuming or costly to undertake. These users leave the Internet for greener pastures. 'Greener' means more expensive private networks that offer the Internet user or the commercial user more cost-effective ways to do work. AT&T is building its business Internet because serious

commercial activities cannot cope with real or perceived threats from an unreliable Internet.

The result is, at some point in the future, that the Internet loses most of its charm. Users abandon the system by the millions and switch to a commercial information service in order to obtain the speed or service required.

If we assume the Internet as it now exists disappears, the infrastructure does not. The telecommunication companies have to fill the fibres and satellites with data; otherwise, they experience punishing financial losses.

As a result, the datasphere has the seeds germinating for a new Internet. The reasoning of the large telecommunication companies is likely to follow this chain: [1] We have excess capacity now that 50+ million people are not sending electronic mail to one another; [2] We can offer this and more services at a low price by teaming; [3] As the users expand their usage, we can raise prices and offer better services than the Internet did.

The outcome of a collapse of the Internet would be likely to draw support from several sectors, namely:

- The government sector, regardless of country, would invest or fund services in order to maintain competitiveness or ensure a back up to its own private and secure system.
- Big telecommunication companies would take aggressive action singly and in combination in order to fill the data pipes to capacity as rapidly as possible.
- Entrepreneurial individuals would look at the infrastructure, needs and costs and develop services that attract users.

If the Internet as it now exists ceases to exist (which is not impossible), the cry from the millions of users will be, “The Internet is dead. Long live Son of Internet.”

In the context of the Total Network environment, a global public access network of distributed computers *must* exist. The technological, social and financial climate is such that the Internet is an environment and cannot be allowed to die.

1.3 Scenario Three: Hiving

The third scenario assumes that commercialisation continues to accelerate, new opportunities for products and services present themselves, and technological developments foster the creation of virtual networks or *ad hoc* linkages among different systems. One example might be high-speed Internet access to video servers with French language training tapes. The user simply presses a button on a remote control and the video in Montpellier, France is transmitted via a virtual network to the customer in Morgantown, West Virginia.

The Internet in 2000 looks like a bathtub filled with running water and bubble bath. As the water — the infrastructure — flows into the tub, the impact of the water on the bubble bath generates bubbles — the new Internets. The bubbles fill the available space and then overflow the tub until someone turns off the water or the bubble solution is too diluted to foam.

When the conditions are right, big and little bubbles form, burst, reform and create a highly complex, three dimensional space. *Hiving* refers to the Internet's being a source of other networks and finding itself in an ocean of other networks.

Unlike physical bubbles, the electronic network hive permits a user to move from network to network just as a person switches from Excel to Word. The digital link does not destroy; it creates a temporary connection within the Total Network.

Thus, the network environment becomes increasingly complex until the system lacks the resources to continue its development. Like the diluted bubble solution, it is possible that networks will exhaust the available resources. Insufficient capacity or some unforeseen software capacity can stop the formation of new networks and virtual linkages. But for the foreseeable future, the environment fosters connections.

1.4 Common Threads

In 2000, there is not one Internet, there are many internets in these scenarios. The user can move from network to network, community to community as required by the task at hand. Armed with sufficiently robust hardware, software and telecommunications links, the user can forge a virtual linkage that permits different types of electronic information to be integrated seamlessly in one computing space. An engineer might participate in a video conference, monitor a real time discussion about the World Cup, and watch CNN news on a single display device. The user, not the telecommunication company or the online service, limits the information retrieved. Fees incurred are billed electronically to a credit card, but the user is in control.

It is difficult to conceptualise the Internet in its present form. Few can grasp the scope, power and opportunities inherent in large numbers of Internets each with its own suite of capabilities, data sets and information pools.

Moving from network to network, handling the different languages and cultures, becomes so complex that only intelligent software can facilitate the process. The flows of data are of such magnitude that radically different types of filtering and formatting tools will be required, invented and refined to manage the information storms that are present at all times.

Regardless of the scenario, the range of user options is, for all practical purposes, limitless.

2. Some practical considerations

A number of practical considerations will be paramount in 2000. These include:

- *Intellectual property and security.* The issue of ownership of information will remain a thorny issue. It is unlikely that billing, copyright, patent and legal mechanisms will remove the risk of unauthorised use of electronic data. Different strategies and tactics will be tested. However, once information finds its way into publicly accessible files, it is available. Security codes, encryption and intelligent software are control mechanisms but work on data, not individuals. The effectiveness of external control must be demonstrated. This issue strikes at the heart of protecting certain types of know-how, proprietary technical processes or information, or patentable techniques, processes or inventions.
- *Haves and have nots.* The popular mythology of the Internet relies upon an ideal of equal access to information for personal, scientific and educational purposes. Interactivity, distance learning advocates believe particularly in the US where the school systems routinely graduate people without basic reading and mathematical skills, will help schools do a better job. The larger issue will haunt Internet and other public access services well into the next century. Electronic access amplifies forces that create a two-tier social construct. There are those who have the money, knowledge and equipment required to connect. Those without these resources can consume television shows and use automatic teller machines, but these people (there is no way to estimate what percentage of the world's population will fall into this underclass) will not be part of the Total Network environment. They will be consumers.
- *Commercial databases.* The continuing electronification of societies will fuel database development. Commercial databases will continue to generate revenue and attract a clientele drawn from the world's leading organisations and research centres. However, commercial databases will be under increasing pressure as software tools perform certain information monitoring, filtering and formatting functions for individuals and organisations. In some circumstances, traditional publishers may be "dis-inter-mediated." Certain commercial databases will find that software operating tirelessly for an individual user provides useful background information. The most successful commercial databases will be those that provide value that cannot be added by shrink-wrapped software. Furthermore, publishers or creators of primary information will have more electronic distribution options. Instead of using an intermediary commercial database, users will be able to obtain information directly from the producer of the data. The two forces — agent software and grassroots information publishing — will squeeze certain commercial databases relentlessly.
- *Embedding.* In 1984, a spelling checker was a word processing luxury, Today, mainstream word processors include a spelling checker and

thesaurus. Most users do not know who provides the word lists. The luxury has become embedded. In 2000 Internet access, software filters, automatic flagging of important items and seamless network access to collaborative communication services will be embedded in application software, effectively putting the Total Network in any connected computing device. The complexities will be simplified, and the functions will be available but otherwise out of sight until required. Embedding raises some hard questions: Who decides what information sources will be selected and then embedded? When filtering becomes automatic, how will busy users verify that data are representative and reliable, not just good enough? In 2000 information may be filtered before released into the public access network; how can one ensure that these data are accurate, complete and timely? People want answers. Believing that an informed user will take the time to verify each data point is a testament to one's faith in scholarship but leaves unanswered questions about accuracy, completeness, comprehensiveness and control.

- *Junk, trash and lumber.* As the number of users increases, the amount of data and information goes up. The percentage of excellent information in commercial databases is not known. Experts in information assume that commercial databases are structured and produced to standards that are consistently applied. Information on the Internet varies, of course. Although there are no facts and figures that say what percentage of Internet information is good or bad, one wants to reason that the Internet files will have a larger proportion of trivial or garbage information. However, even though 'good' information may comprise a small percentage of the total, as the number of users goes up, the amount of information, both good and 'noise', increases as well. High value information exists within the Internet, but the user must find it. The commercial database, on the other hand, seeks the customer with the halo of quality that goes with 'real' databases. If one examines the information available on any online service, it becomes evident that determining what is junk, trash and lumber is a tough job. There is no taste committee for electronic information. In 2000 locating and harvesting the right information at the right time will remain increasingly be the domain of software, not people. New directory services, filters, retrieval tools and digital agents or daemons will provide some relief, but there is little hope for a quick resolution of the problem of scanning terabyte upon terabyte of information for the valuable bits.
- *Connectivity.* Despite the excitement about effortless Internet connectivity, forging an economical, reliable and appropriate Internet link is not trivial. In 2000 the burden will be eased because network software will have the sockets necessary to let users plug in. However, plugging in does not solve the problems for an organisation wishing to leverage the Internet. Within a few years, organisations will have to have a wide-area network plan that addresses who will have access to public networks, what applications will be available to users with such connections, and how the Internet and any other networks will integrate into the organisation's

activities. Will the Internet be a communications medium? A marketing medium? Possibly a blend of functions? Solving technical problems does little to address how to leverage the connection to the benefit of the company, its customers and partners. An Internet plan will be a routine part of an executive's responsibilities.

Other issues loom as well. Among those that warrant discussion and debate are the role of the state in an electronic environment. The community to which one owes allegiance may be an electronic virtual neighbourhood, not the physical place of residence. Political issues promise to be significant as well, particularly in view of the evidence that electronic information can have profoundly corrosive effects upon certain structures and institutions. The economic issues cast a shadow upon behavioural and technical issues. If the funds are not available to provide connectivity, can an individual, organisation or nation flourish in a world increasingly dependent upon computers, software, global networking, and so on? Lack of connectivity may condemn certain nations to permanent economic deterioration. When nations fail, the consequences of dislocation, conflict and mass migration cast a pall upon nation states with thriving economies. Can affluent nations afford not to build Internet-capable systems in poor nations?

Internet in 2000 will exacerbate these problems; Internet 2000 will not solve these problems and turn the world into a digital Garden of Eden.

3. The vectors of change

Internet in 2000 is of scant interest to most professionals at this time. The pivotal question is, "What does the Internet mean to *me* and *my* organisation now?" This is a fair question, and the right question to pose.

The meaning of the Internet is not the present web of backbones, computers and software. These are merely the technical enablers. The Internet phenomenon which attracted mass notice in the early 1990s launched new forces into the global business and professional community.

The impact of the Internet is not the 20 million or so people who are discovering the joy of electronic mail and cyberspace. The Internet has metamorphosed from the domain of the academic to a new medium.

The new medium, in turn, brings remarkable tools and building blocks to the attention of millions of people. As the user community has grown and gained experience with an environment in which the network *is* the computer, new forces of change have been unleashed. These are:

-  An individual becomes an information fountain. No gatekeeper prevents new information from being created, distributed, modified and re-used. Exploitation of this capability propagates new business opportunities. A single person with Internet access can create, distribute, support, and innovate with no significant obstructions. An author or database publisher does not need the John Wiley & Sons or the

Dialog Information Services to move from idea to market on the time line set by people with other agendas.

- *Government publishing.* At present information assembled, organised and kept by government entities is simply not available. It will be. The release of these data will have significant impacts upon professional publishers and consultants who sell these data in different formats. But more importantly, access to health, real estate, insurance and other information will act as a trigger for commercial, social and political action.
- *Expanding bandwidth.* Networks, both public and private, will be able to handle imaging, live video and other multimedia data types. The power of pictures is rooted in man's ability to assimilate data visually in gigabyte gulps, not nibbles of words. With bandwidth will come new applications.
- *Copyright and security.* The value of information will become a pivotal point in electronic access. Hardware, software, contracts and many other tactics will be used to make sure that creators of information retain control of their information and are paid when the data are sold. The world's legal systems will be on the trailing edge of the new businesses developed to handle copyright and security concerns. Individuals will have to assume responsibility for their information. The system will provide no protection.
- *New types of companies.* In 2000 words will have been coined to describe companies that provide Internet-related services. Just as Microsoft has expanded into something far beyond a software publisher, hundreds of new companies will thrive in the datasphere of the Internet. With the new companies will come the economic processes that drive the global economy: mergers, acquisitions, strategic partnerships, life and death marketing battles, and so on. The Internet phenomenon will spawn a new industry devoted to providing, exploiting and servicing Internet-related products and services.
- *Collaborative communications.* Telecommuting provides only a hint of the interactive communications environment that the Internet has demonstrated. The plain text collaborative messaging has had the same effect as the early morning aroma of freshly brewed coffee on a still drowsy person. The ability to form virtual teams that will be able to interact using complex information objects, promises to alter forever the ways organisations can approach certain creative and analytical processes. The clumsy Internet of today is a useful demonstration of what will be.

In closing, Internet 2000 is not a single network nor is it likely to be something that has a definite shape and form. The Internet today has created awareness of the potential of linked computers and the benefits enjoyed by those linked to the network.

Internet 2000 will be a way-station on the path to a Total Network. The *Total Network*, of course, is a condition where all computing devices seamlessly integrate as required in real time. That level of connectivity is far in the future. Year 2000 is

nearly at hand. With certainty, the network environment then will be complex, dynamic, rapidly changing and significantly more powerful than what is available today. The networking infrastructure drives change and helps organisations and individuals leverage change.

The path to the Total Network will be filled with twists, switchbacks, and surprises. Old issues will not be easily resolved. New ones will be added. When the challenges are balanced against the benefits resulting from harnessing the vectors of change, Internet 2000 will remain a hyper-accelerator to innovation and opportunity. It will be the primary tool for a global culture that requires instant access to products and services that must be instantly available.